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Central Securities Depositories and Geopolitical Risks

Challenges for European Policy

Olena HAVRYLCHYK

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Abstract

Central Securities Depositories (CSDs) form the backbone of financial market infrastructure by registering securities, settling trades, distributing cash flows, and managing collateral. While often regarded as mere financial “plumbing,” they in fact underpin strategic objectives such as advancing the Savings and Investment Union, curbing tax evasion, and reinforcing Europe’s geopolitical stance.

The academic and policy debate on CSDs is fragmented across three strands of literature that rarely intersect. From a regulatory perspective, concerns focus on the persistent fragmentation of the EU CSD market. From a political economy perspective, omnibus accounts and opaque custody chains are criticized for facilitating tax evasion. From a geopolitical perspective, Euroclear – the EU’s largest International CSD – has been thrust into the spotlight for its central role in immobilizing and freezing Russian assets after the 2022 invasion of Ukraine. This Paper brings these three strands of literature together to identify and analyze the key challenges facing European policymakers.

Résumé

Les dépositaires centraux de titres (DCT) constituent l’épine dorsale de l’infrastructure des marchés financiers en enregistrant les titres, en réglant les transactions, en distribuant les flux de trésorerie et en gérant les garanties. Bien qu’ils soient souvent considérés comme de simples « tuyaux » financiers, ils sous-tendent en fait des objectifs stratégiques tels que la promotion de l’Union de l’épargne et de l’investissement, la lutte contre la fraude fiscale et le renforcement de la position géopolitique de l’Europe.

Le débat académique et politique sur les DCT est fragmenté en trois courants de la recherche qui se recoupent rarement. D’un point de vue réglementaire, les préoccupations portent principalement sur la fragmentation persistante du marché des DCT dans l’Union européenne (UE). Du point de vue de l’économie politique, les comptes omnibus et les chaînes de conservation opaques sont critiqués pour faciliter l’évasion fiscale. Du point de vue géopolitique, Euroclear, le plus grand DCT international de l’UE, a été propulsé sous les feux de la rampe pour son rôle central dans l’immobilisation et le gel des actifs russes après l’invasion de l’Ukraine en 2022. La présente étude rassemble ces trois courants de la littérature afin d’identifier et d’analyser les principaux défis auxquels sont confrontés les décideurs politiques européens.

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Introduction

Central Securities Depositories (CSDs) are a core component of post-trade infrastructure. Each issuer must select a CSD to register newly issued securities, and when these securities are traded, the CSD records the change in ownership – a process known as settlement. Beyond settlement, CSDs facilitate the distribution of cash flows such as dividends, coupons, and bond redemptions, and they have become increasingly important in collateral management. In short, CSDs safeguard the integrity of securities issuance, maintain accurate records of ownership, and guarantee the finality of settlement.

What may seem like a purely technical matter of “financial plumbing” is, in fact, central to Europe’s broader ambitions. Mobilizing domestic savings to finance the energy transition, curbing fiscal evasion, reinforcing the euro’s role as a global reserve currency, and strengthening Europe’s geopolitical position all depend on the design of the settlement infrastructure.

Despite being the backbone of financial markets, CSDs usually attract little public attention. When they are discussed, it is typically within three distinct contexts that rarely connect with each other. From a financial regulation perspective, the persistent fragmentation of the European Union (EU) CSD market is regarded as a major obstacle to the establishment of a genuine Savings and Investment Union (Draghi, 2024). From a political economy perspective, the reliance on omnibus accounts by most CSDs and the resulting opacity of end-investor ownership are criticized for enabling tax evasion (Nougayrède, 2018; Zucman, 2015). Finally, from a geopolitical perspective, Euroclear – the largest International CSD (ICSD) in the EU – has been thrust into the spotlight as it played a central role in immobilizing and freezing Russian assets following the 2022 invasion of Ukraine.

This paper brings these three strands of literature together to offer an integrated perspective on the role and future of CSDs. Its aim is twofold: first, to provide a clear account of how CSDs function within the broader financial system; and second, to identify and analyze the key issues that European policymakers must address.

The first challenge facing Europe’s CSD landscape is its persistent fragmentation. Despite legal integration efforts in past decades and the apparently dominant role of Euroclear and Clearstream, technical integration remains limited. European regulation has sought to harmonize the functioning of CSDs, yet national CSDs continue to operate under diverse legal, fiscal, and supervisory frameworks. This fragmentation slows

cross-border settlement, increases costs, and reinforces home bias (Hanssens et al., 2025). In his 2024 report on European competitiveness, Mario Draghi (2024) advocates the establishment of a single European Union-wide CSD as a means to streamline settlement and reduce its costs.

Second, the current design of CSDs obscures the link between issuers and beneficial owners, thereby undermining corporate governance, tax compliance, and sanctions enforcement. Most European CSDs rely on the indirect holding model: CSDs register securities in the name of custodians, while ultimate investors are separated from issuers by long and opaque custody chains. To address this issue, Gabriel Zucman and Thomas Piketty have advocated the creation of a Global or European Asset Register to enhance the transparency of beneficial owners (Neef et al., 2022; Nougayrède, 2018; Zucman, 2015).

Third, the Russian invasion of Ukraine has revealed that CSDs are not merely neutral market infrastructures but can also serve as geopolitical instruments. The authorities have leveraged ICSDs as powerful chokepoints to immobilize the Russian central bank's reserves and freeze assets of Russian politicians, oligarchs, and propagandists. As of June 2025, Euroclear Holding holds €194 billion of Russian assets, which amounts to 85% of Euroclear's total assets. This raises questions about the use of windfall revenues and legal, economic, and political tensions around asset confiscation. There is a risk of financial fragmentation, illustrated by the Hong Kong Exchanges and Clearing's announcement to create an alternative ICSD.

Finally, new technological challenges are emerging. Cyberattacks, though not yet disruptive to CSDs, have demonstrated their potential to destabilize other institutions. Distributed ledger technology (DLT) is promoted as a means to reduce reconciliation costs, increase transparency of beneficial ownership, create new market structures, and enhance resilience (Catalini and Gans, 2020; Yermack, 2017). Yet, its adoption is very slow and remains fragmented across platforms, raising concerns regarding scalability, interoperability, and governance.

In what follows, Section 2 explains the functioning of CSDs as the ultimate record of securities ownership, with particular attention to the debate between omnibus and segregated accounts. Section 3 presents data on the fragmentation of the EU CSD market and outlines the horizontal and vertical integration processes that have taken place over the past decades. Section 4 examines how CSDs can be weaponized to choke off financial flows, while Section 5 analyzes in detail the impact of the immobilization and freezing of Russian assets on Euroclear Bank's balance sheet. Section 6 discusses additional challenges facing CSDs, and Section 7 concludes.

CSDs maintain the ultimate record of securities ownership

Before the establishment of CSDs, settling a trade in securities required the physical transfer of paper-based instruments. As securities trading accelerated in the 1960s and 1970s, the physical transfer of paper instruments became increasingly cumbersome, culminating in so-called “paper crunches” in New York and London when settlement delays threatened to disrupt the operations of the securities markets. This led to the creation of central securities depositories, which physically immobilized securities in their own premises and transferred them through a book-entry system only.

Euroclear Bank (originally known as the Euro-clear Clearance System) was created by J. P. Morgan in 1968 in Brussels to facilitate the administration and settlement of US dollar-denominated Eurobond transactions outside New York. Belgium was chosen for its politically neutral government, stable yet flexible legal framework, and sound financial system. A competing institution, the *Centrale de Livraison de Valeurs Mobilières* (Cedel), was established a few years later in Luxembourg and eventually evolved into Clearstream. In 1973, the Depository Trust Company (DTC) was created in the United States (US), which immobilized US securities certificates within a single CSD and executed transfers exclusively by book entry.

Today, these three CSDs are central to the global securities markets. Euroclear Bank and Clearstream Banking S.A. (Luxembourg) are considered to be International CSD (ICSD) because they register and settle trades in international securities. They also play a central role in cross-border settlement in Europe and worldwide. Finally, ICSDs have banking licenses, which allow them to have risk profiles closer to those of custodians than ‘non-banking’ CSDs.

