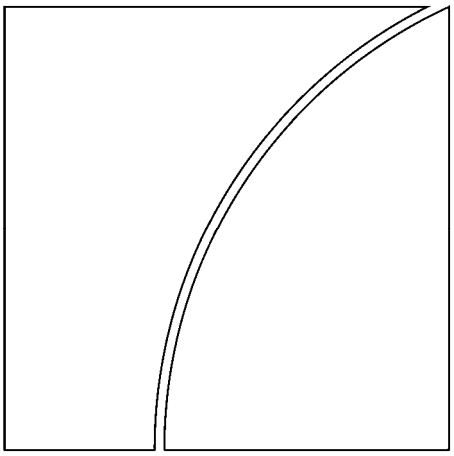
Committee on Payment and Settlement Systems



Market structure developments in the clearing industry: implications for financial stability

Report of the Working Group on Post-trade Services

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Foreword

During the last decade, the central clearing industry has experienced a large number of changes, which have profoundly affected both its role in the broader financial infrastructure and its own market structure. In June 2009, the Committee on Payment and Settlement Systems (CPSS) therefore commissioned a working group to investigate the developments in the clearing industry's market structure, their drivers and the implications for financial stability. The Working Group was also asked to assess whether different market structures give rise to new risks that may affect the robustness of central counterparties (CCPs) and to outline some practical issues for central banks, regulators and overseers with an interest in the stability of CCPs.

This report first provides a broad overview of the clearing industry in CPSS countries, covering both traditional markets and OTC derivatives markets. In particular, it describes developments in market structure between 2000 and 2010. Second, the report assesses how far these developments have given rise to new risks. It further outlines practical issues that central banks, regulators and overseers may wish to consider, either as part of their oversight role or in the context of their broader financial stability remit. Furthermore, the report examines to what extent changes in market structure or ownership might affect the expansion of central clearing services. Finally, the effect of ownership on CCPs' incentives to manage their counterparty risk is considered.

The report shows that different types of market structure have developed over the last decade. However, there is no evidence that the industry is settling on one particular structure. Specific market structures may create specific risks and amplify interdependencies between systems and markets. These warrant careful consideration by both market participants and the authorities. However, there is no evidence to suggest that one market structure is superior to another, either in terms of CCP risk management or in terms of wider systemic risk. In fact, many risks occur in several types of structures.

Nevertheless, central banks, regulators and overseers may usefully pay attention to specific risks that are more likely to occur in some market structures than in others. These include incentives to weaken the robustness of CCP risk controls that may in turn reduce in the CCP's ability to manage a member default. Although some of the risks considered in the report have yet to materialise, CCPs and their regulators or overseers face significant future challenges, in particular as market structures in many countries continue to evolve. Hence, public authorities will need to continue applying rigorous and consistent oversight.

The clearing industry's structure also has a bearing on how far central clearing will be used in different market segments, and hence on the resilience of the financial system as a whole. In fact, the broader risk-mitigation benefits of central clearing may be diluted if changes in market structure affect access to CCPs, raise the cost of central clearing or hamper the process of creating new CCP services.

The CPSS is very grateful to the members of the Working Group and its Chair, Anne Wetherilt (Bank of England), for their excellent work in preparing this report.

William C Dudley, Chairman
Committee on Payment and Settlement Systems

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Executive summary

Background

During the past 10 years, the central clearing industry has experienced a large number of changes, which have profoundly affected both its role in the broader financial infrastructure and its own market structure. These changes include consolidation of existing central counterparties (CCPs), increased competition, and new linkages between competing CCPs. The changes themselves were the result of several, often related, factors, including the growing globalisation of financial services, new regulatory initiatives and technological changes affecting both trading and post-trading services. Equally important was the drive for greater use of central clearing services in response to increased awareness of counterparty credit risk following the onset of the 2007–09 financial crisis.

This report examines the developments in the clearing industry, their drivers and their implications for financial stability.

Objectives of the report

The main objectives of the report are as follows:

- to describe the developments in the clearing industry within a clear analytical framework;
- to understand the broad developments and the drivers which may have contributed to the different market structures;
- to describe the risk reduction benefits associated with different market structures;
- to assess whether different market structures give rise to new risks that may affect CCP robustness;
- to assess whether these developments present any new systemic risks; and
- to outline some practical thoughts for central banks, regulators and overseers with an interest in the stability of CCPs.

Structure of the report

The report comprises three main parts. Part I provides a broad overview of the clearing industry in CPSS countries, covering both traditional markets and over-the-counter (OTC) derivatives markets. The focus of this part of the report is on describing developments between 2000 and 2010.[1] Using a simple analytical framework, together with information gathered by each member of the working group, the report highlights the main developments across countries and markets.

Part II of the report assesses the extent to which these developments have given rise to new risks. The analysis focuses on whether changes in market structure have altered the incentives of CCPs to manage their counterparty risk, whether those changes have created new interdependencies that represent new risk challenges for the CCP, and how those changes affect the products and services offered by CCPs. Part II further outlines practical issues that central banks, regulators and overseers may wish to consider, either as part of their oversight role or in the context of their broader financial stability remit.

[1] The closing date for the empirical analysis was 31 March 2010.

Part III examines to what extent changes in market structure or ownership might affect the expansion of central clearing services. The analysis also considers the effect of ownership on CCPs' incentives to manage their counterparty risk.

Conclusions

The main findings of the report can be summarised as follows:

There are differences between CCPs serving traditional markets and those serving OTC derivatives markets. While some of the industry developments and drivers are similar, there are important differences related to: first, the range of post-trade service providers other than CCPs; and second, the relative roles of CCPs, market participants (ie banks) and public authorities.

The analysis shows that different types of market structures have developed over the last decade. They can be classified in two dimensions: vertical versus horizontal structures, and integrated versus fragmented structures. It appears that the structural organisation of the clearing industry affects the way CCPs design their risk management processes and the probability of risks spreading across the financial systems. There is no evidence, however, that the industry is settling on one particular structure.

Specific market structures may create specific risks and amplify interdependencies between systems and markets. These warrant careful consideration by both market participants and the authorities. However, market structures may also have risk reduction benefits and mitigate interdependencies. Moreover, as governance arrangements typically provide incentives to carry out prudent risk management and CCPs are subject to rigorous oversight and regulation, the potential risks inherent in different market structures may actually not fully materialise. As a result, it is not possible to determine a priori the ultimate effect that a particular structure may have on systemic risk.

Nor is there evidence to suggest that one market structure is superior to another, either in terms of CCP risk management or in terms of wider systemic risk. In fact, many risks occur in several types of structures. For example, risks that are related to the size of an infrastructure are relevant in the case of both vertical and horizontal integration. Similarly, interdependencies may arise in both vertical groups (bringing together trading, clearing and settlement activities) and horizontal groups which serve multiple markets, possibly in multiple jurisdictions. New interdependences are also created when CCPs become reliant on niche providers (vertical specialisation) or when a market is served by multiple interoperating CCPs.

Nevertheless, central banks, regulators and overseers may usefully pay attention to certain risks that are more likely to occur in certain market structures than in others. These include incentives to weaken the robustness of CCP risk controls that may in turn result in a reduction in the CCP's ability to manage a member default. Although many of the risks considered in the report have so far not materialised, going forward the challenges for CCPs and their regulators/overseers are significant, particularly as market structures in many countries continue to evolve. Hence, public authorities will need to continue to apply rigorous and consistent oversight. For each type of market structure, the report provides a checklist of questions that central banks, regulators and overseers may use to that end.

In many instances, these key risks are especially likely to materialise during the transition phase, when CCPs are adjusting their risk management processes, market participants are familiarising themselves with new rules and procedures, and authorities are developing new oversight arrangements. This is particularly relevant for the OTC derivatives industry. The regulatory community should therefore be vigilant during periods of rapid change in the post-trade services industry.

The structural setup of the clearing industry also has a bearing on the degree to which central clearing will be used in different market segments, thus determining the resilience of the financial system in general. In fact, the broader risk reduction benefits of central clearing may be diluted if market structure changes affect access to CCPs, raise the cost of central clearing or hamper the process of creating new CCP services. This may arise, for example, when CCPs have significant market power, which in itself may be a result of either vertical or horizontal integration. A related risk may arise when competing CCPs aim to capture market share by aggressively marketing new CCP services that are not sufficiently robust, and would in turn undermine the robustness of the CCP. Finally, market structure changes may also affect the size and market coverage of individual CCPs, thereby potentially amplifying the "too big to fail" problem.

In many instances, changes in market structure are accompanied by changes in the ownership structure of CCPs. However, there appears to be no clear relationship between ownership and systemic risk: there is no evidence to conclude that either a user-owned or a for-profit ownership model would be more (or less) likely to undermine CCP risk management. There is also no evidence indicating that any particular ownership model favours or hampers the introduction of central clearing services. Finally, there is no evidence to suggest that a particular form of ownership leads to a particular form of market structure.

Introduction

During the past 10 years, the central clearing industry has experienced a large number of changes, which have profoundly affected both its role in the broader financial infrastructure and its own market structure. These changes include the consolidation of existing central counterparties (CCPs), increased competition, and the introduction of new linkages between competing CCPs. The changes themselves were the result of several, often related, factors, including the growing globalisation of financial services, new public policy initiatives and technological changes affecting both trading and post-trading services. Equally important was the drive for greater use of central clearing services in response to increased awareness of counterparty credit risk following the onset of the 2007–09 financial crisis.

This report examines the developments in the clearing industry, their drivers and their implications for financial stability.

The main objectives of the report are as follows:

- to describe the developments in the clearing industry within a clear analytical framework;
- to understand the broad developments and the drivers which may have contributed to the different market structures;
- to describe the risk reduction benefits associated with different market structures;
- to assess whether different market structures give rise to new risks that may affect CCP robustness;
- to assess whether these developments present any new systemic risks; and
- to outline some practical thoughts for central banks, regulators and overseers with an interest in the stability of CCPs.

The report makes a distinction between CCPs serving on-exchange markets (such as equities and exchange-traded derivatives), those serving "traditional" over-the-counter (OTC) markets (such as government bonds or repurchase agreements) and those serving OTC derivatives markets. While some of the industry developments and drivers are similar, there are important differences related to: first, the range of post-trade service providers (not all are CCPs); and second, the relative roles of CCPs, market participants (ie banks, dealers, buy-side institutions) and public authorities in establishing new CCPs and (perhaps inadvertently) determining the market structure.

The report comprises three main parts. Part I provides a broad overview of the clearing industry in CPSS countries, covering both traditional markets and OTC derivatives markets. Its first section describes the analytical framework, which will help identify key drivers and industry responses. Section 2 provides an overview of the main developments, based on information gathered by each member of the working group.

Part II contains an assessment of new risks emerging, and their implications for regulation and oversight and for financial stability (Sections 3–6). The analysis also considers risk reduction benefits associated with the different market structures, and outlines issues for consideration by central banks, regulators and overseers. Part III considers the impact of changes in market structure on the expansion of central clearing into new products and markets (Section 7), and the relationship between market structure and CCP ownership (Section 8). A list of the CCPs in the countries surveyed in this report is presented in Annex 1.

The report was finalised in June 2010.

Part I: Developments in the central clearing industry

Part I of the report is organised into two sections. Section 1 introduces the analytical framework employed in the report. In order to summarise the many changes in market structure, it distinguishes between ***responses*** and ***drivers***. Section 2 uses this framework to describe the broad developments in CPSS countries.

1. Developments in the central clearing industry: an overview

1.1 Post-trade functions

The report examines developments in the market structure of central clearing services. Changes are evident in all stages of the trading-clearing-settlement "value chain", including the central clearing stage (illustrated in Figure 1 below). Throughout the report, the term "clearing" refers to all the processes which take place between "trading" – when participants agree the terms of a transaction – and "settlement" – when the obligations related to the transaction are discharged through the exchange of assets and/or monies.

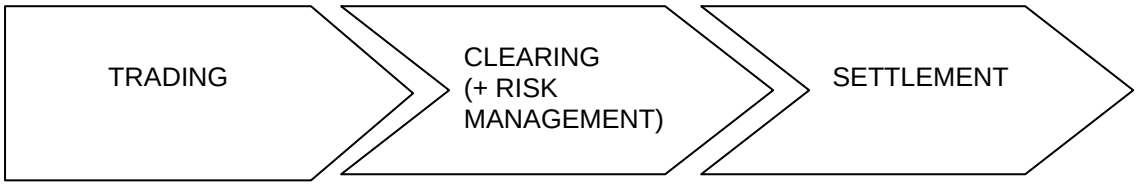
As shown in Figure 1, the key functions involved in the clearing process are trade capture, economic affirmation (trade verification), trade matching or affirmation, legal confirmation, reporting to a trade repository, position and payment netting, portfolio compression, novation (central clearing mechanism[2]), trade/portfolio valuation, portfolio reconciliation and collateral management. These clearing functions are not essential in every market, nor are they necessarily sequential or exhaustive.[3] For example, the central clearing of OTC derivatives differs from the clearing of exchange-traded derivatives, reflecting the bilateral, more specialised nature of the OTC derivatives marketplace (which will be discussed later).

[2] Trade novation is the process by which one party to a trade legally assigns its side to a third party. A CCP typically employs a novation mechanism in order to interpose itself between the original two parties to become principal to each side of the trade.

[3] This is just one of many ways of attempting to describe the functions involved in clearing. For an alternative, see Bliss and Steigerwald (2006). Furthermore, there are two uses of the term "clearing", and when the report discusses central or CCP clearing ("central clearing") for OTC derivatives, it is often the case that not all of the clearing functions (in the broad sense) are performed just by the CCP.

Figure 1

The trading-clearing-settlement value chain



- Price discovery
- Trade execution

- Trade capture and verification
- Trade matching/ affirmation/legal confirmation
- Reporting to a trade repository
- Position and payment netting
- Portfolio compression
- Novation (central clearing mechanism)
- Trade/portfolio valuation
- Portfolio reconciliation
- Collateral management (bilateral or centralised)

- Money/cash flow settlement
- Transfer of title in securities

Clearing functions can be provided bilaterally – between direct market counterparties or their agents – or centrally, through one or more service providers. Bilateral clearing requires a market participant to undertake its own processing, netting and risk management (or rely on the services of an agent bank), often in a coordinated and pre-agreed manner with its transaction counterparty, and may involve the use of ancillary service providers. Centralised clearing effectively involves a market participant outsourcing certain or all of these functions to a CCP.

A CCP may provide an integrated range of clearing functions to market participants. However, its core service is to become principal to every transaction that it clears. Through the legal process of novation, the original contract between counterparties is replaced by two contracts between the CCP and each counterparty. Hence, the CCP becomes the "buyer to every seller and seller to every buyer".[4] As such, a participant faces only the counterparty

[4] Note that there is an alternative legal mechanism whereby a CCP can stand between the buyer and the seller of a trade. For example, the CCP itself may make an open offer to clearing members, rather than substituting itself in between the two counterparties. Hence, in open offer, there is never any contractual obligation between trading participants, although from an economic point of view there is no material difference with the novation process. It is also worth noting that where spot markets are operating for limited volumes of trades, there is often a preference for ad hoc default risk mitigation techniques, such as the implementation of guarantee funds managed directly by the stock exchange. See eg Bliss and Papathanassiou (2006) for further information.

credit risk of the CCP, rather than that of its original trade counterparties.[5] This central clearing function will be the key focus of the report.[6]

Box 1

Post-trade functions

Once a trade is executed between two parties, a number of processes must take place in order to make the transaction legally enforceable and to ensure that the contractual obligations of the trade are carried out. Trade *matching* is the process by which two sides to a trade are paired with each other and often involves the submission of trade data by both parties to a third-party system. A trade *confirmation* is documentary evidence of the legal execution of a trade and is issued after the economic execution of a trade. A confirmation typically specifies key economic terms of the trade. In order to reduce the risk of mismatches in trade sides between economic and legal execution, trade *affirmation* is often employed in order to verify the details of a trade bilaterally prior to issuance of the confirmation. Trade *novation* is the process by which one party to a trade legally assigns its side to a third party. A CCP typically employs a novation mechanism in order to interpose itself between the original two parties to become principal to each side of the trade. *Portfolio reconciliation* services reconcile sets of related OTC derivatives trades between two parties in order to help value the portfolio and determine the amount of corresponding collateral required. *Portfolio compression* services reduce the number and/or notional size of economically offsetting (and therefore redundant) OTC derivatives trades either bilaterally or multilaterally. Finally, *dispute resolution* services reduce counterparty credit risk exposures by resolving valuation differences and corresponding collateral disputes.

Settlement entails the final transfer of funds or securities in order to carry out the terms of a transaction. *Asset servicing* includes income processing, tax management, valuation, notification and dealing with corporate actions. *Fund accounting* is the provision of independent valuation and multiple pricing sources. Finally, *client servicing* includes master custody, sub-custody risk management, fee management and outsourcing.

While in some markets all clearing functions are carried out by the CCP, elsewhere some are provided by exchanges, central securities depositories (CSDs) or third-party service providers.[7]

1.2 The market structure of central counterparty clearing

In order to understand the changes in market structure of central counterparty clearing, and how they fit into broader post-trade developments, it is useful to start with a "baseline" model of a single trading venue served by a (separate) single CCP and a (separate) single settlement provider. In many countries, this was indeed the model until quite recently and, as Section 2 will show, in some remains the model to date. Starting from this baseline, one can identify four broad types of structure to which the industry has evolved under pressure from various external drivers. These "responses" are summarised in Table 1 and Figure 2 and

[5] See Bliss and Papathanassiou (2006). It also allows the CCP to act as principal in enforcing the terms of the transaction.

[6] In the OTC derivatives markets, two central clearing models are offered: the "cleared only" model, pursuant to which bilateral contracts remain OTC contracts after clearing (subject to the terms of ISDA standard documentation); and a futures-based model, whereby bilateral contracts are converted into futures contracts (in an "exchange of futures for swaps" process).

[7] This is largely a function of the OTC derivatives (specifically credit default swap (CDS)) infrastructure developing without the benefit of a front-to-back, complete solution that is seen in exchanges.

explained in more detail in the remainder of this section, alongside their main external drivers.

Table 1

Summary of industry responses

Response 1 describes vertical integration along the value chain. This may result either from mergers or acquisitions among infrastructure providers at different levels within the value chain, or from existing infrastructure providers extending their range of services vertically through organic growth. ***The CCP is part of a group offering a broader set of trade and post-trade services.***

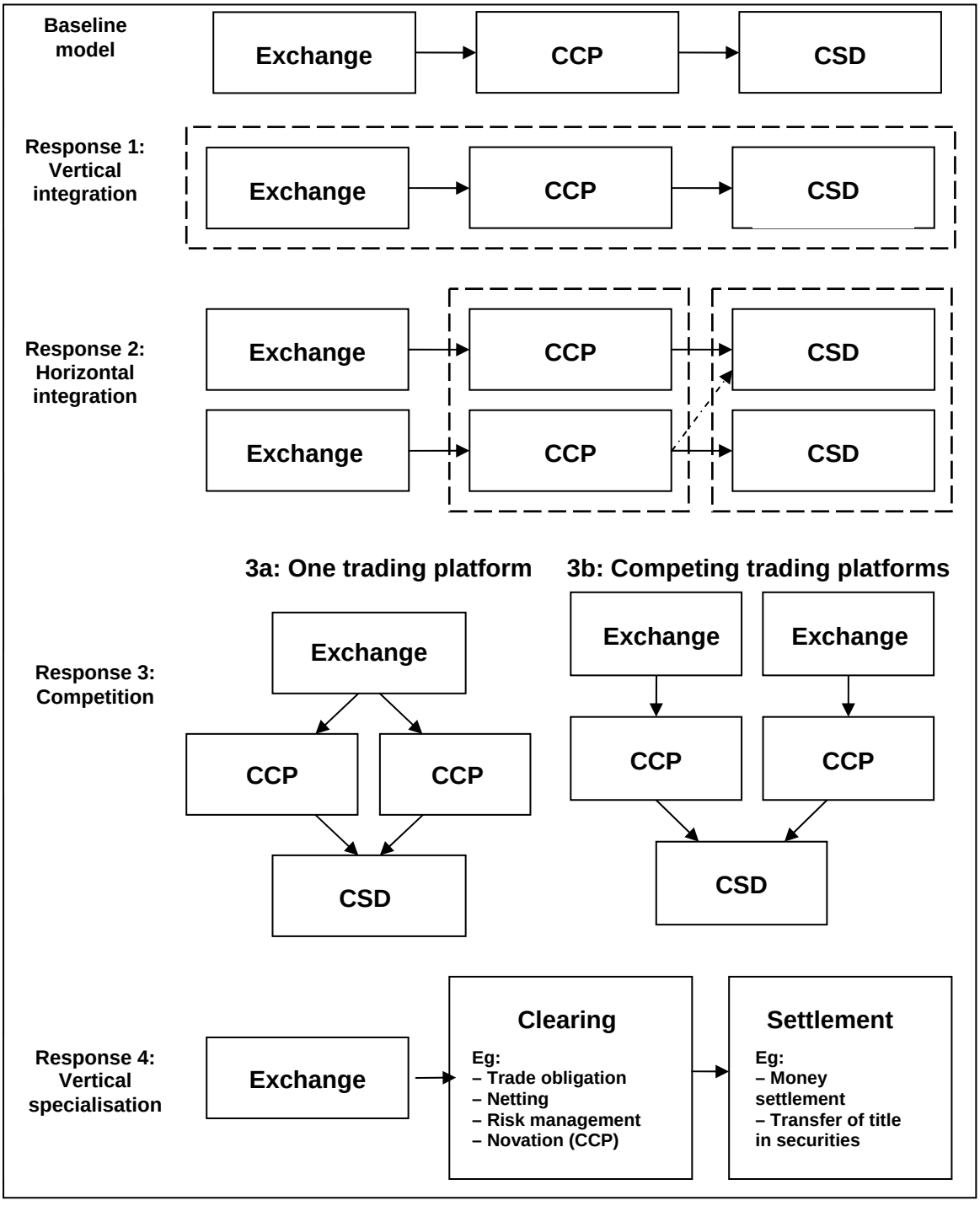
Response 2 describes horizontal integration, with infrastructure providers at each level expanding their service offerings across a number of product markets, including cross-border operation. This again may come about through mergers or acquisitions. ***The CCP provides post-trade services to a range of trading venues or market participants, possibly in different jurisdictions.***

Response 3 describes competition among CCPs, with new entrants attempting to build market share. ***The incumbent CCP faces competition in the provision of central clearing services.***

Response 4 involves vertical specialisation with the emergence of niche service providers specialising in narrow functions. ***Post-trade clearing functions are carried out by separate entities which are either competing with or complementing services offered by the CCP.***

Figure 2

Stylised summary of industry responses[8]



The dotted line represents the merged entity.

