

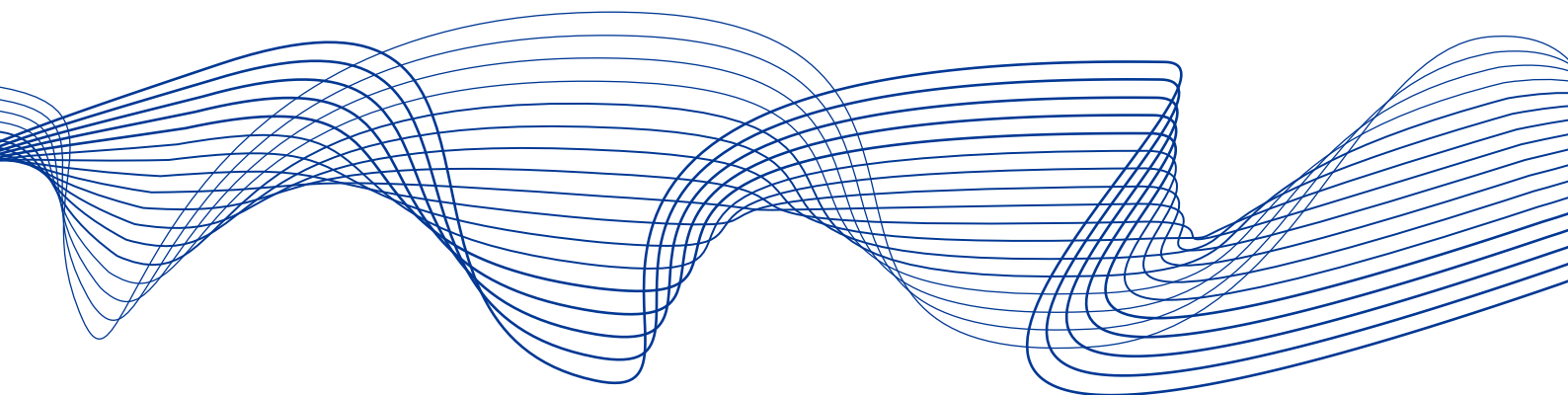


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Is post-trade fragmentation in equities a barrier to the savings and investments union?



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1 Introduction

A long-standing challenge in Europe is improving the functioning of capital markets – including equity markets. Well-functioning capital markets are essential to unlocking the economy’s full potential and to mobilising savings to address major societal priorities, such as the energy transition and increased defence spending.

The industrial organisation of capital markets is a key determinant of how effectively they function. Monopolistic financial market infrastructures generate substantial costs and inefficiencies and contribute to an underdeveloped capital market. Before 2007 each European country had its own monopolistic securities trading and post-trading system. Since 2007 regulators have implemented substantial initiatives to advance the capital markets union in Europe and to make European capital markets more competitive. Most of the action has taken place at the trading stage, with the Markets in Financial Instrument (MiFiD) directives having dismantled the national monopolies of domestic exchanges. As a result, European equities are no longer traded exclusively on their listing exchanges but also on alternative platforms (a process called “trading fragmentation”). Today, only around 40% of trading in European stocks takes place on the listing exchange.

The fragmentation of equity trading across trading venues has brought renewed attention to the organisation of post-trading infrastructure. Trades are only final once they are settled – that is, when cash and securities have been exchanged and the trade and new owner have been documented. The structure of the post-trade industry, and the barriers to cross-border clearing and settlement, were already highlighted in the Giovannini Reports of 2001 and 2003 – more than two decades ago. Although several initiatives have sought to dismantle the “Giovannini barriers”, significant obstacles remain. More recently, the Draghi (2024) report has refocused attention on the organisation of post-trading services, including their market structure and the limited degree of competition among providers. What may appear to be a technical matter of financial “plumbing” in fact plays a decisive role in determining whether investors finance new projects and how efficiently they can find counterparties to meet their trading needs.¹ The costs of post-trade fragmentation will ultimately be reflected in financing costs for corporations.

The capital formation and allocation gap between Europe and the United States can be partly attributed to the complexity and inefficiencies of Europe’s post-trading landscape. Several studies have attempted to quantify the economic cost of these inefficiencies for the European economy. While they point to limited transparency in post-trade fee structures, they nevertheless provide meaningful cross-regional comparisons. AFME (2025), for example, compares post-trade costs for a set of assets (i.e. equities, fixed income and other instruments) in the European Union and North America (there is no separate analysis for equities). It finds that total settlement costs in Europe are, on average, 65% higher than in North America. Fees

¹ Degryse, Van Achter and Wuyts (2021) model how post-trade fees and the way they are allocated between buyer and seller may impact quote aggressiveness and trading volume.

charged by international central securities depositories (ICSDs) are estimated to be around 300% higher than those of their North American counterparts. Applying North American pricing levels to European settlement activity could generate potential cost savings of up to 80%, or approximately €1 billion per year. Custodian fees – covering the safekeeping and servicing of assets – are also substantially higher in Europe, ranging from 160% to 500% above US levels. Skrutkowski (2025) translates these additional post-trade costs into implications for firms' financing conditions, estimating that a fragmented post-trade infrastructure increases the cost of capital for European companies by up to 0.4 to 0.6 percentage points per year.

This ASC Insight examines Europe's post-trading landscape for equities and assesses whether its current fragmentation creates significant friction for capital markets. It explores potential pathways for reform, while taking into account financial stability risks that may arise from different organisational and market-structure choices. The objective of this ASC Insight is to identify the key issues that European policymakers should address to increase the efficiency and competitiveness of the post-trade infrastructure and, in line with the mandate of the European Systemic Risk Board (ESRB), to identify and address the systemic risks associated with the proposed pathways.

We argue that while fragmentation of equity trading at individual stock level across several trading venues can be good for efficiency, fragmentation in clearing, settlement and custody increases the cost of post-trading. Reducing fragmentation in the post-trading landscape, however, requires a much stronger role for regulators and supervisors, especially at European level. Moving regulation and supervision from national to European level, as also recommended by the recent Commission proposal (European Commission, 2025), could internalise some of the possible externalities of national supervision, including national bias in regulation and supervision and cross-border spillover risks. It should also lead to more transparency and convergence in the pricing of clearing and settlement, which would counter the monopolistic pricing powers of central counterparties (CCPs) and especially central securities depositories (CSDs).