A CSD can be defined as an institution that maintains the ultimate record of securities ownership. This concerns mostly transferable securities eligible for exchange trading (stocks, corporate bonds, Treasury bonds, investment funds), though in some countries, CSDs may also register securities that are not traded. In practice, a security issuer must choose a CSD with which to open an account to register all newly issued securities. The CSD then records all information related to security ownership (e.g., resulting from secondary market trading), a process referred to as settlement. It also maintains the account, facilitating the distribution of cash flows such as dividends, coupons, and bond redemptions. In recent years, some CSDs

have also become important for collateral management. A CSD has to make sure that the number of securities issued is equal to the number of securities in circulation, which is called maintaining the integrity of the issue.

CSDs are a core component of the financial market infrastructure that includes trading, clearing, and settlement. Once a trade is executed on a stock exchange, the seller must be assured that the buyer will not default. To mitigate counterparty risk, the transaction is cleared through a Central Counterparty (CCP), which interposes itself between the parties—becoming the buyer to every seller and the seller to every buyer. After clearing, the CCP sends settlement instructions to the CSD, which records the transfer of securities. As a rule, CSDs do not assume counterparty risk, though they may be exposed to intraday credit risk.

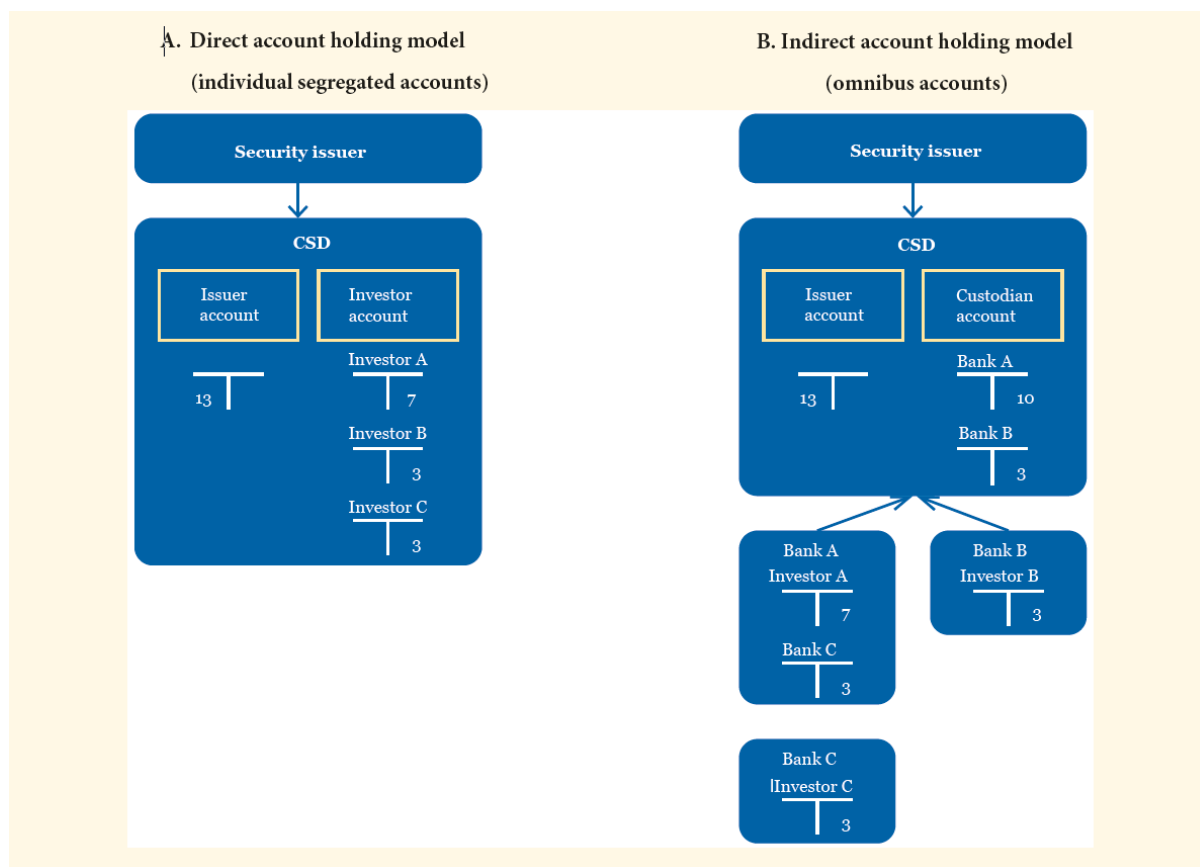
The primary vulnerability of CSDs and ICSDs lies in operational risk, which encompasses failures or malfunctions in internal systems and processes. Given their systemic role in recording ownership and ensuring the finality of settlement, any disruption – whether due to technical outages, cybersecurity breaches, or data processing errors – can have significant repercussions for market stability.

Segregated vs omnibus accounts

CSDs connect issuers and investors, but modern account-holding models can also obscure these connections. Theoretically, two models of account holding exist: direct and indirect (see Figure 1 for an illustration). In a direct holding system, a CSD opens segregated accounts in the name of individual investors. By contrast, in an indirect holding system, a CSD opens omnibus accounts in the name of a participant (custodian, broker, etc.), which then allocates the securities among its clients in its internal books. In the latter case, the CSD does not know the identity of the ultimate beneficial owners, and transfers between clients of the same custodian are processed internally without notifying the CSD. A hybrid model combines both individual and omnibus accounts.

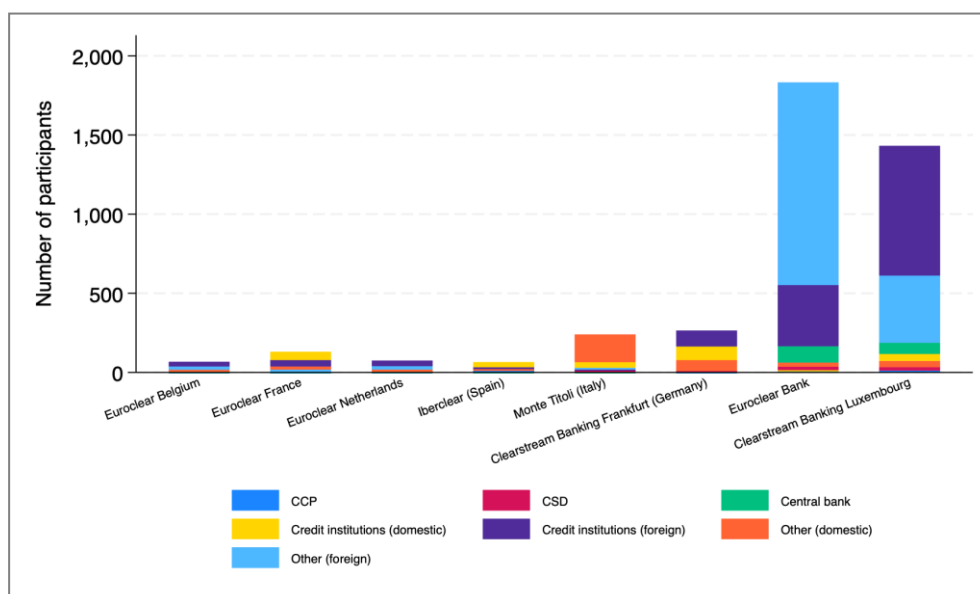
Direct access to CSDs entails high operational costs that smaller financial institutions may be unwilling to bear. Figure 2 shows the number of participants in the largest EU CSDs. These participants either open omnibus accounts for their clients or segregated individual accounts for each client. As expected, Euroclear Bank and Clearstream Banking S.A. (Luxembourg) have the largest number of participants, particularly foreign banks and other international institutions. Among these participants are global custodians that manage networks spanning over 100 markets, allowing their clients to operate across jurisdictions with a single point of entry. In some markets, CSDs and custodians compete to provide asset servicing, as clients can choose between direct connection to a CSD or indirect access through a custodian (Coste et al., 2021).

Figure 1. Direct and indirect account holding models



Source: Adapted from "Paiements et infrastructures de marché à l'ère digitale. Chapitre 12 : Les dépositaires centraux de titres", Banque de France, 2023.

Figure 2. Number of participants in the largest CSDs in the EU



Source: ECB Data Portal (securities settlement).

