Complementary Platforms: The Provision of Custody for Internationally Diversified Investors*

Patrick J.G. Van Cayseele†

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Abstract

An analytical framework close to the canonical model on platform competition introduced by Rochet and Tirole (2004) is used to investigate the two-sidedness of the market for custodian services. The canonical model has to be changed to include the effects of bundling. It becomes clear that horizontal consolidation of the European post-trading institutions is welfare increasing.

The model developed in this paper leads to a natural explanation for one side of the market singlehoming, and the other side multihoming. As such, it is well suited for investigating other industries, more in particular those where a platform needs several other up- or downstream platforms to succeed in business. For example, each time that advertising is necessary to attract members of each side of the market, the present model will apply.

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†K.U. Leuven, Department of Economics, Naamsestraat 69, 3000 LEUVEN, Belgium and Universiteit van Amsterdam, Roeterstraat 11, 1018WB AMSTERDAM, The Netherlands. E-mail: Patrick.VanCayseele@econ.kuleuven.be.
1 Introduction

After that an investor has acquired a security of a company, either by buying it on a trading platform (such as a stock exchange) or by having successfully subscribed in an initial public offering, many activities need to be taken care of. In case of a trade on a stock exchange for example, clearing establishes all the obligations that result from the trade between buyer and seller. After clearing has taken place, settlement completes the transaction by transferring securities to the buyer and money to the seller. Finally, after some time, the company that has emitted the security might want to pay a dividend, or needs to honour a coupon held by the actual owner, and the asset has to be serviced.

Particular players in the post-trading financial services industry have developed to take care of these activities. It is possible to distinguish central securities depositories (CSDs), agent banks and custodians. Often the companies that are active in this industry are multiproduct in nature, in that they perform many if not all of the above roles. And while engaged in providing many different services, it is even more important to recognize that these players often provide services to different parties, which may constitute different sides of the market.

CSDs and custodians consist of an elaborate system of accounts. Most securities are nowadays held electronically and hence the settlement of a trade simply takes place through book-entries in the accounts held by the CSD. Similarly, when a company decides to pay dividends, to engage in a stock split, or to merge, all of these corporate actions can be implemented by the CSD by making the appropriate bookings. And by the same token, many if not all of these activities also can be executed by custodians who operate according to the same principles1.

Much in the same way then that payment card companies link consumers to merchants, see Rochet and Tirole (2002), CSDs link investors to issuers of securities, or even investors (buyers) to other investors (sellers). In the first case,

1To the extent that one player engages more in “banking activities”, as opposed to the more “payment” type of activities described here, a different risk profile will emerge. And electronic bookkeeping through IT management will need to be supplemented by asset and liability management, a.s.o.
the canonical model of two-sided markets, see Rochet and Tirole (2004), can be used to shed light on a number of important policy issues that we discuss below.

When CSDs are seen as platforms hosting both the one-way network between issuers and investors and the two-way trading network between traders, same-side externalities enter into the picture, and the analysis becomes more involved, see Van Cayseele and Wuyts (2005) for the efficiencies of this industry model and Rochet and Tirole (2004) for the distinction between “on us” and “on net” interactions.

Whereas the canonical model to a large extent suffices to deal with a number of pending policy issues, in an environment of international portfolio diversification at least one extension has to be included into the analysis. This is one where one side of the market not only multihomes, but is compelled to do so because the platforms offer complementary services which are needed jointly to produce custody.

When an investor who holds a diversified portfolio of international securities considers a custodian, the latter will need to keep a link with all companies that have emitted securities. This implies that (global) custodians will need to keep accounts with all the CSDs, if the latter safekeep the emission of the company. CSDs then will determine their fees by solving a problem in the pricing of complementary goods, as already investigated by Cournot in 1838, see Sonnenschein (1968) or Nalebuff (2000). While the welfare implications of this setting are well-known for one-sided markets, it remains to be determined how two-sidedness mitigates some of these findings. And also, sometimes particular players like local agent banks interpose theirselves between CSDs and custodians, allowing only access to a CSD through their accounts. Also this will have implications for the welfare of the industry.