[8] This diagram is best suited to understanding the market for exchange-traded products. For OTC derivatives, see the discussion in Section 1.2.

Vertical integration

Vertical integration in clearing ***(Response 1)*** is characterised by the formation of an integrated group, typically bringing post-trade infrastructure providers under common ownership with providers of other parts of the value chain (either the exchange or CSD, or both). In common with other industries, vertical integration often arises because of operational *economies of scope*. Both CCPs and exchanges might face significant up-front investment costs when establishing an operational link. In the vertically integrated group, such costs can be lower.

Vertical integration can also eliminate the so-called *double marginalisation problem* (see eg Tirole (1988)). This issue arises in industries where firms at several stages of the value chain enjoy monopolistic positions. As a result, each firm dominating a step of the value chain will price as a monopolist, leading to a welfare-reducing equilibrium. The vertical group reduces incentives for each of these entities to engage in monopolistic pricing for its product, resulting in a lower overall price for the product, greater quantities available in the market and greater profits for the vertical group.

In the context of central clearing, however, double marginalisation is less likely to be a significant factor in bringing about vertical integration. This is partly because the owners of the CCP are often its users, and as such may have aligned incentives to reduce the cost of central clearing (eg by offering fee reductions). Moreover, other economies-of-scale factors may be important too. For example, vertical integration can benefit a CCP by securing access to the trade feed, or by offering opportunities to engage in joint investments.

The theoretical literature further suggests that the desire to establish or protect *market power* may also drive vertical integration (Joskow (2006)). Indeed, faced with the threat of competition, an incumbent vertical firm may find it easier to lower prices than an incumbent standalone firm, thereby making entry more difficult. This issue will be further explored in Part II.

Similarly to other industries such as the technology sector, *network effects* are a further factor leading to vertical integration. As more users or participants support and buy in to a particular platform or service, greater utility of the service is achieved. A critical mass of participants will generate more efficiencies as the benefits and costs are shared among multiple participants. The market power of these network effects tends to encourage convergence to a single platform or service provider and, in the case of central clearing, may drive the vertical integration of such upstream services.

Another explanation of the occurrence of vertical integration is the so-called *life cycle theory*.[9] This argues that an industry producing a new or niche product is more likely to be integrated, as demand may be too small to support an independent firm. As demand for the product grows, vertical integration is no longer needed, and separate firms emerge.

In some cases of vertical integration, the exchange and CCP are fully integrated, sharing common systems and operations. Elsewhere, the trading and post-trading functions continue to operate separately, although the exchange and CCP have legally become one group (eg through ownership by a common holding company). It is also worth noting that vertical integration may be accompanied by a change in CCP ownership, typically from a user-owned to a for-profit or non-user-owned model, eg when the holding company has a for-profit orientation. The impact of ownership on a CCP's approach to risk management will be considered in Section 8. Finally, it should be noted that the existence of a vertical group does not rule out competition, at either the trading or the clearing level (see Response 3 below), including the case where vertically integrated entities compete against each other.

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[9] Stigler (1951).

Horizontal integration

Horizontal integration (Response 2) occurs when CCPs expand horizontally through mergers or acquisitions to clear more than just one type of product or the products traded at more than one trading venue. This can result in infrastructure providers which serve multiple products (eg bonds and equities) or geographical markets. The horizontal group may look very similar to a multi-product CCP which has grown organically in order to enter new product or geographical markets, or access trading venues. Part II will therefore examine to what extent the horizontal group differs from a multi-product CCP, or a CCP serving multiple trading venues.

Horizontal integration brings about economies of scale, which arise from the combination of operational processes and risk monitoring and risk management processes, and hence can result in a significant reduction of fixed costs. Horizontal integration also permits economies of scope, including opportunities to increase synergies between the different products cleared by the newly merged CCP (for instance, due to cross-margining opportunities). And it provides positive network effects. Hence, economies of scope and scale are often powerful drivers in creating a horizontal group (see eg Tirole (1988)). Of course, scope and scale economies also feature in the context of a multi-product CCP, with the CCP achieving cost savings from integrated risk management systems, and clearing members benefiting from cross-product netting.

By expanding across a wider range of product or geographical markets, horizontal CCPs could end up with considerable *market power*, especially when the industry is highly concentrated to start with. The industrial organisation literature also reveals that, in some instances, such market power is established progressively. This could be because the incumbent is able to use the proceeds from economies of scale to progressively reduce prices whilst still remaining profitable, or to widen its product or service offering (eg increased cross-product margining).

In some cases of horizontal integration, CCPs have fully integrated their operational, communications and risk management processes. Elsewhere, mergers have given rise to new, consolidated ownership structures, but the respective CCPs continue to operate as independent entities, with their own, distinct risk management processes. These issues will be further explored in Part II.

Finally, it should be noted that, in some countries, both ***Responses 1*** and ***2*** are observed simultaneously. For example, the merger of two vertical groups will create a new horizontal group. In this more complex merger, factors explaining both vertical and horizontal integration are relevant.

Competition

Competition (Response 3) can take the form of multiple CCPs serving a single exchange. An alternative form of CCP competition results from competition originating at the trading level: different trading venues operating within a single product market (such as equities) may select different central clearing providers. In a further variant of competition *with CCP interoperability*, customers could have full freedom of choice at all layers along the value chain. A customer may choose to use CCP A to clear a trade on exchange B even if exchange B is served by CCP B but not by CCP A. In this case, the customer only uses CCP A in its capacity as a clearing member of CCP B, in order to obtain access to CCP B. The different models of interoperability will be further discussed in Section 5.4.

In the bilaterally negotiated derivatives space (whether trades are executed on electronic trading platforms or over the phone), multiple CCPs may compete in their offerings with respect to a single asset class (eg interest rate derivatives), although there is also potential competition among CCPs along geographical lines as well as possibly by customer type.

Competition in clearing has traditionally been limited by the existence of a strong *first-mover advantage*, reflecting the importance of technical knowledge (eg risk modelling), network effects, high entry costs, consolidated business relationships with organised markets and high switching costs. As a result, many CCPs enjoyed de facto monopolies in their domestic markets. One of the features of the past decade has been a gradual erosion of this first-mover advantage, at least in some markets, notably due to technological progress leading to diminishing entry and switching costs. Competition has also been facilitated by changes in the regulatory environment, which have further lowered barriers to entry (see Section 1.3 below).

Variable costs are typically low and potentially close to zero: once the central clearing infrastructure is in place, it is relatively cheap to clear an additional trade (except when the infrastructure in place reaches maximum capacity). In theory, when new firms enter an industry, either they or the incumbent may be tempted to charge lower prices with the aim of driving rivals out of the market (so-called *predatory pricing*). Such competition typically drives prices below marginal costs. A firm may also have an incentive to charge low prices so as to create a reputation of being an aggressive incumbent or to signal a low production cost. In either case, the goal for incumbents is to discourage potential entry into the industry, and for the new entrant to rapidly build up market share.

Pricing below marginal cost means that competing firms will be setting a price that is lower than average total cost (which includes the sunk fixed costs), leading to at least temporary losses. This means that predatory pricing requires an ability to absorb temporary losses. A firm can do so either by accessing its own reserves or by borrowing from external parties. To the extent that lenders require collateral (or ration their lending to smaller firms), better capitalised firms have more collateral and can therefore borrow more. Hence, as the theoretical literature suggests, competition is more likely to be intense if a firm has vast financial resources ("deep pockets").

It appears that these theoretical considerations do apply in the central clearing industry, eg there is empirical evidence that large incumbent CCPs have in the past engaged in predatory pricing. These issues will be discussed in further detail in Part II of the report.

New entrants are less likely to be successful if the incumbent CCP has a much larger market share and/or easier access to resources. In addition, the above-mentioned *network effects* may reduce incentives for CCPs to engage in competition, as market participants may be more likely to connect to an established CCP. It is worth noting, however, that smaller CCPs can attempt to carve out niches for themselves in the same asset class, by targeting a different set of customers and/or a different jurisdiction.

Competition among CCPs in a single product creates challenges for market participants trading at multiple venues as they may need to link to more than one CCP. They can do so by becoming a direct clearing member of each CCP or, if they prefer to avoid the costs associated with CCP membership, by clearing indirectly through clearing members.[10] This in turn may create concerns about the systemic importance of clearing members, in particular in markets where their number is small. The failure of a large clearing member could have severe consequences, both for the CCP, and for market participants clearing through the clearing member. An alternative proposal that addresses certain challenges in having multiple CCPs in a market is *interoperability*, which involves the establishment of links between CCPs, allowing a participant in one CCP to centrally clear and settle its trades with a participant in another CCP, while eliminating the participant's need for multiple CCP

[10] Clearing members (sometimes referred to as general clearing members or GCMs) are typically brokers or dealers which clear trades with the CCP on behalf of their customers.

memberships or reliance on clearing members. The specific risk issues associated with interoperability will be discussed in more detail in Part II.

Vertical specialisation

Going back to the value chain illustrated in Figure 1, one could group the various functions enabling and supporting a trade into broad families of services (see also Box 1 for a glossary of terms). The post-trade value chain for financial instruments traded on-exchange typically consists of: (i) a CCP providing integrated "confirmation services" (sometimes shared with exchanges), "central clearing services" and "portfolio rationalisation services"; (ii) a CSD offering various "settlement services"; and (iii) commercial entities providing clearing member services and/or custody-related services.

In contrast, in many OTC derivatives markets, these functions are performed bilaterally by participants or are provided by a range of specialised providers, some complementing CCP services, and some directly competing with services provided by the CCP or companies affiliated with it. Hence, ***vertical specialisation (Response 4)*** occurs with post-trade services being offered by niche service providers, many of which may not be traditional infrastructure providers.

One key difference between the current OTC derivatives value chain and the traditional model (shown in Figure 1) is the limited range of functions performed by CCPs in the OTC space. The bilateral and decentralised aspects of the OTC derivatives markets have typically led to conditions whereby standardisation and infrastructure lag innovation in product design and growth in market activity. OTC derivatives markets historically have been characterised by a high degree of manual processing, clearing and settlement, and, as early as 1998, many opportunities for improving the post-trade infrastructure had been identified by regulators and market participants.[11]

Third-party service providers (some of which were established by the major OTC derivatives dealers) offer centralised solutions to improve the operational efficiency of certain key functions in the post-trade space, such as automated matching and confirmation services and life cycle event processing, as well as portfolio valuation, compression and reconciliation. As a result of the establishment of these niche providers all along the post-trade value chain (some integrating vertically themselves and taking the majority of market share), the OTC derivatives marketplace is characterised by vertical specialisation. A unique challenge is that CCPs (the critical counterparty credit risk management link in the post-trade chain) have had to integrate themselves into this established market structure (see Box 2).

[11] See eg CPSS (1998).

Box 2

Vertical specialisation and the central clearing of CDS

In OTC derivatives markets, post-trade services including trade matching, trade affirmation, trade confirmation and trade reconciliation are often not performed by the CCPs, but by third-party vendors. This is, for instance, the case for Eurex Credit Clear (Eurex Clearing AG's central clearing service for CDS) and LCH.Clearnet SA. The CCPs focus instead on central clearing services, including position and risk management, margining and payments, and collateral management, which are linked into existing infrastructures.

The OTC derivatives clearing service of both CCPs can currently be accessed via various matching and confirmation tools, such as DS Match (together with MarkitWire, now the matching and confirmation services of MarkitSERV, a joint venture between DTCC and Markit). LCH.Clearnet SA plans to provide future access via MarkitWire and Bloomberg VCON (voice confirmation matching utility). In the case of both Eurex and LCH.Clearnet SA, the OTC derivatives clearing services also link into the DTCC's Warehouse Trust Company LLC, the global trade repository for credit derivatives. These arrangements have been in place since July 2009 for Eurex and March 2010 for LCH.Clearnet SA. The outsourced services fall within the scope of the respective supervision of Eurex Clearing and LCH.Clearnet SA.

Some CCPs in traditional markets also rely on external providers. But this phenomenon is most pronounced in OTC derivatives markets, where external providers have benefited from a first-mover advantage. For instance, the Warehouse Trust Company LLC contains records of almost all credit derivatives traded worldwide, whilst MarkitSERV is a virtual monopoly, controlling both MarkitWire and DSMatch and used by major dealers to electronically match and confirm transactions in credit, equity and interest rate contracts.

The specialist service providers supply not only processing efficiency services such as trade confirmation and trade matching, but also services that are growing fast in the OTC derivatives space, such as trade portfolio compression and reconciliation, data and price provision, valuation, repository services and other trade life cycle event[12] management services. So the differences between traditional and OTC derivatives markets could at least partially be explained by the generally late entry of CCPs in the OTC space in comparison with first movers such as TriOptima and service providers like Markit and DTCC. But some specific characteristics of OTC derivatives markets also justify the intensity of vertical specialisation, including their decentralised structure and relationships based on standards and protocols.

1.3 Factors contributing to changes in market structure

A framework for describing the developments in market structure having been outlined, this section outlines the factors that are likely to have influenced these changes. They are summarised in Table 2.

[12] This would include managing processes associated with credit events when applied to CDS.

Table 2

Summary of factors contributing to changes in market structure

Driver 1	Globalisation and the demand for multicurrency clearing and settlement
Driver 2	Public policy initiatives aimed at harmonisation of the regulatory environment
Driver 3	Technological progress
Driver 4	Changes at the trading level
Driver 5	Response to the 2007–09 financial crisis

Globalisation and the demand for multicurrency clearing and settlement

Markets and financial institutions increasingly operate on an international scale. This globalisation ***(Driver 1)*** has led to greater demand for cross-border trading and clearing in securities, derivatives and foreign exchange, both from investors seeking diversification and from issuers wanting to reach broader funding bases. Many major banks and dealers now operate in multiple markets and face payment obligations in many currencies. These institutions – in particular those that manage their liquidity on a centralised basis – have incentives to seek infrastructure solutions that most efficiently match their international reach. For OTC derivatives markets, this dynamic has been facilitated by the development of global documentation and product standards, mostly by ISDA. In comparison, listed market products have traditionally developed within domestic borders, and the globalisation of these markets (eg through foreign market depository receipts) has been a relatively recent development.

In response to Driver 1, some CCPs have increased their range of products (eg by offering clearing in multiple currencies or by expanding to other asset classes); others have merged or linked with CCPs outside their domestic markets. Some CCPs also compete with CCPs outside the domestic markets. Section 2.3 will assess the empirical relevance of this driver across CPSS countries and product markets.

Public policy initiatives aimed at harmonisation of the regulatory environment

Driver 2 relates to a range of public policy initiatives aimed at promoting greater harmonisation across financial markets and/or removing barriers to entry. First, the determination of a globally agreed set of standards for CCP clearing houses – the CPSS-IOSCO Recommendations for Central Counterparties (RCCPs)[13] – in 2004 helped to harmonise regulatory treatment of CCPs and enhanced the ability of CCPs to compete domestically and cross-border.

Second, the introduction of the euro and the unification of financial services markets in the European Union triggered both public and private sector responses, leading to substantial merger activity between exchanges, CCPs and settlement systems, both within the euro area

[13] To promote consistent application and interpretation of the RCCP for CCPs clearing OTC derivatives and to provide guidance on certain unique aspects of OTC derivatives, CPSS and IOSCO published a consultative report, *Guidance on the application of the 2004 CPSS-IOSCO Recommendations for Central Counterparties to OTC derivatives CCPs* (http://www.bis.org/publ/cpss89.htm) in May 2010. The guidance presented in the report and the comments received during the consultation will be incorporated into a comprehensive review of RCCP and other international standards for financial market infrastructures, which the CPSS and the Technical Committee of IOSCO have been undertaking since February 2010 (see http://www.bis.org/press/p100202.htm).

and within the wider European Union. Public sector initiatives include the launch of a single, shared platform for euro payments in 2008 (TARGET2), the project for a single shared European securities settlement platform (TARGET2-Securities), and the Directive on Markets in Financial Instruments (MiFID). More detail is provided in Box 3 below. Together with private sector initiatives such as the Code of Conduct, these initiatives have had a significant impact on the competitive environment in which European CCPs operate as well as on the risks that they are exposed to and manage.

Box 3

Code of Conduct, CESAME, T2S and MiFID in Europe

Historically, financial market infrastructures in Europe were primarily designed to meet national requirements and to manage securities denominated in the national currency. National infrastructures typically consisted of one or two major exchanges for the trading of listed securities and a domestic central securities depository (CSD). Central clearing counterparties (CCPs) were introduced in most, but not all, domestic markets in the 1990s. However, the introduction of the euro eliminated exchange rate risks, resulting in a significant increase in cross-border securities transactions. In response, the infrastructures supporting these financial markets have been subject to a fundamental process of restructuring that has been further reinforced by a number of public and private sector initiatives as well as changes in the regulatory framework, including the work of the CESAME group, the Code of Conduct for Clearing and Settlement ("the Code"), the Directive on Markets in Financial Instruments (MiFID) and the future TARGET2-Securities.

The first major European harmonisation initiative in the field of securities infrastructures dates back to the late 1990s when a group of financial market experts chaired by Alberto Giovannini was set up by the European Commission to develop policy advice on the lack of integration of the EU post-trading sector. The group produced a report in 2001 which identified the main sources of inefficiencies in the EU financial markets in the form of 15 barriers to the efficient cross-border clearing and settlement of securities. A second report, in 2003, set a time frame and assigned responsibilities for achieving harmonised solutions to address each of the barriers. Whereas 11 barriers are embedded in diverging market practices, and therefore require changes in the way market players do business ("private sector barriers"), four barriers pertain to the fiscal and legal frameworks of the member states ("public barriers"). The Clearing and Settlement Advisory and Monitoring Expert group (the CESAME 2 group) was monitoring and coordinating the work aimed at dismantling these barriers. Although not all barriers are solved yet, this group has been closed. The European Commission is now in the process of setting up a new expert group on market infrastructures.

In November 2006, the work on dismantling the barriers identified in the Giovannini report was complemented by the launch of a Code of Conduct on Clearing and Settlement. The Code is a self-regulatory initiative which was signed by all major European exchanges, CCPs and CSDs. With a specific focus on equity markets, it commits all signatories to implement a number of measures to create the conditions for freedom of choice and more competition between infrastructures on the basis of three building blocks: price transparency, interoperability, and service unbundling. Ultimately, the Code aims at establishing freedom of choice and competition between service providers at all levels along the value chain. Its impact on CCPs, however, has been most significant, as the Code has helped to create an environment which allows participants in a particular CCP to access other CCPs through their existing clearing arrangements. In principle, membership of a single CCP should be sufficient to obtain access to all other CCPs, which allows participants in a particular CCP to trade (and clear) with participants in any other CCP. Competition among CCPs in this case is not limited to competition between the two CCPs serving the same exchange or to competition between two CCPs that serve two competing exchanges. Instead, the Code of Conduct could create (potential) competition between all existing CCPs regardless of the exchange that they provide services for. Also, as a result of the Code, clearing fees in Europe have considerably decreased. Several link requests have emanated from or have been directed towards CCPs, although few have actually become operational.

Box 3 (cont)

Code of Conduct, CESAME, T2S and MiFID in Europe

Another initiative which will have a significant impact on the structural setup of the European post-trade landscape is TARGET2-Securities (T2S). In July 2008, the ECB Governing Council decided to launch the T2S project to build a single technical platform for the settlement of a large number of European securities. The objective of T2S is to harmonise and commoditise delivery-versus-payment (DVP) settlement in central bank money, so as to make the distinction between domestic and cross-border securities transactions irrelevant within the European market. T2S will remove many of the barriers identified in the Giovannini report, and may act as a catalyst for further harmonisation in post-trading services. As T2S will facilitate cross-border settlement, eg by consolidating the currently dispersed cash and securities liquidity among different CSDs and central banks into one pool of liquidity, it will also make it easier for CCPs to extend their services across borders, thus fostering competition between CCPs as well as CSDs.