The largest EU economies—France, Germany, Italy, and Spain—predominantly rely on the omnibus account model. In contrast, many smaller countries—including Sweden, Finland, Norway, Bulgaria, Greece, and Romania—either mandate full segregation for domestic investors (particularly for equities) or promote it as the preferred model. These divergences are primarily rooted in national legal frameworks. For instance, Swedish law encourages the use of individual accounts because omnibus accounts prevent end investors from exercising voting rights at general assemblies. In France, by contrast, end-investors retain their voting rights even when their securities are held in omnibus accounts. Outside Europe, the Chinese CSD also applies a direct holding model based on individual accounts, while the US, the United Kingdom (UK), and Japan rely on an indirect holding model.

Table 1 reports the number of omnibus and individual accounts collected by the European Central Securities Depositories Association. Neither Euroclear Bank nor Clearstream has provided the data. Among CSDs that did, the number of omnibus accounts is the highest at the SIX SIS (the Swiss CSD) and at KDPW (the Polish CSD). The largest number of individual accounts is in Turkey, Romania, Greece, the Czech Republic, Sweden, and the Baltic States.

Table 1. Number of omnibus and individual accounts

Country	CSD	Number of omnibus accounts	Number of individual accounts
AT	OeKB CSD	411	41
BE	Euroclear Belgium	748	91
CH	SIX SIS	23,476	0
CZ	CSD Prague	27	777,119
ES	Iberclear	250	536
FR	Euroclear France	1,051	234
GR	ATHEXCSD	77	1,012,959
HU	KELER	7,448	1,827
LU	LuxCSD	28	0
LV/EE/LT/IS	Nasdaq CSD SE	1,399	337,250
MT	Malta Stock Exchange	53	65,894
NL	Euroclear Nederland	754	98
PL	KDPW	14,763	226
PT	Euronext Securities Porto	231	461
RO	Depozitarul Central	66	8,354,108
SE	Euroclear Sweden	4,976	309,541
SI	KDD	1,372	82,992
SK	CDCP SR	55	114,523
TR	MKK	2	77,305,981
UK	Euroclear UK and International	1,801	17,408

Source: European Central Securities Depositories Association.

There is an ongoing debate about the optimal level of account segregation. The role of CSDs is to register who owns what. However, in practice, long custody chains often prevent CSDs from fully performing this role. Little empirical evidence exists on the actual length of custody chains in different countries. To investigate this issue, the Deutsche Bundesbank conducted a survey of German custodian banks to understand the structure of sub-custodian chains with regard to all securities belonging to German UCITS funds that were held in safe custody abroad. Droll et al. (2016) report that the mean number of chains per custodian bank is 4.25, while the standard deviation is 8.65. Such long custody chains reduce transparency and increase operational risks.

From time to time, scandals emerge in the securities industry. During an SEC investigation in 2006, it became apparent that Madoff had lied about maintaining segregated securities accounts at the DTC for his clients' assets. A major scandal involving money laundering and illegal arms sales through unpublished accounts implicated Clearstream Banking S.A. (Luxembourg), although the Luxembourg court found no evidence. Clearstream Banking S.A. (Luxembourg) was also involved in the Central Bank of Iran's (CBI) evasion of economic sanctions (cf. *infra*).

Gabriel Zucman, Thomas Piketty and other researchers argue that segregated individual accounts at the global level would significantly reduce tax evasion and increase sanctions effectiveness (Neef et al., 2022; Nougayrède, 2018; Zucman, 2015). Zucman (2015) encouraged governments to take control of CSDs and gradually unify them. In response to the Russian invasion, Neef et al. (2022) urged the establishment of a European Asset Registry with comprehensive beneficial ownership data. Such a tool would strengthen the EU's capacity to enforce economic sanctions by closing loopholes and ensuring that Russian oligarchs cannot hide assets behind opaque custody chains. Taken together, these measures would strengthen state capacity.

In the EU, the debate on account segregation happened after the Global Financial Crisis during the discussions that led to the adoption of the EU Regulation (2014) on improving securities settlement in the European Union and on central securities depositories. The 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 the level of segregation that best suits their needs.

The opponents of segregated accounts usually advance two main arguments. First, they emphasize that transparency preferences differ significantly across jurisdictions. For instance, Swedish law obliges Euroclear Sweden to maintain a public shareholder register for each CSD-registered company, listing all shareholders holding more than 500 shares. While such a financial panopticon may appear excessive, most countries nevertheless

have established mechanisms – at least in principle – that allow issuers to identify their beneficial owners (see Computershare & Georgeson, 2015, for a detailed overview of national practices). This information is considered essential for shareholder communication, the exercise of voting rights, and ultimately the promotion of sound corporate governance. In practice, however, these mechanisms are costly, inefficient, and weakly enforced. Many issuers report difficulties in obtaining accurate beneficial ownership data, and regulators rarely impose fines for non-compliance. Importantly, all DLT initiatives (cf. *infra*) criticize the archaic nature of current arrangements and emphasize that DLT could significantly improve the transparency of beneficial ownership (Catalini and Gans, 2020).

Second, segregated accounts are often criticized for being more costly. Since each transaction must be processed independently, they generate higher gross settlement volumes, which in turn raises operational costs. These additional costs are passed on to investors, increasing transaction fees and potentially reducing market liquidity. However, the Nordic experience challenges the assumption that there is a trade-off between transparency and market depth. Countries such as Sweden, Denmark, and Finland – where the share of individually segregated accounts is particularly high – are home to some of the most developed capital markets in Europe, as measured by market depth (Arampatzi, 2025), and IPO fundraising activity as a share of GDP (*Financial Times*, 2024). Moreover, the requirement for individual segregation has not discouraged retail participation: in Sweden, around 40% of households hold financial instruments, with Denmark and Finland reporting slightly lower, but still high, rates (*Financial Times*, 2024). Taken together, this evidence suggests that individual segregation does not impede the development of deep and liquid capital markets.

Fragmentation of the EU market

As a rule, each country has either one or two CSDs. For example, in the US, the Fedwire Securities Service handles all marketable US Treasury securities, while the Depository Trust Company (DTC) registers and settles private securities. Similarly, in China and Japan, separate CSDs exist for public and private securities.

Such a concentrated market structure of CSDs is largely driven by economic considerations. Registration and settlement of securities constitute a two-sided market (or platform), enabling interactions between two distinct groups of users: issuers and investors during the registration phase, and buyers and sellers during settlement. The system exhibits indirect network effects, whereby the value for each group depends on the size and activity of the other. This is analogous to other two-sided markets, such as payment systems (linking merchants and customers) or stock exchanges (connecting buyers and sellers), and is characterized by significant economies of scale (Schmiedel et al., 2006).

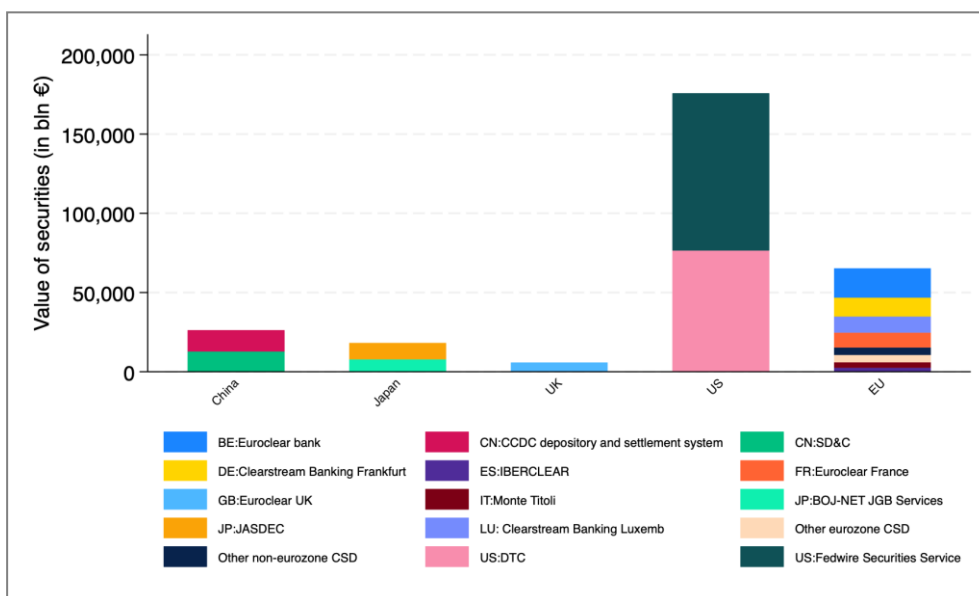
The EU market is fragmented for historical reasons. As of April 2025, the ESMA lists 27 private-sector CSDs authorized under the Central Securities Depositories Regulation (CSDR), whereas the ECB data portal provides information on 33 CSDs that also include other types of CSDs, such as central-bank operated CSD.