When discussing the optimal landscape for post-trading, financial stability concerns loom large. We highlight four, on which we will elaborate below, and discuss how the pathways towards reform affect them. First, fragmentation across CCPs reduces multilateral netting and raises aggregate collateral demand, with procyclical implications in situations of stress. Second, concentration in issuer CSDs creates single points of failure whose operational disruption would propagate across the settlement chain; this might be exacerbated if there were a single CSD in Europe. Third, interoperability arrangements, while alleviating the netting problem, introduce inter-CCP contagion channels, as already highlighted in ESRB (2016). Fourth, the coexistence of distributed ledger technology (DLT) and legacy infrastructures raises questions of netting efficiency and collateral demand under stress that are only beginning to be understood.

The remainder of this ASC Insight is structured as follows. In Section 2, we first briefly discuss the liquidity problem in European capital markets, with the objective of drawing lessons from this for post-trade fragmentation. Section 3 sheds light on the

different steps in post-trading, the current post-trade infrastructure and the frictions involved. Section 4 sets out possible pathways to harmonise European post-trading and highlights implications for systemic risk. Section 5 discusses the role of new technologies in this harmonisation process and their implications for systemic risk. Section 6 concludes.

2 Setting the stage: is there a liquidity problem in European capital markets?

The first question we must ask is whether there is a “liquidity problem” in European equity markets. And if there is, what are the drivers behind it? We will argue that fragmentation in trading (i.e. the same stock being traded across trading venues) is benign and can even help reduce illiquidity in European equity markets, while post-trading fragmentation increases costs.

The most comprehensive analysis of this question so far is that of Brogaard, Hagströmer and Zareei (2025). They study whether a “liquidity gap” existed between the United States and European stocks over the period 2010 to 2024. Of course, Europe has no “mega caps” like Alphabet, Apple or Tesla in the United States. While ownership turnover is higher in the United States, this does not necessarily translate into lower trading costs as measured by the effective bid-ask spread. The results of the study show that the perception that European stocks are less liquid than those in the United States is only partially true, and that from 2010 to 2024, the European liquidity gap has decreased substantially. Brogaard et al. find that large European stocks now have effective bid-ask spreads on par with their US peers of similar size. European small cap stocks on the other hand, remain 70% more expensive to trade than similar stocks in the United States.² The “liquidity gap” is wider for stocks with lower free float, listed at smaller exchange groups, and in countries with lower levels of retail ownership. Other researchers argue that liquidity of European equity markets is still lower compared with those of the United States as reflected in a lower trading volume and turnover velocity for stocks with similar market capitalisation (see for example, Arampazi et al., 2025)

Brogaard et al. also look at the impact of exchange competition as measured by how fragmented trading is within the same stock. They find that the “liquidity gap” is wider for stocks with lower exchange competition (i.e. a lower degree of trade fragmentation). It also establishes that the European liquidity gap for large cap stocks is lower when the share of trading that takes place at opaque trading venues (such as dark pools, periodic auctions and single dealer platforms) increases.³ These findings contrast with the 2025 Oliver Wyman report, which identifies the key friction for liquidity as “intra-market trading fragmentation” with lots of liquidity not being addressable (for example, when it is kept in dark pools) and liquidity within one stock being fragmented.

In sum, trading fragmentation where the same stock is traded on multiple venues leads to more competition and is generally beneficial for liquidity. Europe could take

² They find similar results for the price impact, which measures how much transaction prices move in the direction of the trade within a short horizon. This captures the market’s ability to absorb order flow without large price adjustments.

³ The dark volume share is negatively related to large-cap illiquidity in Europe, whereas it is positive in the United States. These different impacts on liquidity may stem from the fact that retail flows in Europe are typically routed to lit markets, whereas in the United States, payment for order flow directs such orders to off-exchange wholesalers.

further steps towards enjoying the benefits of trading fragmentation by reducing trading frictions to create a virtual integrated trading market. Trading frictions can play a role, such as the lack of (i) a European Best Bid and Offer and (ii) a policy similar to the “order-protection rule or trade-through prohibition” in the United States (where trading centres are obliged to connect to other centres and forward orders to them when quotes are protected (i.e. better priced than at their own trading venue)).⁴

One way to document the existence of barriers in terms of liquidity flows across trading venues is to gauge the effect that power or software outages at primary exchanges have on liquidity. Box 1 discusses evidence that shows that such outages have a much bigger negative impact on liquidity in Europe than in the United States, suggesting that post-trade fragmentation in Europe possibly hampers the benefits of trading fragmentation.

Box 1

Exchange outages and European equity market liquidity

Consider the following “natural experiment”: an outage bringing down an entire trading venue for technical reasons. If a well-functioning fragmented trading market is “a single market with multiple points of entry” (O’Hara and Ye, 2011), the impact on liquidity in the affected stocks should be limited.

In the United States, liquidity during the outage is affected to a limited degree. For example, Clark-Joseph et al. (2017) investigate the effects of a technical malfunction on the NYSE in July 2015, reporting a normalised effective spread increase of only 17%. Woods (2021) investigates four outages on the US listing exchanges NYSE and Nasdaq between 2013 and 2016. The effective spread effects of these events vary widely, between 22% and 278%. Outages at exchanges without their own listings, by contrast, do not seem to undermine liquidity.

For Europe, Degryse, Hagströmer and Landsberg (2025) find that during a primary market outage, “the overall market” effective spreads in the affected stocks increase by 110% and turnover drops by 96%. The degree of ex-ante trading fragmentation does not mitigate illiquidity during the outages.

These different studies provide some tentative evidence for a more fragmented market in Europe compared with the United States, where local outages do not affect overall liquidity.

⁴ Note however that the “trade-through prohibition” is under discussion at the U.S. Securities and Exchange Commission (SEC), where the market perceives it as costly and cumbersome and asks for “best execution” policies (see SEC, 2025). Cespa and Vives (2022), for example, argue that exchanges’ technological capacity decisions are an important driver of market liquidity. Indeed, modern exchanges do not only offer matching services but supply technological services (connectivity) to competitive “downstream” liquidity providers. Connectivity fees or entry regulations are instruments that regulators can use to improve welfare.

To compare trading fragmentation in Europe and the United States and to link these results regarding the “liquidity gap” to the implications for the industrial organisation of post-trading, we will highlight two points. First, while at individual stock level the degree of trading fragmentation is on a par with that of the United States (also in terms of non-addressable liquidity), overall trading fragmentation across equities is much greater in Europe than in the United States, given that in Europe individual shares are traded across a larger number of exchanges than in the United States. This difference comes from the legacy of there being a greater number of primary exchanges in Europe. Whereas the alternative venues are similar across stocks, the primary exchanges differ depending on the national listing of the security. Second, the primary exchanges use different clearing and settlement systems, highlighting the importance of harmonising the post-trade infrastructure. By contrast, for equities, the United States has one clearing agency and one settlement agency – the National Securities Clearing Corporation (NSCC) and the Depository Trust Company (DTC) respectively.