In order to investigate these issues, the paper is organised as follows. First, we cast the CSD as a platform and explain the nature of the interaction that goes on over this platform. We show that CSDs are platforms, with one side of the market the companies (emittents) and the other side internationally diversified investors,
their custodians or their investor banks. In this section, we also explain what each of the parties is charged, based on the tariffs that actually prevail on the platforms. In a third section, we then set up the model and provide some initial results. The fourth section considers some other industries that can be analysed along the lines of the present model and the fifth section concludes, by offering policy implications.

2 Complementary platforms

In this section, we first explain the nature of the interaction that takes place on the platforms we investigate. In the next subsection, we explain why platforms in this industry are complementary. The last subsection further clarifies the approach in terms of the platforms generating utility from membership or usage.

2.1 CSDs as platforms between companies and investors

When a company chooses to finance an investment project, essentially two possibilities exist. It either finances the project by its own funds, i.e. internally, or it turns to other economic units, i.e. it finances externally. In the latter case, again two possibilities exist. The company can go to a bank and finance the project indirectly, or it can emit securities and choose for direct finance. In the last case, it has the choice between bonds and stock, and when it goes for stock, it can either list it on a stock exchange or not.

Direct finance nearly always will imply that the company floats notes, regardless whether they take the form of bonds, stock or listed stock. The company will register these notes and deposit them in a Central Securities Depository (CSD). This CSD is often called the “issuer-CSD”. At the same time, the company will seek investors who want to pay in cash for acquiring the securities that have been emitted. The company here will be assisted by an issuing and payment agent (IPA) who will place the securities with the “public”, i.e. the final investors.
Among other things, this implies that the IPA together with other banks in the consortium, will hold a position in the security in the CSD. The cash proceeds from the emission will be made available to the company by the IPA.

This implies that the CSD acts as a platform between two sides of a market. On the one hand, the companies that have emitted securities, and on the other hand the banks that have gathered investors to subscribe the emission. The CSD therefore can charge each side a fee. It can charge the company for registering the emission and accepting the entire package of the securities (the “global note”) while it can also charge the banks belonging to the consortium for they all will have an account on which they hold an initial position. After that initial investors have sold (part of) their initial holdings of the securities, a variety of custodians, representing internationally diversified investors, will hold positions in accounts with the CSD, together with the banks initially in the consortium and the IPA.

After the emission of the securities, the CSD will continue to act as a platform between companies and custodians, and ultimately the investors. This will be the case each time “corporate events” take place. When companies take certain actions, information needs to be exchanged between the issuer (i.e. the company) and its’ investors. For example when the issuer offers the option to the holder of its securities to extend the maturity of the paper and the holder has to respond whether or not he agrees. Or when the issuer offers a special dividend or proposes an exchange or repurchase, and again the holder has to respond his decision. Or when the issuer calls together a general assembly and the holder has to tell whether he will participate. Still another example is when the conditions of the issue change because of a stock split and the investors’ holdings need to be adjusted, a.s.o.

In the classification introduced by Evans (2003), the CSD-platform is approached as a demand coordinator, although it performs activities that could be classified in other categories as well.

Although some of these events are unavoidable, for example because corporate law dictates that a general assembly has to be called together each year, companies here have alternatives too. They can for example turn to the global custodians
directly to service the assets. Or they can use the specialised financial press to announce certain events, a.s.o.

On the other side of the market, the investor banks or custodians also have to consider different options. Either they hold directly an account with all the CSDs². Or they choose to hold a single account with a global custodian, who in turn holds an account in the CSDs. Or they decide to offer only services to local investors, and keep simply one account in one CSD. All these options will be investigated, starting from the simplest scenario where all investor banks prefer offering “global custody”, and the CSDs all can be accessed directly.

2.2 Complementary platforms

Since companies who emitted securities have sunk the titles all at once in a single CSD (they emitted and registered a “global note”), a global custodian who wants to offer safekeeping and asset servicing facilities to internationally diversified investors will open accounts in as many CSDs as his clients require. Suppose investors diversify completely in an international setting, then they will hold securities of each company in each country. Under this assumption, the global custodians who want to participate in the global investor market will take an account with each and every CSD.