Figure 3 shows the value of securities managed by individual CSDs, separately for the EU, the US, the UK, Japan, and China. While some of the European CSD belong to the same holdings, the value of securities is presented separately for each individual entity, and not at the level of the holding. This reflects the fact that corporate integration in the EU does not imply full integration, and each entity in the holding might have its national license, governance, and technical system. The overall value of securities managed by CSD mirrors the size of the capital markets in each country.

The fragmentation of the CSD market in Europe is widely regarded as a major obstacle to the creation of a fully integrated European capital market. It slows down cross-border settlement and increases operational costs (Arampatzi, 2025; Draghi, 2024; Murphy, 2025; Tapking and Tang, 2006). While the value of securities managed by EU CSDs is smaller than in the US, market fragmentation leads to a much higher value of deliveries (Figure 4). In the EU, securities transactions are typically settled on a T+2 basis, meaning

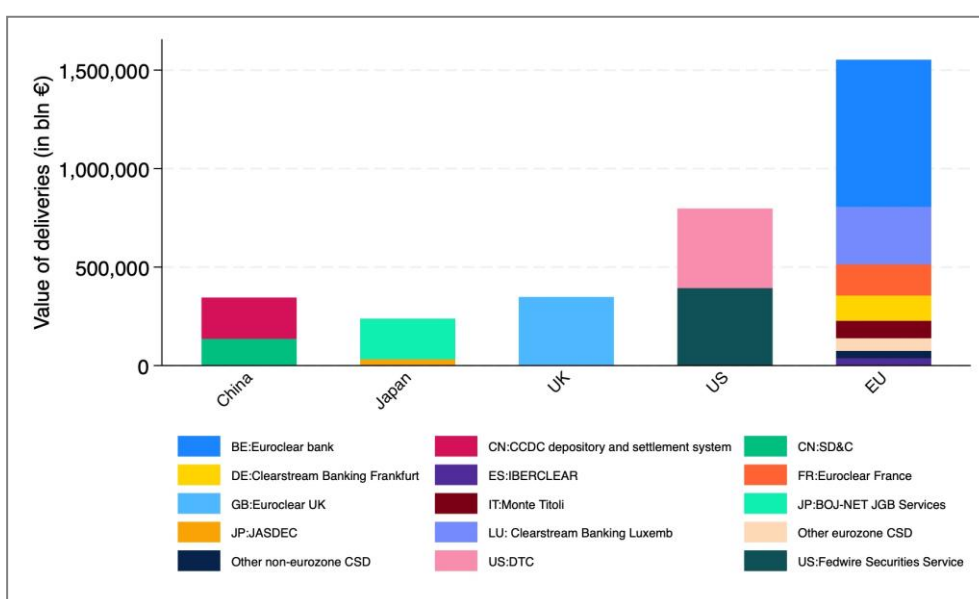
two business days after the trade date, whereas in the US, the standard has shifted to T+1 in 2024. The EU should shift to T+1 in October 2027.

Figure 3. Value of securities managed by individual CSD



Source: BIS Red Book (Statistics on financial market infrastructures and their critical services). The data is provided for the year 2022 for individual CSDs in the following countries: Belgium (BE), China (CN), Germany (DE), Spain (ES), France (FR), the UK (GB), Italy (IT), Japan (JP), the Netherlands (NL), the USA (US). The values are grouped by currencies: US dollar (USD), Euro (EUR), Japanese Yen (JPY), British Pound (GBP) and Renminbi (CNY).

Figure 4. Value of deliveries managed by individual CSD



Source: BIS Red Book (Statistics on financial market infrastructures and their critical services). The data is provided for the year 2023 for individual CSDs in the following countries: Belgium (BE), China (CN), Germany (DE), Spain (ES), France (FR), the UK (GB), Italy (IT), Japan (JP), the Netherlands (NL), the USA (US). The values are grouped by currencies: US dollar (USD), Euro (EUR), Japanese Yen (JPY), British Pound (GBP) and Renminbi (CNY).

Horizontal and vertical integration

According to the European competitiveness report by Mario Draghi (2024), the EU should aim to create a single CSD for all securities trades. As a practical pathway towards consolidation, he suggests consolidating the largest actors and then relying on their gravitational pull to attract smaller ones. While this proposal resembles that made by Gabriel Zucman and Thomas Piketty (Neef et al., 2022; Nougayrède, 2018; Zucman, 2015), Draghi's main motivation is cost-efficiency and, hence, he does not discuss the benefits and costs of segregated accounts.

Theoretical work on horizontal and vertical integration in securities trading and settlement is scarce. Tapking and Yang (2006) show that full technical integration of CSDs is always welfare-improving, regardless of whether vertical integration occurs in some countries. The emphasis is on technical integration, as it enables cost reductions, unlike mere legal integration, which primarily reduces competition between CSDs. They also argue that vertical integration between a trading venue and a CSD generates higher welfare than complete separation because their outputs are perfect complements (i.e., trading on the exchange requires settlement in the CSD). As a result, vertical integration allows the new entity to reduce the prices of these two complementary services while increasing its profits.

In light of the above discussion, it is worth considering the major horizontal and vertical integration processes that have occurred over recent decades within the EU and beyond. Table 2 identifies the key players in the European market and illustrates the extent of both horizontal and vertical legal integration. Vertical integration, in particular, refers to the consolidation of services across the trading, clearing (via central counterparties, or CCPs), and settlement layers of the securities market infrastructure.

Table 2. Vertical and horizontal integration of securities trading, clearing, and settlement in Europe (selected major players)

	DK	IT	PT	NO	FR	BE	NL	IR	UK	SE	FI	DE	LU	SH
Trading	Nasdaq	Euronext							LSE	Nasdaq	Deutsche Börse		SIX SIS	
CCP	Nasdaq Clearing	Euronext Clearing							LCH	Nasdaq Clearing	Eurex Clearing		SIX SIS	
CSD	Euronext Securities				Euroclear Holding							Clearstream		SIX SIS
T2S	YES			NO	YES							YES		YES*

Note: This table includes only the largest players in each market. Vertically integrated financial market infrastructures are shown in the same color. T2S refers to TARGET2-Securities, which allows horizontal technical integration of CSDs via a platform operated by EUROSYSTEM.

* Switzerland is connected to T2S only for euro-denominated securities.

Source: Author's illustration.

Euroclear Holding, the largest European CSD group—controlling 49% of the EU assets in custody in 2023 – is an example of horizontal integration. It includes Euroclear Bank (created in 1968), Euroclear Belgium (acquired in 2000), Euroclear France (in 2001), Euroclear Netherlands (in 2001), Euroclear UK and Ireland (in 2002), Euroclear Sweden (in 2008), and Euroclear Finland (in 2008). Nevertheless, each national entity retains its national license.

Effective integration requires the harmonization of technical settlement systems, but this has proven to be a significant challenge. Euroclear Holding has succeeded in creating a common technical platform for three CSDs: Euroclear Belgium, Euroclear France, and Euroclear Netherlands. This was possible due to strong political will from the three national regulators, as well as from Euronext, the trading platform on which French, Belgian and Dutch securities are traded. The three CSDs agreed on a common set of rules and only when this process was complete, migrated to a new technical system – known as the Euroclear Settlement of Euronext-zone Securities (ESES) – in 2009. Beyond technical integration, these three CSDs have integrated their governance with a single board and director. Nevertheless, each entity has kept its national license and remains supervised by its national financial market authority.

Despite substantial efforts and investment, Euroclear Holding has not succeeded in integrating the remaining national systems (Sweden, the UK, Finland) as well as Euroclear Bank into a single platform. The integration process is challenging because each country has its own securities law, fiscal law, insolvency law, regulatory framework, rules for corporate actions, and operational practices, meaning that each CSD operates differently. Nevertheless, following Brexit, Irish securities were migrated from Euroclear UK & Ireland to Euroclear Bank in 2021, suggesting that migration to a common system is feasible when driven by political will or necessity.