Finally, another important factor that has spurred competition between CCP has been the Directive on Markets in Financial Instruments (MiFID). MiFID requires member states to allow internalisation of orders and, therefore, to eliminate concentration rules, ie provisions mandating execution of share trades on national stock exchanges as a requirement for the "best execution" of transactions by investment intermediaries. This has fostered competition among trading venues and offers investors a choice between different trading functionalities, such as regulated markets, multilateral trading facilities (MTFs) and internalising intermediaries. In fact, since the entry into force of MiFID in November 2007, a number of MTFs have entered the market. Their success has been compounded by often novel post-trade arrangements. Typically, the post-trade model of the new MTFs has involved using a newly established CCP clearing house, and then using agent banks in order to connect to incumbent CSDs. This model has been followed by Chi-x, NASDAQ OMX Europe and BATS Trading Europe, each of which uses the European Multilateral Clearing Facility (EMCF) as its CCP clearing house before using various agent banks to connect to CSDs. Turquoise follows the same model, using EuroCCP as its clearing house and Citi as its agent connecting to the CSDs in the markets where it competes.

In the United States, the Securities and Exchange Commission issued new rules (Reg NMS) in 2005 designed to "modernize and strengthen the regulatory structure of the US equity markets" by implementing a national market system for the historically fragmented equity markets. Reg NMS' Order Protection Rule requires trading centres to establish policies and procedures reasonably designed to prevent the execution of trades at prices inferior to protected quotations displayed by other trading centres. To be protected, a quotation must be immediately and automatically accessible. In addition, the Access Rule requires fair and non-discriminatory access to quotations, establishes a limit on access fees to harmonise the pricing of quotations across different trading centres, and requires each national securities exchange and national securities association to adopt, maintain and enforce written rules that prohibit its members from engaging in a pattern or practice of displaying quotations that lock or cross automated quotations.

While Reg NMS was intended to facilitate efficient price discovery for investors by increasing transparency in the equity markets, markets continued to innovate, resulting in the emergence of alternative trading systems (eg electronic crossing networks or "dark pools") in which market participants quote and trade equities off-exchange with limited public transparency (see also Driver 4). However, in contrast to European equity markets, the US equity market structure is not characterised by multiple CCPs, notwithstanding the choice in electronic trading venues.

Elsewhere, harmonisation of the regulatory environment was the result of central bank policies, eg to reform securities settlement systems (India, Japan). Finally, it should be noted that, where central banks have location policies for CCPs, handling their domestic currency, this might impact new entry, and in turn the market structure of clearing services.

Technological progress

Better and cheaper technology ***(Driver 3)*** has helped transform the economics of financial services infrastructure provision – as it has in other industries. For example, technology has reduced the fixed costs of establishing infrastructure. The high fixed costs necessary to build the systems to support post-trade infrastructure (such as electronic communication systems) were previously a barrier to entry and so protected incumbents from competition. In some markets, these legacy investments may possibly hinder the incumbent – it will still need to service past investment costs, but its competitors may be able to deploy newer (and better) systems at lower cost (for instance, web-based services hosted on cheap but reliable servers).

In OTC derivatives markets, the challenges are slightly different, as networks exist with multiple participants providing technological support services for incumbent post-trade services, eg confirmation matching, portfolio reconciliation). Hence, these network effects may have increased barriers to entry, even though technology costs may have fallen.

New flexible technology, facilitated by the development of common technical standards such as uniform communication protocols, makes it easier and cheaper for market participants to switch between alternative market infrastructures. In clearing, links between CCPs have the potential to preserve the cost and risk benefits associated with a single clearing provider, whilst at the same time reducing barriers to entry by making it easier for new CCP entrants to gain the network benefits enjoyed by incumbents.

Changes at the trading level

Driver 4 refers to the changes in the trading environment that in turn have affected CCPs. These changes are multiple, and concern both the ownership structures of exchanges and changes in trading practices across a wide range of markets. First, many of the major exchanges are now demutualised and some have become listed companies. As part of its growth strategy, a profit-oriented exchange may seek to merge with or acquire an exchange, CCP or CSD. Alternatively, where it already owns a CCP or CSD, it may have stronger incentives to limit the opportunities for a competing infrastructure provider to capture market share. These issues will be further discussed in Part II of the report.

Second, the creation of new trading platforms, facilitated in part by regulatory change (including MiFID in Europe and Reg NMS in the United States[14]) is a major change in the trading environment. As explained in Box 3, in Europe regulatory change has led to more competition in the post-trade industry as new trading platforms often select non-incumbent post-trade providers. In contrast, while the US equity market is characterised by competition at the trading level, this has not led to competition at the clearing level (see Driver 2).

The new trading platforms have typically positioned themselves as competing on cost and speed of trade execution, which has increased pressure within the post-trade sector to reduce costs and improve services. In addition, the "best execution" requirements in these regulations also mean that brokers need to have rapid access to multiple markets.

Third, changes in the method of trading can also impact on post-trade services. Transaction costs are a key concern for market participants, particularly where fee schedules are volume-based. For instance, the algorithms used by high-frequency traders can take into account post-trade fees when minimising the total cost of trade execution. This has increased the competitive pressure put on CCPs operating in environments such as equities where such trading techniques have gained traction. Furthermore, some trading platforms and sell-side

[14] The SEC's 2005 Regulation National Market System – see Driver 2.

firms are moving to net trades prior to submission to clearing and settlement infrastructure, putting pressure on volumes and on fee revenues. But wider use of electronic trading platforms for OTC derivatives trading of certain products such as interest rate derivatives has also facilitated the development of centralised post-trade infrastructures, particularly for more standardised products.

Fourth, the development of new financial instruments often requires new trade and post-trade mechanisms. Typically, these mechanisms will evolve over time as the product itself gains acceptance and the market for it matures (the above-mentioned life cycle model). New products will be supported initially by bilateral or OTC trading and post-trading arrangements between market counterparties. But post-trade services may be provided piecemeal, perhaps by a number of suppliers, which may not necessarily be established providers of "traditional" infrastructure services. For instance, as the market for OTC instruments grew exponentially, so did the backlogs of unexecuted paper-based confirmation of trades in OTC derivatives dealers' back offices. Such unconfirmed trades prevented dealers from being able to accurately determine their counterparty exposures. Regulatory concerns about these increased risks have led to service providers entering the post-trade services segment of the market to offer straight-through-processing (STP) services (see Response 4).

It may only be as market liquidity deepens and broadens that the creation of a recognisable centralised infrastructure becomes economically feasible (although causality also runs in the opposite direction). Users of post-trade services in the OTC derivatives market often play a key role in the development of CCPs. But a conflict of interest could arise between the dealers that provide bilateral clearing services and the CCP that will typically rely on these same market participants to act as clearing members. Such conflicts may arise because dealers clearing their trades bilaterally might experience reductions in revenue streams when OTC derivatives shift from bilateral to central clearing. In other words, the growth in OTC instruments not only has implications for competition across CCPs (Response 3) but can also affect competition between CCPs and clearing members, and between CCPs and other service providers (Response 4).

Response to the 2007–09 financial crisis

Finally, ***Driver 5*** refers to the financial industry's response to the financial crisis which started in 2007 and which has engendered a much greater awareness of the importance of robust counterparty credit risk management and more automated and resilient trade and life cycle management processing during the post-trade period. This driver includes both public and private sector responses.

First, public sector financial authorities have been calling for increased use of CCP clearing. These include the G20 (Pittsburgh, September 2009), the Financial Stability Board, the US Treasury and the European Commission as well as the central banks and finance ministries of several CPSS countries.

At the time of writing, legislative work is under way in the United States, Japan and Europe that will result in mandatory central clearing for so-called "CCP-eligible" products. In parallel, the CPSS and IOSCO are reviewing the standards for CCPs (and other financial market infrastructures) with a view to strengthening them where appropriate. Public sector financial authorities in several countries have also been working with the industry on a range of initiatives to strengthen post-trade operational processes (eg confirmation backlogs), bilateral clearing arrangements (eg improved use of collateralisation) and regulatory information sharing and transparency (eg greater use of trade repositories), as well as standardisation of documentation and processes and the setting-up of new CCPs.

Second, market participants have increasingly sought to protect themselves against counterparty credit risk, thereby creating a greater demand for central clearing, with many established CCPs seeing increases in clearing volumes, and others seeking to enter new markets. This increased demand has been evident in both short-dated instruments (eg repo trading) and longer-dated OTC derivatives (eg interest rate swaps).[15] In addition, some CCPs have recently developed, in association with the dealer community, new clearing services for longer-dated maturities.

[15] See BIS (2010).

2. Developments in the clearing industry

This section discusses the main developments in the clearing industries of all CPSS countries, using the framework of responses and drivers outlined in Section 1. Before doing so, it is useful to: (i) outline the methodology used for collecting the empirical evidence presented in Section 2.2; and (ii) describe the clearing industries and the products that are centrally cleared in the different CPSS countries (Section 2.1).

2.1 Clearing industries in CPSS countries: an overview

The facts and charts presented in this section are built upon a survey of the 14 CPSS countries which participated in this study.[16] The data were collected on a country-by-country basis. Surveyed countries were asked to: (i) present the CCPs in each market and the products they clear; (ii) describe market structure developments in the clearing sector ***(industry responses)***; and (iii) select the ***main drivers*** behind these developments. The country survey also included information about ownership structures. The exercise was completed on 31 March 2010.

Three broad market categories were considered: traditional on-exchange traded products (eg equities, futures and options); traditional OTC-traded products (eg government bonds, repos, FX) and OTC derivatives (eg interest rate or credit default swaps).

Annex 1 provides a list of all CCPs covered, together with their product coverage. The greatest coverage is found in exchange-traded equities (all CPSS countries participating in the study have access to at least one CCP clearing equities), the lowest in OTC derivatives. The majority of CCPs considered clear within a single asset class.

2.2 Industry responses in CPSS countries: empirical evidence

This subsection discusses developments in the clearing industries in CPSS countries between 2000 and 2010. It is worth highlighting, however, that in some countries the clearing industry did not undergo any significant changes during the period considered in this study. As such, the fact that the clearing industry of a particular country is not discussed does not imply that it conforms to the baseline model (some developments may have taken place more than a decade ago, and hence fall outside the study period). For example, in the United States the clearing industry for on-exchange equity markets has long been characterised by a user-owned CCP providing a monopoly service. Elsewhere, eg in Hong Kong and Russia, CCPs have been part of a vertical group for a number of years, but there have been no recent structural changes to the clearing industry. Yet in several countries, a number of developments are observed, with CCPs merging vertically and/or horizontally, and seeing entry by newcomers. And globally, the OTC markets for derivatives underwent profound changes.

Table 3 and Figure 3 below provide a summary of industry developments across markets. In the table, a tick indicates that the response was observed in the participating CPSS country. Figure 3 provides a more detailed summary and indicates the number of times each response was observed across markets in all participating CPSS countries. A number of insights emerge.

First, all responses are observed in the set of countries surveyed. Across participating CPSS countries, horizontal integration (Response 2) is quoted most frequently. In most countries, horizontal integration has taken the form of mergers between existing CCPs: this includes Australia, Belgium, the Netherlands, Sweden and the United States. In some countries,

[16] See Annex 2 for the participating countries.

however, CCPs have expanded horizontally by connecting to multiple trading venues: this includes Italy, Germany and Switzerland. In France and the United Kingdom, both mergers and CCPs connecting simultaneously to several trading platforms were observed.

Table 3

Summary of clearing industry responses per participating country

Responses	Response 1: Vertical integration[1]	Response 2: Horizontal integration[2]	Response 3: Competition[3]	Response 4: Vertical specialisation[4]
Australia		✓		
Belgium		✓	✓	
Canada	✓			
France		✓	✓	✓
Germany		✓	✓	✓
Hong Kong SAR	✓			
India	✓			
Italy	✓	✓	✓	
Japan	✓			
Netherlands		✓	✓	
Russia	✓			
Sweden	✓	✓	✓	
Switzerland	✓	✓	✓	
United Kingdom	✓	✓	✓	✓
United States	✓	✓	✓	✓

[1] Response 1 describes vertical integration along the value chain. This may result either from mergers or acquisitions among infrastructure providers at different levels within the value chain, or from existing infrastructure providers extending their range of services vertically through organic growth. The CCP is part of a group offering a broader set of trade and post-trade services. [2] Response 2 describes horizontal integration, with infrastructure providers at each level expanding their service offerings across a number of product markets, including cross-border operation. This again may come about through mergers or acquisitions. The CCP provides post-trade services to a range of trading venues or market participants, possibly in different jurisdictions. [3] Response 3 describes competition among CCPs, with new entrants attempting to build market share. The incumbent CCP faces competition in the provision of central clearing services. [4] Response 4 involves vertical specialisation, with the emergence of niche service providers specialising in narrow functions. Post-trade clearing functions are carried out by separate entities which are either competing with or complementing services offered by the CCP.

Response 2 is closely followed by vertical integration (Response 1) and competition (Response 3). The number of quotations under Response 3 is largely the result of the high number of European clearing houses in the list of CCPs considered in the survey. As vertical specialisation (Response 4) is associated only with OTC derivatives clearing, it is not surprising to see it in fourth place.

Figure 3

Summary of industry developments

Percentage and number of CCPs per response

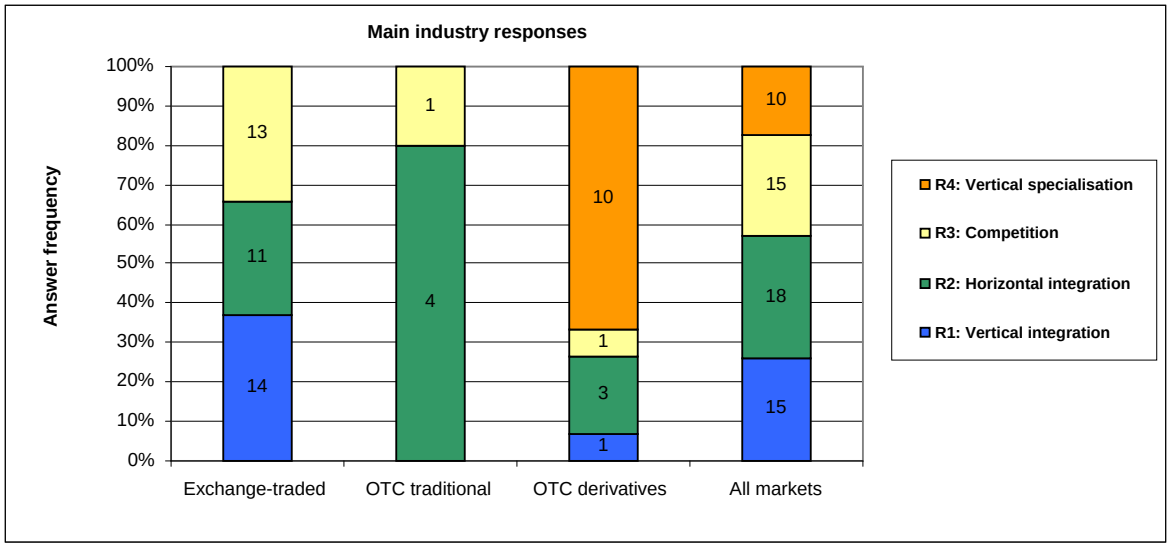


Figure 3 provides data on the frequency of the four responses observed in CPSS countries across the three market categories as defined in the survey (see Section 2.1). The responses vary across market segments. In exchange-traded markets, the market structure of CCP clearing underwent significant changes, particularly so in equities and exchange-traded futures and options markets. Vertical integration was a feature during our study period in equities markets in Hong Kong SAR, India, Italy, Japan[17], Russia, Sweden[18], Switzerland and the United States. Vertical integration was also observed in Canadian, American and UK futures and options markets, for instance with the creation of the TMX Group in Canada and LiffeClear and ICE Clear Europe in the United Kingdom.

Horizontal integration was an important development in European equity and listed derivatives markets, with the merger of Belgian, Dutch, French (and Portuguese) equity CCPs. CCPs clearing futures and options merged too, eg in the United Kingdom. In Sweden, the CCP for exchange-traded derivatives merged with its counterparts in Finland and Denmark at the same time as those three countries' exchanges merged. In some cases, a combination of horizontal and vertical integration is observed. For example, in Germany the CCP is owned by a stock corporation which is equally owned by two vertical groups and provides services to different trading platforms, including platforms outside these groups. Outside Europe, horizontal integration is observed mainly in the US exchange-traded markets, eg starting in the 1970s with the formation of the National Securities Clearing Corporation (NSCC) through a merger of the CCPs belonging to the New York Stock Exchange, American Express and the National Association of Securities Dealers, and more recently with the Chicago Mercantile Exchange's group acquisition of the New York Mercantile Exchange and its CCP, NYMEX Clearport, and the ICE's acquisition of the TCC for CDS clearing.

[17] In Japan, we observed a case of "organic vertical integration", consisting of a CSD launching a CCP further up the value chain.

[18] This was a partial vertical integration as NASDAQ OMX purchased 22% of EMCF, the CCP clearing for its Nordic equity exchanges.

Competition among CCPs is a key feature in exchange-traded markets, particularly European equity markets (see Table 4 below). In some cases, new entrants are in direct competition with the incumbent CCP clearing the main exchange (eg in Switzerland). Elsewhere, they are indirect competitors, clearing for newly established trading platforms, which in turn compete with existing exchanges (eg in Switzerland and the United Kingdom). Competition between CCPs can take the form of CCPs entering foreign markets. Hence more than one country will take note of this development. Note also that, in some countries, there is competition between vertical groups (eg in India and Russia) or between new entrants and horizontal groups (eg in Belgium, France and the Netherlands).

Table 4

Competition in different product markets

Market	**Exchange-traded**	**Traditional OTC**	**OTC derivatives**		
Asset	**Cash equities**	**Fixed income instruments**	**Interest rate swaps**	**Credit default swaps**	**Energy derivatives**
Australia					
Belgium	☑				
Canada					
France	☑	☑		☑	
Germany	☑	☑	☑	☑	☑
Hong Kong SAR					
India	✓				
Italy	☑	☑			
Japan					
Netherlands	✓☑				
Russia	✓				
Sweden	☑				
Switzerland	☑				
United Kingdom	✓☑	☑	☑	☑	☑
United States			☑	✓☑	✓☑

✓ denotes direct competition within countries; ☑ refers to direct international competition.

In traditional OTC markets, relatively fewer changes took place. CCPs are expanding their product range within their domestic markets, but no actual mergers of existing CCPs took place in this market segment. However, some CCPs have extended the number of electronic trading platforms they clear for (eg in Italy). Competition is an important feature in a small number of traditional OTC markets only. For instance, Cassa di Compensazione e Garanzia (CC&G) and LCH Clearnet SA jointly developed a link for the clearing of Italian debt products traded on certain markets operated by Mercato dei Titoli di Stato Group (MTS) or Brokertec, allowing their participants to choose between either CCP.

Competition in the central clearing of OTC derivatives is a relatively new phenomenon, and has to date been confined to interest rate swaps (International Derivatives Clearing Group (IDCG) launched a clearing platform to compete with LCH's SwapClear only in 2009 and the CME is working on an offering), CDS and certain commodity derivatives. In countries where OTC derivatives are centrally cleared, this is typically done within existing CCPs wishing to expand their product coverage, client access and/or geographical range. As a result, in some countries OTC derivatives central clearing is done within an existing vertical group (eg in Germany and the United States) or an existing horizontal group (eg in France). Elsewhere, some of the new CCPs are owned by (or have revenue-sharing arrangements with) the main dealers participating in the market, as in the case of the United States.

The OTC derivatives markets are further characterised by vertical specialisation. Here, CCPs offering central clearing services have had to integrate themselves into this market structure. This vertical specialisation consists in the emergence of niche service providers specialising in quite narrow functions in certain markets, leading to further fragmentation of the value chain. It is observed mainly in the United Kingdom and the United States, but also in France and Germany.

2.3 Main factors contributing to changes in the clearing industry: survey evidence

The analysis in this subsection is based on members' assessment of the key drivers in their markets (see Table 5 below). This was inevitably a subjective exercise, and in some countries it was difficult to identify one or two key drivers, particularly if multiple drivers were present. Moreover, some of the drivers were interrelated. With these caveats in mind, Table 5 and Figure 4 summarise members' views on the relevance of the main drivers. For CPSS countries as a whole, Driver 4 (changes in the trading environment) emerges as the key factor influencing change in the clearing industry.