This implies that the demand exerted by global custodians on CSDs will depend on the total bill that needs to be paid for keeping an account with each CSD. A CSD who raises his fees for holding an account will induce a negative externality on the other CSDs, since the price increase leads to fewer customers (less global custodians participate in the system), both in the CSD that raised prices and the others. This shows how the nature of competition in this industry mainly is between CSDs, not in terms of attracting clients but in terms of capturing the purchase power of the internationally diversified investor.

²When a particular CSD can only be accessed over a local agent bank, they will hold an account in this local agent bank as well as in the CSDs.
2.3 Usage or membership?

It is well known that platforms generate utility to both sides of the market, either in the form of usage or in the form of membership, see respectively Rochet and Tirole (2003) and Armstrong (2004a). It is equally known that the two approaches can be integrated, see Rochet and Tirole (2003). Hence, it is not crucial to choose one approach or the other.

Nonetheless, in order to be clear, we start from the tariff (price) structure used by most CSDs, and indicate what utility a particular service generates. On the emittent’s side, apparently something can be said in favour of the usage approach, since few CSDs charge the companies for their global note. Subsequent information exchanges with the investor side on the contrary is priced. Various fees are levied for a diversity of services and communication facilities offered.

On the investor’s side, or better on the side of their representatives, a membership approach, at first sight, seems appropriate. Global custodians as well as other banks who are clients of the CSDs pay for their accounts. However, they pay for the value of the holdings that are deposited on the account, and to the extent that this is related to activities such as dividend payments, again a usage approach seems justified\(^3\). This certainly is even more the case when settlement is considered, for CSDs usually charge a fee per package of securities that is settled, but the focus is here on safekeeping rather than settlement. Overall then, a usage approach seems appropriate for this industry although elements of the membership model also could be included. In the next section, we set up the model as if CSDs are platforms that generate utility entirely from using them.

\(^3\)To be clear on this, suppose a global custodian has 1000 fully diversified clients who hold positions in 100 securities each. In this portfolio, 5 securities of value 1 have been emitted in country 1 and hence this global custodian will have an account with a value of holdings equal to 5000 in CSD1. Next, consider each of the 5 companies in the country paying a dividend. This will enable the global custodian to charge 5000 times a fee to the investors for collecting their dividends, while its costs will be proportional to the value of the holdings in the CSD, i.e. 5000 also.
3 The model

In this section, we first introduce the notation used. We then solve the model for the simplest scenario. The last subsection considers extensions within the context of the same industry.

3.1 Definitions and notation

Consider a global economy with $L$ different countries. In each country, an emission of securities has to be registered in a CSD. This however does not mean that all companies who seek finance in a country will have registered securities in a CSD. On the contrary, companies in their finance decisions will take into account the costs associated with registering the global note, and servicing it through the CSD until maturity. When they thrust the global note to the CSD however, they know they reach all the investors that rely on the custodians participating. So the total utility that a company derives from choosing the CSD when emitting securities depends on the number of custodians that keep an account in it. As such, we can define a quasi-demand function in country $l$ (belonging to the set of countries $L$) as:

$$ D_{\text{companies}}^l = M^l \left( p^l \right) $$

The number of custodians that are active in representing diversified investors also will depend on the fees charged by the CSD in country $l$, but also by the fees charged by the other CSDs. Indeed, as explained above, the custodians need to open an account in each of the $L$ CSDs if they want to cater for an international diversified investor. This implies that a custodian will offer a “global service” if the fee that can be collected exceeds the costs, where the latter are the sum of the fees charged by the CSDs. This again allows to define a quasi-demand function which now takes the form:
\[ D_{\text{global custodians}} = N \left( \sum_{i=1}^{L} r^l \right) \]  

(2)

Notice immediately the following. Since each global custodian needs to be a client of all CSDs, we can suppress the superscript \( l \), for each platform gets the same number of customers\(^4\).