In sum, based on recent empirical evidence, our view is that trading fragmentation in equities is largely benign, and can even be beneficial for liquidity through competition between venues, but fragmentation in post-trading is a meaningful drag on European capital markets. We will explore this in more detail in the following sections.

3 Fragmentation of the post-trade infrastructure: the current landscape and sources of friction

In this section, we first discuss the economics of post-trade industrial organisation. We then turn to the current landscape by comparing the European situation with that of the United States, noting the costs of post-trade fragmentation. Lastly, we discuss sources of friction in post-trading.

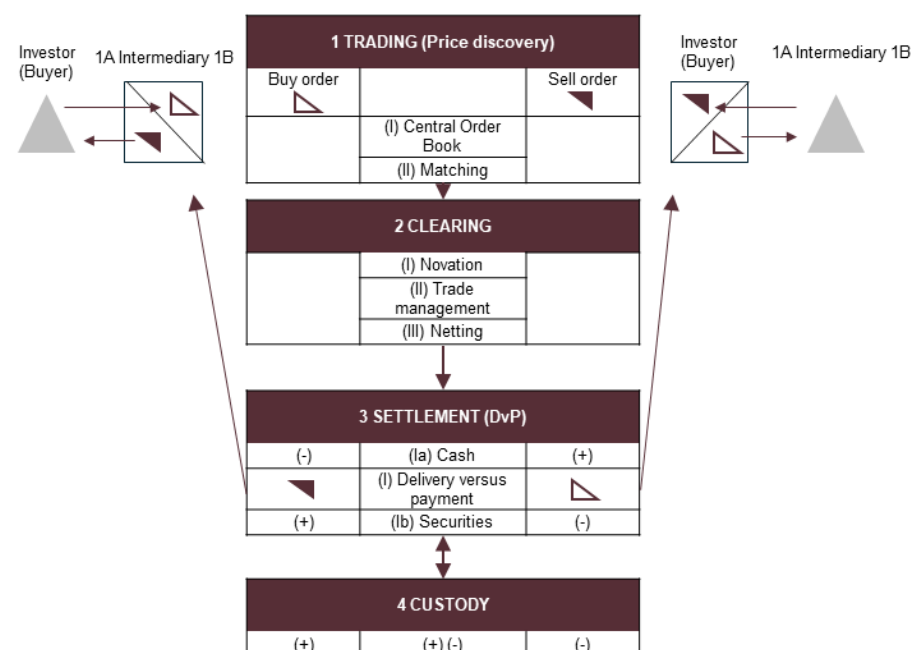
3.1 The economics of post-trade industrial organisation

3.1.1 Trade and post-trade organisation

We will now summarise what happens after a trade is agreed, that is, how the post-trade infrastructure works. Figure 1 displays the securities industry value chain including (1) trading, (2) clearing, (3) settlement and (4) custody.

Figure 1

From trading to custody – the securities value chain



Source: based on Francioni and Schwartz (2017).

The post-trade infrastructure forms the backbone of a well-functioning financial market. Indeed, when investors trade financial instruments, several critical steps must occur before the seller receives the cash and the buyer receives the traded security. These post-trade processing steps are clearing, settlement and custody, and are impacted by the post-trade industrial organisation.

- Clearing is the process of reconciling, matching and confirming the details of a trade. The European Market Infrastructure Regulation (EMIR) defines clearing as “the process of establishing positions, including the calculation of net obligations, and ensuring that financial instruments, cash, or both, are available to secure the exposures arising from these positions”. When there is no bilateral trade, a clearing house or central counterparty (CCP) may step in between buyer and seller, meaning that the buyer and seller both have an agreement with the clearing house (“the novation process”). EMIR defines a CCP as “a legal person that interposes itself between the counterparties to the contracts traded on one or more financial markets, becoming the buyer to every seller and the seller to every buyer”. The CCP performs multilateral netting and manages market and counterparty risks by requesting initial and variation margins from its clearing members.
- Settlement is the actual exchange of securities against cash.⁵ This function is typically performed by central securities depositories (CSDs) within borders or international CSDs (ICSDs) across borders. CSDs may run two different models or “segregated accounts” in the name of individual investors, or an indirect holding system with “omnibus accounts” in the name of a participant (custodian, broker). The participant then allocates the securities among its clients in internal books. EU Regulation requires the segregation of a participant’s own securities from those of the participant’s clients. CSDs and their participants must offer their clients both omnibus and individual client segregation so that clients can choose their desired level of segregation.
- Custody is the safekeeping and managing of assets after settlement. Custodians perform this job and may service the assets (e.g. dividend payments, capital increases). In practice, some CSDs also perform custody and asset servicing functions for securities.

3.1.2 The economics of post-trading

Before discussing the current landscape and possible pathways towards harmonisation, we discuss the economic rationales for clearing and settlement systems.

⁵ Settlement could also involve exchange of securities (delivery-versus-delivery, i.e. DvD) or delivery only.

CCPs

In the absence of a CCP, when two investors trade with each other, clearing is bilateral, meaning that these investors are exposed to each other's counterparty risk.⁶ When doing several trades, this counterparty risk needs to be managed (e.g. through collateral requirements) with every single counterparty an investor has. Securities that are traded on an exchange, however, are typically served by a CCP. In this way investors are only exposed to the CCP. The economic motivation for central clearing stems from economic frictions that make bilateral clearing more costly. For example, counterparties could double pledge collateral to guarantee other trades, or investors may not be perfectly informed about an underlying counterparty's default risk (see Menkveld and Vuillemeij (2021) for a review). CCPs may be better equipped to deal with this risk management by requiring initial margin or variation margins. Indeed, central clearing provides insurance against counterparty risk (Biais et al., 2012, 2016) but requires the initial margin to be posted at the CCP. Central clearing reduces the need to post collateral owing to multilateral netting, that is, the ability to net positions and collateral calls across multiple counterparties. The implication is that a given quantity of collateral can support a greater number of positions (Duffie and Zhu, 2011).

Central clearing further reduces the risk of fire sales stemming from the liquidation mechanism in the event that a member defaults. This is because other members have greater incentives to participate and/or to bid more aggressively in the auction that liquidates these positions to avoid further fire sales. A CCP then serves as a pre-commitment to provide liquidity in situations where forced liquidations leading to fire sales would otherwise occur. A member's default also restricts access to clearing for that member's clients, leading to reduced trading (Gadgil et al., 2026). The governance of CCPs is also relevant, as for-profit CCPs may engage in more risk-taking than member-owned CCPs and may exhibit incentives to weaken risk-management practices.

