

OECD Business and Finance Outlook 2016

CHANGING
BUSINESS MODELS
OF STOCK EXCHANGES
AND STOCK MARKET
FRAGMENTATION





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Chapter 4

Changing business models of stock exchanges and stock market fragmentation

This chapter provides an overview of structural changes in the stock exchange industry. It provides data on mergers and acquisitions as well as the changes in the aggregate revenue structure of major stock exchanges. It describes the fragmentation of the stock market resulting from an increase in stock exchange-like trading venues, such as alternative trading systems (ATs) and multilateral trading facilities (MTFs), and a split between dark (non-displayed) and lit (displayed) trading. Based on firm-level data, statistics are provided for the relative distribution of stock trading across different trading venues as well as for different trading characteristics, such as order size, company focus and the total volumes of dark and lit trading. The chapter ends with an overview of recent regulatory initiatives aimed at maintaining market fairness and a level playing field among investors.

Main findings

- Regulatory reforms and developments in information and communication technology have increased competition between different types of stock trading venues. The result is fragmentation in two dimensions. First, we find extensive fragmentation of trading between stock exchanges and off-exchange venues, such as alternative trading systems (ATSS) and multilateral trading facilities (MTFs). Second, we also find an increased fragmentation between dark (non-displayed) trading and lit (displayed) trading.
- In 2015, two thirds of all stock trading in the United States took place on 11 different exchanges and the remaining 33% on numerous off-exchange venues. Of all trading, 42% was in the form of dark trading, of which about one-fifth was carried out on exchanges. In the European countries, around 50% of all trading takes place on exchanges and the rest on off-exchange venues. The amount of dark trading in Europe varies across countries from 35% to 48% of all trading.
- Off-exchange trading and dark trading have often been seen as a way for investors to reduce the market impact that could occur if they place large orders on a stock exchange. However, our analysis of trading data for the United States indicates that average order sizes do not differ significantly between off-exchange venues and traditional exchanges.
- Fragmentation does not seem to have affected the distribution of trading in large and small company stocks. Moreover, the distribution of trading in large and small company stocks is fairly similar in countries with fragmented trading venues and countries where trading is concentrated. Since 2000, trading in the 10% largest companies has accounted for 70-90% of all trading, both in the United States and Japan.
- The main concerns with respect to increased off-exchange and dark trading are the quality of the price discovery process, the fairness of markets, and the level playing field among investors. Together with recent enforcement actions against some dark pools, this has opened up a discussion about the rationale for existing differences in regulatory regimes between trading venues that seem to serve similar functions.
- Looking ahead, it is likely that regulatory initiatives in both Europe and the United States will come to focus on regulatory convergence between exchanges and off-exchange venues. It remains to be seen what the effects will be in terms of stock market fragmentation.

Introduction

From a company's perspective, there are two characteristics that make equity capital different from other forms of capital that the company can use. First, providers of equity capital (the shareholders) are not guaranteed any fixed interest rate or any given rate of return on the money that they invest. Second, once the equity capital is provided to the company, shareholders cannot withdraw their individual stakes. These characteristics mean that equity capital is crucial to, and particularly well suited for, long-term corporate investments that have an uncertain outcome, such as research, innovation and the development of new technologies.

Based on firm-level data, Chapter 2 also demonstrated that greater equity financing in relation to debt is essential to promote the long-term focus that is needed for productivity growth. It showed that a higher debt-to-capital ratio was negatively correlated with productivity growth. A recent OECD report (Cournède et al., 2015) addressed the use of equity at an aggregate level, highlighting the role of equity for overall economic growth. The report noted that while an increase in outstanding bank credit was associated with a reduction in long-term growth across OECD countries, further expansion of equity financing was likely to promote economic growth.

There are a number of different sources of equity capital, including the founder's initial equity capital and the retained earnings that are re-invested in the company rather than taken out in the form of dividends. Importantly, a company may also raise equity in the capital market. And since 2000, companies around the world have used public stock markets to raise a total of USD 11 trillion in equity.

During this period the stock exchange industry has experienced profound structural changes. Most traditional stock exchanges have either been acquired by another entity or become subsidiaries of an upstream parent company. The ultimate parent company of an exchange may in turn be a public company with its shares listed and traded on one or more of its own stock exchanges. As part of this transformation many of the national stock exchanges today form part of an international group structure.

At the same time, public equity markets have also been characterised by fragmentation along two lines. First, there has been a fragmentation of trading between stock exchanges (on-exchange trading) and other trading venues (off-exchange trading). Second, there has been a fragmentation between lit (displayed) and dark (non-displayed) trading. Among the driving forces behind these fragmentation trends are advancements in information and communication technology, supported by regulatory reforms aiming to promote competition between different trading venues.

This chapter describes the features and functioning of this new stock market ecosystem. It also discusses how developments may have influenced access to equity capital for smaller growth companies and concerns that have been raised with respect to market fairness and a level playing field among equity investors.

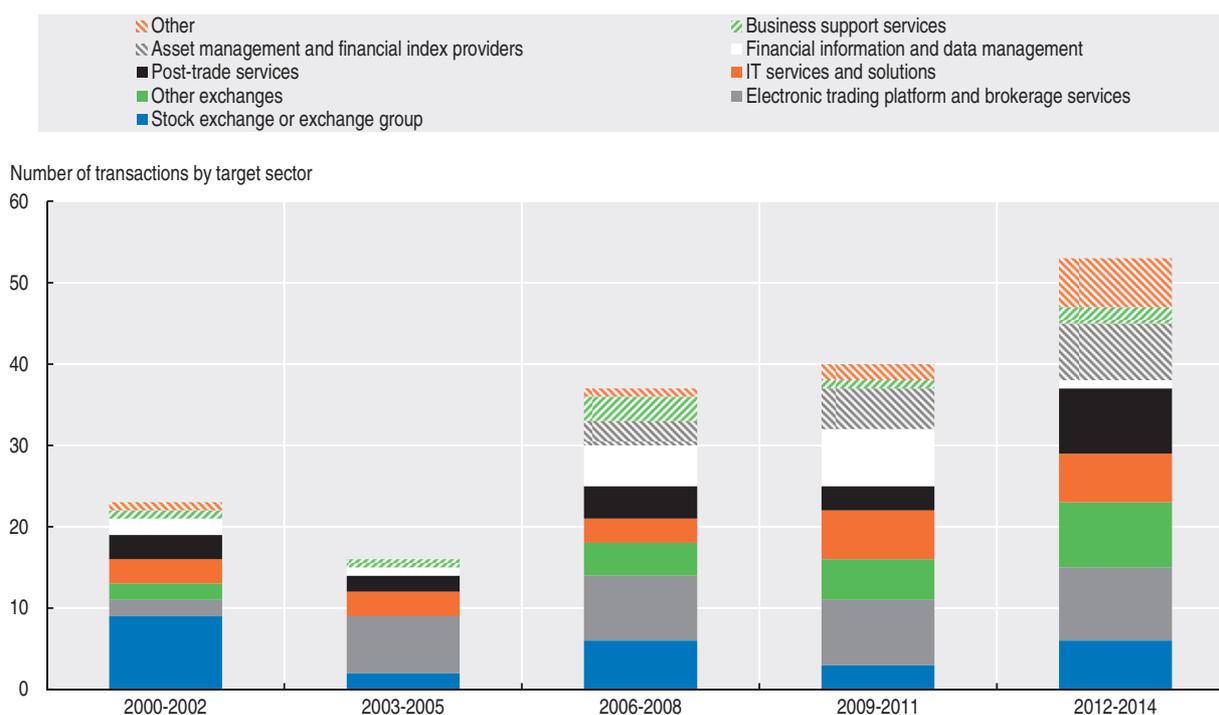
The changing landscape of the stock exchange industry

In advanced economies, stock exchanges were traditionally established as member-owned organisations or government institutions. Since the mid-1990s, however, most stock exchanges have been transformed into privately owned for-profit corporations. Today, all major stock exchange operators in advanced economies have their shares listed and traded on their exchanges, while the mutual form based on brokers' membership has almost disappeared.

In emerging markets, stock exchanges were often established in the form of state-owned corporations and their transformation into listed corporations has been more gradual. While the stock exchanges in Brazil and Mexico are now listed companies, those in Turkey and Saudi Arabia are still run as state-owned enterprises. Furthermore, the largest emerging market stock exchanges, which are in the People's Republic of China, operate as semi-public institutions and are membership institutions directly governed by the China Securities Regulatory Commission (CSRC).

During this transformation, there have been a large number of mergers and acquisitions (M&A) in the stock exchange industry, involving companies from sectors such as electronic trading platforms, financial information providers, financial index providers, data management and asset management. Figure 4.1 shows the number of M&A transactions in the stock exchange industry between 2000 and 2014. The figure covers a total of 169 buy-side deals and mergers involving publicly listed stock exchange operators. In 26 of these transactions, a stock exchange acquired an equity stake in another stock exchange or stock exchange group. In 18 cases, the stock exchange acquired a 100% or majority stake and in eight cases, a minority stake. There were an additional 19 transactions where stock exchanges acquired an exchange that was trading securities and derivatives other than stocks. After 2005, a significant number of buy-side deals, with respect to related businesses such as information technology and post trade services, can be observed.