The profit function for the \( l^{th} \) platform then can be written as:

\[ \pi^l (p^l, r^l; r^i \neq l, c^l) = M^l (p^l) N \left( \sum_{i=1}^{L} r^l \right) \left( p^l + r^l - c^l \right) \]  

(3)

Because we focus on symmetric equilibria, we initially assume that \( c^1 = c^2 = \ldots = c^l = \ldots = c^L = c \). Given the nature of the technology, it seems that this assumption is close to reality, see also Van Cayseele and Wuyts (2005) for empirical evidence on costs in CSDs. When in addition, a linear specification is assumed for the quasi-demand functions, it becomes possible to rewrite (3) as

\[ \pi^l = (1 - p^l) \left( v - \sum_{l=1}^{L} r^l \right) \left( p^l + r^l - c \right) \]  

(4)

The specification of the quasi-demand exerted by the custodians thus incorporates the fact that in order to offer a global service, all \( L \) CSDs have to be accessed. This bundle of services is located at 1, where along a line segment extending from 0 to 1, the custodians or investor banks are located. This allows for introducing a “global custodian” as in Holthausen and Tapking, who then will be located at 0. For the moment such an offering is not considered to be in the market and the quasi-demand function takes the form of a simple linear demand function.

\(^4\)This is as if there is no alternative for a custodian except to be global (or not to be at all). Extensions where custodians can determine whether they are global, international or local are deferred to further analysis of the problem.
3.2 Symmetric equilibria

Given (4), it becomes easy to solve for the symmetric Nash Equilibrium of the fee setting game played by the CSDs. It is possible to prove:

**Proposition 1** In the symmetric Nash Equilibrium in prices, each CSD platform charges to the emittents

\[ p = \frac{n(1 + c) - v + 1}{2n + 1} \]  \hspace{1cm} (5)

and to the investor banks

\[ r = \frac{c + 2v - 1}{2n + 1} \]  \hspace{1cm} (6)

It is easily seen that payment by both sides, i.e. \( p \) and \( nr \), increases as the number of CSDs increases. Hence horizontal consolidation decreases the costs to both enterprises and investors in the economy. Profits are equal to:

\[ \pi = \frac{1}{t} \left( \frac{n + v - nc}{2n + 1} \right)^3 \]  \hspace{1cm} (7)

whereas industry profits are simply obtained by multiplying the RHS of (7) by \( n \). Industry-wide profits increase in \( n \), but individual platforms become less profitable as the number of countries increases.

**Proof.** By differentiation of (4), the First Order Conditions are obtained. They define reaction functions that can be solved for the desired results, by invoking symmetry. \( \blacksquare \)

**Corollary 1** When only 2 countries are involved, we have:
\[ p = \frac{3 + 2c - v}{5} \]  
(8)

\[ r = \frac{2v + c - 1}{5} \]  
(9)

\[ \pi = \frac{1}{125t} (2(1 - c) + v)^3 \]  
(10)

In the future, the results for the two-country model will be used as a benchmark.

These results can be compared to the Ramsey prices that would result when a public utility would operate the \( n \) platforms, and would price according to maximise social welfare. The latter is defined as the surplus of an emittent for an average operation times the number of investors that benefit from the operation plus the surplus an investor obtains times the number of emittents. It is easy to prove that the Ramsey monopolist would charge \( p^R \) and \( r^R \) according to the following proposition:

**Proposition 2** The Ramsey prices that a public utility owning all \( L \) platforms would charge is given by:

\[ p^R = \frac{c - v + 1}{2} \]  
(11)

\[ r^R = \frac{c + v - 1}{2} \]  
(12)

*Note that in the above, \( r^R \) is only charged once.*

**Proof.** By maximising the social welfare function subject to a break-even constraint for the CSD. ■

As expected, the market outcome yields higher prices to both the emittents and investors. But the integration of \( L \) platforms by a public utility is by no
means trivial, as many investment activities need to be undertaken to achieve such integration. Plausibly this industry then is confronted with the well-known static-dynamic trade-off, see Schumpeter (1961).