The second-largest CSD, Clearstream Holding (34% of EU assets in custody in 2023), is an example not only of horizontal integration (Clearstream Banking S.A. [Frankfurt] and Clearstream Banking S.A. [Luxembourg]), but also vertical integration with Deutsche Börse and Eurex Clearing. Vertical integration allows the group to control the whole value chain that includes trading, clearing, and settlement. Nevertheless, the Frankfurt and Luxembourg settlement systems are still not technically integrated, and there are currently no plans to achieve such integration.

Euronext Securities is a much smaller CSD than Euroclear or Clearstream Holdings (8.5% of EU assets in custody in 2023). It is part of the Euronext Group, which has acquired CSDs in Italy (2021), Norway (2019), Portugal (2002), and Denmark (2020). Euronext Securities is currently working on the technical integration of settlement across these four CSDs. This might be particularly challenging because two of its CSDs are not in the euro area.

While the Euronext Group encompasses trading, clearing, and settlement services, full vertical integration has been achieved only in Italy, Norway and Portugal, where Euronext controls all three layers. Notably, in September 2024, Euronext successfully migrated clearing across all its markets to Euronext Clearing. This was a significant milestone, as most clearing activities had previously been handled by LCH SA, a subsidiary of the London Stock Exchange Group. Securities settlement is viewed by the Euronext Group as the next logical step in its integration efforts.

Currently, most securities traded on Euronext are settled through Euroclear Holding. In 2025, Euronext Securities made several announcements aimed at attracting both issuers and investors currently relying on Euroclear Holding. Most notably, it transferred the registration of its own shares from Euroclear France to Euronext Securities, specifically to its Italian entity. This move was intended as a strong signal to other issuers that switching from one CSD to another – specifically to Euronext Securities – is feasible.

Until recently, competition among national CSDs has been virtually nonexistent. Issuers—particularly of public bonds and equities—have typically registered their securities with their domestic CSD and rarely considered switching. Each CSD operates under its own national securities law, tax code, solvency regime, and corporate action procedures, making local expertise indispensable. Although there are no formal legal barriers to switching, the perceived costs of doing so remain prohibitively high.¹

A second important development is Euronext's announcement that, starting in September 2026, its markets in Amsterdam, Brussels, and Paris will designate Euronext Securities as the default CSD for the settlement of equity trades. While Euronext cannot compel clients to use Euronext Securities, the default designation is expected to encourage wider adoption. Still, the final settlement must occur in the CSD where the security is issued. In practice, if issuers do not migrate their securities to Euronext Securities, settlement instructions will continue to be routed through Euroclear. However, this shift will alter the distribution of settlement fees. Previously, both buyers and sellers of a security paid settlement fees entirely to Euroclear. Under the new arrangement, these fees will be shared between Euronext Securities and Euroclear.

To conclude this section, we advance three main hypotheses to explain the persistent lack of technical integration among CSDs in the EU. First, technical consolidation is constrained by the fragmentation of national

1. Regarding international securities, there is some competition between Euroclear Bank and Clearstream Banking S.A. (Luxembourg). Both were established for registering and clearing of international bonds (e.g., eurobonds). Luxembourg is also the world's leading cross-border asset management hub and the second largest fund hub globally after the United States, which made it the leading CSD for the registration of international funds.

frameworks. Each country retains its own securities law, fiscal regime, insolvency rules, regulatory requirements, and procedures for corporate actions, making harmonization and technical integration highly complex. In other words, technical fragmentation of CSDs is a symptom of the broader legal and institutional heterogeneity that continues to characterize the European financial market.

Second, CSDs remain under the supervision of national financial market authorities, who generally prefer to keep securities registered domestically – reflecting concerns about strategic autonomy understood at the national rather than the EU level. Although EU Regulation No. 909/2014 (CSDR) aimed to harmonize settlement rules, national supervisors have preserved specific requirements and interpretative nuances. A transfer of supervisory powers to the European Securities and Markets Authority (ESMA) could, in principle, provide the institutional framework needed to enable deeper technical integration and consolidation.

Third, all CSDs – particularly national ones – hold significant market power, which may generate resistance to integration efforts in line with the “quiet life hypothesis”. Governance structures further reinforce this tendency: unlike the DTC, their U.S. counterpart, which operates as a user-owned cooperative, the largest EU CSDs are private, profit-oriented entities. This difference in corporate culture could be significant. In the EU, the combination of entrenched market power and the pursuit of short-term profitability might weaken incentives to undertake costly, long-term integration projects – even though such projects would ultimately benefit users and generate positive externalities for the broader financial system.

Eurosystem’s initiatives to harmonize post-trade processes

In response to the persistent fragmentation of the EU market and the inability of private actors to achieve technical integration, the Eurosystem has launched several initiatives – most notably TARGET2-Securities (T2S) and the Eurosystem Collateral Management System (ECMS) – to harmonize cross-border post-trade processes.

When securities are traded across borders (for example, when a German bank buys a French security held by Euroclear France), settlement can be initiated in any CSD; however, it must ultimately be finalized in the CSD that originally issued the security (Euroclear France). In the absence of full technical integration, cross-border settlement can take place either through bilateral links between CSDs or, within the euro area, via TARGET2-Securities (T2S). Euroclear Bank and Clearstream Banking S.A. (Luxembourg) maintain extensive links with numerous CSDs across Europe

and beyond. Global custodians also connect to multiple CSDs. Together, these institutions play a crucial role in enabling cross-border settlement.

Communication between CSDs, custodians, banks, and other financial institutions is facilitated by SWIFT. Much like its more widely recognized role in payments, SWIFT enables the exchange of standardized electronic messages to support securities settlement. According to SWIFT's 2024 Annual Report, around 50% of all messages concerned securities transactions. While domestic settlement often relies on local infrastructures, cross-border settlement depends heavily on SWIFT. For example, the DTC does not rely on SWIFT for domestic settlement in the United States, whereas European CSDs make extensive use of SWIFT for intra-European settlement due to persistent market fragmentation.

The Eurosystem launched the T2S platform in 2015. T2S provides a common infrastructure that enables the transfer of securities between European CSDs in central bank money. Communication with the platform is carried out via standardized electronic messages, primarily through SWIFT or, alternatively, Nexi-Colt. According to SWIFT, around 95% of these communications use its network. As of April 2025, the T2S platform connects 24 European CSDs. Although established by the Eurosystem, four non-euro area members also participate – Switzerland's SIX SIS, Hungary's KELER, Romania's DC, and Denmark's VP – which use T2S to settle transactions in euros. Since 2019, T2S has also supported settlement in Danish kroner (DKK).

In June 2025, the Eurosystem launched the Eurosystem Collateral Management System (ECMS) to harmonize collateral management for its credit operations by introducing common rules, practices, and the *ISO 20022* messaging standard. The system currently connects euro area CSDs, and from the end of 2028, CSD participants will also be able to join (Hanssens et al., 2025).

Before launching T2S, an ECB study evaluated its potential to create an integrated market for settlement and to make markets safer and more efficient (Weller, B., 2012). However, no comparable study was undertaken after the system's introduction to evaluate efficiency gains. The impact of T2S on cross-border settlement appears to have been limited. The share of intra-CSD settlement volume (i.e., when the delivering and receiving parties belong to the same CSD) has only marginally declined – from the 99% of total T2S settlement volume in 2018 to 95.5% in 2024.² Conversely, cross-CSD settlement volumes remain small, suggesting that cross-border settlement is still predominantly conducted via ICSDs (Euroclear Bank and Clearstream Banking S.A. (Luxembourg)) and global custodians, thereby bypassing direct cross-CSD settlement within T2S. Since data on cross-border settlements by

2. Data is taken from 2018 and 2024 TARGET Services Annual Reports.

ICSDs and global custodians are not disclosed, it remains difficult to estimate the total share of cross-CSD settlement volumes.

These Eurosystem initiatives represent a second-best response to the lack of full technical integration among European CSDs. Although T2S has contributed to the harmonization of cross-border settlement, it has simultaneously introduced an additional layer of complexity and remains dependent on external messaging infrastructures, notably SWIFT and Nexi-Colt.