Figure 4.1. **Mergers and acquisitions in the stock exchange industry**



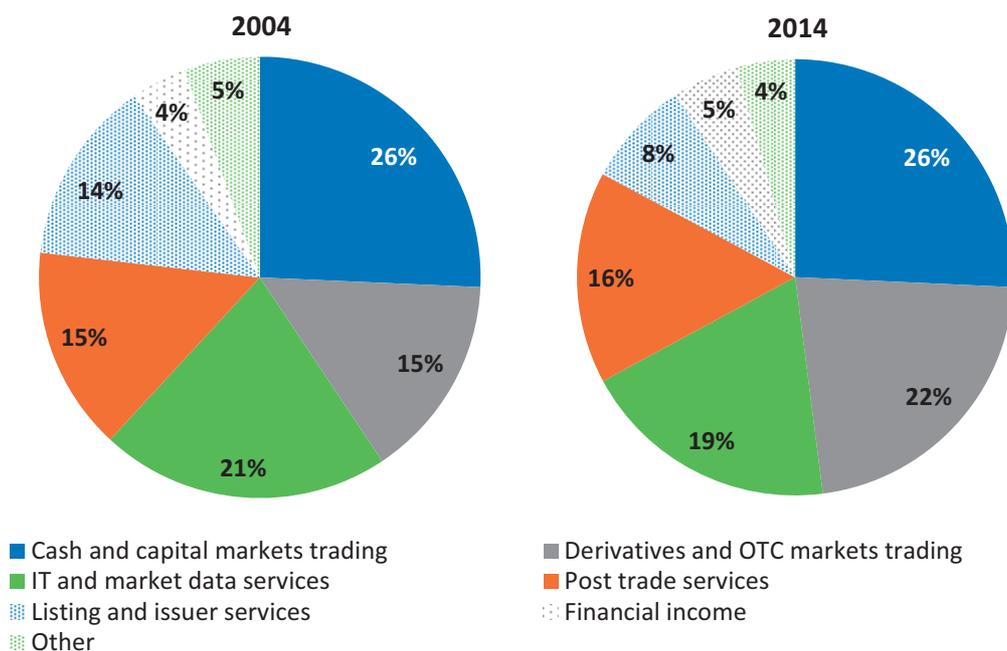
Note: Based on data from 16 stock exchanges.

Source: Factset, OECD calculations.

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The changes in the ownership structure of stock exchanges, as well as the structural changes that followed from M&A activities have been accompanied by a shift in the revenue structure of stock exchanges. Figure 4.2 compares in some detail the revenue structure of listed stock exchanges in 2004 and 2014. The share of revenues from listing new companies and issuer services, which consists of new listing fees – including from exchange-traded funds (ETFs) – and fees paid by existing listed companies dropped from 14% in 2004 to 8% in 2014. During the same period the share of revenues from derivatives trading and over-the-counter (OTC) markets increased by almost half and represented 22% of total revenues in 2014. This makes income from trading (cash, capital markets, derivatives and OTC) the largest source of revenue with a total share of 48% in 2014.

Figure 4.2. Revenue structure of stock exchanges



Note: Aggregated revenue data from 18 stock exchanges.

Source: Thomson Reuters, stock exchanges' websites and annual reports.

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Fragmentation of public equity markets

Traditionally, trading a specific stock in a single venue generated economies of scale and network externalities that made stock exchanges considered as natural monopolies sustained by regulatory advantages (Kay, 2006). However, technological advances have come to challenge that; notably, communication technology that makes the geographical location of a trading venue less important and information technologies that have drastically decreased costs and time required for processing and disseminating large amounts of information, such as orders and quotes.

Today, trading is fragmented in two dimensions: 1) between stock exchanges (on-exchange) and a large number of other trading venues (off-exchange); and, 2) between transactions where investors have access to pre-trade information about buying and selling interests (lit or displayed trading) and transactions where pre-trade information is not made available (non-displayed trading, often referred to as dark trading).

In most advanced economies, trading in a company's shares now takes place in many different venues in addition to the stock exchange where the company's shares are actually listed. Most important among these "off-exchange" venues are alternative trading systems (ATs) in the United States and multilateral trading facilities (MTFs) in Europe, which match buyers and sellers for a transaction. ATs are not regulated like national securities exchanges. They must register as broker-dealers and comply with Regulation ATS. Unlike national securities exchanges, ATs are not required to publicly disclose their trading services, operations or fees. MTFs are regulated as investment services under the EU regulatory framework.

In addition to exchanges and off-exchange trading venues such as ATs and MTFs, trading can also be executed in a firm's internal trading system (e.g. broker, dealer or

investment bank). When a firm “internalises” a client’s order in this way, it generally matches the order with its own inventory of securities. This means that the client’s order is not routed to an exchange or an off-exchange trading venue. Instead, it is executed on a bilateral basis within the internal trading system of the firm and against its own portfolio.

Taking advantage of advancements in information and communication technology has been facilitated by regulatory changes. For example, the EU’s Markets in Financial Instruments Directive (MiFID 1), which was adopted in 2007, abolished the “concentration rule” that allowed EU member countries to require investment firms to route equity orders only to stock exchanges, in particular to the company’s listing exchange. Together with the recognition of the MTFs and systematic internalisers as trading venues, the abolition of the concentration rule amplified competition between exchanges and off-exchange trading venues in European equity markets.

Initiatives to the same effect have been taken in the United States. The US Regulation National Market System (Regulation NMS) adopted in 2005 is a collection of existing and new rules issued by the US Securities and Exchange Commission (US SEC). A new key rule was the “Order Protection Rule” which requires trading centres to enforce policies and procedures that prevent the execution of trades at prices inferior to protected quotations displayed by other trading centres. The objective is to ensure that investors receive an execution price equivalent to the best price available in all trading venues. A second change was the “Access Rule” which was aimed at ensuring a level playing field among trading venues by improving access to quotes in different trading venues. The third major change was to amend the market data rules to further promote market data availability and to allocate market data revenues to those Self-Regulatory Organisations¹ that produce the most useful data for investors.

One of the key objectives of the US SEC’s new rules in Regulation NMS was to promote competition among trading venues. First, Regulation NMS assured new or smaller trading venues that if they displayed the best prices, they would attract order flows since larger, dominant venues, according to the Order Protection Rule are not allowed to ignore their quotations.² Second, Regulation NMS provided new or smaller trading venues with access to displayed quotations of dominant venues as required in the Access Rule (US SEC, 2005).

As mentioned above, the fragmentation of trading into multiple venues has been accompanied by an increase in dark trading in the last decade. The difference between dark and lit trading lies in the transparency of trade information. The information can be transparent either pre-trade, which gives investors access to information about buying and selling interest before trading, or post-trade, which means that trade information is disseminated to the public after the execution of the trade. In both the United States and Europe, post-trade disclosure is required for all trades, including trades that are executed on off-exchange platforms and internal trading systems of firms. Therefore, the distinctive character of dark trading is that there is no pre-trade transparency with respect to buyer and seller interests.

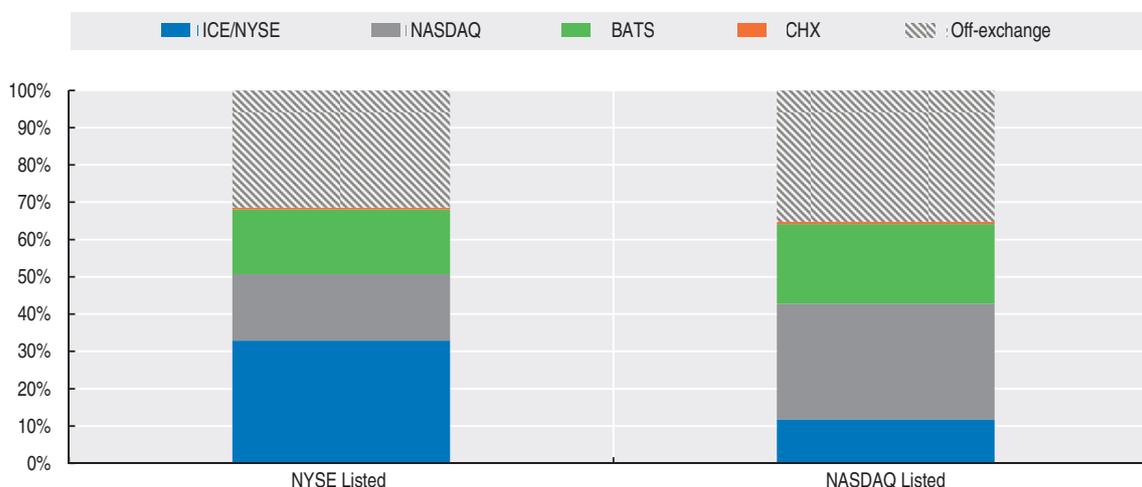
While dark trading is often associated with off-exchange trading, the picture is not that clear-cut. In fact, there are off-exchange venues that can carry out lit trading and there are regulated exchanges that execute a significant amount of dark trading based on so-called hidden orders. For example, one type of ATS, an Electronic Communication Network (ECN) in the United States, is organised as a publicly displayed limit order book that is fully electronic. An ECN automatically and anonymously matches and executes orders, avoiding the need for a third party to be involved in the transaction.