What is the impact of fragmentation across CCPs? Fragmentation across CCPs reduces opportunities for multilateral netting. Benos et al. (2019) argue that this may give rise to a CCP basis, i.e., an equilibrium difference between the prices of two identical assets, depending on the CCP in which they are cleared. The fragmentation leads to increased collateral requirements, especially if there are different levels of local inventories and netting opportunities across markets. This impact is mitigated in the presence of more sophisticated clients who can choose where to clear (which in turn depends on CCPs' market power and pricing).

The theoretical arguments seem to point to one single CCP providing an optimal equilibrium. In this scenario, participants of the CCP can seamlessly deal with other participants of the CCP. This is a clear example of network effects being present, as one CCP allows participants to connect more easily with other participants, allowing them to contribute to one default fund only and save on costly collateral. Historically, there has only been one CCP per trading venue. The EU's fragmented trading

⁶ Internalised trades are an example of this. When both sides are clients of the same broker, the broker may internally net the trade.

industry means that participants have to deal with different CCPs. For instance, traders that are active on multiple trading platforms would prefer to consolidate their clearing activities, rather than incur the cost of connecting to and maintaining membership of multiple CCPs. Having one CCP across all trading venues would maximise network effects and allow participants to be a member of only one CCP, make one default fund contribution and meet one collateral requirement. A drawback of having one CCP is that it introduces a single point of failure for the financial system, which by design becomes a Systemically Important Financial Market Infrastructure. Therefore, such a model would also require more regulation/supervision to avoid monopoly pricing and stability concerns. This, in turn, would necessitate a stronger role for the European Securities and Markets Authority (ESMA).

CSDs

A central securities depository (CSD) is an institution that keeps track of who owns securities and ensures trades are settled safely and efficiently. CSDs have characteristics of two-sided markets, in that the value to the issuers of securities depends on buyers and sellers of securities who need to settle within the CSD. Regulation mandates that securities admitted to trading on a MiFID trading venue are issued within a CSD. CSDs are also required to comply with the national corporate and securities laws of each Member State where they intend to provide issuer CSD services (see Article 23 of the Central Securities Depositories Regulation (CSDR)), which may entail costly adaptations and discourage competition. Issuer CSDs have an incumbency advantage for the issued securities, as switching CSDs is costly. Two-sided markets are often characterised by economies of scale, suggesting that having one CSD might be preferable to a setting with multiple CSDs operating alongside each other. On the other hand, the question of scale economies in CSDs has not been settled, with the European Commission (2025) not finding evidence of their existence.

The fees and costs of interoperable links between CSDs is important when different CSDs coexist, as it determines whether transferring securities is technically or legally feasible and possible. Interconnection fees between CSDs determine how competitive the market is, and if they become too high, then CSDs merely compete to become the issuer CSD.

CSDs are mainly subject to operational risks stemming from the malfunctioning of internal systems and processes. The impact of technical outages or cybersecurity breaches could be more systemically relevant in an environment with a monopolistic CSD, as in either scenario the entire post-trade infrastructure would be down. Competition can also have an impact on incentives to take the necessary precautionary measures. Another risk related to settlement is that of settlement failures. These occur when a securities transaction is not fully completed on the agreed settlement date owing to a lack of inventory or cash.⁷ Settlement failures

⁷ ESMA (2020) estimates a 5-10% settlement failure rate for equities.

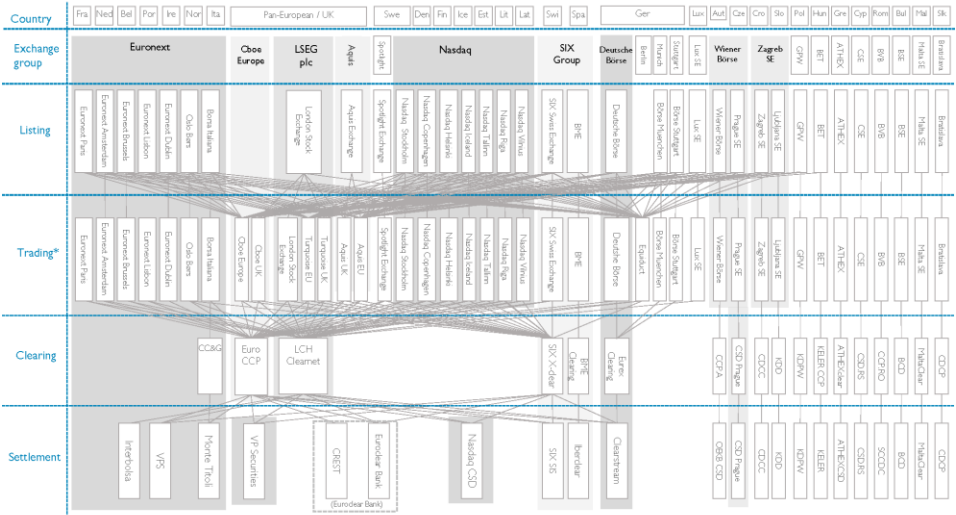
may have knock-on effects owing to liquidity lock-up. In the EU, settlement failures are sanctioned under the Central Securities Depository Regulation, providing incentives to reduce their likelihood.

3.2 Current landscape

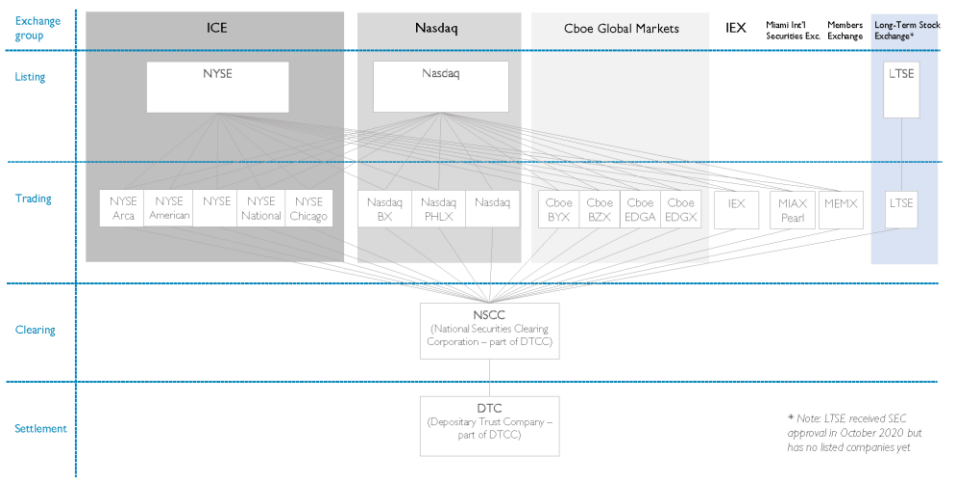
A comparison of the trading and post-trading landscape for equity markets in Europe versus the United States is shown in Figure 2 (showing the situation in 2021). We also refer to the recent discussion of the European post-trading landscape in Carmassi et al. (2026).