3.3 A-symmetric equilibria: Stackelberg leadership

When in the two-country model a CSD has the opportunity to announce its fees before the other, would it do so and what are the implications for the market parties? It is possible to state:

**Proposition 3** In the Stackelberg setting when a CSD in country 1 leads and his opponent in country 2 follows, the fees charged to emittents are resp.

\[ p^1 = \frac{1 + 2c - v}{3} \]

and

\[ p^2 = \frac{7 + 2c - v}{9} \]

Whereas the fees charged to the investor respectively are:

\[ r^1 = \frac{2v + 1 - c}{3} \]

and

\[ r^2 = \frac{2v + 5c - 5}{9} \]

**Profits to the leader are:**

\[ \pi^1 = \left( \frac{2(1 - c) + v}{3} \right)^3 \left( \frac{1}{3l} \right) \]
and to the follower:

$$\pi^2 = \left( \frac{2(1 - c) + v}{3} \right)^3 \left( \frac{1}{27t} \right)$$  \hspace{1cm} (18)

and hence leading is more profitable than following. Compared to the symmetric Nash equilibrium for the two-country model as spelled out in corollary 1, it is clear that investors in the country of the follower and emittents in the country of the leader become worse off, whereas the investors in the country of the leader and emittents in the country of the follower win. In symbols:

$$r^2 < r < r^1$$  \hspace{1cm} (19)

$$p^2 > p > p^1$$  \hspace{1cm} (20)

and

$$\pi^1 > \pi > \pi^2$$  \hspace{1cm} (21)

**Proof.** By backward induction, the reaction function of the follower is derived by optimising his choices in the last stage. Using this reaction function in the first stage optimisation problem of the leader leads to the results. ■

Intuitively, it is clear that leading should lead to higher profits. The one-sided complementary duopoly problem yields a first mover advantage to the leader, since he can charge a high fee, to which the follower has to adapt. In a two-sided market high rates on the complementary (investor) side however need to be compensated by lower rates on the other (emittent) side. The follower, who is forced to charge a lower rate on the investor side will compensate this loss by increasing the fee to the emittents. The latter however interact with fewer investors than before (as $r^1 + r^2 > 2r$), and hence the follower platform cannot fully recover the lower charges to the investor side. This explains for a decreased profitability vis-a-vis the Nash outcome.
Corollary 2  Since profits to the leader are higher than profits to the follower, regardless the identity of the platforms, there is no clearcut way to endogenise the role of the leader, since both platforms will equally strongly favour this role. However, the Stackelberg prices “inversely straddle” the Nash outcome, and hence, although the follower platform will make less profits overall, the investor side benefits. If the decreased prices yield a larger surplus that can compensate for the reduced profits, an investor owned platform in country 2 might favour the follower role. Together with an emittent owned platform in country 1, or an investor owned platform in country 1 where the losses to the investors in terms of surplus can be compensated by the increase in profits following from assuming the leader role will lead to an outcome where the platform originating from country 1 leads and is followed deliberately by the platform from country 2.

3.4 Extensions: Accessibility of the CSDs

Given the market and regulated outcomes, it becomes possible to investigate the implications of particular industry organisations that occur in reality. More in particular, in some countries, the CSD can only be accessed through a local agent bank (LAB). This has a number of implications. First, a global custodian now will need to have an account in all the CSDs, as before, except in the one that can only be accessed by the LAB. For simplicity, we thus assume that there are two countries, one in which the CSD can be accessed directly, and one in which regulations require to access the CSD through the LAB. Next, the CSDs will take into account in their pricing behaviour the actions taken by the LAB. That is, we assume the CSDs assume the role of the leader in the pricing game.

Given these assumptions, it becomes possible to state the following proposition:

Proposition 4  When both CSDs act as a Stackelberg leader, equilibrium prices again are given by equations (8) and (9). The LAB charges \( r^0 = \frac{v_2}{2} \) and steals profits from both CSDs.
Proof. The profit function for the LAB is given by

\[ \pi^0 = \left( \frac{v - (r^1 + r^0)}{t} \right) \left( r^0 - r^2 \right) \left( 1 - p^2 \right) \]  

(22)

After differentiating, one solves for \( r^0 \) to obtain the reaction function of the LAB. Then substituting into the profit functions for the CSDs, it becomes clear that the latter only differ from (4) by a multiplicative factor, hence the invariance results. ■

Hence, a LAB that follows the pricing decisions taken by both CSDs together does not distort the outcome to either side of the market. This neutrality however is no longer guaranteed when the CSD which is foreclosed by the LAB acts as a Stackelberg leader and is followed by the CSD that can be accessed directly and the LAB.

Whenever this setting prevails, the following outcome results.