Table 5

Summary of key drivers of clearing industry responses per participating country

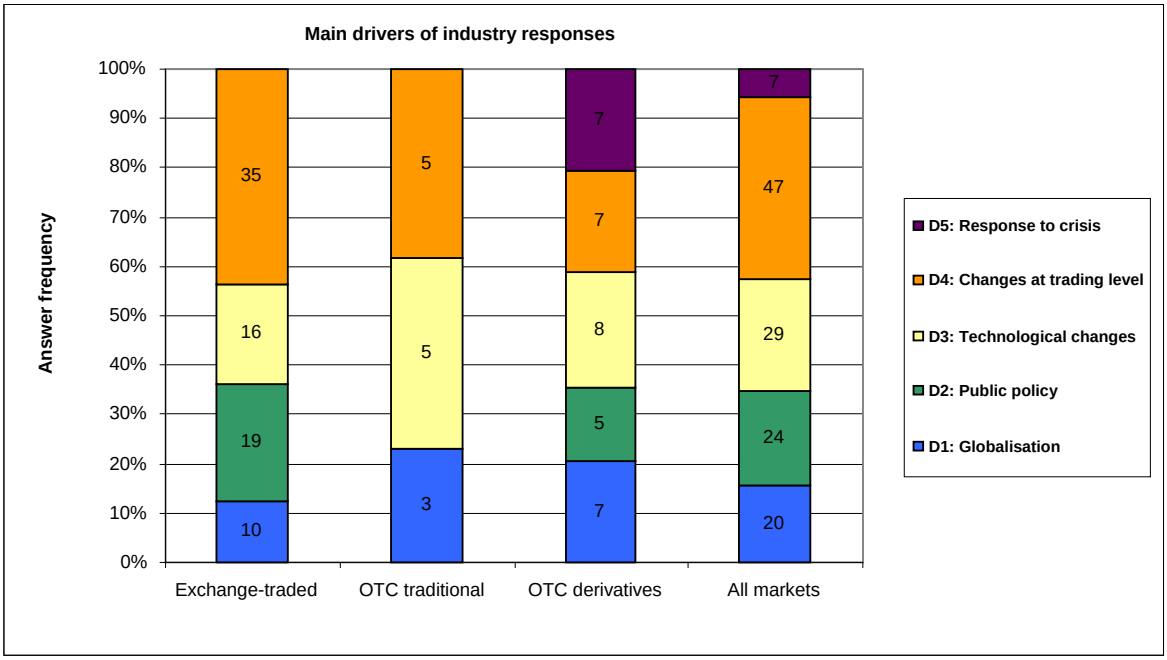
Drivers	Driver 1: Globalisation	Driver 2: Public policy	Driver 3: Technolog-ical changes	Driver 4: Trading changes	Driver 5: Response to crisis
Australia				✓	
Belgium	✓	✓	✓	✓	
Canada				✓	
France	✓	✓	✓	✓	✓
Germany	✓	✓	✓	✓	✓
Hong Kong SAR	✓		✓	✓	
India		✓		✓	
Italy	✓	✓	✓	✓	
Japan		✓		✓	
Netherlands	✓	✓	✓	✓	
Russia		✓		✓	
Sweden	✓	✓	✓	✓	
Switzerland	✓	✓	✓	✓	
United Kingdom	✓	✓	✓	✓	✓
United States	✓	✓	✓	✓	✓

Figure 4 synthesises the members' views on drivers across the three market categories as defined in the survey (see Section 2.1). Looking at the different market segments more closely, in exchange-traded markets Driver 4 (changes at the trading level) is clearly dominant, with Driver 2 (harmonisation of regulatory frameworks) and Driver 3 (technological change) in second and third place. For example, the creation of new trading platforms in the United Kingdom such as Chi-X and Turquoise was accompanied by the entry into the equities clearing space of CCPs such as EuroCCP and EMCF. In traditional OTC markets Drivers 3 and 4 predominate with similar weights, whereas in OTC derivatives markets all the drivers contribute about equally to fundamental changes in market structure, with Driver 5 of particular relevance for those countries that saw the introduction of central clearing for CDS.

Figure 4

Members' views on drivers

Percentage and number of drivers per market



When relating drivers to responses across countries and markets, some further insights emerge. Figure 5 below summarises the relationship between the four responses observed in CPSS countries and the drivers identified. First, both Response 1 (vertical integration) and Response 2 (horizontal integration) are mainly associated with Driver 4 (changes in the trading environment). Demutualisation of exchanges and/or mergers at the trading level led to consolidation in the clearing sector. Observed examples include the formation of LCH Group in Europe, the merger between demutualised stock exchanges and clearing houses in Hong Kong SAR, or the acquisition by CME Group of NYMEX, COMEX and the Chicago Board of Trade, which resulted in horizontal integration at both the trading and the clearing level.

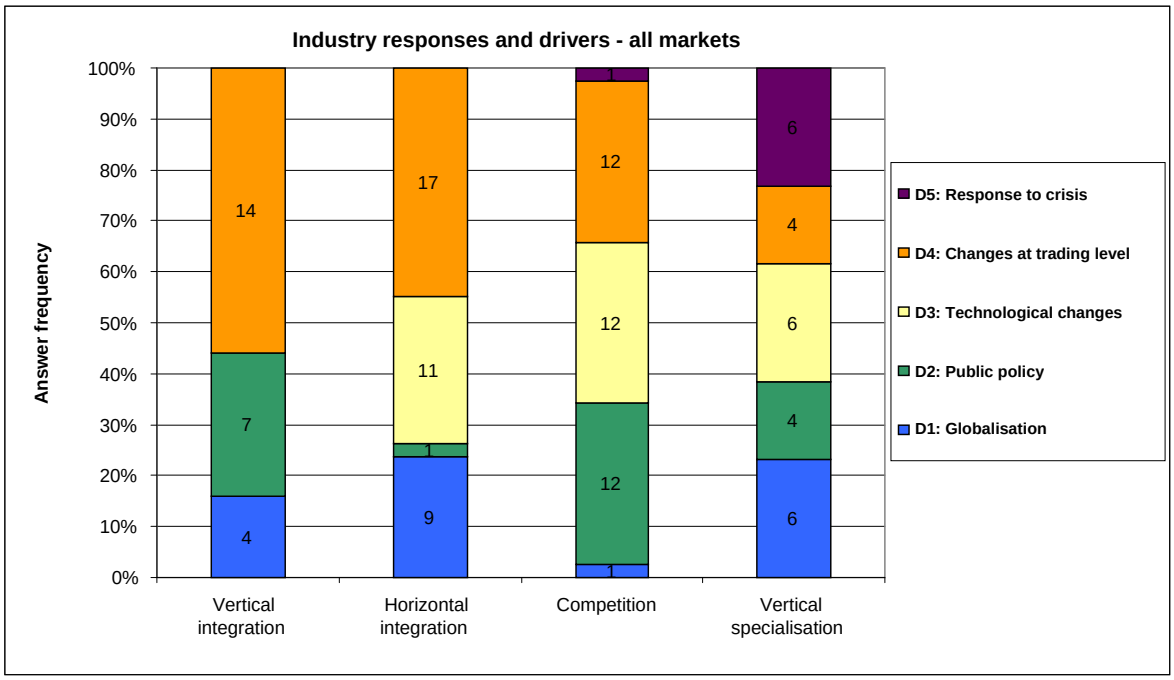
Response 3 (competition) is linked with Driver 4, but also with Driver 2 (harmonisation of the regulatory environment) and Driver 3 (technological improvement). This phenomenon is for instance reported in Europe, where new regulations removing barriers to entry at the trading level (MiFID) combining with technological change (eg the introduction of cheaper and more powerful IT infrastructure) enabled MTFs and new clearing houses to compete with incumbent infrastructure providers. All drivers affect Response 4 (vertical specialisation). For

example, in the United States some OTC derivatives markets have developed post-trade centralised infrastructure platforms to address specific needs such as trade repositories and portfolio compression. These developments arose via the combination of technological changes (Driver 3) which enabled such solutions to be developed, the globalisation of OTC markets (Driver 1) and significant regulatory pressures for improved and centralised infrastructure in OTC markets following the 2007–09 financial crisis (Driver 5).

Figure 5

Members' views on drivers and responses

Percentage and number of drivers, per response (for all markets)



To conclude, this subsection has shown that a wide range of industry developments exists across CPSS countries and markets. This concludes Part I of the report. Part II takes each response in turn and examines whether it has given rise to new risks in the clearing industry.

Part II: Implications for CCP risk management, systemic risk and oversight

Part I has described how the market structure of clearing underwent significant changes in the past decade. Part II of the report assesses the extent to which these developments have given rise to new risks. In the first instance, the focus is on the CCPs themselves, and in particular on whether changes in market structure may have altered their incentives to manage their counterparty credit risk. A second question is whether the changes in market structure have created new interdependencies that represent new risk challenges for the CCP. A third question is how changes in market structure affect the products and services offered by the CCP, as this may in turn affect how widely central clearing services are used. Wider use of central clearing services can reduce systemic risk by improving counterparty risk management in the market.

To answer these questions, the report develops an analytical approach aimed at identifying the potential risks generated by each of the stylised market responses identified in Part I. Drawing on the theoretical industrial organisation literature, Sections 3–6 first consider whether changes in the market structure have the potential to affect the behaviour of either CCPs or their clearing members, and whether this may give rise to new risks, or indeed bring about some risk reduction benefits. The different sections also explore to what extent the unique risk management role of CCPs, together with strong regulatory oversight, may have mitigated some of these (theoretical) risks. Finally, each section explores the risks that may have arisen from new interdependencies and considers whether the provision of central clearing services has been affected.

The analysis presented in Part II of the report draws on insights from the existing academic literature, and assesses their relevance for the clearing industry. At the same time, some of the risks arising from the developments described in Part I of the report are unique to the clearing industry. Hence, while presenting a comprehensive overview of these new risks, the report also contains ideas for further academic study.

3. Vertical integration: risks and risk reduction benefits

This section considers the risks and risk reduction benefits associated with vertical integration. As described in Section 1.2, vertical integration is defined as the formation of an integrated group, bringing post-trade infrastructure providers under common ownership with providers of other parts of the value chain. Throughout the discussion, a distinction is made between so-called deep integration (systems and operations are fully, ie legally and technically, merged) and partial integration (one legal entity through common ownership structure). It will also be useful to consider risks that arise during the transition phase (when distinct processes are being harmonised) and the steady-state phase (when the merger is completed).

It should further be noted that the analysis below is likewise applicable to arrangements where an informal form of vertical integration is achieved via a preferred supplier arrangement between a trading venue and a CCP. Such arrangements – although they are not the explicit focus of this section – may have similar risk implications. The specific risks that arise will depend on the particulars of each arrangement and also the degree of interdependencies between the relevant functions.

3.1 Risk reduction benefits

Vertical integration offers a number of risk reduction benefits. In the first instance, these may arise from the economies of scope mentioned in Section 1.2. Integrating corporate and operational risk management processes may result in cost savings. This in turn may reduce *operational risk*, provided the CCP chooses to use the extra resources to improve its

operational risk management. For example, an integrated organisation would be able to use a common IT infrastructure for all its functions, potentially lowering its operating expenses. Reduced costs may, however, simply be translated into greater profits, without necessarily leading to improved operational resilience.

Vertical integration may also allow for a higher degree of straight through processing, which may cut down on errors or risks related to manual processing, further reducing operational risk. There are further likely benefits associated with the ability to address operational issues in a comprehensive, integrated manner.

A further benefit arising from economies of scope is that the vertical group may be less exposed to *business risk* as its revenues may be more stable (ie its trading business guarantees a minimum level of clearing business). Clearly, these benefits will be greater in a vertical entity that is fully (technically and legally) integrated. There is of course a counter to this argument, as the clearing function will be exposed to the business risk of the trading function (which will be discussed in Section 3.2).

Second, in a vertical group it might be easier to monitor and control participants' risk exposures, provided there is free flow of information between the trade and post-trade functions. More generally, a better understanding of the different business functions may enable fine-tuning of different processes and ultimately better *credit risk management*. In addition, the CCP in the vertical group can make direct use of services provided by the exchange, and would for example have timely access to pricing data.

Third, vertical integration may act as a catalyst to harmonise rules and procedures within the group. For example, this might include the business continuity procedures and testing requirements of the exchange and the CCP. Related to this, there may be opportunities to simplify the documentation that participants have to provide and/or sign, thereby avoiding unnecessary duplications. This may in turn benefit the group's users. Most likely, it would also result in some cost savings for the group.

Fourth, a vertical group may be more inclined to innovate, although this is a debated point (see also Section 7). This may mean that the CCP in the vertical group is more likely to either expand its product range or broaden its client access. This may be because that CCP may coordinate with exchanges more easily (eg on the requirements for central clearing), thereby allowing for a smooth introduction of new products into the CCP. It may also be easier to implement new products, since all levels of the product offering (trading, clearing, settlement) would be aligned within one comprehensive project. The CCP may be less concerned about business risk (it may have greater revenues to absorb the costs related to product innovation) or it may be under less pressure to reduce clearing fees (since it may be under less pressure to attract business). Section 7 will further explore whether vertical market structures are more (or less) responsive to the needs of its users and of the trading venue.

3.2 Risks arising from changes in behaviour

The theory of industrial organisation may help us to understand some of the risk implications of vertical integration, and whether theoretical arguments concerning market power are relevant in the context of CCPs. In seeking to understand those implications, it will be useful to consider two distinct industry configurations: (i) a vertically integrated CCP which is the monopolist CCP in its market; and (ii) a vertically integrated CCP which faces competition. The theoretical predictions concerning the two configurations differ slightly, as will be explained below.

A first theoretical concern raised in the literature is that the vertical entity may acquire greater market power and hence be able to prevent entry of competitors. This is also referred to as *foreclosure* (Tirole (1988)). There are several ways in which foreclosure may manifest itself in the clearing industry. A CCP operating within a vertical group may be tempted to do one of the following:

- It may negotiate exclusive access to the trade flow from the exchange in the vertical group.
- It may exclude trading platforms outside the group from accessing the CCP. By doing this, it will restrict overall access to central clearing.
- It may disallow positions from different exchanges from being treated as fungible or offset with contracts on other exchanges, hence reducing the scope for multilateral netting.
- It may prevent interoperability with other CCPs.
- It may bundle the pricing of various services so that users are not able to compare the pricing of individual services.

Foreclosure concerns are relevant in the context of central clearing. They may apply when the vertical CCP is the monopolist provider, but equally when others are entering the market. At the same time, these concerns do not always materialise. CCPs themselves may aim to expand and connect with more than one trading platform. Legislation may also prevent foreclosure in general, and bundling of pricing in particular. In Europe, the Code of Conduct has provided for unbundling of services and transparency of prices.

A second concern raised in the industrial organisation theory applies to the second scenario only, ie when the vertically integrated CCP competes with others.[19] The theory suggests that a vertical entity may be more likely to engage in *predatory pricing*, as it typically has "deep pockets". In this scenario, the incumbent initially substantially reduces its pricing to prevent successful entry by the competitor, and subsequently increases its pricing when the competitive threat has disappeared. This behaviour has indeed been observed in the clearing industry.

Both foreclosure and predatory pricing affect competition, either directly, or indirectly (by making the market less contestable), and in turn may affect the extent to which market participants can enjoy the risk reduction benefits of central clearing.

A third, theoretical argument is that, within a vertical group, one entity may have incentives to take excessive risks, either because it knows that it can rely on the group's financial resources or because there is pressure to cross-subsidise a different function within the group. In the context of CCPs, this argument could translate into a concern about a weakening of the *credit risk management* processes that underpin central clearing. Specifically:

- A CCP within a vertical group may be inclined to set lower margins, as lower margins could translate into greater trading volumes, hence increasing both trading and clearing revenues.[20]
- Likewise, a CCP in a vertical group may be tempted to lower access criteria.
- The CCP might be inclined to further reduce its buffers in the form of default contributions collected, relying instead on the group's financial resources (to the extent that there is a parental guarantee from the holding company).

[19] It should be noted that predatory pricing and other anti-competitive actions may also arise in markets where the CCP is a standalone entity. This will be discussed in more detail in Section 5.

[20] For the relationship between margins and trading volumes, see eg Hartzmark (1986) and Hardouvelis and Kim (1995).

- The CCP may be more willing to take risks, for example by expanding into new products that bring greater risks to it (thereby reversing the above-mentioned innovation benefits).

In practice, these risks may not manifest themselves in every vertically integrated CCP and may not be unique to the vertical group. First, CCPs are inherently conservative institutions, whose primary focus is to manage counterparty credit risk in a prudent way. Hence, a CCP's strategic decisions will typically be driven by risk considerations (eg decisions to expand into new product markets). Second, CCPs and their regulators pay great attention to the risk controls that are in place, and this is reflected in international standards for oversight. Furthermore, CCPs will typically set more stringent access requirements than exchanges, and the vertical group is no exception in this regard. CCPs also have strict rules on the use of financial resources, and vertical groups have appropriate governance arrangements in place to protect the CCP's financial resources. Again, these risks may be mitigated through effective oversight, regulation and appropriate legislation.

For a further discussion of such "race to the bottom" issues, including in markets where CCPs are not part of vertical groups, see Section 5.

3.3 Risks arising from new interdependencies

Vertical integration creates links and interdependencies between exchange and CCP functions that do not exist when these services are provided by separate entities. Some of the benefits arising from new interdependencies were discussed in Section 3.1. The remainder of this subsection considers whether these interdependencies may exacerbate existing risks faced by the CCP or may bring about new risks.

A first issue arising from the interdependencies associated with vertical integration is that losses experienced by one of the group's functions may affect the entire entity. As such, some of the risks that would be faced by any CCP may be exacerbated when that CCP is part of a vertical group. Indeed, as vertical integration links the financial well-being of the CCP to that of the other functions in the vertical group, *business risk* may be exacerbated (potentially offsetting the aforementioned risk reduction benefits associated with more stable revenues).

Furthermore, where vertically integrated entities rely on common facilities, systems and staff, they concentrate and may amplify *operational risk*. For instance, in the case of a fully vertically integrated entity, an operational outage at one level could spread through common IT systems and cause disruption at other levels of the organisation. Clearly, this increase in operational risk is most relevant for groups which have fully integrated their technical and operational functions.

A second concern relates to size. Vertical integration will make an entity larger and more important in the market(s) that it serves. There is a concern that, if an entity recognises that it is "too big to fail", it may have a reduced incentive to manage its risks, or it may not plan for a broad enough range of stress scenarios. In such a situation, pressure from external sources to manage risks (eg from non-owner participants) may also be weakened. For the same reasons, market participants may be tempted to increase their exposures to the CCP and/or reduce their monitoring efforts.

Of course, these are issues that affect all CCPs of a certain size, but they may be heightened when the CCP is part of a large vertical entity linked to a wide range of markets. As such, vertical integration may contribute to increased *systemic risk*. However, this may not only be a risk specific to the vertically integrated CCP but may also be applicable to any major financial market infrastructure.

Vertical integration will by definition lead to a change in ownership, and with it possible changes in *governance*. Specifically, as trading and clearing functions are now part of the same legal entity, key considerations are whether the day-to-day CCP risk management

function is sufficiently independent, and whether strategic decisions on CCP risk management and product expansion are made independently of exchange decisions. Such governance issues, including possible processes to deal with conflicts, are likely to be an important part of the integration process.

Finally, it is worth noting that, in some markets, the different functions carried out by a vertical group may be subject to oversight by different regulators (possibly in different countries) or may be subject to different regulatory treatment. For instance, the exchange function may be overseen by a securities regulator and the CCP function by a central bank. When these functions are merged within the same entity, *regulatory frictions* may arise – possibly due to miscommunication, regulatory gaps or differing requirements set by the respective regulators. With appropriate regulatory/oversight frameworks, these risks can be largely avoided, provided they are addressed early on during the integration phase.

To conclude, while vertical integration presents some clear risk reduction benefits, there are a number of risks that may either directly affect the robustness of the CCP within the group, or affect the risk reduction benefits of central clearing more generally. In particular, regulators and central banks will need to be aware that there may be particular challenges related to business risk, operational risk, the management of counterparty credit risk and the risks arising from interdependencies that are different from those in the case of a standalone CCP.

3.4 Issues to be considered by central banks and regulators/overseers

Section 3 has described the risks and risk reduction benefits related to vertical integration. These risks are distinct from those arising in the benchmark single-entity CCP and may be the result of changing incentives or new interdependencies. The section has also argued that many of the risks can be effectively mitigated through adequate risk controls, regulation/oversight and legislation. The main risks are summarised below, together with some practical considerations for central banks and regulators/overseers. In the summary, the focus is first on risks to the CCP and then on risks to the financial system as a whole. The tables below focus on risks only – the risk reduction benefits having been described earlier in the section.

Table 6

Key risks that may arise from vertical integration

Risk category	Risks: vertical integration
Risks to the CCP	
Counterparty credit risk	• CCP may weaken risk controls (eg lower margins or default contributions) • CCP may lower access criteria • CCP may take more risks (eg product expansion, with insufficient investment in development of credit risk management)
Business risk	• CCP revenues may be affected by group revenues • CCP revenues may be affected by lowering of clearing fees • Choice of clearing products may depend on group's strategy (rather than CCP risk management capabilities)
Operational risk	• CCP operational resiliency may be affected by group operations
Liquidity risk	• *Vertical integration tends not to create any new liquidity risks*
Governance	• CCP governance arrangements may not be sufficiently independent • Strategic decisions regarding the CCP may be influenced by group objectives
Risks to the financial system	
Systemic risk	• CCP is part of a larger entity (too big to fail)
Reduced benefits from central clearing	• Group may use market power to restrict alternative trading venues' access to the CCP • Group may use market power to restrict new entry into central clearing
Regulatory frictions	• Group's entities may be subject to conflicting regulatory requirements • Coordination failures (eg leading to key risks being overlooked)

Taken as a whole, the analysis in this section suggests that central banks and regulators/overseers may want to consider the following issues:

Table 7

Key issues to consider with vertical integration

Risk category	Issues to consider: vertical integration
Risks to the CCP	
Counterparty credit risk	• Is there evidence of any weakening of the CCP's risk controls that may affect its ability to deal with a member default (eg lowering of margins or default contributions, lowering of access criteria)? • Is there evidence of too rapid product expansion? • Has the CCP devoted sufficient resources to developing new risk management processes?
Business risk	• Does vertical integration make the CCP more dependent on group revenues? • Is there a thorough understanding of developments in the trading function that may affect the clearing business? • Are there sufficient financial resources to support expansion of the clearing function? • Is product expansion based on a sound business case? Or is the CCP relying on the capital (or other financial support) from the group?
Operational risk	• Does the vertical group have a coordinated approach to the management of group-wide operational risks and, if so, is this appropriate for its clearing function? • Is there a risk that an operational failure at the trading level affects clearing and, if so, are there adequate plans in place to mitigate this risk?
Liquidity risk	• *Vertical integration tends not to create any new liquidity risk*s
Governance	• How is the risk management function organised? Is the risk management function independent of business areas in both the CCP and the exchange? • Where are key decisions made on CCP projects and product expansion? Are they influenced by trading considerations (eg restricting clearing links with trading platforms outside the group)? • Does the board contain enough members with CCP expertise and who can represent the interests of the CCP? • What policies does the group have in place to avoid potential conflicts of interest or differing objectives that might affect risk controls?