Equity market structure in the United States

Stock trading in the United States is fragmented into a number of different venues that fall into three main categories: 1) 12 national securities exchanges; 2) 44 ATSs,³ including off-exchange visible trading venues (ECNs) and dark pools; and 3) various OTC systems, including internal trading systems of firms. It is worth noting that trading in off-exchange venues is not a new phenomenon. Already in 1990, 17% of the volume traded in shares that were listed on the New York Stock Exchange (NYSE) took place in venues other than NYSE itself.⁴ This share remained stable until 2005 when it started to successively increase. Figure 4.3, shows that in 2015 only 33% of the trade in NYSE-listed shares actually took place on the three NYSE Group exchanges. The remaining two thirds of all trades were carried out in other venues. Similarly, the three NASDAQ exchanges' share of the total trading in NASDAQ Stock Market listed firms was just 31% in 2015.

Out of the 18 national securities exchanges registered with the US SEC at the end of 2015, 12 exchanges traded equity securities in the United States. However, 10 of these 12 exchanges belong to one of three exchange groups (Intercontinental Exchange/New York Stock Exchange [ICE/NYSE], NASDAQ and Bats Global Markets [BATS]).⁵ Figure 4.3 shows how the trading volume in companies that are listed on NYSE and NASDAQ is distributed among these three exchange groups and the only independent securities exchange, the Chicago Stock Exchange (CHX). CHX share of trading volume was less than 1% in both NYSE and NASDAQ-listed shares.

Figure 4.3. **Market shares in the trading of NYSE and NASDAQ-listed shares among trading venues in the United States, 2015**



Note: Off-exchange volume includes ATS, internal trading systems of firms and other OTC trading that are reported to the FINRA. This is primarily done through the two Trade Reporting Facilities (TRFs) operated by the two exchanges or through the Alternative Display Facility (ADF) directly operated by FINRA.

Source: BATS Global Markets.

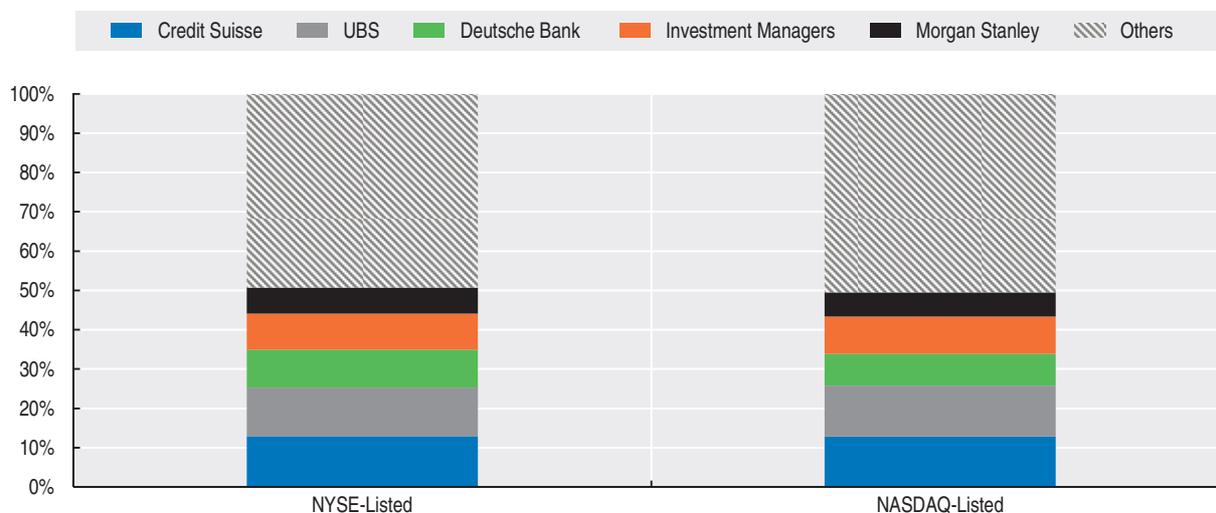
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Figure 4.3 also shows the off-exchange trading in shares listed on NYSE and NASDAQ. In 2015, 31% of all trading in NYSE-listed and 35% of all trading in NASDAQ-listed shares took place in off-exchange venues.

In January 2014, the US SEC approved a rule that requires all broker-dealers that operate an ATS to report the aggregate weekly trading information for each security to the Financial Industry Regulatory Authority (FINRA). FINRA has made this information available since July 2014.

As of 1 December 2015, there were 85 trading venues operating as ATs.⁶ Of these, 44 venues traded NMS stocks.⁷ Figure 4.4 displays the distribution of traded volume among the different ATS venues based on data retrieved from FINRA. As seen in Figure 4.4, ATS trading is quite concentrated to the five largest venues that trade NMS stocks, which account for about half of the total ATS trading volume for both NASDAQ-listed and NYSE-listed stocks. The two largest ATs by trade share, Credit Suisse's CrossFinder and UBS, account for about 25% of the total.

Figure 4.4. **Market shares in total alternative trading system volume in NYSE and NASDAQ-listed shares, 2015**



Note: The category "Others" includes 39 ATs.

Source: FINRA, OECD calculations.

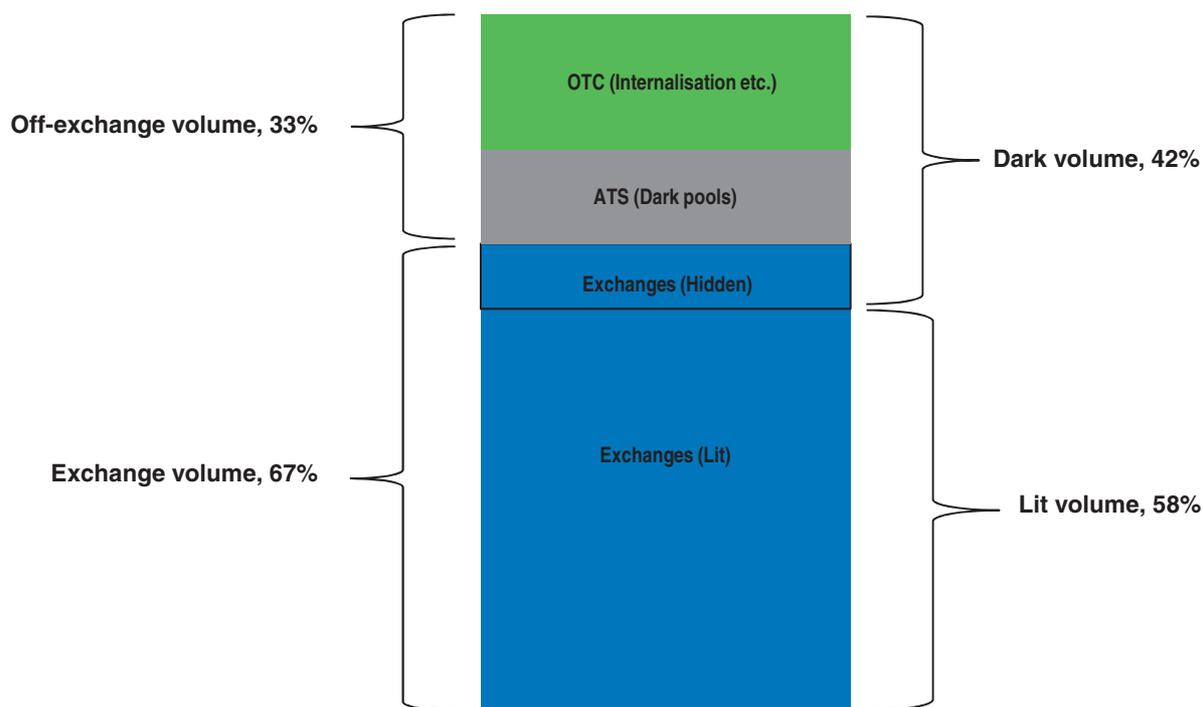
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Figure 4.5 summarises the secondary equity market structure in the United States in 2015 and shows that 67% of all trading in shares listed on NYSE and NASDAQ was executed on 11 national securities exchanges. The remaining 33% was executed on ATs, internal trading systems of firms and other OTC trading centres.

With respect to the second dimension of fragmentation, Figure 4.5 clearly shows that the demarcation line for fragmentation between dark and lit trading is not necessarily between exchange and off-exchange trading. The reason is that ATS venues can indeed be lit, for example, in the form of an ECN venue while part of the exchange trading is actually dark.⁸ However, ATs in the form of lit ECNs play an insignificant role in terms of total trading today. On the other hand, there is a significant portion of dark trading on regulated exchanges, which is estimated to be 9% of total trading volume. This overlap between dark trading volume across off-exchange trading venues and exchange trading is identified in Figure 4.5. Adding the volume of dark trading in exchanges to the dark trading in off-exchange trading venues (including ATS and non-ATS OTC volume) shows that about 42% of the total trading volume in US equity markets in 2015 was in the form of dark trading.