ICSDs and sanctions enforcement

Globalization has given rise to financial institutions that are the focal points of large global networks, such as Euroclear Bank, Clearstream Banking S.A. (Luxembourg), SWIFT, VISA/Mastercard, and large custodians. States with political authority over these institutions can weaponize such networks and choke off financial flows.

Farrell and Newman (2019) explain two strategies through which states can gain powerful advantages: the panopticon and chokepoint effects of networks. In the former, advantaged states use their network position to extract informational advantages vis-à-vis adversaries, whereas in the latter, they can cut adversaries off from the network.

To illustrate the chokepoint effect, this section analyzes ICSDs as key infrastructures in the enforcement of sanctions against Russia. It focuses on two dimensions: 1) their involvement in immobilizing the Central Bank of Russia's foreign reserves and in freezing other assets, and 2) their role in restricting European investment in Russian Eurobonds and other securities.

ICSDs and foreign reserve holdings

Let us consider the role of ICSDs in managing foreign reserve holdings. Euroclear Bank counts 103 foreign central banks among its direct participants, while Clearstream Banking S.A. (Luxembourg) has 70. By contrast, national CSDs typically admit only their domestic central bank as a participant. In the United States, the Fedwire Securities Service—the CSD that issues and settles government securities—does not grant accounts to foreign central banks. Instead, this function is carried out by the New York Fed, which provides custody services for foreign central banks holding US Treasuries as reserves.

On February 26, 2022, following the full-scale Russian invasion of Ukraine, the leaders of the US, the UK, the EU, Canada, France, Germany, and Italy jointly announced their decision to immobilize the reserves of the CBR.³ To implement this measure, on 28 February 2022, the EU Council Regulation 2022/334 prohibited any transaction related to the management of the CBR's reserves and other assets.

3. It is important to note that the terms “immobilize” and “freeze” are not used interchangeably. While they may describe similar economic effects, their legal application differs: “immobilization” refers to sovereign assets, whereas “freezing” pertains to private assets.

The exact amount of immobilized and frozen assets is not disclosed by the authorities. The widely circulated figure of about \$300 billion refers to the CBR reserves held in G7 currencies, as reported in December 2021 by the CBR. In anticipation of the full-scale invasion and potential sanctions, the CBR sought to reduce its exposure to G7 currencies, particularly the U.S. dollar: the share of USD reserves fell from 39% in March 2014 to 11% in December 2021. The share of euro reserves also declined, from 40% to 34%, but the absolute value of euro-denominated assets rose to €213.8 billion, reflecting an overall increase in reserves. Over the same period, the share of renminbi-denominated assets increased from zero to 17%, while gold rose from 9% to 22% (Hilgenstock et al., 2025).

Euroclear Bank is the only major financial institution that publicly discloses the exact amount of Russian assets. As of June 2025, it reported €194 billion of immobilized and frozen assets, a figure that is expected to rise further as additional securities mature and income payments are blocked (cf. *infra*). The immobilization of the CBR's assets was possible because the Central Bank of Russia maintained a direct account with Euroclear Bank.

As the ultimate record keepers of securities ownership, CSDs can, in principle, exclude investors – even sovereigns – from markets by denying access. In practice, however, both the panopticon effect (transparency of ownership) and the chokepoint effect (exclusion) are weakened by omnibus accounts and long custody chains that obscure the ultimate beneficial owner. If the CBR had accessed Euroclear Bank through a custodian, its assets could have been immobilized only if that custodian was based in a jurisdiction enforcing sanctions. While in theory the CBR might have invested through custodians in non-sanctioning countries, in practice global custody is dominated by a few large U.S. and French institutions (e.g., JPMorgan, Citigroup, BNY Mellon, BNPP Securities Services, Société Générale Securities Services, and CACEIS), which makes such strategies difficult.

A series of Council Regulations has also imposed asset freezes targeting designated individuals and entities. The list was first established by Council Regulation (EU) No 269/2014, adopted in response to Russia's annexation of Crimea, and has since been amended numerous times to include additional persons and entities. Sanctioned individuals include President Putin, senior Russian officials, several oligarchs, and prominent propagandists.⁴

The precise amount of frozen assets is not publicly disclosed. Even if some of these assets are invested in G7 securities, they are difficult to trace due to omnibus accounts, multi-layered custody chains, and the absence of a comprehensive register of beneficial ownership, as discussed earlier.

4. As of October 2025, the list includes 1958 individuals and 641 entities.

Novokmet et al. (2018) estimate that the offshore wealth of Russian oligarchs amounted to around 85% of Russia's national income in 2015, roughly three times the size of the official foreign reserves of the CBR.

In a historical perspective, the immobilization of Russian foreign assets stands out by its sheer scale: the CBR's reserves represent around 2.5% of global foreign reserves (Minesso et al., 2024). In the post-World War II era, the only comparable precedent is the immobilization of Iranian dollar reserves by the US following the 1979 hostage crisis. At the time, these assets amounted to approximately \$12 billion – equivalent to about \$53 billion in 2025 prices, or roughly 4% of global reserves in 1979. A substantial share of these Iranian reserves was held in Eurodollar accounts at British banks, which made them vulnerable to the US financial sanctions. The episode was resolved within 14 months through the Algiers Accords of January 1981, which provided for the release of hostages in exchange for the gradual unfreezing of Iranian assets (Carswell, 1981).

Clearstream and the Central Bank of Iran: A case of sanctions circumvention

Effective sanctions require the participation of all financial actors in the custody chain. The past involvement of Clearstream Banking S.A. (Luxembourg) in the violation of US sanctions on Iran illustrates this point. According to the U.S. Office of Foreign Assets Control (OFAC), in 2007-2008, Clearstream maintained an omnibus account at a financial institution in New York through which the CBI invested in US securities with a nominal value of \$2.8 billion. Because of the omnibus structure, the CBI's beneficial ownership was not transparent to the U.S. financial institution, thereby obscuring its exposure to a sanctioned entity.

In February 2008, Clearstream, acting on instructions from the CBI, transferred the securities entitlements from the CBI's account with Clearstream to a European bank's newly opened custody account at Clearstream. This new account allowed the CBI to continue holding US securities through Clearstream, while its beneficial ownership was buried one layer deeper in the custodial chain. According to OFAC, Clearstream had reason to know that the CBI was retaining beneficial ownership of the securities. This issue came to light in 2014, when Clearstream agreed to settle the case by paying \$152 million to the US authorities (OFAC, 2014).

ICSDs are essential players in the eurobond markets

ICSDs act not only as custodians for foreign central banks and investors but also as gateways that enable European investors to access eurobonds and other foreign securities. This occurs via two channels. First, foreign states can

issue eurobonds settled through Euroclear Bank or Clearstream Banking S.A. (Luxembourg). For instance, Russia placed its first eurobond in 1996. Second, ICSDs can establish links with foreign CSDs, allowing European investors to purchase foreign securities in local currencies. For example, the links between ICSDs (Euroclear Bank and Clearstream) and the Russian CSD – the National Settlement Depository (NSD) – went live in 2013, enabling settlement of Russian government bonds, followed in 2014 by corporate and municipal bonds, as well as equities. This opening of capital markets is typically associated with a lower cost of capital for issuing countries.

ICSDs can be leveraged to choke off European investment in sanctioned countries. Following the Russian annexation of Crimea in 2014 and, later, the full-scale invasion in 2022, a series of Council Regulations progressively restricted and eventually prohibited investment in Russian transferable securities and money market instruments. Subsequently, Council Regulation (EU) 2022/878 of June 3, 2022, sanctioned the NSD, effectively preventing any investment in the Russian economy that required settlement through the NSD.

Russian assets reflected on Euroclear's balance sheet

In this section, we describe how the immobilization and freezing of Russian assets have fundamentally reshaped Euroclear's balance sheet and generated windfall profits. These developments have had important implications for both financial stability and geopolitics.