Table 7 (cont)

Key issues to consider with vertical integration

Risk category	Issues to consider: vertical integration
Risks to the financial system	
Systemic risk	• Does the CCP manage its risk in a manner commensurate with its size and role in the market(s) it serves? • Are the effects of interdependencies between clearing and other group functions monitored (eg contagion effects)?
Reduced benefits from central clearing	• Is there evidence that the expansion of central clearing may be negatively affected (either to new users or to new products)?
Regulatory frictions	• Is there evidence of appropriate coordination amongst the various regulators/overseers?

4. Horizontal integration: risks and risk reduction benefits

This section considers the risks and risk reduction benefits associated with horizontal integration, again drawing on the theoretical industrial organisation literature. Horizontal integration is narrowly defined as the formation of an integrated group, bringing a number of clearing providers under common ownership. But in a broader sense, the horizontal CCP is not entirely different from a large standalone CCP serving a range of product markets or trading venues, possibly in different countries. Hence, the discussion below will aim to identify the unique risks that arise as a result of a horizontal merger. As in Section 3, a distinction will be made between so-called deep integration (systems and operations are fully harmonised) and partial integration (one legal entity through common ownership structure). And it will be particularly useful to consider risks that arise during the transition phase (the length of which may vary).

4.1 Risk reduction benefits

A number of benefits may arise when CCPs serving different products, venues or geographical markets merge to form a single entity. First, significant *economies of scale and scope* may arise, which in turn may reduce risks to the CCP. Scale economies include the revenues associated with increased transaction volumes and the savings arising from using the same backup arrangements. Scope economies arise, for example, when corporate functions or risk management measures such as participant monitoring, margin methodologies or stress testing are offered by the group instead of the individual CCPs. As mentioned in the context of vertical groups, the CCP may use these cost savings to invest in risk management or operational processes, which would have risk reduction benefits, but this need not always be the case.

Second, participants themselves are likely to benefit from connecting to a single CCP, as this may lower their overall operational costs and access fees. Participants may also benefit from the *network effects* which materialise when the creation of a horizontal CCP brings about an increase in its membership base: the more members that connect to the CCP, the more trades that can be netted. As netting opportunities increase, collateral requirements may be lower in turn.

Economies of scope and scale associated with network effects may significantly reduce the cost of using the CCP, and provide incentives to increase the use of central clearing (absent mandatory CCP use). In addition, participants may benefit from being able to use a common risk management model in a range of markets, which further reduces the cost of central clearing. Similar benefits can, however, arise with a single, multi-product CCP.

From a risk management perspective, the centralisation of trades in a single CCP increases the *multilateral netting* effect and cross-margining benefits and may reduce the CCP's own credit exposure. This is because of the diversification benefit that ensues whenever any number of less than perfectly correlated assets is bundled into a portfolio. Again, this benefit is similar in the case of a multi-product CCP.

Once the merged entity is in place, and the appropriate oversight framework has been established, a number of additional benefits may accrue. The regulator may have greater visibility of positions and concentrations across products or geographical markets. The same level of *transparency* to the regulator may be more difficult to achieve when several standalone CCPs serve the same market (but this argument would again be similar for the multi-product CCP). CCPs themselves may also benefit from greater access to information, as they will be able to view the consolidated position from each of their members, and thus have a more accurate picture of their own exposure to credit risk. Finally, horizontal integration may also bring about harmonised *default management*, which may have operational benefits.

4.2 Risks from changes in behaviour

This subsection draws on insights from the industrial organisation literature to develop an understanding of risks arising from changes in the incentives of the horizontal CCP. As in the case of vertical integration, the literature offers insights that relate to two distinct scenarios: (i) a monopolistic horizontal CCP; and (ii) a horizontal CCP facing competition.

First, the theory suggests that horizontal integration may lead to greater market power, allowing the merged firm to charge higher prices (Tirole (1988)). In the context of central clearing, this means that a newly merged CCP may be tempted to raise clearing fees and/or restrict access to the clearing industry.

Industrial organisation theory further suggests that such market power is most likely an issue if concentration in the industry is high to start with – a condition which may indeed apply to merging CCPs that in many cases were the sole clearing providers in their market. In contrast, if the merged CCP faces (actual or potential) competition in its market(s) (the second scenario), then its ability to raise prices will be more limited. Instead, it may engage in predatory pricing and set lower prices, as in the case of vertical integration.

In practice, the experience with horizontal CCPs shows that, with oversight and legislation, these risks can be mitigated. In this respect, market power considerations raised in the context of vertical integration apply equally here (see Section 3.2).

4.3 Risks arising from new interdependencies

A horizontal merger typically leads to new interdependencies, which may bring about new risks. These additional risks are worth highlighting, even though in many instances they are not distinct from those facing a multi-product CCP (or a CCP clearing for multiple trading venues). First, increased concentration of risks is a consequence of horizontal integration because transaction volumes can be expected to increase. In other words, the impact of the failure of a larger CCP would have a larger spillover effect for the financial markets it serves. Hence, without appropriate risk controls, *systemic risk* could rise. On the other hand, if the merger led to a significant increase in netting opportunities at the member level, then the increase in clearing volumes may not be so marked, or they may even decline. Clearly, this would be most relevant for a merger involving CCPs clearing similar products.

Second, as the merged CCP encompasses more markets or serves a wider range of market participants, the network of counterparty exposures widens. This may have a number of effects. It could result in reduced concentration, thereby lowering the exposure of the CCP towards an individual member. But it could also lead to greater concentration if the members of the integrating CCPs are the same large participants, operating in the different markets now served by the merged CCP. As the integration may entail further netting benefits, it is not clear whether the CCP's exposure towards an individual member would increase or not. For individual financial institutions, however, the merger may increase their dependence on the single merged CCP.

Third, horizontal integration may bring about a change in the *aggregate risk exposures of the CCP*. This reflects both the above-mentioned changes in netting, and changes in the actual distribution of exposures, as netting affects tail risk. Any CCP is faced with some well known problems in trying to calculate the size of its default fund(s). First, it is difficult to assess tail risk because tail events are rare and therefore the empirical evidence contains little usable information about the true likelihood of such events. Second, it is difficult to assess the magnitude of the losses-given-default because they depend on the replacement cost of an exposure and the effectiveness of the CCP's loss absorption system, both of which can be hard to assess.

However, for a multi-product CCP, estimating the necessary size of its default fund is even more challenging. Apart from the usual difficulties in accurately estimating tail risk and the losses-given-default for single asset classes, the CCP has to estimate asset return

correlations to determine what its risk exposures are. This is a non-trivial task because, at times of market turbulence, asset correlations tend to break down and thus correlations estimated using past data are likely to be poor predictors of the correlations that prevail in distressed times.

Taken together, this means that calibrating the level of the default fund following a merger (assuming that the merged CCP decides to have a single default fund) requires careful consideration. A reduction in the default fund (relative to the sum of the individual default funds) may be warranted and could be compatible with underlying risk characteristics. If, however, this is not the case, then the horizontal CCP will not be adequately protected against a participant default, and should either raise the level of the single default fund or maintain separate default funds.

In addition, if a rationalisation plan accompanying the merger results in a reduction of financial resources, then there may be a significant risk that the newly merged CCP has too few resources as insurance against default.

Fourth, closing out transactions quickly after a *participant default* is essential for the continuous smooth operation of a CCP and may become more difficult when the CCP grows larger and clears more transactions. The timely closing-out of positions may also be made more difficult by legal or regulatory frictions if the CCP expands its activities into a new jurisdiction. The delay in closing out positions could then subject the CCP to additional risks. These risks are, however, also present in the case of a large, multi-product CCP, and are as such not unique to the horizontal group

Liquidity risk is another area which may be affected as a result of a horizontal merger. While a domestic CCP is likely to be a direct member in a large-value payment system or have direct access to facilities of its central bank, a remote or foreign CCP may not be a member, either because national rules do not allow this or because of the operational difficulties involved in acting in multiple systems. As a result, a cross-border CCP might rely more on commercial banks for its money settlement in non-domestic currencies. This risk is shared by horizontal and standalone multi-product (multicurrency) CCPs. At the same time, the merger may present an opportunity to further reduce this risk, eg by reorganising the CCP's payment or liquidity arrangements. The merged CCP will also need to ensure that its stress test scenarios reflect such changes in liquidity management.

4.4 Risks arising during the transition phase

As in any industry, a merger is a complex activity and requires robust project management. In particular, there may be additional risks that manifest themselves during the transition period (ie the period between the conclusion of the merger and the completion of the so-called "deep integration") and as such are unique to the merger process.

First, if the merger is accompanied by harmonisation of rules and procedures, or by rationalisation of processes, then the implications need to be fully considered up front. For a CCP, it is crucial that there is a clear understanding of how the various *risk defences* will be affected (the so-called "waterfall"). For example, the merging CCPs may have operated under different rules regarding the use of the default fund. Or clearing members may have had different obligations in case of a member default (eg participation in auctions to transfer the defaulter's positions). It is critical that these rules and procedures be considered early on in the merger process, in particular that decisions as to which rules and procedures are (or are not) harmonised be taken early on.

Second, if as a result of the merger the CCP expands into new products, it must adapt its risk management rules and procedures to cover any new products or cross-product risks that may arise. For example, it would need to determine whether the *default funds* for different products will be commingled or kept separate.

During the early stages of the merger, there is also a risk that existing *risk methodologies* may not be sufficiently complex or robust. For example, netting traditional and new products across equity markets with linear risk exposures and derivatives markets with leveraged risk exposures could lead to a complex risk structure that may not accurately be represented by an integrated risk management model. The CCP may therefore opt to keep risk management models and processes separate, either as a transitional measure or as a permanent choice. If this process is not well understood or does not proceed fast enough, the CCP will not be adequately protected against counterparty credit risk, particularly during periods of increased price volatility.

Market participants too will need to understand the implications of the merger, particularly if a CCP clearing traditional, low-risk products merges with a CCP clearing riskier products. For participants in the former, horizontal integration might entail an increase in their risk exposure to the CCP (eg via the default fund if not segregated). Hence, if during the transition phase market participants do not monitor the changes occurring at the CCP (or if the CCP fails to provide adequate information), then individual risk exposures to the CCP may increase without participants being fully aware. Market participants also need to understand the implications of any changes in the structure of the CCP's default fund, as the mutualisation of losses may change: as stated, some CCPs may decide to keep a single default fund following the merger; others may opt for one or more segregated funds.

Third, combining operational and risk management processes that were developed in different entities may also lead to *operational risks*, which could be exacerbated if the merger is accompanied by cost cutting (eg through staff reductions). There may also be a question as to whether previously independent support services will remain of sufficiently high quality as they are being merged.

Fourth, as horizontal integration often takes place across different jurisdictions, legal differences may become apparent during the merger process. The horizontal CCP may become subject to potentially conflicting legal acts in the respective jurisdictions. Differences in law may affect the CCP's rights in the face of a participant's bankruptcy, rules concerning the finality of transactions, its rights over collateral, the robustness of its netting arrangements, the enforceability of contracts, and recognition of the place of jurisdiction. During the transition phase, significant *legal risks* may therefore arise if the horizontal CCP fails to adapt its default procedures or has not devoted sufficient resources to understanding its legal obligations in the various jurisdictions in which it operates. This risk may persist beyond the transition phase if, in spite of the harmonisation of rules, there are significant differences in the legal frameworks of the different jurisdictions in which the CCP is operating.

Fifth, *outsourcing* relationships may also be affected during the transition process. For example, the merged CCP may decide to rely on providers that had a relationship with one of the merging entities. Or the merged CCP may employ outsourced functions informally within its group, rather than entering into a formal agreement with an external supplier. In either case, there may be a risk – at least during the transition phase – of the new relationship proceeding without sound legal underpinnings, or weakening the degree of control the CCPs can exercise over the outsourced functions.

Finally, integration of independent CCPs with different *governance structures* may create challenges. For example, a horizontal merger may bring together different groups of users (eg if access criteria were different in the merging CCPs) or different owners. Moreover, the individual CCPs may have had different governance models (eg different boards, board committees, reporting lines between management and board), and the merged entity may be sufficiently different to warrant a new governance structure altogether.

To conclude, horizontal integration may require changes to operations in general as well as to access criteria, risk management models, liquidity risk management and governance

arrangements. During the integration phase, regulators will therefore need to assess whether the CCP is managing its risks soundly while building up its new business.

4.5 Issues to be considered by central banks and regulators/overseers

Section 4 has described the risks and risk reduction benefits related to horizontal integration. Many of these risks are distinct from those arising in the benchmark single-entity CCP and may be the result of changing incentives or new interdependencies. In some cases, however, the risks are similar to those facing a single multi-currency CCP, or a CCP serving multiple markets. The section has further shown that some of the risks are unique to the transition phase, when the operations and procedures of the different CCPs are being merged and/or harmonised.

The section has also argued that many of the risks can be effectively mitigated through adequate risk controls, regulation/oversight and legislation. The main risks are summarised below, together with some practical considerations for central banks and regulators/overseers. The tables below consider risks only – the risk reduction benefits having been described earlier in the section.

Table 8

Key risks that may arise from horizontal integration

Risk category	Risks: horizontal integration
Risks to the CCP	
Counterparty credit risk	• Greater complexity of risk management (modelling, default fund calculation)* • Greater complexity of default procedures* • Particular challenges during integration phase
Business risk	• CCP revenues may be affected by group revenues (eg as a result of increased netting efficiency)
Operational risk	• CCP operational resiliency may be affected during transition phase • Outsourcing relationships may be affected during transition phase
Liquidity risk	• CCP may need to make greater use of commercial bank settlement (if clearing multiple currencies following merger)* • CCP may become dependent on wider set of commercial liquidity providers (if clearing multiple currencies following merger)*
Governance	• Integration of CCP governance arrangements may be challenging
Risks to the financial system	
Systemic risk	• CCP is a larger entity (too big to fail)* • CCP covers a wide range of markets and participants (possibly cross-border), hence spillover effects may be greater* • Market participants may face increased dependence on a single CCP* • Market participants may not be fully aware of changes to rules and procedures during the transition phase
Reduced benefits from central clearing	• Group may use market power to raise prices* • Group may use market power to restrict new entry* • Merger may lead to higher access requirements, thus limiting access to central clearing
Regulatory frictions	• Merging entities may be subject to different regulatory requirements or legal frameworks* • Particular challenges during integration phase (eg insufficient coordination between regulators)

* indicates that similar considerations apply to any multi-product CCP.

Table 9

Key issues to consider with horizontal integration

Risk category	Issues to consider: horizontal integration
Risks to the CCP	
Counterparty credit risk	• How does the merger affect the integration of risk management models and processes? • Does the merger involve a harmonisation of risk management procedures (eg access criteria, margin requirements) and, if so, could this weaken the merged CCP's risk controls? • Does the merged CCP have an accurate view of aggregate risk? • Does the merged CCP continue to have adequate financial resources (eg margins and default fund)? • Is there sufficient clarity around default management procedures and members' obligations during the transition phase? • Do members understand the implications of bringing together products with different risk characteristics?
Business risk	• Is the merger likely to affect the revenues of the merged CCP? Is the merger proposition built upon a sound business plan? • Is there pressure to rationalise and reduce the financial resources of the merged CCP (eg during the transition phase)? • Are financial resources commensurate with the new risks the merged CCP might face (eg clearing more complex products)?
Operational risk	• How will the different operational processes be harmonised? Is there a sound project management plan in place to deal with transition issues? • Is there evidence of cost cutting that could adversely affect operational resilience? • Is there a plan in place to harmonise outsourcing relationships? If they remain separate, will contracts still be appropriate? • How will business continuity plans be harmonised? How will separate business continuity plans function during the transition phase?
Liquidity risk	• How will access to liquidity lines be harmonised? • If the merger leads to increased use of commercial bank settlement, are the arrangements sufficiently robust? • If the merger leads to greater reliance on commercial liquidity lines, are appropriate risk controls in place? • If the merger leads to greater foreign currency flows, does the merged CCP have adequate liquidity arrangements in place? • Are increased complexities of liquidity arrangements reflected in the CCP's stress scenarios? Are currency risks covered?

Table 9 (cont)

Key issues to consider with horizontal integration

Risk category	Issues to consider: horizontal integration
Governance	• How will different approaches to governance be harmonised? Is there a sound project plan in place that deals with these issues during the transition phase? • Is the new governance model appropriate for the (often more complex) merged entity? • Are the different users from the merging entities represented in material decisions? • Does the group's board have the relevant expertise (eg if the merger brings together different product classes)?
Risks to the financial system	
Systemic risk	• Does the CCP manage its risk in a manner commensurate with its size and role in the market(s) it serves? • Are the effects of increased interdependencies considered (eg contagion risk)?
Reduced benefits from central clearing	• Is there evidence that the expansion of central clearing (either to new users or to new products) may be negatively affected? • Is there evidence that the merger might lead to higher access requirements, thus limiting access to central clearing?
Regulatory frictions	• Is there evidence of a lack of coordination? • Are appropriate oversight arrangements in place for the merged entity? Specifically, has an efficient cooperative framework been set up between interested authorities? • Are legal risks well understood?

5. Competition between CCPs: risks and risk reduction benefits

Competition has been defined above as the emergence of CCPs clearing identical (or closely related) securities traded on either a single exchange or competing trading platforms, or providing identical or similar clearing solutions for OTC derivatives previously cleared bilaterally. As a result, the incumbent CCP faces competition, either from another CCP in its home market or from a remote CCP. This section first considers the risks and risk reduction benefits that arise in such situations. It considers both actual competition and the threat of competition – drawing, as before, on the theory of industrial organisation. It also takes a brief look at interoperability – a particular response to competition in clearing – and the risks it brings about.

5.1 Risk reduction benefits

Competition – in what has traditionally been viewed as an industry characterised by high fixed costs and hence operating as a natural monopoly – may offer a number of risk reduction benefits. First, it may lead to lower clearing costs or wider access to market participants not traditionally served by CCPs. This may in turn encourage more central clearing, thereby extending its systemic risk reduction benefits. Similar systemic risk benefits may arise if competition leads to greater innovation, eg by encouraging CCPs to offer new products, or to develop clearing solutions for a wider range of market participants, including those who previously did not have access to central clearing. The issue of innovation will be discussed in more detail in Section 7.

Competition may have a further benefit in that it provides regulators with a benchmark for good risk management or governance. This may be particularly relevant when central clearing is introduced into new markets. Through the interaction of the public sector financial authorities with candidate CCPs, particular risk management challenges may be addressed in a more efficient and coordinated fashion.

In theory at least, the presence of multiple CCPs offers additional flexibility relative to the case of a monopoly provider. For example, if a CCP were to fail, there would be an alternative arrangement in place. However, significant practical concerns remain – eg would, or could, positions be transferred to an alternative CCP in the event of a temporary operational disruption? An "immediate" switch may not be feasible unless participants have previously established access to the alternative CCP and that CCP already clears identical or fungible products.

5.2 Risks arising from changes in behaviour

As mentioned briefly in Sections 3.2 and 4.2, industrial organisation theory suggests that firms may engage in *predatory pricing* (ie may aggressively cut prices) as a means to keep out actual (or potential) entrants. From a social welfare perspective, the theory contends that predatory pricing is usually inefficient in the longer term, because successful firms increase their prices in the future in order to take advantage of their (newly established or regained) market power, and entry of productive newcomers may be deterred. The theory also points to the possibility of a so-called *race to the bottom*, whereby firms remain engaged in a costly price-cutting battle for successive periods, each hoping the competitor will eventually withdraw.

In the context of central clearing, this "race to the bottom" could manifest itself in a number of ways:

- CCPs could compete by offering less stringent margin requirements or lower default contributions.
- CCPs could lower access requirements.

- CCPs could raise the remuneration on assets pledged as collateral.
- CCPs could lower the quality of collateral accepted.

In each instance, the concern is that, by doing so, the CCP could undermine its own protection against counterparty credit risk. In practice, there is tentative evidence about competition on margin requirements (eg in equity markets and in interest rate swaps). There is also anecdotal evidence that CCPs offer different rates of remuneration based on commercial considerations. These constitute significant risks, which warrant careful attention from regulators/overseers and central banks.

Both predatory pricing and a "race to the bottom" may arise when CCPs are standalone entities, and when they are part of a consolidated group. As mentioned in Sections 3.2 and 4.2, in the latter case there is a risk that, since the CCP may have access to greater resources (the so-called deep pockets argument), it has a greater ability to absorb any losses arising from competing with new or existing CCPs, and may thus behave more aggressively. In practice, examples of CCPs competing on margins are observed in markets with and without consolidated groups. Evidence on CCPs competing on collateral remunerations is more anecdotal, as indicated in the previous paragraph. This suggests that competition could lead to a "race to the bottom" regardless of the structure of the competing CCPs.