Equity market structure in Europe

Fragmentation in European equity markets accelerated after MiFID 1 came into effect in November 2007. The Directive allowed equity trading to be executed on MTFs, as well as on

Figure 4.5. **The two dimensions of fragmentation in United States equity markets, 2015**

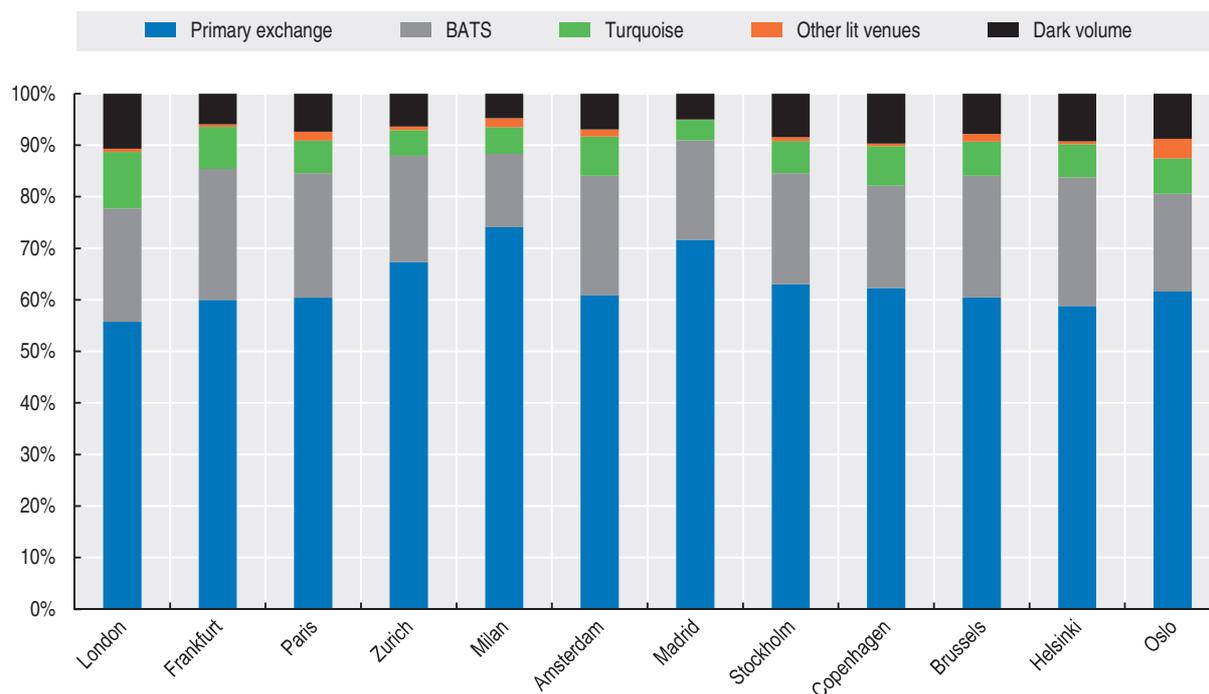
Note: Data include NYSE and NASDAQ-listed securities. Lit volume in ATSs in 2015 was insignificant and is not included in the figure.
Source: BATS Global Markets, US SEC, FINRA, Thomson Reuters.

traditional stock exchanges, and to be matched internally by investment firms (systematic internalisers). The impact of MiFID 1 on market fragmentation in Europe has been significant. Starting with the launch of the first MTF in 2007, in January 2016 there were 103 regulated exchanges, 151 MTFs and 11 systematic internalisers in Europe according to the European Securities and Markets Authority's (ESMA) database on MiFID.

Comparing the fragmentation between exchange and off-exchange trading in the United States and Europe is not straightforward. The main reason is that in Europe, there is no publicly available standardised and consolidated trading information for all trading venues, including OTC and internalised trading. Using trading information available from BATS for stocks listed on 12 major European exchanges in 2015 gives the distribution between exchange and off-exchange trading illustrated in Figure 4.6. For the London Stock Exchange (LSE), for example, the use of BATS data shows that 57% of the trading in stocks listed at LSE is actually traded on the LSE. Another third is traded on BATS and Turquoise;⁹ less than 1% in other lit venues and about 11% is in the form of dark volume. However, unlike Figure 4.3 for the United States, the numbers for London and other European exchanges in Figure 4.6 do not take into account trading on off-exchanges venues other than MTFs and off-order book trading on exchanges.¹⁰ This poses particular challenges when it comes to estimating the extent of dark trading in equities listed on European exchanges.

Moreover, since the trading data in Europe is not standardised across trading venues, concerns have been raised about the quality and consistency of the data provided by different venues or data providers. For example, a study by the Association of Financial Markets in Europe (AFME, 2011) which analysed data from a number of brokers in Europe, found that approximately 60% of all reported MiFID OTC trading between Q1 2008 and

Figure 4.6. Market shares among trading venues in Europe, 2015



Source: BATS Global Markets.

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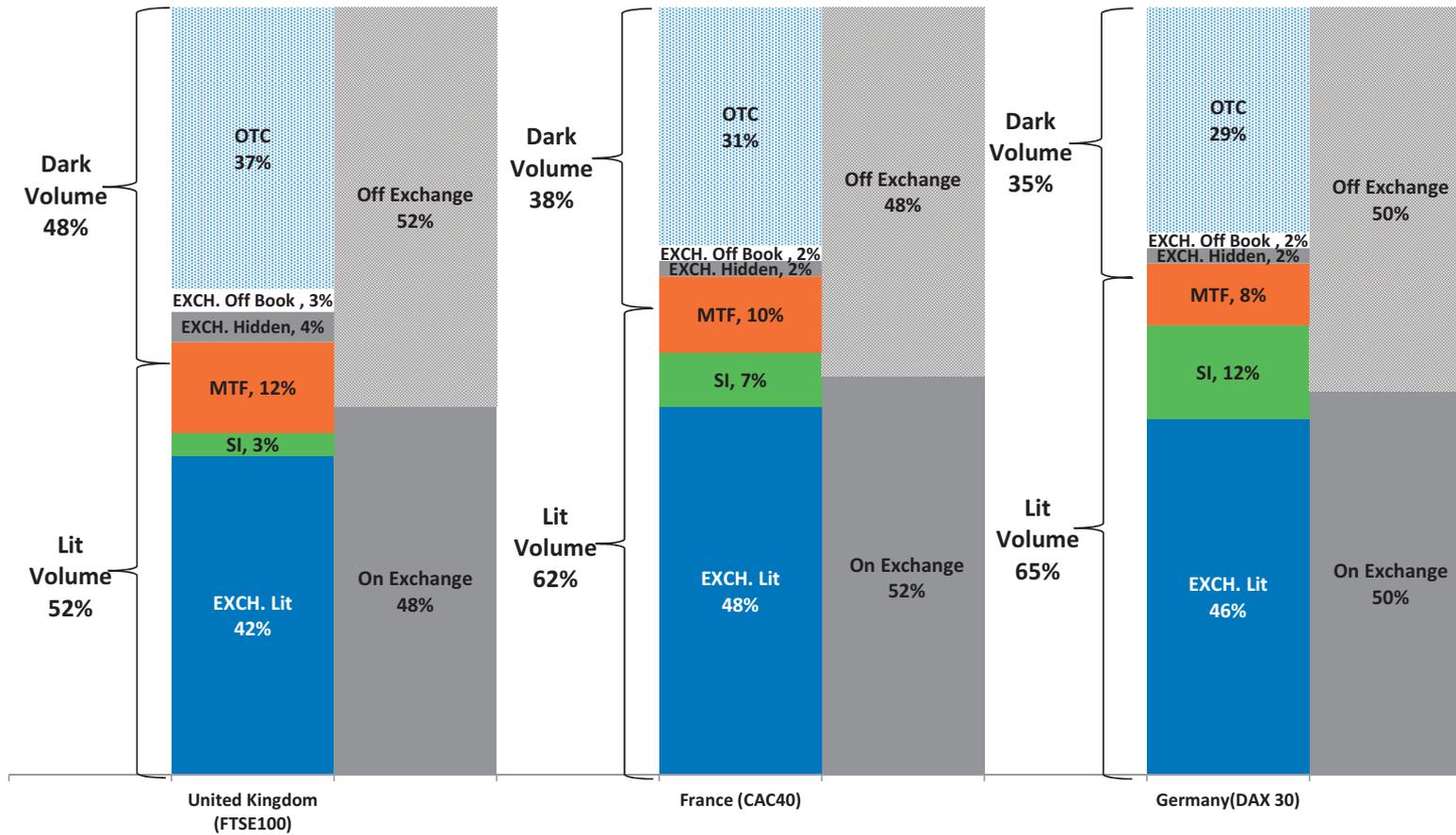
Q3 2010 was duplicate trades already reported elsewhere. A major source of double counting in trading data is that “give up/give in” trades, which transfer ownership of stocks from one broker to another to execute an order on behalf of the broker, are reported by both of the two brokers involved.

In an attempt to provide a more comparable picture between trading in US and European equity markets, we have collected firm-level data on the trading volume of individual stocks that are included in three major European stock indices (i.e. FTSE 100 in the United Kingdom, CAC 40 in France and DAX 30 in Germany) for the period from 1 December 2015 to 31 March 2016. Based on this data, we have calculated how the trading is distributed among all the individual trading venues, including exchanges, MTFs and other OTC trading.

Given the difficulties with analysing the trading data in Europe, potentially double-counted trades have been excluded, based on the explanations provided for each trading category in the dataset, including give up/give in trades. Each trading category has also been categorised as on/off exchange and lit/dark volume using the same explanations. The aggregated results are summarised in Figure 4.7.

Using this method, the figure shows that the share of on-exchange volume is similar across the three markets, between 48%-52% of all trading volume, but considerably lower than in Figure 4.6. This also includes on exchange off-order book trading and hidden orders on exchanges, which are both classified as dark volume. With respect to off-exchange venues, the market share of MTFs is around 12% in the United Kingdom, 10% in France and 8% in Germany, while the lion’s share of the off-exchange volume was executed on non-MTF OTC centres.