Figure 2
Trading and post-trading landscape for equities

a) Europe



b) United States



Source: Noyer report (2024) based on New Financial (2021).
Note: The asterisk in trading for Europe refers to the fact that the underlying paper does not include analysis of the additional complexity of more than 200 trading venues in Europe (MTFs) and more than 70 'systematic internalisers'.

A number of insights can be obtained from this figure. First, in addition to the previously discussed fragmentation in trading, which also reflects the fact that there is a large set of primary exchanges in the EU, Figure 2 reveals a spiderweb of CCPs (“clearing” line in panel a) and CSDs (“settlement” line in panel a). Indeed, today there are nine CCPs and 34 CSDs in the EU compared with only one CCP and one CSD in the United States (panel b). A natural question arises as to whether there is scope for harmonisation with fewer players. Second, the CCPs in Europe can be CCPs operating in a vertical silo or CCPs linked through interoperability arrangements. The latter are connected across trading venues and allow cross-CCP access and netting. “Vertical silo” CCPs, in contrast, clear for their group-owned venues, or have preferred clearing arrangements (i.e. they are the standard CCP unless otherwise decided by participants). This complexity and heterogeneity in design means a lower netting efficiency, higher CCP membership fees, greater initial and variation margins and a lock-up of collateral. These operational frictions induce costs that ultimately fall on investors and hinder stock market activity. Third, CSD Regulation in the EU mandates that issuing securities must happen through a single issuer CSD. This CSD is responsible for establishing and maintaining the primary book-entry register for that security. The issuer CSD maintains the ultimate record of securities ownership. Transactions taking place on trading venues must ultimately be recorded on CSDs – not necessarily the issuer CSD. Other CSDs are interoperable with the issuer CSD through direct connection to the issuer CSD or are facilitated through Target 2 Securities (T2S) (see Box 2 for an explanation of T2S). This implies that settlement at one CSD still leads to adjustments within the issuer CSD. A trade on any venue is then ultimately settled into the issuer CSD. The legacy of national issuer CSDs necessitates a spiderweb of connections and leads to a lot of “cross-CSD” settlement.⁸ It is worth noting that this cross-CSD settlement is almost always cross-border, as most countries have only one CSD. This links back to the “cross-border” clearing and settlement barriers already identified by Giovannini in 2001.

Box 2

The role of T2S

Target 2 Securities (T2S) became operational in June 2015 with the goal of harmonising European securities markets. The T2S infrastructure is a pan-European technical platform which allows for the settlement of securities transactions by providing three core functionalities: (i) maintenance of securities accounts, (ii) maintenance of cash accounts, and (iii) settlement. It follows the same harmonised procedures even for settlement transactions involving different CSDs. The platform implements delivery-versus-payment (DvP) settlement, by executing simultaneous bookings on the securities accounts (provided by CSDs) and on the central bank money cash accounts (provided by the central bank). T2S can be seen as a single connection point for accessing several CSDs; however, it still requires investor CSDs to establish direct links with issuer CSDs.

⁸ In that case, the “investor CSD” establishes a link with the “issuer CSD” by opening a securities account with the “issuer CSD”.

T2S is owned and managed by the ECB and acts on a cost-recovery basis. The expectation was that there would be large economies of scale leading to large volumes with low average costs. Additional benefits would be a more efficient use of collateral, less credit risk due to settlement in central bank money, and a netting of cash flows. The expectation was that CSDs involved with T2S would outsource their traffic to T2S, allowing them to have lower transaction fees than those staying outside T2S, but in practice not all CSDs employ T2S for settlement. T2S makes cross-border settlement less complex and therefore opens up markets for cross-border investments.

How important are CSD fees? The CSDR mandates that fees charged by CSDs be transparent and that CSDs provide access to their services on a fair and non-discriminatory basis. A report by AFME (2025) compares the fees charged by (a subset of the) CSDs in the EU versus North America, without differentiating, however, on the type of asset (i.e. it covers equities, fixed income and other instruments). The report finds that a European CSD settlement is, on average, 65% more expensive than a North American settlement (i.e. a weighted average of €0.38 per settlement for European CSDs compared with €0.23 for North American settlement).⁹ In aggregate numbers, this would imply potential cost savings of almost €1 billion per year if North American settlement charges were applied. In addition to higher fees, the report also notes a large number of different fees and a lack of consistency in how these fees are reported across different CSDs in Europe. This adds additional costs for users, especially those active across several CSDs. While prices are higher in Europe than in the United States, profit margins are also higher, possibly reflecting differences in the ownership structure of CSDs, as the DTC in the United States is user-owned. This suggests that higher costs do not exclusively explain the higher settlement fees in Europe. Rather, monopolistic pricing power plays an important role.

The settlement industry is quite fragmented and still often national, owing to legal and taxation-related frictions. Equities are issued nationally within the local issuer CSD. While this leads to fragmentation along national borders, the question is whether this fragmentation is per se a problem. It could be argued that interoperability among CSDs makes settlement fragmentation less worrisome. Ultimately, as long as CSDs are interoperable with the issuer CSD, settlement at one CSD still leads to adjustments within the issuer CSD.¹⁰

The formation of T2S in 2015 could be seen as a step towards creating structural interoperability across CSDs. One of the major objectives of T2S was to reduce settlement costs, particularly for cross-border transactions. The outsourcing of settlement to T2S by CSDs should have lowered settlement costs and the expectation was that all CSDs would connect to T2S to create complete interoperability. It was also expected that the involvement of T2S would reduce the number of CSDs.

⁹ A large portion of settlement charges stems from non-core settlement fees (e.g. penalties, cancellations and manual charges).

¹⁰ A concern is that some CSDs may prevent interoperability with selected CSDs for strategic reasons, i.e., to hamper competition.

Evaluations of the success of T2S differ considerably. While the Noyer (2024) report considers that T2S essentially adds an additional layer of complexity, the Oxera (2025) report considers T2S to be a success. However, four remarks are in order. First, not all CSDs are connected to T2S, also because T2S does not settle in all currencies. Second, of the settlements executed by T2S, close to 98% of transactions in value and more than 95% of volumes were settled between parties in the same individual CSD, and therefore only limitedly across CSDs. So, there is a home bias in most settlements, even though T2S was originally designed to enhance cross-border settlement. Third, CSDs seem to pre-settle transaction flows among themselves or do settlement internalisation on their own books before sending transaction flows to T2S. This suggests that T2S is perceived as either too expensive, or as inefficient (as measured by settlement failures requiring manual interventions). Fourth, AFME (2025) finds that several CSDs that have connected to T2S continue to apply their own (additional) transaction processing fees, and some CSDs continue to charge the same settlement fees to directly connected participants (who send instructions directly to T2S without the CSD's intervention) as to other types of participants. This shows that CSDs have substantial market power and T2S has not managed to reduce settlement costs to the Eurosystem's target of 15 euro cents.