As also mentioned in Sections 3.2 and 4.2, CCPs have strong incentives to protect their own resources, and thus minimise their own probability of default, even when actively competing for market share. This applies equally to standalone CCPs and to CCPs that are part of a consolidated group. And CCPs may actually compete on the soundness of their risk controls, as well as their operational resilience. Competition on this basis would then result in CCPs with better protection against counterparty credit risk and with more robust operations.

Furthermore, a CCP's ability to compete based on risk controls is likely to be constrained by the risk appetite of its members (as well as by their own capital requirements).[21] Members might not be keen on a CCP reducing margins or access requirements, particularly where they contribute to the default resources, as this would increase the likelihood that a member's default could impact all other members' contributions. This is because, in the event of a member default, a CCP will typically call on these funds after it has exhausted the funds provided by the defaulting member. Lower margins may also create an adverse selection effect, as counterparties with weaker balance sheets may choose CCPs that require lower margins, thus further increasing risks to the CCP and the exposure of the stronger members. For these reasons, it is not obvious that a CCP will actually increase its market share by lowering its participation or margin requirements.

Finally, active supervisory monitoring of CCPs for robust risk management processes should reduce potential tendencies towards a prolonged "race to the bottom". Yet, in spite of these arguments, the risk of such a race cannot be fully discounted, as the cost of collateral is significant and market participants do have incentives to seek the lower-cost clearing solution.

Competition between CCPs may also take the form of too rapid product innovation, with a CCP trying to offer new products ahead of (or in tandem with) the rest of the market, but without having devoted sufficient time, expertise or resources to ensuring robust credit risk management. This would be of particular concern where CCPs attempt to clear more complex products that require significant investments in risk methodologies and default management processes. Again, this is a risk that is likely to be mitigated through robust oversight, as most CCPs have to obtain regulatory permission before launching new

[21] See eg BCBS (2009).

products. And product quality may also influence competitive dynamics if CCP participants judge that a new product offering is not sufficiently robust and therefore decline to use it.

Besides the effects of competition on risk controls, there are a number of other issues that warrant attention. First, there is a risk that the CCP ends up charging fees that are not high enough for it to recoup its investment costs, thereby leading to greater *business risk*. As there is evidence that CCPs do compete on clearing fees (eg in equity markets), this is a material risk that warrants careful consideration by regulators/overseers.

A second risk may arise if competition is effected through cost-cutting measures that negatively impact *operational resilience* (or risk controls more generally). For example, reductions in technological support and maintenance costs, cutting of administrative or other support staff, or rationalisation of the operation of any disaster recovery or backup site may all reduce the ability of the CCP to withstand operational risk in the longer term.

Competing CCPs are likely to draw from the same pool of experienced staff, leading to concerns that "poaching" – either as a result of natural attrition or for strategic reasons – may lead to a loss, albeit temporary, of critical expertise. This may be particularly problematic when a startup CCP enters the market. However, it could be argued that this is only a transitory concern; in the longer term, it may be that the presence of multiple CCPs leads to a larger pool of qualified staff.

Finally, the removal of barriers to entry (mentioned in Section 1.3), while allowing for more competition, may also lead to more frequent instances of exit. Hence, regulators may be concerned that such exit decisions be managed in an orderly way. Indeed, it is critical to have a clear idea of how this exit would be managed with minimal disruption to market functioning. This may be a particular concern in jurisdictions that do not have a resolution regime for CCPs.

5.3 Risks arising from new interdependencies – fragmentation

Competition in clearing creates new interdependencies, in particular when links are created between CCPs serving the same market (see Section 5.4 below for a discussion of interoperability). But in the absence of such links, competition may also lead to a fragmentation of the aggregate clearing volume. This has a number of implications. First, from the overall market point of view, the amount of outstanding positions or contracts will increase. Second, there may be a loss in *netting efficiency* as each CCP clears only a fraction of the total volume.

This loss in netting efficiency may manifest itself both at the level of the individual member and at the level of the CCP. If all contracts are cleared by a single CCP, then each clearing member has just one net exposure with the CCP. So, from the point of view of CCP members, netting is at its maximum. Suppose instead that the market is cleared by two competing CCPs, and they are not linked. Unless the market splits into two segments which do not trade with each other, some firms will need to be members of both CCPs. Such double-membership firms will then entertain two exposures, one with each CCP. Thus exposures increase in number and there are fewer netting opportunities. This argument is akin to the one developed by Duffie and Zhu (2010), who are concerned about reduced netting when some trades are cleared centrally and others bilaterally.

The overall reduction in netting efficiency could of course be reversed if the competing CCPs were to have links and cross-CCP netting were possible (see Section 5.4 below). With fewer opportunities to net long and short positions, members will have fewer opportunities to save on collateral. This is likely to have a direct impact on *liquidity needs*, as members may face higher initial margin requirements.

Second, fragmentation of clearing volumes may lead to more complex collateral management, in turn contributing to increased *operational risk*. Members now need to manage variation margin and intraday margin calls at two or more CCPs. This increases the

risk of missing the strict payment deadlines imposed by most CCPs. Furthermore, in stressed market conditions, it might be more difficult to meet margin calls in a timely manner if this involved moving collateral from one CCP to another. More generally, competition requires participants to manage connections to multiple CCPs and settlement locations. This is likely to increase the complexity of the participant's back office operations and as such may increase the likelihood of human error. This is particularly true where CCPs' message standards differ.

Third, fragmentation of the clearing volume could result in a loss of *transparency* of data or an increase in the complexity of accessing such data. As a result, it may be more difficult for both the CCP and its regulator to have an accurate view of total exposures brought by a member to each of the CCPs. This may be particularly relevant for CCPs that impose limits on clearing volumes for individual members. But a CCP rarely sees the total exposure of each member. For example, a member may have significant exposures in a related instrument that is not centrally cleared. Moreover, most CCPs can actively manage concentrations (eg in particular products) by calling for additional margin or by asking members to close out positions. Hence, to the extent that CCPs are able to identify their own concentration risks at an early stage, they may not be unduly affected by fragmentation of the clearing flow. Members may, however, be able to circumvent these controls by clearing through another CCP, thereby reducing the effectiveness of the respective CCPs' risk controls.

Fourth, regulatory complexity, and with it the potential for regulatory arbitrage, may increase, especially when competing CCPs are regulated by different authorities and/or are located in different jurisdictions. Regulators may also be concerned by level playing field issues. Typically, the incumbent is subject to onerous regulatory requirements as it is likely to be of systemic importance, while the new entrants may (at least initially) be too small to warrant the same degree of scrutiny (eg the regulator/overseer may assign fewer staff to them). This would give the former a disadvantage, while the latter may have fewer/lower incentives to invest in risk management processes.

Finally, as mentioned above, fragmentation of clearing may compel market participants trading on multiple trading platforms to become (direct or indirect) participants in all the CCPs that they wish to clear trades with. Besides creating greater operational complexity, this requires them to apply for (direct or indirect) membership of several CCPs, which can be burdensome. Moreover, dealers may have a preference for clearing trades through only one or a few CCPs.

A second option could be for (smaller) dealers to acquire indirect access to the relevant CCPs through clearing members. However, as clearing members tend to be (large) dealers and thus potential competitors, this option might not be the preferred solution for some of the smaller dealers. Moreover, this solution might also create systemic concerns as it introduces more tiering in the clearing environment, thereby creating further interdependencies for those market participants clearing through clearing members. Furthermore, dealers acting as clearing members would concentrate larger amounts of risk and may thus become systemically (even more) important.

5.4 Risks arising from new interdependencies – interoperability

An alternative solution, which would also restore netting opportunities, is for CCPs to establish links. These can take the form of agreements to allow cross-netting or cross-margining, or involve so-called interoperability. This section briefly describes the different interoperability models and their implications for both CCP risk management and systemic risk.

Interoperability is defined as the agreement between two (or more) CCPs which allows a member of one CCP to use its "home" CCP to clear trades transacted with a member of

another CCP. As such, members have access to two or more CCPs (possibly connected to different trading venues) but need only to become member of one.

Interoperability between CCPs may restore netting efficiency. Instead of splitting its trades across two (or more) CCPs, each firm may again clear all its trades via a single CCP, thus facing just one net exposure. However, interoperability creates exposures between CCPs: trades between members of different CCPs cannot be "internalised", so CCPs will need to complete the clearing process by interacting with each other, ie by acquiring reciprocal exposures.

Two basic forms of interoperability can be distinguished. In so-called peer-to-peer interoperability, there is a direct link between the interoperating CCPs. Each has full capacity to assume the direct counterparty relationship with the respective members and undertake risk management including full collateralisation. The main challenge in such a peer-to-peer relationship is that of determining margin requirements between the two CCPs, particularly when their margin methodologies and/or collateralisation processes differ from each other, or where they wish to apply an approach which is different from that applied to members. Moreover, there is a greater risk of contagion, as each CCP is now exposed to the risk of default of the other CCP (and hence indirectly to the default of the other CCP's members) while not being able to monitor/control exposures to participants at the other CCP. In addition, if they contribute to each other's default fund, both CCPs will be exposed to the additional risk of loss mutualisation arising from the default of the other CCP's members.

In a second type of interoperability, one CCP acts as a participant in another. In this case, the CCPs' exposures to each other are similar to those arising in peer-to-peer interoperability. This form of interoperability may, however, involve a different form of risk management. In particular, contagion risk will also be an issue, unless the "subordinate" CCP has clearly separated its interoperability business (in order to be a clearing member in another CCP) from its own CCP business. As in the peer-to-peer arrangements, there is a risk that the "prime" CCP is not sufficiently protected from a default of the "subordinate" CCP. On the other hand, there is a risk that if the "subordinate" CCP is automatically included in loss sharing among the "prime" CCP's members, this could be a drain on its resources and could therefore adversely affect its ability to meet its obligations to its own members. A further concern is that the "subordinate" CCP will not be protected from a default of the prime CCP if it delivers margins towards the "prime" CCP unilaterally.

Taken together, this suggests that contagion risks are a serious concern in the case of interoperability, and that clarity about the risk management process in general, and default management in particular, is essential. There may be a risk that CCPs and their members may not be fully aware of how risks are managed at the other, interoperating CCP. CCPs may also need to set aside additional financial resources should any new credit exposures arise, as mentioned above. Moreover, interoperability issues can become particularly complex when more than two CCPs interact with each other.

But there may also be other risks that affect interoperating CCPs and their members. Interoperability may require the exchange of margin between interoperating CCPs, which might lead to additional *liquidity risk* if the probability of missing payment deadlines increases. And a certain harmonisation of their risk calculation methodologies for margining purposes may be required, which can be a complex process to achieve.

Access to central bank money for the settlement of payment flows might be more difficult, especially if the two CCPs are located in different currency areas and have different relationships with their respective central banks. It should, in addition, be noted that legal problems may arise if the two CCPs are located in different jurisdictions, and that regulatory coordination might be more complex to achieve, especially if either the CCPs' risk processes or the regulatory frameworks are not sufficiently harmonised. Interoperability may also increase the complexity of settlement arrangements which will take place in multiple locations.

5.5 Issues to be considered by central banks and regulators/overseers

This subsection summarises the key risks arising from competition. As before, the focus is on risks that are different from those in the case of the benchmark single-entity, monopolist CCP. Again, some thoughts are offered on how the regulator/overseer or central bank may want to mitigate the new risks. This subsection does not review the specific risks arising from interoperability, as these were considered in detail in Section 5.4.

Table 10

Key risks that may arise from competition

Risk category	Risks: competition
Risks to the CCP	
Counterparty credit risk	• CCPs may lower margins, default contributions or access requirements • CCPs may lower quality of collateral accepted • CCPs may increase rate of remuneration on assets pledged as collateral (and in turn may invest in riskier assets) • CCPs may take excessive risks (eg product expansion, with insufficient investment in developing credit risk management) • With fragmented order flow, CCPs may find it more difficult to monitor concentrations of member positions (and, where used as a risk control, apply position limits)
Business risk	• CCP revenues may be affected by excessive fee cutting
Operational risk	• CCP operational resiliency may be affected by excessive cost cutting • CCP may be vulnerable to loss of key staff (poaching) • Increased operational complexity as users need to connect to multiple CCPs (thus increasing operational risk to the CCP)
Liquidity risk	• With fragmented flow, complexity of collateral management may increase, hence CCP may face increased risk of payment delays • Members will need to manage margin calls at more than one CCP
Governance	• In the absence of strong governance, CCP may focus more on gaining market share, and less on risk controls
Risks to the financial system	
Systemic risk	• Competition and free entry may increase the frequency of exit
Reduced benefits from central clearing	• Fragmentation of clearing volume may reduce netting benefits • Excessive focus on cost cutting or fee reductions may affect ability to expand central clearing
Regulatory frictions	• Competing CCPs may be subject to different regulatory requirements • New entrant may not be subject to sufficient regulatory scrutiny

Table 11

Key issues to consider with competition

Risk category	Issues to consider: competition
Risks to the CCP	
Counterparty credit risk	• Is there evidence of a race to the bottom amongst competing CCPs and, if so, what is the precise form it takes (lowering of margins, lowering of access criteria, remuneration of collateral, contributions to default fund)? • Is there evidence that the CCP is investing in riskier securities? • Is there evidence of too rapid product expansion? Has the CCP devoted sufficient resources to developing new risk management processes? • Does fragmentation of the order flow affect the CCP's ability to monitor member positions/concentrations and/or apply position limits (where applicable)?
Business risk	• Are CCP revenues being eroded as a result of increased competition? • Is product expansion based on a sound business case? • Is the CCP able to absorb the losses related to failed product expansion? • Does the CCP manage its business risk in a robust manner?
Operational risk	• Does fragmentation of the order flow lead to increased operational complexity (and hence increased operational risk) (eg members may need to meet margin calls at more than one CCP)? • Is there evidence that competition might lead to cost-cutting measures that negatively impact operational resilience? • Is there evidence of loss of key staff at either the incumbent CCP or one of the new entrants? • Does fragmentation of collateral lead to operational risks (eg if it needs to be moved from one CCP to another to meet margin calls)?
Liquidity risk	• Is there evidence of (or the potential for) increased delays in margin payments as a result of (i) greater operational complexity for members clearing though more than one CCP or (ii) different margin policies across CCPs? • Is there evidence that fragmentation of the clearing volume affects netting and hence the need for collateral? • Do CCP stress scenarios model this increased risk?

Table 11 (cont)

Key issues to consider with competition

Risk category	Issues to consider: competition
Governance	• Is there evidence of risk management decisions being overly influenced by competition issues? • Is there evidence of product expansion plans being influenced more by profit (eg to be the first mover in a market, or to gain market share) than by risk considerations?
Risks to the financial system	
Systemic risk	• Does the CCP have a plan for orderly exit?
Reduced benefits from central clearing	• Is there evidence of reduced transparency (of member positions) to the CCP or the regulator/overseer? • Is there evidence of excessive cost cutting or fee reductions? Does this affect CCPs' ability to expand their offering? • Are there barriers to competition that would negatively affect entrance (and hence the use of central clearing)?
Regulatory frictions	• Are new entrants subject to sufficient oversight? • Are there any level playing field issues (either within or across jurisdictions)? • Is there evidence of regulatory arbitrage?

6. Vertical specialisation

Vertical specialisation was defined in Section 1.2 as the simultaneous presence of CCPs and niche service providers and, in some cases, the presence of competition between CCPs and niche providers for certain services. As previously described, vertical specialisation is primarily an OTC derivatives market phenomenon – indeed, many of the niche providers originated in the bilateral trading environment and have established themselves as the de facto providers of such services. As a result, CCPs have had to integrate themselves into this established market structure. Vertical specialisation may present risks for both CCPs and market participants – some arising from new interdependencies, others from expansion into a new asset class.

6.1 Risks arising from new interdependencies

First, as a result of the CCP's dependence on the niche providers supporting its core central clearing function, certain *operational risks* are shifted from the CCP to the external party. The successful operation of a CCP clearing OTC derivatives depends on reliable and accurate information inputs from various marketplaces relating to: (i) submission of trades for clearing from electronic trading venues (where available); (ii) trade matching and confirmation of bilaterally executed trades; (iii) pricing sources for risk-managing positions and related margin amounts; and (iv) other post-trade infrastructures such as trade repositories and portfolio compression. If a third-party vendor experienced an outage, especially with respect to a critical function, there could be a negative impact on the connected CCP and the latter's ability to appropriately manage its risk. A particular risk arises if a pricing provider were to fail, as this could directly jeopardise the CCP's ability to provide adequate *credit risk management*.

To some extent, these operational risks can be mitigated through sound contractual arrangements between the CCP and the external service provider(s). But the high degree of reliance on external service providers may imply lesser control over these processes on the part of the CCP's management. Although the issue of management control over outsourced activity is not specific *per se* to vertical specialisation, it may become more acute in such a context and therefore needs to be adequately taken into account in a CCP's governance.

Second, *business risk* could be adversely impacted to the extent that some of the services currently developed by the aforementioned external service providers could potentially reduce CCPs' revenue streams. For instance, portfolio compression prior to the novation of trades to the CCP could reduce values and volumes cleared centrally and therefore the total amount of fees CCPs could charge to their users as well as the revenues generated by the collateral managed by the CCP. However, CCPs entering an existing vertically specialised structure would already be aware of this potential risk and would therefore be expected to have the ability to appropriately price so as to limit the impact.

Providers of post-trade services, building on their successes, could potentially further erode CCPs' revenues by competing directly with CCPs on other services that a CCP may provide, such as trade confirmation or even netting of payments. Finally, some CCPs could opt to internalise some of the new functions offered by external providers, either by developing their own systems or through acquisitions. Both options could divert resources away from investment in core activities (ie risk management) but may mitigate the business and operational risk issues mentioned above.

Further interdependencies may arise as service providers themselves expand their services. This is evident in the role of trade repositories (TRs), some of which are in the process of expanding their functions from record-keeping and data maintenance to confirmation and matching of transactions and product life cycle event management (see Box 4 below).

Box 4

The role of trade repositories

As outlined in CPSS-IOSCO (2010b), a trade repository (TR) for OTC derivatives is a centralised registry that maintains an electronic database of the records of open OTC derivatives trades. In line with the G20 Leaders' September 2009 recommendations, all OTC derivatives contracts should be reported to TRs.

The primary public policy benefit of a well designed TR stems from the improved market transparency facilitated by its record-keeping function, the quality and integrity of the information it maintains, and effective access to that information by relevant authorities and the public in line with their respective information needs.

A number of TRs are being established for OTC derivatives. There are currently three TRs in operation. Each of these serves a particular class of OTC derivatives. DTCC's Warehouse Trust Company LLC (WT) is the TR for credit derivatives, TriOptima is the TR for interest rate derivatives, and a joint venture (DTCC/MarkitSERV) serves the equity derivatives market.

A TR may also provide other market services, such as the management of trade life cycle events and other downstream trade-processing services (eg payment calculation and bilateral netting, cash flow settlement and credit event management) based on the records it maintains. By leveraging existing matching and confirmation platforms, TRs are able to maintain two-sided transaction records which may then serve as the official legal record of the trade, thus facilitating downstream services.

Finally, as stated above, vertical specialisation often involves moving from bilateral clearing (underpinned by third-party services) to central clearing (where the CCP links with the same third-party services). It follows that *systemic risk* will only be reduced if the CCP has the ability to manage the risks arising from the clearing of a new asset class. Equally, the CCP's success in providing these new clearing services may depend on its ability to connect with the existing bilateral process and to make full use of the expertise developed by others in this area.

6.2 Issues to be considered by central banks and regulators/overseers

Table 12 below summarises the key risks arising from vertical specialisation. As above, the focus is on new risks to the CCP and to the financial system as a whole.

Table 12

Key risks that may arise from vertical specialisation

Risk category	Risks: vertical specialisation
Risks to the CCP	
Counterparty credit risk	• CCP's core risk management functions are dependent on the provision of services by third parties
Business risk	• CCP's revenues may be eroded, as functions carried out by service providers may lead to a reduction of clearing volumes (and hence revenues) • Service providers may compete with CCP in the provision of ancillary services, further eroding CCP revenues
Operational risk	• CCP's operational resilience may be affected if there is an outage at one of the service providers
Liquidity risk	• *Vertical specialisation tends not to create any new liquidity risks*
Governance	• *Vertical specialisation tends not to create any new governance issues* • However, some well known issues relating to CCPs' control over outsourced functions may become more acute
Risks to the financial system	
Systemic risk	• New interdependencies are created between CCP and a range of service providers • CCPs may be reliant on common service providers
Expansion of central clearing	• *No issues – as the third-party service providers themselves may benefit from the move from bilateral into central clearing*
Regulatory frictions	• In spite of their critical role, new or niche service providers may be subject to light oversight or no oversight at all

Table 13

Key issues to consider with vertical specialisation

Risk category	Issues to consider: vertical specialisation
Risks to the CCP	
Counterparty credit risk	• How would the CCP manage its counterparty credit risk if one or more of the service providers were not available (either for a short or for a long period of time)? • Does the CCP have backup arrangements? If so, are these tested?
Business risk	• How would the CCP's revenues be affected by the default of one of the service providers? • If the CCP decides to develop some of these functions itself, is there a sound business case? • Is the CCP able to absorb the losses that may arise from competing with an established niche provider?
Operational risk	• How would the CCP be affected by an operational failure of one of the service providers? • Does the CCP have good business continuity procedures in place to deal with such outages? • Does the CCP have sound contractual arrangements in place with its external service providers?
Liquidity risk	• *Vertical specialisation tends not to create any new liquidity risks*
Governance	• Do the CCP's governance arrangements include adequate measures to keep sufficient control over outsourced functions?
Risks to the financial system	
Systemic risk	• Are the effects of interdependencies between CCPs and the various service providers monitored? • How is the impact of a failure at a common service provider assessed?
Expansion of central clearing	• *No issues – as the service providers themselves may benefit from the move from bilateral into central clearing*
Regulatory frictions	• Are the niche providers subject to adequate oversight?