Figure 4.7. An illustration of the distribution of trading among trading venues and between lit and dark volume in France, Germany and the United Kingdom, December 2015 – March 2016



Note: For each index constituent company, the trading volume across all European venues between 1 December 2015 and 31 March 2016 is included. The figure covers only EUR volume for France and Germany, and GBP volume for UK companies. All firm-orders are classified according to their visibility, on/off exchange trading and the type of the venue. For example, transactions reported by exchanges on behalf of Systematic Internalisers (SI) or over-the-counter (OTC) are reclassified as SI and OTC transactions respectively. Transactions that are recorded as give up/give in trades are excluded.

Transactions reported on behalf of SIs are classified as visible, off-exchange transactions and SI. Transactions reported as OTC of any type are classified as non-visible, off-exchange transactions and OTC. Hidden transactions executed in the order books of regulated markets are classified as non-visible, on-exchange and exchange hidden. Transactions executed in the dark order books of regulated markets are classified as non-visible, on-exchange and exchange hidden. Off-book transactions reported and executed in exchanges are classified as non-visible, on-exchange and exchange off-order book. Transactions executed in an MTF's order book are classified as visible, off-exchange and MTF. Transactions executed in an MTF's dark order book are classified as non-visible, off-exchange and MTF.

Source: Thomson Reuters, Factset, OECD calculations.

Since the data used for Figure 4.7 includes all OTC trading, any on exchange off-order book trading, hidden orders on exchanges and dark order book volume of MTFs, it is possible to arrive at a more accurate picture of the amount of dark trading in Europe. As a result of using more complete trading data, the total amount of dark trading in European listed stocks is estimated to be 48% in the United Kingdom, 38% in France and 35% in Germany, which is significantly higher than the 10% indicated in Figure 4.6.

Since there are certain pre-trade transparency requirements for Systematic Internalisers in Europe, unlike the US data, they were classified as part of the lit volume. In addition, the market share of dark pools (dark MTFs) in Figure 4.7 is lower than their share in Figure 4.6 because of the fact that the latter figures are calculated by including OTC and on-exchange off-order book trading to the total trading volume. For example, the market share of dark MTFs in the United Kingdom drops from around 7% to 4% when all trading volume is taken into account. It should be noted that the dataset used in Figure 4.7 covers a shorter time period (four months instead of one year) and a somewhat different period, which may limit the comparability of the two figures.

The increase in dark trading

Dark trading has existed for a long time in many stock markets. As noted above, it can take place in many different forms including undisclosed orders on regulated exchanges, trading on alternative trading platforms, off-order book trading on exchanges and other OTC centres. Trading by using orders that do not appear in the visible order book has traditionally been associated with the needs of institutional investors that want to reduce the market impact of large orders. This need has become increasingly relevant as algorithmic trading and high frequency trading (HFT) have increased in importance.

With respect to the argument that dark pools meet the needs to place large orders, Table 4.1 shows the average trade sizes in ATs in the United States in 2015. As seen in the table, some ATs execute large trade sizes of up to 500 000 shares. However, the top five ATs in terms of average trade size account for less than 3% of the total share volume executed in ATs. The top five ATs in terms of volume traded, which account for 49% of total share volume traded, had an average trade size between 153 and 233 shares. The average trade size in all ATs was 207 shares, which is very close to the average trade size in stock exchanges for the same period (209 shares). These findings suggest that ATs, with respect to the execution of large orders, do not distinguish themselves from the regulated exchanges whose listed shares they are trading.

The increase in dark volume, particularly in the form of dark pools, has raised concerns about the efficiency of the price discovery process, the fairness of markets and the level playing field among investors. For example, the US SEC in a recent release (US SEC, 2015a) on proposed rules with respect to Regulation of NMS Stock ATs, expressed concerns that;

- In terms of trading, ATs operate in a similar manner to securities exchanges with whom they compete for business. However, unlike securities exchanges, there is limited public information available to market participants about their operations. These differences may create a competitive imbalance between two functionally similar¹¹ trading venues that may trade the same security but are subject to different regulatory requirements.
- This difference in operational transparency is to the disadvantage of market participants, since it limits their ability to adequately assess the relative merits of many trading

Table 4.1. **Average trade sizes in ATSS in the United States, 2015**

Top 5 ATSS sorted by Volume Traded			Top 5 ATSS sorted by Average Trade Size		
ATSS	Average trade size (shares)	% of total ATSS share volume	ATSS	Average trade size (shares)	% of total ATSS share volume
Credit Suisse	177	12.62	Dealerweb	494 877	1.49
UBS	153	12.31	Barclays	75 430	0.02
IEX Services	225	8.52	LEHM Barclays	70 464	0.00
Deutsche Bank	184	8.29	Liquidnet	39 116	1.24
Morgan Stanley	233	6.79	Luminex	30 544	0.02
Cumulated volume		48.54¹	Cumulated volume		2.78²
ATSS average trade size:		207			
Exchange average trade size³:		209			

1. Top 5 ATSS in terms of share volume traded account for 47.26% of total ATSS USD volume.
2. Top 5 ATSS in terms of average trade size account for 7.22% of total ATSS USD volume.
3. Exchange average trade size is calculated based on information reported by BATS Global Markets and includes the three US exchange groups: NYSE, NASDAQ and BATS.

Source: FINRA, OECD calculations.

venues and to adequately discern how their orders interact, match, and execute on ATSS and to find the optimal venue or venues for their orders.

- There is a lack of transparency around potential conflicts of interest that arise from the activities of the broker-dealer operator of the ATSS and its affiliates in connection with the ATSS.

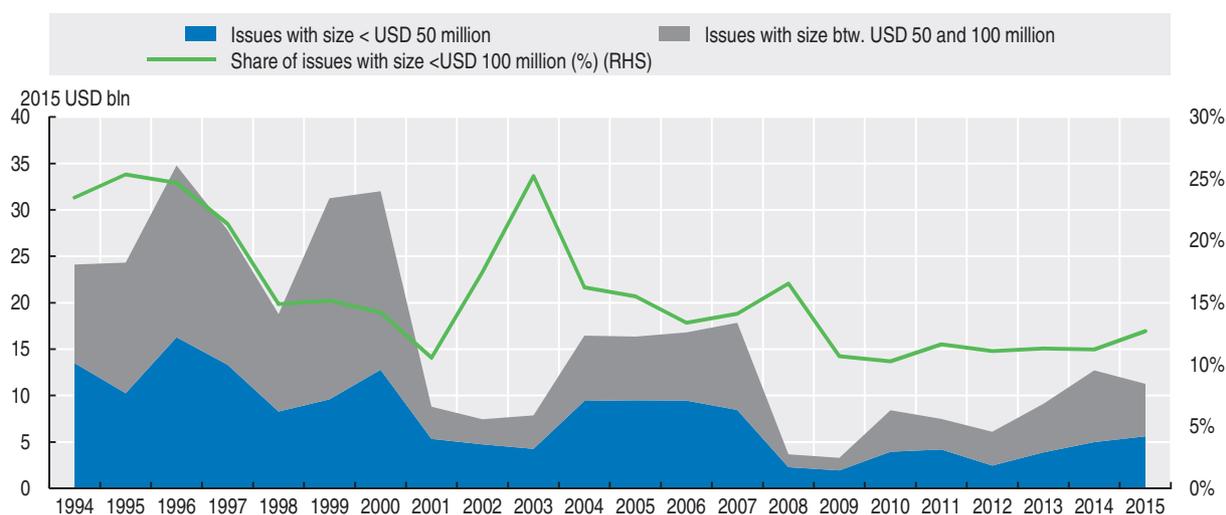
Recent US SEC enforcement actions highlighting the difference in regulatory frameworks between national securities exchanges and ATSS have attracted public attention in the United States. In 2011, for example, the US SEC settled an enforcement action against a dark pool operator who advertised that no proprietary trading took place in its dark pool while, on the contrary, the overwhelming majority of the shares traded on its ATSS were bought or sold by an operator's wholly owned subsidiary. In addition, the operator provided its subsidiary with certain access and information that improved the subsidiaries ability to trade advantageously and were not known to other customers (US SEC, 2011). In a more recent case, the US SEC has settled another enforcement action against a dark pool operator who had also not disclosed that it was engaged in proprietary trading within its ATSS and gave its proprietary trading desk access to live feeds of highly confidential order and execution information that were used to inform the desk's trading decisions (US SEC, 2015b).

Changes in market structure and the decline in smaller growth company IPOs

Markets where companies raise external equity financing are referred to as the primary public equity markets. In the last two decades, advanced economies have experienced a significant decline in both the average number of non-financial companies who use primary markets to make an initial public offering (IPO) and in the average annual amount of equity they raise. Between 1994-2000, there were on average 1 152 IPOs per year. That number fell to 853 in the period 2001-07 and again to just 453 per year in the period 2008-15. This decrease in number of companies has been accompanied by a significant decline also in the amount of capital raised over the three periods; from USD 147 billion in the period 1994-2000, to USD 88 billion in the period 2001-07 to USD 67 billion in the period 2008-15.¹²

An important aspect of this trend is the steep decline in smaller, growth company IPOs, particularly in the United States and Europe. Figure 4.8 shows the trends in IPOs by non-financial growth companies in advanced economies, both the absolute amount of equity raised by growth companies as well as the decline in the relative share of all equity raised that goes to growth companies. In the period from 1994-2000, IPOs smaller than USD 100 million represented 19% of all funds raised. Since 2004 however, this proportion has declined almost monotonically and in 2015 it amounted to just 13%. As a result, in advanced economies there are fewer but larger IPOs. Considering the importance of access to equity funding for innovation, productivity and overall economic growth, discussed earlier in this chapter, this development has given rise to discussions about the causes behind these trends.