3.3 Sources of friction

A natural question is whether and how the higher costs of clearing and settlement are related to the fragmentation of post-trading in Europe and to what extent this also constitutes a systemic risk concern. We discuss a few sources of friction – some of which could be addressed if the European Commission market integration package of 4 December 2025 were to be fully implemented.

- Fragmentation in clearing due to limited interoperability reduces netting benefits and leads to locked up initial margins and increased collateral requirements. In terms of systemic risk, the limited degree of CCP interoperability also has a procyclical collateral-demand channel, as during downturns extra collateral will be required.
- Differences in national securities regulation and tax legislation mean that CSDs operate on a national level. As detailed by the European Commission (2025), this involves different definitions of types of securities, ownership and point of finality of settlement, but also different tax laws. Selection of an issuer CSD is mostly based upon nationality, and switching issuer CSD is costly, giving substantial market power to CSDs. The fragmentation of legal frameworks at national borders also creates jurisdictional obstacles that can complicate the effective resolution of issuer CSDs.
- Supervision of CSDs is largely national, with supervisory colleges when cross-border, under the ESMA umbrella. As also argued by Carmassi et al. (2026), centralised supervision by ESMA, in a similar way as banking supervision is undertaken by the ECB, may provide a system-wide view and internalise some

of the possible externalities of national supervision, including national bias in regulation and supervision and overlooked cross-border spillover risks.

Centralised supervision is also a precondition for having a system-wide view in the event of a systemic crisis. The European Commission proposal suggests giving greater power to ESMA in order to reduce “gold plating” by national authorities and augment supervisory efficiency. It calls for direct supervision by ESMA over significant trading venues, CCPs and CSDs and gives ESMA new supervisory convergence powers.

- While settlement ultimately always occurs at the issuer CSD (either directly or through the interoperable infrastructures connected to it), the market power of the interoperable infrastructures and issuer CSD leads to higher settlement fees compared with the United States, possibly reflecting the different ownership structure of CSDs in the two regions. The market power of issuer CSDs also leads to concentration risk, with single points of failure whose operational disruptions can propagate further down the custody chain. This not only adds to the call for a stronger role for European regulators and supervisors such as ESMA, but also scrutiny from the competition policy authority.

4 Possible pathways for the future

We will now discuss possible pathways towards harmonising the organisation of CCPs and CSDs, taking into account aspects of financial stability and systemic risk. The possible role of new technologies in this process will be explored in Section 5.

4.1 Pathways for CCPs

It is natural to ask why the market cannot provide a socially optimal level of central clearing.¹¹ Coordination failures, lower collateral provision in bilateral contracts and excessive leverage with double pledging of collateral could be explanations for the under provision of central clearing. Trading venues with only one CCP, or which have a preferred clearing arrangement with one CCP, may result in captive clients and limited competition between CCPs. Explicit bail-out commitments for specific CCPs may also lead to lower risk-management standards, as well as to less monitoring by clearing members.

A possible pathway is to **increase or mandate interoperability among CCPs**. The Principles for Financial Market Infrastructures issued by the Committee on Payment and Market Infrastructures - International Organization of Securities Commissions (CPMI-IOSCO) encourage interoperability between CCPs where this can reduce risk and promote access. The EU's Markets in Financial Instruments Directive and Regulation (MiFID II/MiFIR) framework contains open access and non-discriminatory provisions. The fragmented clearing industry has, in some cases, led to demand for interoperability arrangements, driven by clearing members wishing to net positions in securities traded at different trading venues, which would otherwise be cleared through different CCPs. Interoperability arrangements allow participants in one CCP to centrally clear trades with members of the interoperable CCP and benefit from multilateral netting, without being a member of both CCPs. An interoperability link between two CCPs allows a participant of one CCP to carry out centrally cleared trades with a participant of the other CCP. A trade cleared through an interoperable link will be "novated" by replacing the original contract with three separate contracts: one between the first CCP and the buyer, another between the other CCP and the seller, and a third between the two interoperable CCPs. In this way, interoperability preserves the netting benefit to participants of using a single clearing venue, that is, the benefit of having incoming and outgoing obligations from different trades cancel each other, which allows participants to avoid duplicating CCP membership fees and duplicating default fund contributions. Participants can then choose from a variety of CCPs offering different services. The advantage of having multiple CCPs is that they

¹¹ This Insight focuses on equity markets, but similar analysis may apply to other markets, such as those for corporate and government bonds (repos). For example, it is not mandatory for repos on government bonds to be centrally cleared, but central clearing could limit the build-up of leverage by non-bank financial intermediaries ex-ante and reduce the impact of market stress ex-post (O'Donnell and Tamburrini, 2025). Furthermore, when clearing services are provided across other types of securities, this may allow cross-margining across products.

can compete and offer user choice, and if one CCP is not operational, it can be substituted.

A possible drawback of CCP interoperability is that it may lead to contagion from one CCP to another. Regulators have therefore asked that the “bridge” between CCPs be sufficiently covered by collateral, i.e., that a risk-management framework be implemented regarding these interconnections. To the extent that this bridge is overprotected (i.e., over-collateralised for risk-management or anti-competitive reasons), this will trickle down to greater collateral requests for participants at each of the individual CCPs, or additional fees when crossing the bridge. Interoperability may then be less used than is socially desirable and could induce larger default fund contributions than would be required if only one CCP were active.

Interoperability may lead to possible systemic risk implications. The ESRB (2016) has already focused on the benefits and threats of interoperability arrangements and summarised them in the following table. From a systemic risk perspective and to reduce contagion, the concern primarily relates to the risk of inter-CCP positions being under-collateralised.

Table 1
Main systemic risk implications of interoperability arrangements

Main benefits	Main threats
Reduced aggregate exposures	Inter-CCP exposures
Reduced aggregate collateral needs	Possible under-collateralisation of inter-CCP positions
Reduced liquidity risk	Operational risks/complexity in the risk management frameworks of CCPs
Reduced complexity for clearing members	Operational risks/complexity in the risk management frameworks of CCPs
Substitutability	

Source: ESRB (2016).