Part III: Market structure, ownership and the expansion of central clearing

7. Market structure and the expansion of central clearing services

7.1 Introduction

This section examines whether the expansion of central clearing services either to newly created financial products or to existing products that were exclusively traded over the counter is more or less likely to happen in certain market structures. The expansion of central clearing services requires the development of operational and risk management processes. It may also necessitate concurrent changes in the underlying product. A recent example of such innovation is the central clearing of CDS index contracts that involved both the development of a clearing solution and improvements to contract design.

Central clearing generally reduces systemic risk and therefore carries social benefits. Principally, it reallocates credit risks to an entity (ie the CCP) whose dedicated role it is to manage those risks in a robust and transparent manner. As such, central clearing can have a welfare-improving effect. Moreover, it may help improve market liquidity. But these social benefits may not be fully internalised by all market participants. That is to say, in determining whether or not to have trades cleared via a CCP, market participants may consider only the private benefits they obtain from doing so. They may not consider the positive effects central clearing may have for third parties or the economy at large. At the same time, central clearing may increase the cost of post-trading processes, due to the systematic use of initial margin and the increased frequency of margin calls.

CCP members may also be unwilling to expand central clearing to more (hitherto bilaterally cleared) financial products, as they may derive profits from bilateral clearing services themselves. And there is a theoretical possibility that they may design and trade products with the sole purpose of resisting further central clearing, ie products which are either too complex to clear via a CCP or mimic the payoffs of standard centrally cleared products. As a result, the demand for central clearing services on the part of market participants may remain below what would be optimal if all private and social benefits were taken into account.

Recent public policy initiatives have encouraged the expansion of central clearing for OTC derivatives. In particular, the G20 has mandated that "[a]ll standardised OTC derivative contracts [should] be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central counterparties by end-2012 at the latest".[22] At the time of writing, work is under way in several jurisdictions to define the "clearing obligation".

In the meantime, regulators have encouraged the increased use of central clearing for credit and interest rate derivatives via "soft" incentives (such as voluntary industry commitments or targets). New capital and/or legislative requirements will most likely change this voluntary dynamic. These issues are, however, beyond the scope of the present report.

A relevant question, in the context of this report, is whether and how the desired expansion of central clearing is affected by the market structure of CCPs (ie vertically and horizontally integrated CCPs versus standalone CCPs) and the competitiveness and concentration of the clearing industry. This section will draw on the theoretical literature on innovation to understand the effect that a change in market structure may have on expansion of central clearing, all else being equal. In practice, however, it is not clear whether these effects will hold since (i) other factors may be more important than market structure in determining the

[22] FSB (2009).

expansion of central clearing, and (ii) there is little empirical literature to test the validity of the theoretical arguments.

7.2 Expansion of central clearing services and consolidation

This subsection considers theoretical arguments as to whether product innovation may happen more (or less) rapidly within vertical or horizontal groups offering central clearing.

Starting with *vertical integration*, the theoretical literature suggests that issues related to economies of scale and market power matter (Tirole (1988)). First, many new financial instruments are launched by exchanges. An exchange integrated with a CCP can introduce new clearable products faster than two standalone entities, because of economies of scale in the form of reduced time dedicated to and reduced cost of coordination. For example, two separate entities would have to sign legal documentation to allow them to collaborate on a new product, which is not necessary for a vertically integrated CCP.

Second, owing to synergies associated with vertical integration, vertically integrated CCPs may have a larger internal investment opportunity set. For example, integration may bring about synergies in the form of lower operating and contracting costs. It follows that, holding revenues constant, an investment is more likely to be profitable for an integrated CCP than for a standalone CCP. The integrated CCP may also have greater revenues to absorb the costs related to product innovation. In other words, the set of profitable investments is likely to be larger for the integrated CCP, as an innovation that is unprofitable for a standalone CCP may be profitable for an integrated CCP, but not vice versa.[23]

Third, if the expansion of services is expensive (ie requires a substantial initial outlay) and there are frictions in capital markets, then vertically integrated structures have the added benefit of an internal capital market. That is, if the CCP function needs funds for an investment, the joint firm may be able to channel capital from the exchange function.[24] But internal functions will have to pay and compete for capital, so capital will be channelled only to profitable investments. Hence, if the expansion of services is a good investment opportunity, then the CCP should be able to find investors outside the group structure. Consequently, unless there are frictions and imperfections in capital markets, a CCP may be able to make the investments necessary to expand its services regardless of whether it is part of a vertical group or not.

Finally, an exchange-owned CCP may be induced to broaden the range of products cleared, as this might increase trading volumes and hence the exchange's revenues. At the same time, guaranteed (or, in some cases, exclusive) access to the trading volume may also reduce the business risk associated with new innovations, as the new CCP service has a guaranteed clearing flow (provided the new product is actively traded, of course).

Equally, vertical integration could prove detrimental to innovation if the exchange and the CCP within the vertical group agree to an exclusive relationship (a so-called tie-in). As mentioned in Section 3, when such an exclusive relationship is formed, the vertical group may obtain significant market power at the clearing level, thereby reducing competition and with it potentially the incentive to innovate. This concern might be most relevant if, prior to the

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[23] CCPs that are technically but not legally integrated may also make use of economies of scope, so these arguments may also apply to such entities. This argument may also apply to horizontal integration – discussed below.

[24] In a frictionless world, the existence of an internal capital market is irrelevant because outside capital providers can assess the profitability of an investment as well as the CCP, since they both have the same information. In reality, however, information asymmetries between insiders and external capital providers often render outside financing an extremely expensive option. Myers and Majluf (1984) is the classic treatment of the subject.

formation of the vertical group, clearing was competitive but trading was not. In that scenario, CCPs might compete against each other for trade flow from the monopolist exchange and would therefore have an incentive to innovate so as to render their clearing services more attractive to the exchange. Hence, vertical integration, by removing this competition between existing CCPs, might weaken their incentives to continue innovating.

Taken together, there are a number of theoretical arguments that suggest that, *ceteris paribus*, vertical integration may facilitate the expansion of central clearing solutions for exchange-traded products. But the theory also suggests that a greater *ability* to expand central clearing services may be offset by lower *incentives* to do so if vertical integration reduces competition in central clearing, and with it incentives to further expand. The literature is inconclusive as to which of the two effects dominates. Nevertheless, anecdotal evidence from the clearing industry suggests that vertically integrated CCPs demonstrate a high propensity to innovate.

Issues of access to capital and market power are also relevant when *horizontal integration* is being considered. First, its effect on the expansion of central clearing will depend on the impact it has on competition in the market, namely whether the horizontal group occupies a monopolist position or competes with others. Even though the incentive to maximise profits is shared by both monopolists and firms operating in a competitive environment, incentives for the latter to expand clearing services are heightened, as it is only through this method that the firm can gain advantages over its competitors. Therefore, if the merger results in a horizontal group that is a monopoly provider (or a group that has substantial market power), it may be less inclined to expand clearing services because its dominant position is less likely to be challenged.

This argument assumes that markets with monopolistic incumbent CCPs are not contestable, ie that the group does not face potential competition. But where there is the threat of entry, or where horizontal integration does not result in reduced competition, the group may be more inclined to innovate.

Second, horizontally integrated firms may benefit from significant economies of scale which free up resources that can then be devoted to the expansion of clearing services, or may increase the firm's ability to absorb losses associated with the expansion of clearing services. A similar issue arose in the context of vertical integration: horizontally integrated CCPs effectively have a larger investment opportunity set, which means that a larger number of profitable investment projects may be available for them. On the other hand, as is the case with vertical integration, horizontal CCPs may not be limited by the availability of internal funds and retained profits, as they too may have access to external sources of funding.

In sum, industrial organisation theory suggests that there may also be two offsetting effects when horizontal integration is considered: although the economies of scale associated with horizontal integration may increase the *ability* of a group to expand clearing, if this integration results in increased market power, it may reduce the group's *incentives* to do so. Again, it is unclear which effect will dominate. Nevertheless, some horizontal groups also demonstrate a high propensity to expand clearing services.

7.3 Expansion of central clearing services and competition

This subsection considers how competition – both actual and potential – affects both the type and speed of product expansion, again drawing on the industrial organisation literature. But, as indicated in Section 7.2, competition and consolidation are often related, mainly because a higher degree of either horizontal or vertical integration usually means more market power for the integrated entities and therefore a less competitive environment.

Academic studies support the argument that market competition has a positive effect on research and development intensity (Gayle (2001)). Competition is usually viewed as a key driver of innovation, with studies showing that the incentive to innovate increases with

competition (Viscusi et al (2005)). In a theoretically purely competitive environment where firms have the same marginal costs of production and similar access to capital to support their growth strategies, price competition is impossible as every firm sets its price equal to its marginal cost. In this setup, the only way for a firm to expand its business is through product innovation. Innovation differentiates the products that a firm offers, effectively creates a new market (Dasgupta and Stiglitz (1980)) and enables firms to "escape competition".[25] If firms and/or external capital markets see a viable market for the firm's new product, then they are likely to devote funds to facilitating innovation. This will be especially true if firms benefit strongly from a first-mover advantage, and new products cannot easily be replicated or adapted.

On the other hand, firms in a competitive market may value keeping costs down over undertaking costly innovation. Contrary to the case of vertical integration, firms facing actual or potential competition will not have a guaranteed market for their new products, so the investment in innovation comes with additional business risk. Even if a firm feels that it has a viable investment opportunity, capital markets may be dissuaded by this risk, and the competitive firm may not have the internal resources to undertake the investment with its own funds. Furthermore, if the products of innovation can be copied and there are weak property rights in place, then, in a competitive environment, the rents from innovation are minimal as they are shared with other competitors.

Overall, industrial organisation theory does not offer firm conclusions, suggesting instead that, depending on the circumstances, competition may have a strictly positive, negative or marginal effect on innovation.[26]

In the clearing industry, the theoretical arguments may imply that if competition between CCPs puts greater pressure on fees, then CCPs may first attempt to reduce their costs, which might slow down product innovation. However, competition may also compel CCPs to try and differentiate themselves by clearing new products or offering new services in order to maintain or increase their market share. But this argument assumes that property rights are irrelevant, and that CCPs have unique access to the know-how required to expand clearing in new products (typically developed in-house). Under these circumstances, innovating CCPs would reap the entire rent of innovation, implying a positive relationship between competition and innovation, at least in the short term. If, on the other hand, technical knowledge is readily available so that the rents from innovation are short-lived, then the relationship between competition and innovation may be less clear-cut.

Hence, in common with the broader industrial organisation literature, the overall effect of competition on the expansion of central clearing is likely to depend on a number of factors, including product and market characteristics. So far there has been little systematic empirical work to test whether more competitive clearing markets also happen to be the ones that innovate most.

Furthermore, a given market may see both competition and consolidation. It follows that it is no longer clear what the net effect on innovation will be. For instance, as noted in Section 7.2, the horizontal merger of two CCPs may decrease competition in a given market,

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[25] This usually assumes that either the products of innovation cannot be copied by the firm's competitors or there are property rights in place (ie patenting) which protect the innovator's intellectual property.

[26] There are a multitude of models in the industrial organisation literature that describe the relationship between competition and innovation. Depending on the assumptions and the framework (eg whether intellectual property is protected or whether agency problems are present), these models reach different conclusions. Empirical evidence (Aghion et al (2005)) suggests that there is an inverted U-shaped relationship between competition and innovation implying that different effects can be dominant at different levels of competition.

but at the same time the associated synergies may give the integrated CCP the resources required to develop new products and expand its business.

It should also be noted that CCPs may approach innovation in different ways. For some CCPs, the primary aim may be to establish a *first-mover advantage*. A first-mover advantage grants the innovating firm surplus profits. If surplus profits are temporary, then their role may be to encourage dynamism and further innovation. But if surplus profits are permanent, for instance due to barriers to entry, then the first-mover advantage can lead to monopolistic market structures. The persistence of this advantage depends on product and market characteristics, including the regulatory environment, the presence of switching costs and potential network effects. As noted above, CCP business is characterised by both network economies and high switching costs. This implies that the first CCP to enter a market and build up market share may gain a significant first-mover advantage.

The legal and regulatory environment will also influence a first mover's ability to sustain this advantage by keeping its processes and knowledge as trade secrets and by preventing competitors from accessing an asset essential to the business sector (eg by locking in suppliers). In addition, surplus profits are more likely to be permanent for the incumbent in the presence of high switching costs for customers or network effects, which prevent competitors from entering the market.

In practice, many CCPs appear unlikely to maintain their first-mover advantage by protecting their know-how and processes: their staff could be hired by potential new entrants; risk management waterfalls could be difficult to patent; and the information technology or infrastructure used could be provided by third parties. However, the first-mover advantage could persist if a CCP's scale creates high netting efficiency gains for clearing participants, leading to savings in margin, collateral and liquidity for settlement.

As mentioned in Section 1.2, in many exchange-traded markets the first-mover advantage, once a significant barrier to new entry, has been weakened by regulatory changes that have led to structural reforms enabling competition at the trading level. In particular, the entry of MTFs and providers of dark pools of liquidity has created new sources of trade flow, in turn enabling the entry of new CCPs. The sharp decrease in the cost of technology – in both IT infrastructure and computing power – has also reduced the fixed costs linked to market entry and limited the importance of returns to scale, thus further reducing the importance of the first-mover advantage.

In OTC derivatives markets, CCPs offering to clear new instruments can still gain a first-mover advantage via pre-emption of scarce assets if they manage to obtain strong support from the dealer community (which typically has a lot of know-how itself) and to secure the exclusivity of that community's trade flow. This might be easier in concentrated markets (eg CDS). As before, network effects may reduce market participants' incentives to switch CCPs. On the other hand, dealers' agreements with CCPs are probably not exclusive. In addition, CCPs entering new OTC derivatives markets may have a limited ability to lock in dealers through high switching costs: CCPs competing in the OTC space tend to construct their clearing offering using the same pre-existing market infrastructure (such as integration with DTCC's global credit derivatives trade repository, Warehouse Trust).

In sum, changes in market characteristics (instigated by better and cheaper technology) and market structure (due to regulatory reforms) have potentially reduced the persistence of the first-mover advantage, in both exchange-traded and OTC derivatives markets. This has enabled market entry in formerly uncontested markets. Some CCPs have been able to establish a first-mover advantage, either by offering central clearing for OTC products that were bilaterally cleared or by clearing new products (eg as seen in energy, commodity and other exchange-traded derivatives markets). Going forward, while some CCPs will still be keen to act as first movers, others may choose to compete in existing markets, by offering different clearing services or slightly different products or by targeting different market participants rather than aiming for a short-lived first-mover advantage.

7.4 Expansion of central clearing: some concluding thoughts

To sum up, the discussion in this section suggests that product expansion in central clearing may be affected by a number of factors, including market structure. In common with the broader literature on this topic, it is difficult to identify a particular market structure that leads to more or more rapid product expansion. Therefore, one cannot identify a particular market structure that is preferable as regards the likelihood of a CCP expanding its services to a wider range of products.

It is also possible that other factors are more important than market structure in influencing the degree of innovation. First, the direction and/or incentives provided by regulators can greatly speed up the provision of CCP solutions. This was evident in the development of a central clearing solution for CDS. Second, market participants themselves may demand new central clearing solutions, either because they themselves perceive a need to improve their counterparty credit risk management or because they will be required to do so as a result of new regulatory requirements. This was highlighted in Section 1.3 in the discussion of Driver 5.

8. Market structure and ownership

This section looks at the impact of ownership on CCP risk management, and how it might affect the range of risks facing CCPs in different market structures. The section first provides empirical evidence on ownership across CPSS countries. It then considers the incentives of CCP owners and managers in different ownership models. Next it examines what the implications are for CCP risk management, and whether ownership matters for the expansion of central clearing. It concludes by asking whether ownership models might affect developments in market structure.

There are two main ownership models: user-owned and non-user-owned. A user is defined as a direct clearing member that clears a proportion of its trades via the CCP. Some CCPs are owned by all their users, others by a subset (typically the largest users). A non-user-owned CCP may be owned by a CSD, a commercial bank or an exchange – possibly, but not necessarily, as part of a vertical group. It could also be a publicly listed company. But some CCPs are "hybrids" in that the direct members are joined by non-users, eg exchanges.

Non-user-owned CCPs are likely to be for-profit entities, while user-owned CCPs usually operate "at cost", distributing any excess returns to users in the form of lower fees or rebates.[27]

8.1 Ownership models in CPSS countries

Over the past decade, the ownership of CCPs has diversified away from the traditional user-owned structure. In some countries, this evolution has been associated with the demutualisation of exchanges with which many CCPs were originally vertically integrated. As Table 14 below shows, in CPSS countries as a whole, there are now a range of ownership models. While some CCPs continue to be owned by their members, others are owned by non-users, either as listed companies, or as part of a vertical group, which may itself be listed.[28]

The table also shows that there are a large number of hybrid models, where, for example, members and an exchange share ownership, or other financial institutions own significant stakes. It is also worth noting that, in some markets, (new) owners have played a key role in setting up a new CCP. A special variant of the hybrid model is the case where the government or the central bank has a significant stake in the CCP (eg in Russia). This may lead to much closer public operational involvements and/or supervision than in other models.

[27] Although in most cases user-owned CCPs operate on an at-cost basis, some user-owned CCPs work on a for-profit basis.

[28] That is not to say that all vertically integrated CCPs are non-user-owned. One counter-example is Italy, where the CCP and exchange are vertically integrated but are ultimately partially user-owned.

Table 14

Overview of ownership models

Ownership	User-owned	Non-user-owned	Hybrid
Australia		✓	
Belgium*			✓
Canada	✓	✓	
France			✓
Germany		✓	
Hong Kong SAR		✓	
India	✓	✓	✓
Italy		✓	
Japan	✓	✓	✓
Netherlands*		✓	✓
Russia	✓	✓	
Sweden		✓	
Switzerland	✓		
United Kingdom	✓	✓	✓
United States	✓	✓	

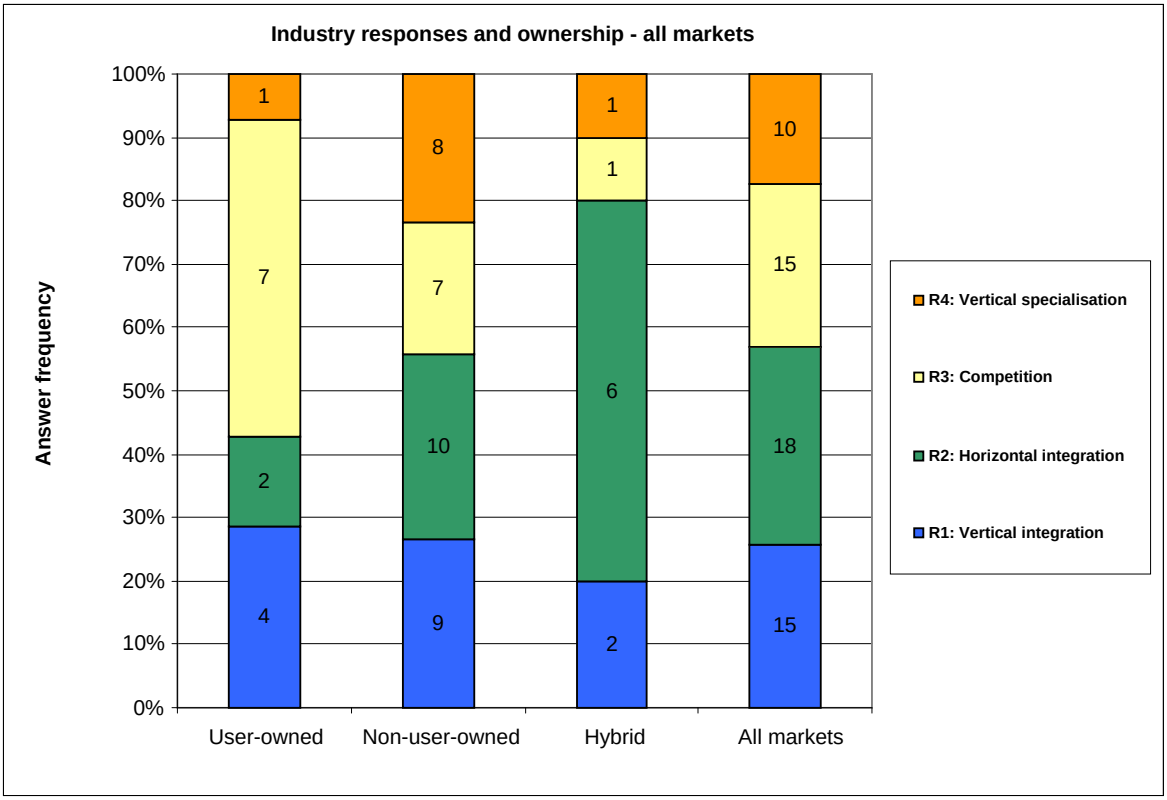
* Hybrid, as is part of French CCP.