Figure 4.8. **The decline in small company IPOs in advanced economies**



Source: Thomson Reuters, OECD calculations.

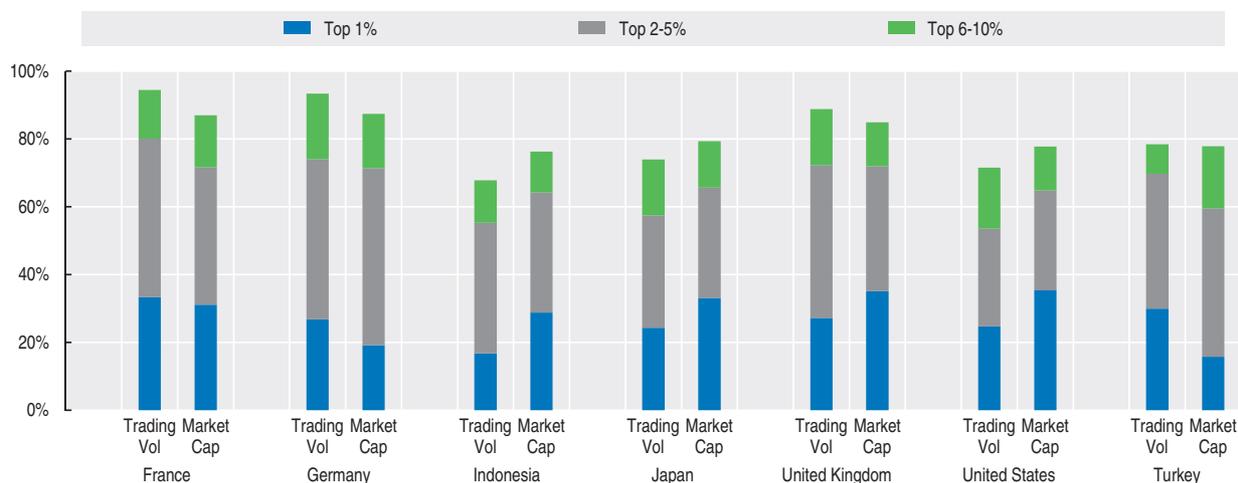
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Many different explanations have been proposed for the decline in non-financial company IPOs in advanced economies (Isaksson and Çelik, 2013). One of them focuses on the impact of structural changes in stock markets, including the effects of fragmentation and new investment techniques and instruments, such as ETF and high-frequency trading (HFT), on the lower liquidity of small company stocks. It has been claimed that the new market structure encourages a focus on large liquid company stocks and less appetite to hold and trade in small company stocks. As a result, the attention of investors has been diverted away from potential growth companies that in turn have been discouraged from going public (Economist, 2009; Bradley and Litan, 2010; Haslag and Ringgenberg, 2015).

One way to illustrate the relative level of attention that secondary markets give to companies of different sizes is to look at the distribution of trading in companies of different sizes. To start with, Figure 4.9 shows the share of total market capitalisation represented by the 1, 5, and 10% largest companies measured by market capitalisation and the share of total trading that is attributed to these largest companies as of December 2015. In Japan, for example, 80% of total market capitalisation is attributable to the 10% largest companies measured by market capitalisation. Similarly, slightly more than 30% of market capitalisation is attributable to the 1% largest companies.

Again, for Japan, about 75% of the total trading volume is attributed to the trading of shares in the 10% largest companies. Similarly, about 25% of all trading in Japan is in the shares of the 1% largest companies measured by market capitalisation. Overall, in all the markets featured in Figure 4.9, the share of total trading volume attributed to the largest 10% of companies in terms of market capitalisation was over 70%, with the exception of Indonesia (68%). Moreover, in most markets 20% of all trading was attributed to the largest 1% of companies. Figure 4.9 does not only show that trading volume is highly concentrated to large companies. It also shows that the share of trading in large companies typically is proportional to their share of total market capitalisation.

Figure 4.9. **Concentration of market capitalisation and trading volume in public equity markets, December 2015**



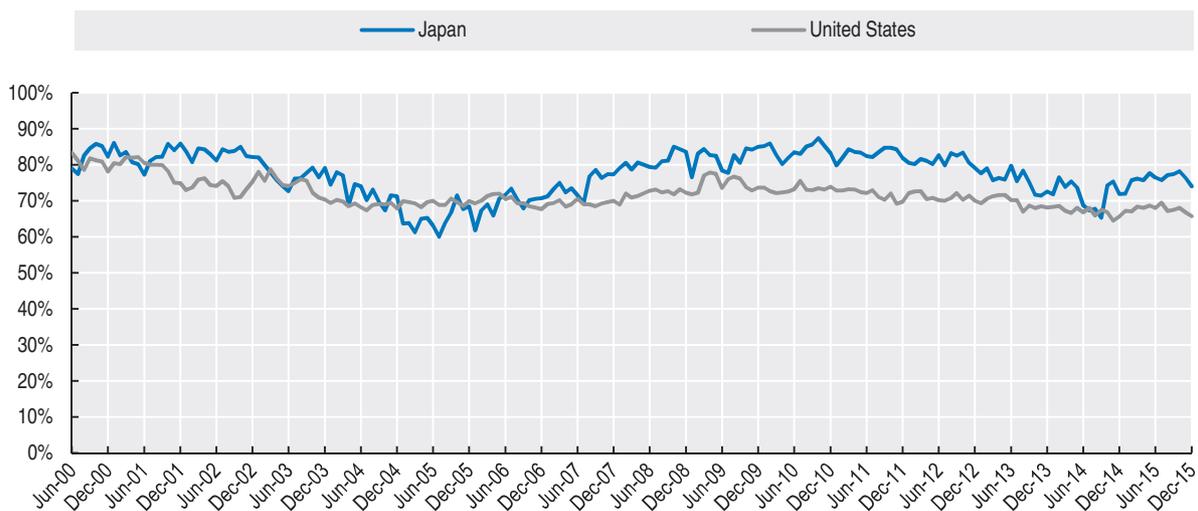
Source: Thomson Reuters, OECD calculations.

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In order to analyse the long-term trends in the distribution of trading among companies of different size and the possible link to changes in stock market structure, Figure 4.10 shows the 10% largest companies' share of total trading volume in Japan and the United States since 2000. The data is computed based on firm-level monthly consolidated trading volume for all listed companies, their respective mid-month prices and end-month market capitalisation. Despite the fact that throughout the period almost all trading in listed companies in Japan was executed on exchanges, whereas United States trading developed in an increasingly fragmented trading environment following the adoption of Regulation NMS, the two markets follow each other closely both in terms of level and trends. Throughout the 15 year period, between 70% and 90% of all trading was attributed to shares in the 10% largest companies, indicating rather limited variations over time.

In order to track overall variations in trading concentration over time, Figure 4.11 shows developments in the form of the Herfindahl concentration index. The index has been calculated based on the same firm-level data used for Figure 4.10 and includes five more countries: France, Germany, Indonesia, Turkey and the United Kingdom. Although there has been some difference in terms of the volatility of the index in different periods in some countries, the figures do not indicate an overall trend towards higher concentration in large company trading. This is particularly marked for the last two-year period. The exception is Turkey with a relatively small public equity market. Interestingly, despite the

Figure 4.10. **Share in total trading volume of 10% largest companies in Japan and the United States, 2000-15**



Source: Thomson Reuters, OECD calculations.