In sum, there is a trade-off between the benefits competition brings for investors, who can easily substitute between CCPs through lower fees, and the contagion effects interoperability may have. Managing such financial stability risks through fees to “cross the bridge” requires careful regulation of such fees to avoid negating the benefits of competition, again calling for a stronger role for European regulators and supervisors.

An alternative pathway to maximise netting benefits and keep user choice is to have **one CCP that is mandatorily active on all regulated equity markets**. This could be achieved by auctioning this right to existing CCPs, or by setting up a European public infrastructure. At the same time, other CCPs would be allowed to stay active with mandated interoperability among this core CCP and other CCPs. This would still offer user choice, competition, and substitutability in the event of operational problems occurring at one CCP, and would allow some CCPs to focus on a subset of countries in which they could specialise. This design would combine the US system, where there is one CCP for participants who choose that option, with user choice for participants who possibly concentrate their trading on specific regions or venues and have less need for network effects. From a systemic risk perspective, it would be important for the core CCP to be supervised by ESMA to mitigate possible contagion

to the other CCPs and transmissions along the custody chain. Weighing up the two suggested pathways for CCPs (mandating interoperability and a core CCP) in terms of systemic risk, the upside of a core CCP is that given the collateral savings it would be less procyclical compared with interoperable systems. On the other hand, the core CCP could become “too big to fail” and thus require strict supervision by ESMA.

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4.2 Pathways for CSDs

How can the issue of CSD market power and high settlement costs in Europe be addressed? One option is to go further down the route of **interoperability**, that is, to maximise CSDs’ interoperability with T2S. For example, it could be mandatory for all CSDs to have connections with T2S. The question is whether this would reduce the market power of CSDs as even participants that are directly connected to T2S are facing similar fees from their CSDs.

A second option is to **change the status of T2S and make it an (issuer) CSD**.

Participants could then simply opt for settlement in T2S and other CSDs would have to compete to become or remain the CSD of choice. Switching costs may hinder the move away from issuer CSDs for securities that have already been issued. CSDs would still have an important role to play in terms of taking care of asset servicing (corporate actions, legal and tax matters).¹³ However, “T2S as CSD” could become an extremely systemically important institution with massive concentration risk, meaning that a disruption would impact the entire European securities market. The systemic nature of T2S is probably less of a concern as long as settlement involves delivery-versus-payment (against central bank money) and appropriate supervision is in place. However, questions may be asked as to whether it is appropriate and credible for ESMA to supervise a publicly owned systemically important institution such as “T2S as CSD”.

The possible further consolidation of primary exchanges may lead to more important vertical structures eliminating choice for CCPs and CSDs. Special attention may need to be paid to interoperability agreements with these new vertical silos. More generally, a stronger role for regulators and supervisors is called for.

As already indicated above, one important cost factor involves the different legal regimes under which CSDs function. As documented by the European Commission (2025), even where CSDs have shared joint platforms, they still have to work with different sets of rules and manuals for securities from different countries and thus different legal frameworks (see also Advisory Committee on Market Infrastructures for Securities and Collateral (2025)). This source of cost could only be addressed by

¹² Shifting supervision of systemically important CCPs to the supranational level would also require shifting the resolution to the supranational level.

¹³ Giving T2S the status of a CSD would, however, mean that all CSDs would be required to be connected to it, while at the same time competing with it as a CSD. Key questions would need to be addressed on the allocation of tasks between ‘T2S as CSD’ and CSDs. Furthermore, “T2S as CSD” would be legally required to cater to the specificities of each national law to provide issuer CSD services and expand to other currencies, which may not be economically viable.

converging legal systems (a very long-term process) or a 28th regime (which might not necessarily apply to issuers of all traded equity claims). A stronger role for European regulators and supervisors such as ESMA, but also scrutiny from the competition policy authority, seems a more immediate path to increasing transparency and reducing monopoly rents and thus costs in CSDs.

5 New technology

In this section, we discuss the opportunities and limitations of distributed ledger technology (DLT). We first consider DLT as a standalone technology, before turning to the opportunities and limitations associated with the coexistence of DLT and legacy infrastructure.

5.1 DLT: advantages, limitations and use-cases.

In recent years, DLT has emerged as a system for recording transactions across decentralised networks. Within this framework, digital securities may be issued directly on a blockchain as “native tokens” or created as digital representations of existing securities (“non-native tokens”). Because these systems operate without a central authority such as a central bank or government, they rely on consensus mechanisms to validate and record transactions. DLT can be permissioned, where participants must receive authorisation before joining the network, or non-permissioned.

The new technology has potential upsides and may bring competition to the existing incumbent post-trade systems.¹⁴ Employing DLT has the potential to lead to end-to-end execution of transactions, because it encompasses trading, clearing and settlement in one step. The implication then is that there is “atomic settlement”, which can occur in seconds or minutes. This differs from transactions executed on exchanges where, in accordance with the CSDR, transactions are to be settled by no later than the second business day after the trading takes place (T+2) with current initiatives to further shorten it to a “T+1” settlement cycle. The implementation of DLT implies a new kind of financial market infrastructure, called a DLT trading and settlement system (DLT TSS) (Priem, 2025). The distinction between trading and post-trading then becomes non-existent: they become intertwined and there is atomic settlement, meaning that counterparty risk is removed.

DLT also has serious limitations, however. First, the implication of atomic settlement is that it eliminates netting by design and accordingly requires vastly greater liquidity and security inventory needs. This contrasts with legacy systems that rely upon multilateral netting reducing collateral requirements. Another concern often mentioned in connection with the use of DLT is its limited scalability, i.e., the fact that blockchain is subject to congestion (and thus lack of speed) and fragmentation (see, for example, Budish, 2025 and Shin, 2026). These limits are material, as the Depository Trust and Clearing Corporation (DTCC) for example processes equity transactions at peak rates of the order of 25,000 per second, whereas it remains unclear whether DLT (depending on the underlying technology) would be able to handle such a large number at such speed.

¹⁴ See also Banu et al. (2026) for a discussion of DLT and its coexistence with legacy systems.

DLT leads to delivery-versus-payment where the payment leg could substantially differ as it could either be private money such as stablecoins (or private deposits) or central bank digital currency (CBDC). This payment leg has different implications for run risk, as stablecoins are more likely to be subject to run risk than CBDC (Cechetti, 2021).

The distributed nature of the technology might improve resilience against the depth of cyberattacks, as there are live copies across the distributed ledger. On the other hand, more points of entry might increase the probability of an attack. Another upside of DLT is that tokenisation allows for fractional ownership of high-value assets, improving accessibility for a broader range of investors. That is to say, it may democratise asset ownership.