It is useful to ask whether there is a relationship between ownership models and industry developments, namely whether a particular market structure (eg consolidation or competition) is more likely to arise when the industry is characterised by a particular ownership model. Figure 6 below summarises the relationship between the various industry responses (as defined in Section 1.2), on the one hand, and ownership models, on the other.

Figure 6

Ownership models and response

Percentage and number of responses, per ownership type (for all markets)



Although it is difficult to clearly link ownership models with responses, Figure 6 shows that Response 1 (vertical integration) has emerged equally under the different ownership configurations (approximately 20–30% of responses). Horizontal integration appears to have been more common amongst non-user-owned and hybrid CCPs (Response 2). This includes the creation of LCH.Clearnet SA, which brought together several CCPs previously owned by their respective exchanges, and NASDAQ OMX's purchase of Nordpool Clearing ASA. The latter merger enabled the Nordic CCP to expand its clearing services to commodity derivatives transactions in Scandinavia. Competition (Response 3) affects all types of ownership structures.

The remainder of this section examines the role of ownership in more detail.

8.2 Ownership models and incentives

In the first instance, it is useful to consider how different ownership models might affect the incentives of a CCP and how this in turn might influence the CCP's risk management decisions (ie its choices regarding the quantum of financial resources and the composition of those resources, as well as its choice of access controls). The discussion will abstract from hybrid ownership models, and instead focus predominantly on the two "stylised" ownership models: a classic *user-owned CCP*; and a *for-profit, non-user-owned CCP*.

In this stylised setup, a user-owned CCP is said to act as a "utility" – ie it is owned by all its users, and these users are assumed to be homogenous. This stylised model further assumes that all users are members, and abstracts from more complex situations where subsets of users with different incentives interact within the CCP.

In this stylised setup, users bear all costs associated with operating the CCP (ie operational costs) and with its risk management (eg margins collected by the CCP). Hence, any profits are essentially internal transfers: if the CCP reduces the fees it charges its users, it may become less profitable. But this is counterbalanced by reduced transaction costs for users. The CCP's profits will be shared amongst the member-owners (eg in the form of fee rebates or lower future fees), and the CCP will have a clear incentive to reduce costs. In addition, when considering strategic issues, the CCP is likely to internalise the impact of its choices, not only on itself but also on the community of user-owners.

In contrast, the stylised non-user-owned CCP has a clear profit motive. All profits accrue to the CCP's private shareholders, which (in the pure model) do not include the CCP's members. As such, a non-user-owned CCP may have a stronger incentive to implement strategies which can lead to higher profits and returns. Given that CCPs tend to incur relatively high fixed costs and relatively low marginal costs, this can be achieved by providing incentives to users to increase the volume of trades submitted to clearing, either by number or by value of trades. Similarly to the user-owned model, the non-user-owned CCP will also have an incentive to minimise costs. However, a key difference between the two models is that, in the non-user-owned structure, not all the costs of the CCP's risk management will be borne by the owners – instead, some of these costs will be faced by the CCP users (eg the opportunity costs associated with funding margins).

8.3 Ownership models and implications for risk management

Using the framework outlined in Section 8.2, a number of insights can be derived regarding CCP risk management. To date, the focus of the theoretical literature regarding CCP ownership and risk management has been on the *composition of risk resources*. In this literature, the user-owned CCP is said to internalise the cost of any risk controls incurred by its members – in particular, the cost of providing margins. While margins often constitute an important part of the CCP's protection against default, they also represent an opportunity cost for its users.[29] Theoretical models by Carter et al (2009) and Haene and Sturm (2009) suggest that the user-owned CCP may therefore place greater emphasis on default fund contributions relative to margin payments. The non-user-owned CCP does not bear this opportunity cost and may therefore apply higher margins. It may have particularly strong incentives to do this in the case where it has a self-funded default fund (rather than a mutualised fund, as is the case for the majority of CCPs), because higher margins will reduce the likelihood of a draw on its own capital. Hence, the incentives of the non-user-owned CCP to minimise the potential for a shortfall are sharpened relative to that in the user-owned case.

However, the incentives of the non-user-owned CCP to expand clearing volumes must also be taken into consideration. There is empirical evidence that higher margins reduce trading (and presumably clearing) volumes.[30] Some theoretical papers therefore suggest that a non-user-owned CCP might be tempted to make clearing easier for members, perhaps by lowering margins (eg Koeppl and Monnet (2006)) or by allowing greater opportunities for netting and margin offsets. Hence, considering the different theoretical arguments, it may be that the risk control choices of the for-profit CCP will look very similar to those of the user-owned CCP, in spite of different incentives.

A related question is how ownership might affect the *quantum of risk resources* a CCP holds. There has been less of a focus on this issue in the theoretical literature, and implications from existing studies are mixed. The incentives of the non-user-owned CCP to expand

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[29] In their models, margin is relatively costly for users compared with a mutualised default fund, because each user must contribute margin to cover all of its own positions. Mutualised default resources, on the other hand, cover only the default of a single user (albeit in extreme market conditions).

[30] See footnote 20.

volumes cleared suggest that it may choose a lower quantum of total resources. Alternatively, owners of a non-user-owned CCP may have incentives to boost the value of risk controls funded by participants, in order to protect their own capital. Evidence therefore is inconclusive.

Viewed as a whole, the theoretical literature does not offer clear predictions about the relationship between ownership and the choices the CCP makes regarding the quantum or composition of its financial resources. Hence, it is difficult to drawn any conclusions about the impact of ownership on CCP robustness.

A related issue is the impact of ownership on access requirements. User-owned CCPs, the theoretical literature suggests, may be inclined to set high participation requirements as they may wish to maintain a broadly homogenous and high-quality participation base. This is particularly likely with mutualised default resources. The non-user-owned, for-profit CCP, on the other hand, has incentives to expand clearing volumes: one way this may be achieved is by relaxing access criteria. It could therefore be argued that – in theory, at least – a non-user-owned CCP is likely to allow less strict participation requirements.

However, a range of additional factors further complicate any relationship between ownership and risk management. The literature focuses on stylised ownership models. In reality, there are a range of more complicated ownership models, such as hybrid ownership, which combines user- and non-user-ownership, and vertical integration, in which the incentives of the exchange and the CCP interact. In addition, heterogeneity of CCP users, the concentration of the industry, different governance structures, the level of mutualisation of default resources, and the role of standards and overseers will all act to shape the CCP's risk management decisions.

8.4 Ownership models and the expansion of central clearing

Section 7 discussed the impact of market structure on the expansion of central clearing services. This subsection considers whether CCP ownership is a factor that can also influence the extent and pace of this expansion, regardless of market structure. In particular, it is useful to ask whether a user-owned CCP is more or less likely to innovate than a non-user-owned, for-profit CCP. Several factors are likely to influence this process, including the motivation of the CCP, the engagement of the CCP with its users, and the needs and incentives of those users.

As mentioned in Section 8.2, in a (stylised) user-owned structure, the CCP's incentives revolve around costs. Hence, one view is that, unless product innovation results in lower costs for clearing members, it may not be a priority for them. In contrast, the additional profit motive of a non-user-owned CCP suggests that it will be keen to expand central clearing services, provided this will result in additional profits for its shareholders. However, this profit motivation could result in a shorter investment horizon than with the user-owned CCP, potentially offsetting its positive effect on the expansion of central clearing.

A second view is that the user-owned CCP is likely to be closely engaged with its users, and so the needs of the users will determine the extent and pace of innovation. Thus, the user-owned CCP is likely to respond where there is market demand for innovation. A non-user-owned CCP, on the other hand, may be less engaged with its users and may therefore be less responsive to their needs. However, it could be argued that, in an efficient market, a for-profit CCP will recognise and meet any market demands. In reality, many non-user-owned, for-profit CCPs have expanded their clearing services in recent years and, in doing so, have extensively engaged in user consultation.

A final point concerns the incentives of users to resist the expansion of central clearing, as this might lead to migration towards the CCP of products previously cleared bilaterally and profitably for the CCP members themselves (see Section 7.1). In a user-owned model, members may be able to exert influence over the CCP and block or delay such expansion. In

contrast, in the non-user-owned structure the interests of the owners and the users may not be aligned to the same extent – ie it may be that developing new products for central clearing is in the interests of owners but not of the CCP's users. In such a case, the non-user-owned CCP may be more inclined to expand central clearing than the user-owned structure. Of course, a counter to this point is that, in an efficient market, where innovation is not in the interests of the users, such innovation is unlikely to gain traction.

In sum, there is no compelling evidence to suggest that a certain ownership structure is superior (or, indeed, inferior) in terms of expanding the offering of central clearing. Again, any theoretical discussion will be complicated by a range of additional factors not covered in the stylised models, including heterogeneity of user-owners and the range of hybrid ownership models. It should also be noted that while a CCP may offer what users want, this will not ensure that expansion of central clearing is at a socially optimal level.

8.5 Ownership and market structure

To conclude the discussion, this subsection asks whether different ownership models may influence developments in market structure. There is very little theoretical literature on this issue. Nevertheless, a number of insights emerge from the discussion on incentives and risk management in Sections 8.2 and 8.3.

A first question is to what extent ownership affects *competition* in clearing. As noted in Section 8.3, a user-owned CCP may prefer stricter access controls. This may preclude a range of players from participating directly in the CCP. If the firms which do not satisfy the incumbent CCP's membership criteria generate enough clearing volume for a new CCP to viably enter the market, this could possibly open the market to (more) *competition*.

In particular, relatively strict criteria governing direct access to CCPs serving inter-dealer markets can favour the entry of CCPs focusing on clearing for smaller sell-side institutions and buy-side firms. For example, the CME's CDS clearing solution initially targeted primarily buy-side firms whilst ICE Trust's focused on clearing for the inter-dealer CDS market.

User-owned CCPs may prefer to maintain strict access criteria even in the face of competition. This is consistent with theoretical work (Buchanan (1965)) which suggests that the members of a club should admit more members as long as the marginal cost of each new member remains less than the marginal benefit. In the case of central clearing, the CCP may judge that the positive network effects from expanding membership may not be sufficient to compensate for the potential losses that might arise from less restrictive membership criteria.

However, it cannot be assumed that a user-owned CCP would never be inclined to broaden access since it also has incentives to maintain clearing volumes in order to preserve economies-of-scale benefits for its members.

A non-user-owned, for-profit CCP may have clear profit-related incentives to expand its market share and may therefore be keen to offer clearing services to a broader group of users. Hence, it may be more inclined to lower access criteria. It should also be noted that, with non-user-owned CCPs, the owners might not bear all the losses that might arise from less conservative risk controls. With many CCPs, users at least partially bear some of the costs.[31] As a result, such costs would not be (entirely) internalised by the non-user-owned CCP when assessing whether to expand access or whether to allow entry by potential competitors. Therefore, in theory at least, non-user-owned CCPs may be more inclined to

[31] For example, in the form of a default fund, although some CCPs have recognised this risk and have the owner's capital higher up in the waterfall.

lower access criteria, and as such prevent market entry and competition, than user-owned CCPs, since it is potentially less costly for them to do so.

A second issue to consider is whether consolidation, either horizontal or vertical, is more (or less) likely to occur in a particular ownership model. User-owners face a trade-off between the positive and negative effects associated with consolidation. As discussed in Sections 3 and 4, the CCP's costs will be likely to decrease since vertical or horizontal consolidation will allow the CCP to benefit from economies of scale and scope.

But as also indicated in Sections 3 and 4, vertical and horizontal integration can have the negative effect of leading to higher clearing costs. For instance, CCP members might rationally want to block a for-profit CCP or an exchange from acquiring the user-owned CCP if they are concerned about the formation of an entity with too much market power. Additionally, where consolidation is proposed between CCPs clearing different products, some members may be concerned about a potential increase in risk (eg if joint default funds are proposed).

In comparison, in the non-user-owned model, consolidation, both vertical and horizontal, may offer profitable business opportunities that are attractive to the CCP's shareholders. Vertical integration might, for instance, enable the for-profit CCP to extract monopoly rents from a tie-in with an exchange (see Section 3.2). This may partially explain why some exchanges are (re-)entering the clearing industry. And, as discussed in Section 4.2, horizontal integration could lead to a significant increase in market power if the market is not already consolidated. This in turn could be exploited by the dominant CCP through higher clearing fees. So both horizontal and vertical integration could increase a CCP's returns on equity to the benefit of shareholders. The latter would therefore be likely to support consolidation, as they reap the benefits of greater profits without being affected by potentially higher clearing fees. At the same time, where for-profit CCPs enjoy monopoly positions, that may not provide sufficient incentives to expand, and hence dominant CCPs might be less keen to consolidate.

In sum, it is difficult to offer any firm conclusions regarding the impact of ownership on market structure, as changes in market structure affect CCPs' incentives to manage their risks in complex ways, and the precise effects are difficult to quantify. Hence, there is not enough evidence to suggest that competition is more or less likely in different ownership models. Equally, there is no strong evidence that indicates that particular ownership models are more likely to lead to either vertical or horizontal consolidation.

8.6 Ownership: some concluding thoughts

On the whole, evidence on the relationships between ownership and CCP risk management, market structure and the expansion of central clearing is inconclusive. It is likely that user-owned and non-user-owned CCPs have different incentives, arising from a different focus on costs relative to profits. Yet, as shown in this section, CCPs may end up making very similar decisions regarding their risk management, either because some of the incentives offset each other or because they may be mitigated by other factors. It follows that there is insufficient evidence (either theoretical or empirical) to state that one ownership model is superior to another, either in terms of risk management or in terms of product expansion. Hence, there is not enough evidence to suggest that one model is less systemically stable than another, or less suitable for achieving the socially optimal provision of central clearing services.

Concluding remarks

This report provides an examination of the recent developments that have occurred in the clearing industries serving traditional exchanges and OTC and OTC derivatives markets across CPSS countries. Different types of market structures have developed and can be classified in two dimensions: vertical versus horizontal structures, and integrated versus fragmented structures. It appears that the structural organisation of the clearing industry affects the way CCPs design their risk management processes and the probability of risks spreading across the financial systems. There is no evidence, however, that the industry is settling on one particular structure.

Specific market structures may create specific risks and amplify interdependencies between systems and markets. These warrant careful consideration by both market participants and the authorities. However, market structures may also have risk reduction benefits and mitigate interdependencies. Moreover, as governance arrangements typically provide incentives to carry out prudent risk management and CCPs are subject to rigorous oversight and regulation, the potential risks inherent in different market structures may actually not fully materialise. As a result, it is not possible to determine a priori the ultimate effect that a particular structure may have on systemic risk.

Nor is there evidence to suggest that one market structure is superior to another, either in terms of CCP risk management or in terms of wider systemic risk. In fact, many risks occur in several types of structures. For example, risks that are related to the size of an infrastructure are relevant in the case of both vertical and horizontal integration. Similarly, interdependencies may arise in both vertical groups (bringing together trading, clearing and settlement activities) and horizontal groups which serve multiple markets, possibly in multiple jurisdictions. New interdependences are also created when CCPs become reliant on niche providers (vertical specialisation) or when a market is served by multiple interoperating CCPs.

Nevertheless, central banks, regulators and overseers may usefully pay attention to certain risks that are more likely to occur in certain market structures than in others. These include incentives to weaken the robustness of CCP risk controls that may in turn result in a reduction in the CCP's ability to manage a member default. Although many of the risks considered in the report have so far not materialised, going forward the challenges for CCPs and their regulators/overseers are significant, particularly as market structures in many countries continue to evolve. Hence, public authorities will need to continue to apply rigorous and consistent oversight. For each type of market structure, the report provides a checklist of questions that central banks, regulators and overseers may use to that end.

In many instances, these risks are especially likely to materialise during the transition phase, when CCPs are adjusting their risk management processes, market participants are familiarising themselves with new rules and procedures, and authorities are developing new oversight arrangements. This is particularly relevant for the OTC derivatives industry. The regulatory community should therefore be vigilant during periods of rapid change in the post-trade services industry.

The structural setup of the clearing industry also has a bearing on the degree to which central clearing will be used in different market segments, thus determining the resilience of the financial system in general. In fact, the broader risk reduction benefits of central clearing may be diluted if market structure changes affect access to CCPs, raise the cost of central clearing or hamper the process of creating new CCP services. This may arise, for example, when CCPs have significant market power, which in itself may be a result of either vertical or horizontal integration. A related risk may arise when competing CCPs aim to capture market share by aggressively marketing new CCP services that are not sufficiently robust, and would in turn undermine the robustness of the CCP. Finally, market structure changes may

also affect the size and market coverage of individual CCPs, thereby potentially amplifying the “too big to fail” problem.

In many instances, changes in market structure are accompanied by changes in the ownership structure of CCPs. However, there appears to be no clear relationship between ownership and systemic risk: there is no evidence to conclude that either a user-owned or a non-user-owned, for-profit ownership model would be more (or less) likely to undermine CCP risk management. There is also no evidence indicating that any particular ownership model favours or hampers the introduction of central clearing services. Finally, there is no evidence to suggest that a particular form of ownership leads to a particular form of market structure.

Annex 1:
Overview of the CCPs considered in this study

Country	Clearing house	Products cleared
AU	ASX Clear (formerly Australian Clearing House)	Cash equities and equity- and commodity-related derivatives
AU	ASX Clear (Futures) (formerly SFE Clearing Corporation)	Futures and options on interest rate, equity, energy and commodity products
CA	Canadian Depository for Securities	Equities, bonds, some derivatives
CA	Canadian Derivatives Clearing Corporation	Equity, index and interest rate financial derivatives
CH	SIX x-clear	Equities, bonds, exchange-traded funds (ETFs)
DE	Eurex Clearing	Contracts executed on Eurex, Eurex Bonds, Eurex Repo (General Collateral segment and Specials), the Frankfurt Stock Exchange (equities), the European Energy Exchange and the Irish Stock Exchange. OTC trades entered via the trading systems of the Frankfurt Stock Exchange, Eurex Bonds, Eurex Repo and the Irish Stock Exchange. OTC trades entered via the trading systems of the Eurex exchanges
FR, BE, NL	LCH.Clearnet SA	European equities, French and Italian government bonds, repos, corporate bonds, carbon emissions, futures and options on equities, CDS
HK	HKFE Clearing Corporation	Stock options
HK	SEHK Options Clearing House	Stock index futures and options, stock futures, interest rate and fixed income futures, gold futures
HK	Hong Kong Securities Clearing Company	Equity securities, equity warrants, derivative warrants, callable bull/bear contracts, equity-linked instruments, ETFs, unit trusts/mutual funds, debt securities
IN	Bank of India Share Holding	Cash equities and equity derivatives
IN	Clearing Corporation of India	Government securities, forex (spot and forward), Collateralised Borrowing and Lending Obligation (CBLO)
IN	National Securities Clearing Corporation	Cash equities and equity derivatives, currency futures and interest rate futures
IT	Cassa di Compensazione e Garanzia	Equities, convertible bonds, warrants, ETFs, exchange-traded commodities (ETCs); futures and options on equity indices and on single stocks; energy futures; Italian government bonds (cash and repos)
JP	JASDEC DVP Clearing Corporation	Cash equities, real estate investment trusts (REITs) and ETFs
JP	Japan Government Bond Clearing Corporation	Government bonds, repos
JP	Japan Securities Clearing Corporation	Cash equities, bonds and exchange derivatives

Country	Clearing house	Products cleared
NL	European Multilateral Clearing Facility NV	Cash equities
RU	Moscow Interbank Currency Exchange	Securities, repos and derivatives
RU	National Clearing Centre	Foreign exchange
RU	RTS Clearing Centre	Cash equities, derivatives and repos
SE	NASDAQ OMX Derivatives Markets	Swedish, Danish, Finnish, Norwegian, Baltic and Russian derivatives; some equity and fixed income products (and, through a branch, commodity products)
UK	CME Clearing Europe	Not currently clearing any instrument but aims to clear credit derivatives
UK	EuroCCP	Equities, securities lending
UK	ICE Clear Europe	Futures and options (oil, gas, gas oil, power, emissions, coal), OTC CDS, OTC gas and power
UK	LCH.Clearnet Ltd	UK equities, UK bonds and OTC repos; interest rate swaps; power, gas, CO_2, freight forward agreements (FFAs)
UK	LiffeClear	Equities, commodity rates – futures and options, OTC equities, OTC energy
US	ICE Clear US	Futures and options (oil, gas, gas oil, power, coal, emissions, agricultural products)
US	ICE Trust US	OTC CDS
US	Options Clearing Corporation	Options on ETFs, equities, equity indices, FX, interest rates and precious metals futures, single-stock and index futures, US Treasury futures, volatility futures, securities lending
US	National Securities Clearing Corp	Equities, corporate and municipal debt, American Depositary Receipts (ADRs), ETFs
US	Fixed Income Clearing Corp (Government Securities Division (GSD) and Mortgage-Backed Securities Division (MBSD))	Government bonds, repos and MBS (although MBSD is not a CCP)
US	CME Clearing	OTC derivatives, including gold forwards, and swaps on agricultural products, commodity indices and energy. OTC CDS. Futures on real estate, and futures and options on economic events, environmental products, equity indices, interest rates, FX and weather. FX futures, and futures and options on agricultural products, energy and metals; Exchange for Physical (EFP), Exchange for Risk (EFR) and Exchange of Options for Options (EOO) for OTC derivatives on FX, interest rate, energy, metals, agricultural product and commodity indices
US	International Derivatives Clearing House (IDC Group)	Interest rate swap futures, interest rate swaps

Annex 2:
Members of the Working Group

This report was produced for the CPSS by the Working Group on Post-trade Services.

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Bank of Japan	Yutaka Soejima
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