Euroclear Holding discloses detailed data on the volume of immobilized and frozen assets, as well as their impact on extraordinary interest income and profits (see Table 3). As immobilized and frozen assets matured through their lifecycle, cash flows (i.e., income payments and redemptions) that were normally either reinvested or transferred to the Bank of Russia remained blocked in Euroclear accounts. At the end of 2022, Russian deposits blocked on the Euroclear Holding's balance sheet amounted to 93 billion euros, i.e., 73% of total assets. In the first half of 2025, the amount grew to 194 billion euros or 85% of total assets. Euroclear Holding also reported 8 billion euros related to Libyan sanctions.

Table 3. Impact of Russian sanctions on Euroclear Holding's accounts

Euroclear Holding (in mln euros)	2021	2022	2023	2024	H1 2025
Total assets	29,400	127,639	165,816	219,174	229,000
of which, Russian deposits		92,782	130,415	174,021	194,000
in %		73%	79%	79%	85%
Russian sanctions impact on interest income				6,897	2,670
of which CBR				5,387	2,425
other Russian				1,509	245
Windfall contribution				4,009	1,800
After-tax profit	458	1,200	4,224	2,111	731
Russian sanctions impact on net profit		597	3,242	1,072	151
in %		50%	77%	51%	21%

Source: Annual accounts of Euroclear Holding.

The use of windfall contribution to support Ukraine

Euroclear reinvests immobilized and frozen deposits, generating additional interest income for Euroclear Holding. While the immobilization and freezing of Russian assets have led to increasing administrative costs, these have remained small compared to the resulting profits. In 2023, 77% of Euroclear Holding's after-tax profits were attributed to the impact of Russian sanctions (Euroclear, 2024). Starting in 2024, this share has decreased due to the windfall contribution.

Euroclear Holding does not report which part of the Russian assets belongs to the CBR and which to other entities or individuals. However, it reported that in 2024, additional interest income amounted to almost €7 billion, of which 78% was attributable to CBR assets and the remaining 22% to other Russian-sanctioned assets (Euroclear, 2025a). Interestingly, the share of interest income attributable to the CBR increased to 91% in the first quarter of 2025 (Euroclear, 2025b).

The increase in interest income has fueled the debate about its appropriate allocation and use. In May 2024, Council Regulation 2024/1469 established a windfall contribution by CSDs holding immobilized assets of the CBR, equivalent to 99.7% of net profits arising from the unexpected and extraordinary revenues accruing to those depositories since February 15, 2024. Table 4 explains the calculation of this windfall contribution by Euroclear Holding in 2024. The tax base corresponds to the net interest income after deducting administrative expenses and Belgian corporate taxes. Importantly, interest revenue from frozen non-CBR assets is excluded from the tax base. Euroclear Holding may provisionally retain 10% of the total windfall contribution.

In 2024, the windfall tax amounted to 4 billion euros. If the tax base had included all Russian assets (not only those of the CBR) and the windfall tax had been applied before Belgian corporate taxes, the total would have reached 6.8 billion euros – 70% more than the current amount. It is unclear what justifies Belgian tax authorities collecting 1.3 billion euros in additional corporate tax revenues resulting from the Russian sanctions. As interest rates decline, the windfall contribution will decrease as well.

Table 4. Calculation of windfall contribution for 2024

in million euros	from 15/02/2024 to 31/12/2024	Windfall contribution (99.7%)
Net interest income from CBR assets	5,386	
Windfall contribution		(4,009)
of which 90%		(3,605)
of which 10% provisionally retained		(404)
Administrative expenses	26	
Operating profit before tax	5,361	(4,009)
Taxation	1,340	
Profit for the year	4,021	(4,009)

Source: Annual accounts of Euroclear Holding (2024).

The regulation specifies that 100% of the funds raised via the windfall contribution must be allocated to the Ukraine Facility. Established in 2024, the Facility aims to provide €50 billion for the recovery, reconstruction, restoration, and modernization of Ukraine. The Ukraine Facility cannot be used for military or defense support. At the same time, the regulation does not exclude the possibility that, in the future, up to 10% of the budget could be directed to EU programmes supporting common procurement and contributing to the recovery, reconstruction, and modernization of Ukraine's defense technological and industrial base. Importantly, the Ukraine Facility also requires Ukraine to implement reforms aimed at strengthening institutional capacity, combating corruption, and stimulating economic development.

In June 2024, the G7 Leaders went a step further, announcing the “Extraordinary Revenue Acceleration Loans for Ukraine” initiative. Its objective is to provide approximately \$50 billion in additional funding for Ukraine's military, budget, and reconstruction needs, to be repaid through future extraordinary revenues generated from the immobilization of Russian sovereign assets. This initiative underscores that Russian assets will remain immobilized for a prolonged period. On June 27, 2024, the European Council reaffirmed this stance, declaring that Russia's assets should stay immobilized until Russia ends its war of aggression against Ukraine and fully compensates for the damage it has caused.

To implement the G7 decision, the European Parliament and the Council adopted Regulation 2024/2773 (October 2024), which established the Ukraine Loan Cooperation Mechanism. Its purpose is to provide exceptional macro-financial assistance in the form of a loan (the “MFA Loan”) as well as bilateral loans to be repaid through future revenues generated from the immobilization of Russian assets. The combined principal of the MFA Loan and eligible bilateral loans shall not exceed €45 billion, with a maximum maturity of 45 years.

EU response to Russia’s freezing and confiscation of Western assets

Euroclear faces more than 100 lawsuits related to immobilized and frozen Russian assets, including those belonging to oligarchs and other sanctioned entities. According to the *Financial Times*, Russia has confiscated approximately €33 billion in assets belonging to Euroclear clients, which had been frozen through the NSD, the Russian central securities depository.

To address the above litigation and confiscatory measures in Russia, Council Regulation (EU) 2024/3192 of December 16, 2024, introduced a loss recovery derogation and a no liability clause for EU CSDs. A loss recovery derogation enables CSDs to request competent authorities of the Member States to unfreeze cash balances and use them to meet their legal obligations towards their clients. A no liability clause clarifies that EU CSDs are not liable to pay interest or any other form of compensation to the CBR.

The above regulation was invoked by Euroclear, which, according to Reuters (2025), obtained authorization from Belgian authorities in March 2025 to release €3 billion in frozen Russian assets to compensate clients whose holdings had been expropriated in Russia. This decision set an important precedent for the confiscation of Russian sovereign assets within the EU. Crucially, however, the proceeds were used to indemnify Western private businesses – effectively socializing their losses from operating in Russia – rather than to support Ukraine or ease the fiscal burden on EU taxpayers financing Ukraine’s defense and reconstruction.

Seizing Russian assets

The above assertive measures imply that G7 leaders are confident that the CBR assets will either remain immobilized for several decades or that Russia will ultimately be compelled to pay reparations. Politically, there is growing support for asset confiscation, as it becomes increasingly difficult to justify shifting the financial burden of Ukraine’s defense and reconstruction onto Western taxpayers while substantial Russian assets remain immobilized or frozen. The US Congress has already enacted

legislation authorizing confiscation,⁵ while the European Parliament has adopted a non-binding resolution encouraging the seizure of Russian sovereign assets.⁶

While the moral and political case for asset confiscation appears to be strong, the ECB has warned that such measures could undermine the long-term stability of the international financial system, as countries such as China and the Gulf states might reduce their reliance on Western reserve currencies. Yet despite these risks, neither the immobilization of the CBR's assets in February 2022, nor the recent loan scheme backed by future interest income, nor the partial seizure of Russian assets to compensate Western clients has so far led to an increase in EU sovereign bond yields.

An increasing number of proposals call for *de facto*, rather than *de jure*, confiscation, and such ideas are now actively discussed among EU policymakers (Becker and Gorodnichenko, 2024; Dixon et al., 2024; Sandbu, 2025). While similar in spirit, these proposals envisage different mechanisms. For example, Sandbu (2025) suggests that the ECB establish a “bad bank” to which Euroclear and other financial institutions would transfer their liabilities affected by sanctions, along with the corresponding assets. Creating such a vehicle would help mitigate geopolitical risks for Euroclear and other intermediaries. The newly created bad bank could then reinvest its assets in “reparation loans” issued by Ukraine in anticipation of future compensation payments by Russia.