Current regulation may in some respects form a barrier to entry for DLT (Priem, 2025). For example, the CSDR requires securities to be issued at an issuer CSD employing a book-entry form. This implies that only “non-native tokens” can be used that form twins for the securities held within the issuer CSD. Authorities have also taken a cautious approach regarding the implementation of DLT. In 2022 the EU started the DLT Pilot Regime, providing a legal framework for tokenised securities such that non-native tokens could be legally issued or migrated to the DLT. According to ESMA (2026), the initiatives within this pilot regime have been limited to six,¹⁵ with limited trading activity. This implies that up to now DLT has been a sideshow within the post-trade infrastructure. This is probably also related to concerns regarding the scalability of the technology. A concern that can be raised is that there is fragmentation within DLT, with different standards, different ledgers and questions regarding interoperability within the new technology framework. For DLT to be a success, it seems that standardisation is a key factor, as otherwise different silos will be created possibly again along national lines, limiting interoperability.¹⁶

5.2 Coexistence of legacy systems and DLT

We have argued above that the clearing and settlement industry exhibits network effects in terms of netting benefits, leading to lower liquidity requirements, collateral requirements and mitigated counterparty risk. At the same time, the current post-trade industry is quite fragmented, leading to underutilisation of this potential on an EU-wide scale due to market power resting with incumbent issuer CSDs and limited or distorted interoperability across CCPs.

A natural question then arises as to *whether* DLT should coexist with the existing financial market infrastructures, and if so, *how*. This question applies to both trading and post-trading. For example, Nasdaq proposes to have tokenised securities coexisting with “traditional securities” for the same asset, and trading occurring within

¹⁵ For a list of authorised DLT market structures, see https://www.esma.europa.eu/sites/default/files/2026-01/Authorised_DLT_Market_Infrastructures.pdf.

¹⁶ The Eurosystem’s Appia project aims to support the development of DLT networks within the EU by promoting common standards (Eurosystem, 2026).

the same order book.¹⁷ Settlement preferences related to “tokenisation” would then be routed separately to the DTC. Tokenisation could then be seen as “internalisation” as at least one side of the trade decides to not take part in clearing and follow a separate route to settlement.

Regarding post-trading, coexistence of DLT with legacy systems may reduce netting possibilities and lead to heightened illiquidity and collateral needs in the settlement process. Allowing DLT within trading and post-trading could lead to increased cybersecurity risks when DLT does not offer the same level of protection as other trading and settlement systems. Trades taking place against tokenised securities could induce greater uncertainty when tokenisation leads to questions regarding the delivery of securities in the settlement process.

As a result, DLT could initially be useful for less frequently traded stocks (e.g., small and medium-sized enterprises) or other securities such as bonds, where netting and collateral requirements over shorter time windows of a couple of days may be less important.

An important question also arises with regards to the supervisory architecture in the event of coexistence of DLT and legacy infrastructures. Above, we have been arguing for stronger supervisory power over legacy infrastructures for ESMA. This naturally extends to DLT TSS regarding the supervision of the consensus mechanism, standards regarding cyber resilience, and the interoperability arrangements of DLT TSS with legacy CSDs. Since it is important that participants be known, only permissioned ledgers should be allowed. Centralised supervision is key to mitigating possible systemic risks that could arise when consensus mechanisms are questioned, and to imposing standards regarding cyber resilience and interoperability arrangements.

¹⁷ For the text of the proposed rule change, see <https://listingcenter.nasdaq.com/assets/rulebook/nasdaq/filings/SR-NASDAQ-2025-072.pdf>

6 Concluding remarks

The Draghi (2024) report calls for a substantial harmonisation of the post-trading infrastructure. The current EU landscape is fragmented in terms of trading and post-trading. This ASC Insight aims to address a number of questions regarding whether this fragmentation is harmful by linking it back to the economics of the post-trade industry. Previous studies suggest that applying North American settlement pricing to European settlement would lead to potential cost savings of about 80% or €1 billion per year, or a decrease in the cost of capital for European firms by up to 0.4% to 0.6% per annum.

While fragmentation in trading (i.e., a stock being traded on several venues) is beneficial for liquidity and efficiency, fragmentation in post-trading increases costs. When addressing these inefficiencies, however, there are also trade-offs between efficiency and financial stability concerns. Reducing fragmentation can lower costs while increasing concentration risks. A stronger role for regulators and supervisors at European level, taking into account network effects and externalities beyond national borders, is critical.

This ASC Insight has outlined several pathways to further harmonising the post-trading industry. Interoperability between CCPs appears to be essential to achieving greater integration. However, tensions may arise between interoperability and risk management, as stringent risk controls can limit frictionless cross-CCP arrangements. One potential pathway would be to foster interoperability in clearing across trading venues by requiring that at least one CCP be active on all major trading platforms. Clearing members that place significant weight on netting efficiencies and collateral optimisation could then automatically reap these benefits by clearing through this CCP. At the same time, other CCPs could remain active and interoperable with the “mandated” CCP, thereby preserving competitive pressure on the primary clearing provider.

At the CSD level, issuer CSDs enjoy considerable market power, largely driven by indirect network effects and reinforced by the limited degree of legal harmonisation across Europe. TARGET2-Securities (T2S) was designed to promote interoperability among CSDs by enabling delivery-versus-payment settlement in central bank money. While opinions differ regarding its overall added value, T2S has not materially reduced the market power of issuer CSDs. One pathway would be to make it mandatory for all CSDs to have connections with T2S, though this might not reduce the market power of national CSDs. To strengthen competition while containing systemic risk, one potential option would be to transform T2S into a fully-fledged CSD. This would require incumbent CSDs to compete more directly to retain their business. Such a reform could further enhance interoperability across CSDs and weaken the entrenched market power of issuer CSDs. But it could also create a new systemically important financial institution and thus concentration risks.

More generally, a significantly stronger role for the regulator is needed in Europe. While the monopolistic CSD in the United States is owned by users (which might

explain why it does not exploit its market power), path dependence has led to different ownership and market structures in Europe. A stronger role for regulators in terms of (i) enforcing harmonisation in fee schedules and transparency and (ii) questioning high fees, is critical.

New technologies should be given scope to develop further, as they may introduce additional competitive pressures in post-trade infrastructure. Distributed ledger technology (DLT), for instance, enables “atomic settlement,” whereby transactions are settled instantaneously and irrevocably. However, this model eliminates the netting efficiencies typically achieved through CCPs, potentially increasing liquidity demands. It therefore appears prudent to advance DLT in market segments where netting benefits and liquidity optimisation are less critical – an approach broadly reflected in the current DLT Pilot Regime. Supervision of the consensus mechanism, cyber-resilience standards and interoperability arrangements with legacy infrastructures is equally important to contain systemic risks.

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