**Proposition 5** Under Stackelberg leadership of the CSD that is foreclosed by the LAB, the fees charged are

\[ p^1 = \frac{15 - 7v + 16c}{27} \]  

(23)

\[ p^2 = \frac{11 - 7v + 4c}{27} \]  

(24)

\[ r^1 = \frac{14v - 3 - 5c}{27} \]  

(25)

\[ r^2 = \frac{8v + 1 - 6c}{27} \]  

(26)

\[ r^0 = \frac{20v + 2 - 8c}{27} \]  

(27)

and equilibrium profits are:
\[ \pi^0 = (28) \]
\[ \pi^1 = (29) \]
\[ \pi^2 = (30) \]

**Proof.** Solving first the second stage of the game where the LAB competes with CSD2 yields expressions for \( r^2, p^2 \) and \( r^0 \). In the first stage, CSD1 then determines \( r^1 \) and \( p^1 \), yielding the outcomes above. \[ \blacksquare \]

Clearly then, the presence of a LAB ..... prices to investors, vis-a-vis the Stackelberg outcome where CSD1 leads, but is not foreclosed, see proposition 4. This shows how a LAB adds a cost to the system, even when it can operate at zero cost. The reason is that due to its “bottleneck” position, the LAB has market power. The result is higher prices to investors, and hence less actions on the platform.

A final extension that can be investigated is the case where a global custodian is located at zero. If the line segment then is split up according to the market shares of the CSDs and the global custodian, the investor banks closest to one prefer to open an account in every CSD, whereas those closest to zero go to the global custodian, who in turn has an account with the CSDs. In a usage framework, this implies that all investors now transact over the platforms, that is when the market is fully covered. This setting is the natural extension of the mode introduced by Holthausen and Tapking (2004), to a double sided market.

It seems plausible to assume that the CSDs act as a Stackelberg leader vis-a-vis the global custodian.
4 Other applications

A typical feature of a two-sided market is that it caters for two types of agents. Credit cards are helpful to consumers and merchants. Dating clubs target at both men and women. Shopping malls seek to attract both consumers and shops.

A special kind of platform according to the present analysis are those that convey information. The CSDs analysed in the previous sections are a typical example. But other examples exist as well. For example, newspapers serve both their readership and advertisers, and the same holds for magazines, for television channels, a.s.o.

A particular industry model then exists when a platform needs other platforms to communicate to the respective members of each side. For example, consider an heterosexual dating club. In most two-sided models of this industry, the analysis is limited to access pricing issues. For example, it is shown why women pay nothing to enter the club while men are charged.

While extremely interesting, it seems that the true business model is somewhat more involved, at least as long as men and women are unaware of the existence of dating clubs. When women and men ignore the possibilities, dating clubs will need to advertise to signal their existence. And since they need both men and women to attend the club, they will need to put ads in both women’s and men’s magazines. The model then can be schematically represented as in figure 1 below.

The problem that has been investigated then has substracted from the fact that the dating clubs also will charge men and women for entering the club. It has instead focused on the behaviour of the complementary platforms, while abstracting from the competing platforms. The analysis including all payments between the different groups is left for further research.
Figure 1: Industry Configuration

Women

Men

Women’s Magazine

Men’s Magazine

Dating Club 1

Dating Club 2

Dating Club n

Complementary Platforms

Competing Platforms
5 Conclusion

Two-sided markets are very much present in modern economies. The same holds for complementary goods and services that need to be consumed as a bundle. In the case of complementary platforms, consumers need to be part of each of the platforms in order to obtain utility. A prominent example is custody for internationally diversified investors. But equally good examples are advertising for shopping malls or dating clubs where all of the specialised press (media platform) need to be accessed in order to create business.

The implications of the model introduced here are far-reaching. For example, whereas Stackelberg leadership might be preferred in a standard model of complementary products, this conclusion might be turned around when platforms are involved.

Also for policy-making, the analysis yields some implications. As it is usually the case with complementary goods, the more complements that are involved, the more expensive the industry becomes. Here, both sides of the market are suffering from a high degree unbundling, and hence the further horizontal consolidation of the European clearing and settlement industry should be encouraged. Whereas practices of granting access to CSDs only through local agent banks should be discouraged.
References