To sum up this section, EU leaders, in coordination with other G7 countries, have pursued a sequence of progressively assertive measures to mobilize Russian sovereign assets, stopping short of asset confiscation: 1) a 99.7% windfall tax on the reserves and assets of the CBR to fund the Ukraine Facility; 2) a \$50 billion loan for Ukraine, to be repaid using future interest income generated from the continued immobilization of Russian sovereign assets; and 3) a loss recovery derogation allowing Euroclear Bank to seize a portion of Russian assets to compensate European clients whose assets were expropriated by the Russian CSD.

5. In 2024, the US Congress voted a law (Public Law No. 118-50, 24.04.2024) that allows the president to seize any Russian state sovereign assets for the purpose of transferring those funds to the Ukraine Support Fund. The law mentions that this should be undertaken as part of a coordinated, multilateral effort, including with G7 countries, the European Union and other countries in which Russian sovereign assets are located.

6. In March 2025, the EU parliament voted with a substantial majority for a non-binding resolution that calls for the confiscation of Russian sovereign assets immobilized under EU sanctions for the purpose of supporting Ukraine's defense and reconstruction. In a joint motion on defense, the EU parliament has mentioned that this should be done together with the G7 partners. In 2024, the Parliamentary Assembly of the Council of Europe voted a resolution that considers that the seizure of Russian assets would constitute lawful countermeasures under international law against the Russian Federation's aggression against Ukraine. In May 2025, Estonia passed the Act enabling the use of Russia's frozen assets, setting the precedent in the EU.

Additional risks and challenges

In the future, CSDs face several additional challenges.

Building Asia's First ICSD

First, geopolitical tensions and the use of ICSDs for sanctions enforcement raise concerns about financial market fragmentation. On March 4, 2025, Hong Kong Exchanges and Clearing (HKEX) announced plans to establish an ICSD with the ambition of competing with Euroclear Bank. However, this may prove challenging: once established, ICSDs and other centralized network infrastructures are difficult for newcomers to challenge, given economies of scale, network effects, and winner-takes-all dynamics. For a new entrant to succeed, it must not only offer a superior model but also coordinate a critical mass of participants willing to defect from existing ICSDs and converge on the new platform (Farrell and Newman, 2019).

Moreover, the power of European ICSDs derives not only from their focal position in the network but also from their integration with the EU financial market and the EU rule of law. ICSDs enable foreign investors to access European assets while allowing European investors to invest in foreign markets. Looking at Euroclear Holding's revenue structure reveals that most revenues come from Eurobonds and European assets (52%), fund distribution (17%), and the collateral highway (16%), while global emerging markets contribute only 13% (Euroclear, 2025). Hence, even if geopolitical tensions fragment emerging markets, only a limited share of Euroclear's revenues would be affected. By contrast, the establishment of a new ICSD in Hong Kong can be seen as part of China's broader strategy to internationalize the renminbi.

While this alternative CSD is presented as less exposed to geopolitical risks, it will just shift the power to immobilize or freeze assets from EU jurisdictions to China. In such a scenario, investors would trade the relative predictability of the EU's rule-of-law framework for the discretionary control of an authoritarian state.

Cyberattacks

Second, CSDs are systemically important financial market infrastructures and, as such, represent potential single points of failure. With rising geopolitical tensions, market participants report that cyberattacks are

becoming both more frequent and more sophisticated, while military strategists openly acknowledge the risks of cyberwarfare.

There is no evidence of cyberattacks directly disrupting CSDs, but past incidents in other domains have demonstrated the disruptive potential of such operations. In 2017, the NotPetya attack – one of the largest cyber incidents to date – inflicted losses estimated at 0.5% of Ukraine's GDP and over \$10 billion globally (*The Economist*, 2022). Attributed to the GRU, Russia's military intelligence service, the attack was highly damaging but not catastrophic. At the outset of Russia's 2022 full-scale invasion of Ukraine, many analysts anticipated a large-scale cyber offensive. However, such expectations did not materialize. This has led to the conclusion that cyber operations are often too slow, unreliable, or volatile to serve as effective tools in full-scale military campaigns (Maschmeyer and Cavelty, 2022). Even in hybrid conflict settings, their strategic value appears limited. Nevertheless, the potential for cyber risks to destabilize financial market infrastructures should not be underestimated.

Distributed Ledger Technology

Distributed Ledger Technology (DLT) is being explored by some CSDs as an alternative solution for the issuance and settlement of securities. In October 2023, Euroclear launched a proof of concept with the issuance of Digitally Native Notes: the inaugural tokenized bond was issued by the World Bank, listed on the Luxembourg Stock Exchange, and settled via Euroclear Bank (Euroclear, 2023). Euroclear has also invested in IZNES, a French fintech that operates a DLT-based fund marketplace, and in Marketnode, a Singapore-based digital market infrastructure operator. Deutsche Börse Group (the parent company of Clearstream Holding) has announced that it owns 100% of FundsDLT, a Luxembourg-based decentralized platform based on DLT for fund issuance and distribution.

In 2022, the EU put in place the DLT Pilot Regime, which provides the legal framework for trading and settlement of tokenized securities. ESMA (2025) reports that the uptake of this pilot regime was limited – with only three authorised infrastructures (CSD Prague, 21X AG, and 360X AG) and minimal live trading activity.

Importantly, these initiatives rely on different DLTs. Euroclear and CSD Prague have chosen Corda, FundsDLT builds on the Ethereum Blockchain, IZNES uses Hyperledger Fabric, and 21X operates on Polygon. Marketnote claims to support Ethereum Virtual Machine (EVM) networks (Ethereum, Polygon, Avalanche, etc.) and non-EVM networks (Solana, Stellar, and XRP Ledger). There is no dominant technological standard, which may create both opportunities for innovation and challenges for interoperability and governance.

Several arguments support the promise of DLT. First, having a single ledger shared by all parties reduces the need for reconciliation and confirmation of settlement details between back offices post-trade, which may decrease complexity and increase speed (Bech et al., 2020; Mills et al., 2016; Catalini and Gans, 2020). The distributed nature of this technology might also enhance its resilience against cyberattacks. Nevertheless, there are concerns about the scalability of different DLTs.

Second, DLT can enhance the transparency of ownership because it resembles a direct holding system in which issuers and beneficial owners are directly connected, thereby reducing the number of intermediaries in settlement (Yermack, 2017; Bech et al., 2020). Even if intermediaries persist, DLT can be designed to allow issuers to look through intermediaries and identify the beneficial owners of their securities (Bech et al., 2020). This would improve corporate governance, particularly by enabling beneficial owners to vote directly instead of through the current proxy voting system (Yermack, 2017). Greater transparency of beneficial ownership would also help reduce tax evasion and strengthen the effectiveness of sanctions, as discussed earlier.

Third, from a market-structure perspective, DLT represents a new market design that combines the advantages of a centralized digital platform – since all participants rely on a shared network and benefit from network effects – with those of competitive markets, as no single participant possesses market power or benefits from winner-takes-all dynamics (Catalini and Gans, 2020). Nevertheless, this assumes that one dominant DLT-based network emerges and raises many questions about its governance.

Conclusions

By highlighting the economic and geopolitical significance of CSDs, this paper seeks to inform policymakers about the challenges and opportunities in reforming this critical – yet often overlooked – pillar of financial infrastructure.

To conclude, the following challenges stand out:

- **Integration of the fragmented EU market:** How can national CSDs and international CSDs be better integrated, and what role should the Eurosystem and T2S play in the future settlement architecture?
- **Transparency of beneficial ownership:** How can regulators shorten custody chains and strengthen end-investor transparency, and what would be the implications for corporate governance, tax compliance, and sanctions enforcement?
- **Geopolitics and sanctions:** How can policymakers balance the effectiveness of using CSDs for economic sanctions with the need to limit the systemic risks arising from growing geopolitical tensions?
- **Operational and cyber resilience:** How can CSDs safeguard settlement integrity against outages, cyberattacks, and other operational risks in an increasingly digital environment?
- **Role of DLT:** Can DLT help overcome fragmentation, enhance the transparency of beneficial ownership, and support the creation of a more integrated and resilient European settlement network?

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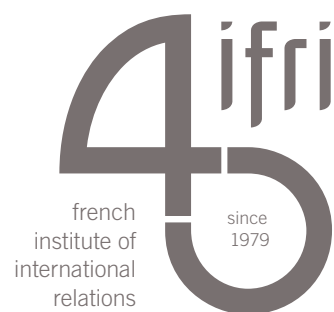
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