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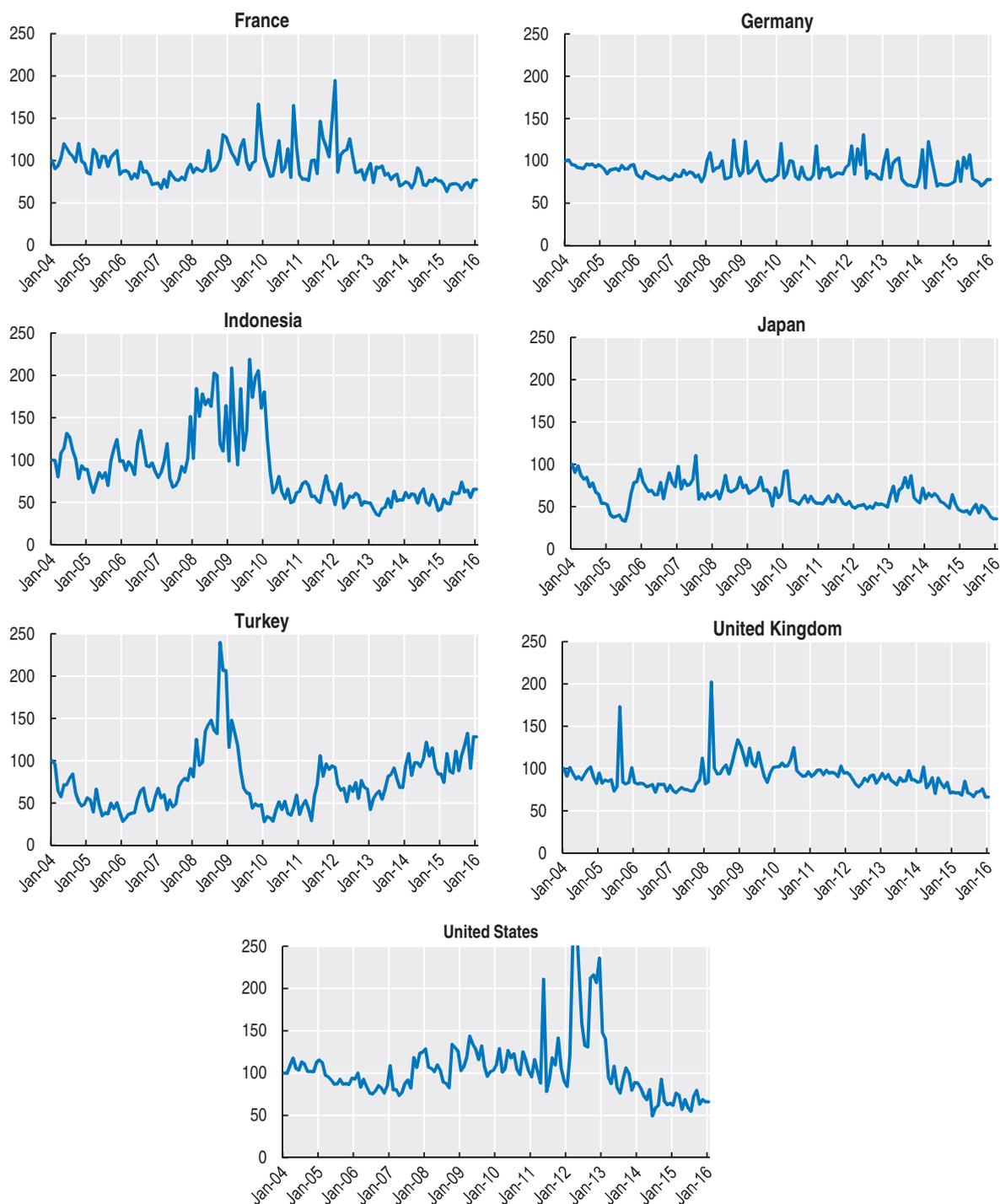
fact that the market structures have undergone significant changes in Europe since 2007, with the implementation of MiFID 1, the distribution of total trading between companies of different size has remained fairly stable.

The results presented above do not indicate an overall increase in the equity market trading concentration for the period from 2000-15. However, since the share of trading in small company stocks of the total volume of trading has been very low throughout the period, relatively small changes may also merit attention.

While the analysis above describes the overall distribution of trading between large and small companies, it may also be of interest to look at any potential differences between exchange and off-exchange venues. Having concluded above that in general, there were no significant differences in order size between exchange and off-exchange venues, the next question is if there are any major systemic differences in off-exchange trading with respect to the distribution of trading in the stocks of small and large companies.

To identify any such differences in the United States, we have used firm-level data from Thomson Reuters on consolidated traded volume and company characteristics, which has been analysed together with the data, obtained from FINRA on ATS trading volume. In a population of almost 4 200 United States listed companies in our dataset, almost all of them had shares traded in an ATS at least once during 2015.

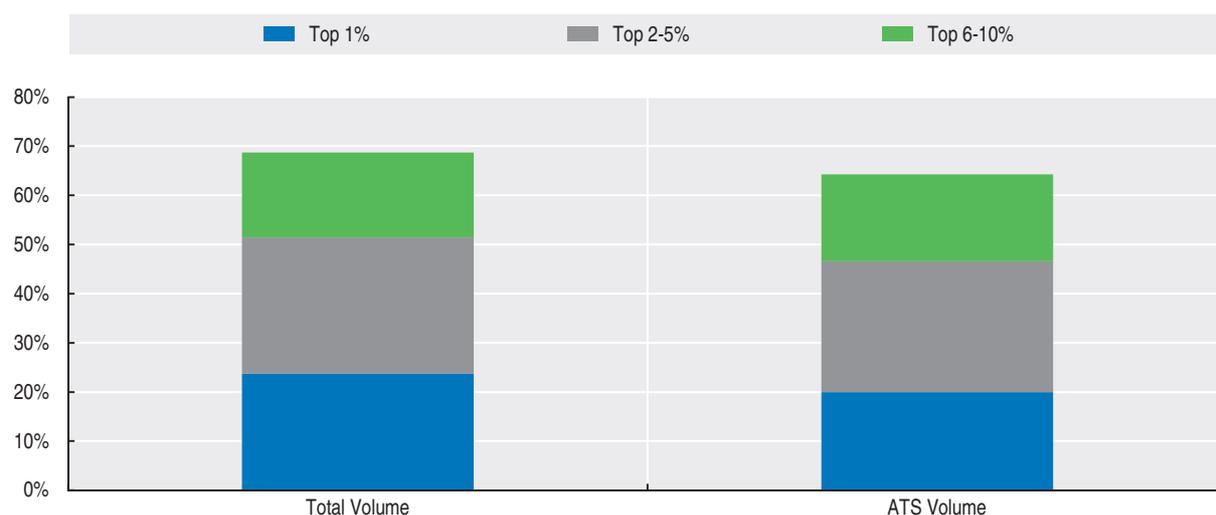
Figure 4.12 compares the distribution of stock trading among companies of different size on ATSs with the overall market pattern (including stock exchanges, ATSs and non-ATS OTC trading). Firms are sorted according to their market capitalisation as of December 2014. Across company sizes, our data reveals very small differences between the trading patterns in ATSs and the overall market. Trading in ATSs is also highly concentrated with the largest 1% of the companies accounting for 23.8% of the trading, which is actually at par with the overall concentration in United States trading volume. The share of the top 5% and top 10% largest companies in total trading on ATSs was somewhat higher than their share in total United States trading volume. The results do not change significantly when company size is measured by the total value of assets instead of market capitalisation.

Figure 4.11. **Equity market trading concentration index, 2004 = 100**

Source: Thomson Reuters, OECD calculations.

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In addition to order size and company size, it has also been suggested that ATS trading may serve the purpose of specialising in specific industries. In order to investigate this, Table 4.2 compares the distribution of ATS and total trading among different industry groups as defined by Thomson Reuters. Columns 2 and 3 show how the total volume traded

Figure 4.12. **The share of large companies in trading in the United States, 2015**

Source: FINRA, Thomson Reuters, OECD calculations.

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Table 4.2. **Top 10 industry sectors traded in ATs (volume), 2015**

Industry Sector	(2)	(3)	(4)	(5)	(6)	(7)
	Consolidated Ex. ATS	Alternative systems Vol. (ATS Vol.)	Ranking Consolidated Ex. ATS. Vol.	Ranking ATS Vol.	As a % of Total ATS Vol.	As a % of Total Consolidated Vol ex ATS. Vol.
Software and Computer Services	81.8	18.2	3	1	9.6	8.6
Pharmaceuticals and Biotechnology	83.5	16.5	2	2	8.6	8.7
Technology Hardware and Equipment	85.7	14.3	1	3	8.5	10.2
General Retailers	84.7	15.3	4	4	6.6	7.4
Oil and Gas Producers	84.3	15.7	5	5	5.5	5.9
Travel and Leisure	83.3	16.7	6	6	5.0	5.0
Media	76.7	23.3	12	7	4.7	3.1
Health Care Equipment and Services	81.9	18.1	9	8	4.5	4.1
Financial Services	83.0	17.0	8	9	4.3	4.2
Banks	85.1	14.9	7	10	3.8	4.4

Note: Column (2) shows for each industry sector, the share of non-ATS USD volume over the total consolidated USD volume; column (3) shows for each industry sector, the share of USD volume traded in alternative systems over the total consolidated USD volume; column (4) shows the industry sector ranking in terms of non-ATS USD volume; column (5) shows the industry sector ranking in terms of ATS USD volume; column (6) shows the industry sector volume traded in ATS over the total volume traded in ATs across all industry sectors; and column (7) shows the industry sector volume traded in non-ATs over the total volume traded in non-ATs across all industry sectors.

Source: FINRA, Thomson Reuters, OECD calculations.

is split between non-ATS venues and ATS venues. The analysis concludes that on average, each industry group trades around 14% on ATs and 86% on other venues, mostly stock exchanges. Columns 6 and 7 compare the distribution of trading in different industry groups for ATs and non-ATs venues. The comparison shows that the distribution of trading in different industry groups on ATs venues generally mirrors the distribution for overall stock market trading.

Policy responses

The increase in market fragmentation and dark trading has been associated with a growing debate about the consequences for essential market qualities, such as the efficiency of price formation, fairness between investors, level playing field between venues and conflicts of interest between service providers and clients. In several countries, this has already led to regulatory responses. Australia and Canada for instance, have both introduced so-called “trade-at” rules which allow a trade to be executed on an off-exchange trading venue only if it provides a price or size improvement over exchanges (Shorter and Miller, 2014). In other jurisdictions, recently launched initiatives may lead to substantial changes. The two most important regulatory initiatives currently undertaken by advanced economies includes the US SEC’s recent proposal to change the regulatory framework for ATSS in the United States and the announcement by the European Commission that MiFID 2 will enter into application in January 2018.

The proposed reforms in the United States

In November 2015, the US SEC submitted an extensive proposal to amend the regulatory framework for ATSS that trade NMS stocks in the United States. The main focus is on differences in operational transparency between ATSS and national securities exchanges and the lack of transparency around potential conflicts of interest between the broker-dealer operator of the ATS and the ATS’s subscribers. An important reason for these differences is that national securities exchanges and ATSS today operate under different regulations. National securities exchanges must, for example, be registered with the US SEC. They must fully disclose their operations and procedures, establish publicly disclosed rules for trading, and submit any changes in their rules to US SEC’s for approval. In contrast, ATSS must register as broker-dealers, which includes becoming a member of a Self-Regulatory Organisation (SRO), and comply with Regulation ATS, which includes noticing its operations to the US SEC on Form ATS. Form ATS is not approved by the US SEC and it is deemed confidential upon filing. ATSS are not required to publicly disclose the character of their trading services, operations, and fees and are not required to file proposed rule changes that national securities exchanges are required to file.

The US SEC’s reform proposal from November 2015 would require that ATSS that trade NMS stocks and that want to be exempted from registering as a national securities exchange, comply with additional conditions and increase the transparency of their operations. The proposal would increase the filing requirements regarding the activities of the ATS operator (broker-dealer) and its affiliates in connection with the ATS that trades NMS stocks. The ATS broker-dealer operator would be required to disclose certain information through Form ATS-N and the US SEC would make it available to the public. The US SEC would also determine whether ATSS that trade NMS stocks would qualify for the exemption from registration as an exchange and would review the Form ATS-N for compliance with the form’s requirements. The proposal would also allow the US SEC to suspend, limit or revoke the exemption provided. Under the proposed regulation, ATSS would also be required to have the ATS’s safeguards and procedures in writing to protect their subscribers’ confidential trading operations.

Overall, the US SEC proposal aims to level the regulatory environment between ATSS that trade NMS stocks and national securities exchanges by means of increasing the requirements for ATSS that trade NMS stocks and increasing the information available to market participants.

The European Union and MiFID 2

MiFID 1 was adopted in 2007 and covers a broad range of market rules related to market structure, transparency, supervision and investor protection. It also includes rules related to trading and clearing of financial instruments, such as shares, bonds and derivatives and the venues on which they are listed or admitted to trading. MiFID 2, which replaces MiFID 1, was approved by the European Council in May 2014. The European Commission has extended the original application date for MiFID 2 which was January 2017 to January 2018 in order “to take account of the exceptional technical implementation challenges faced by regulators and market participants” (European Commission, 2016).

An important rationale for MiFID 1 was to promote competition between different trading venues and decrease the costs for investors. MiFID 1 explicitly allows equity trading to be executed on stock exchanges, MTFs and internal trading systems of firms (systematic internalisers). However, and outside the scope of MiFID 1, it is also possible to execute trading on an OTC basis outside of all these three venue types. Broker crossing networks, for example, without being classified as any of these three categories and without being subject to related regulatory requirements, are frequently used to execute trades in listed equities. MiFID 2 aims to ensure that all multilateral trading is executed either on exchanges or MTFs; and that bilateral transactions are carried out on the internal trading systems of firms. Under certain conditions, it will still be possible to carry out trading on a traditional OTC basis.

MiFID 1 also allows trading to be executed without orders being subject to pre-trade transparency. There are four types of waivers from pre-trade transparency of orders: 1) large in scale transactions, 2) transactions based on a reference price generated by another system, 3) negotiated transactions; and 4) orders held in an order management facility of the trading venue. MiFID 2 will maintain these waivers but introduce certain restrictions. Of particular interest regarding fragmentation between lit and dark trading is the so-called “double volume cap mechanism”. This mechanism stipulates that the dark volume of trading on any trading venue for a particular share should not exceed 4% of the total trading volume on all trading venues in the European Union, and 8% across all trading venues based on a 12-month rolling calculation. The caps will only be applied to dark trading that is making use of the reference price waiver and some types of negotiated transactions. Importantly, the caps will not target dark trades under the waivers for large in scale transactions and trades executed on an OTC basis. This means that the total volume of dark trading under MiFID 2 may amount to 8% of the total trading volume that uses the reference price waiver and some types of negotiated transactions plus all trading that makes use of the large in scale and order management facility waivers plus all trading that is executed outside of the three venues defined by MiFID 2.

A main difference between the United States and European equity markets is access to reliable and consistent aggregate trading data. In the United States, the Consolidated Tape Association, which is a membership organisation of exchanges, oversees the dissemination of real-time trade and quote information in listed securities. For the time being, there is no similar pan-European facility. While recognising the need to improve the situation in Europe, MiFID 2 takes a somewhat different approach to the organisation of consolidated data dissemination. The Directive envisages that a consolidated tape will be established by data providers that collect trade reports from the exchanges, MTFs and other reporting mechanism used by investment firms and consolidate this information into a continuous electronic live data stream providing price and volume data for each financial instrument.

Conclusions

In addition to changes in market structure and the business models of stock exchanges, secondary stock markets are today fragmented along two lines. First, trading is fragmented between stock exchanges and a large number of off-exchange venues, such as stock exchange-like alternative electronic trading platforms and OTC centres, including internal trading systems of firms. In the United States, about 30% of all trading takes place in off-exchange venues and in Europe about 50% of the total trade volume is executed outside of the traditional exchanges.

Second, there is fragmentation between lit volume where investors have access to pre-trade information about buying and selling interests, and dark volume where pre-trade information is not available to the public. Lit and dark trading both occur on exchanges and off-exchange venues. In 2015, the total volume of dark trading in the United States – including dark trading in both exchanges and off-exchange venues – was 42%. In Europe the share of dark volume with respect to total trading volume varies between countries from 35% to 48%.

Commitment to maintain market fairness and a level playing field among investors have given rise to regulatory initiatives in both Europe and the United States. As part of this, it is expected that the rationale for existing differences in regulatory regimes between different types of trading venues will be scrutinised. It remains to be seen what the effects will be in terms of stock market fragmentation.

Notes

1. For example, the National Association of Securities Dealers (NASD) in the United States was established as a national securities association and is a Self-Regulatory Organisation (SRO). In July 2007, the Securities and Exchange Commission (US SEC) approved the merger of NASD and the regulatory operations of the NYSE to form the Financial Industry Regulatory Authority (FINRA). It is important to note that national securities exchanges in the United States are also SROs with regulatory obligations, such as enforcing their rules and the federal securities laws with respect to their members. These obligations do not apply to ATSS (US SEC, 2015a).
2. Since the adoption of Regulation ATS in 1998, ATSS have become more prevalent in equity trading in the United States. It is important to note, however, that dark ATSS are not covered by the Order Protection Rule of Regulation NMS, which means that exchanges and ECNs are not required to route orders to dark venues.
3. Out of 85 trading venues operating as ATSS as of 1 December 2015, we have identified 44 venues that in 2015 traded NMS stocks based on data retrieved from FINRA.
4. NYSE, Market Share of consolidated tape volume by year (1976-2003), www.nyxddata.com.
5. The National Stock Exchange (NSX) ceased trading operations in May 2014, but continued to be registered as a national securities exchange during 2015. Since trading did not resume on NSX until the end of 2015, market share data for NSX is not included in Figure 4.3.
6. US SEC, Alternative Trading Systems with Form ATS on File with the SEC as of 1 December 2015, www.sec.gov/foia/ats/atstlist1215.pdf.
7. Rule 600 of Regulation NMS defines an “NMS stock” as “any NMS security other than an option” and defines an “NMS security” as “any security or class of securities for which transaction reports are collected, processed, and made available pursuant to an effective transaction reporting plan, or an effective national market system plan for reporting transactions in listed options.” In general, the term “NMS Stock” refers to exchange-listed equity securities.
8. On US stock exchanges, however, displayed orders are given execution priority over non-displayed orders at the same price.
9. Turquoise is an MTF which is majority owned by the London Stock Exchange, in partnership with 12 investment banks.

10. A trade that is executed bilaterally off the order book of an exchange, but executed subject to the exchange's rules and reported to the exchange, is classified as an off-order book on exchange trade.
11. The European Union has also stated that the definitions of regulated markets and MTFs "should be clarified and remain closely aligned with each other to reflect the fact that they represent effectively the same organised trading functionality." (Source: Regulation No. 600/2014 in markets in financial instruments and amending Regulation No 648/2012).
12. OECD calculations based on data from Thomson Reuters New Issues Database.

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Changing business models of stock exchanges and stock market fragmentation. This chapter from the 2016 OECD Business and Finance Outlook provides an overview of structural changes in the stock exchange industry. It provides data on mergers and acquisitions as well as the changes in the aggregate revenue structure of major stock exchanges. It describes the fragmentation of the stock market resulting from an increase in stock exchange-like trading venues, such as alternative trading systems (ATSs) and multilateral trading facilities (MTFs), and a split between dark (non-displayed) and lit (displayed) trading. Based on firm-level data, statistics are provided for the relative distribution of stock trading across different trading venues as well as for different trading characteristics, such as order size, company focus and the total volumes of dark and lit trading. The chapter ends with an overview of recent regulatory initiatives aimed at maintaining market fairness and a level playing field among investors.

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