# Credit in a Tiered Payments System

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**Figure 1  A Tiered Payments System**
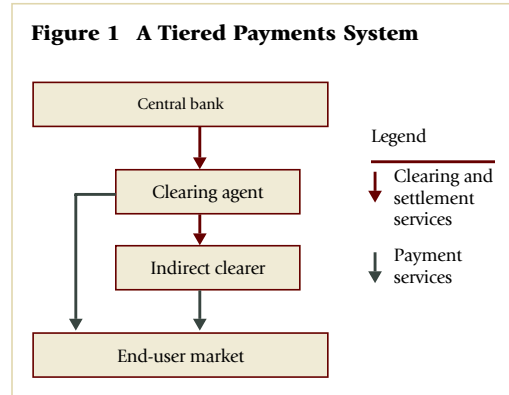


Most payment, clearing, and settlement systems are characterized by some degree of tiering. In a tiered system, some of the financial institutions participating directly in a first-tier network for clearing and settlement (clearing agents) operate a second-tier network that provides similar services to other institutions (indirect clearers). Clearing agents not only provide wholesale clearing and settlement services to the indirect clearers participating in their second-tier networks, but also compete against these same indirect clearers in the provision of retail payment services to individuals and businesses. This arrangement is illustrated in Figure 1.

Survey evidence in Canada (Tripartite Study Group 2006) indicates that because of the high fixed costs associated with operating in the first-tier network, indirect clearers prefer to participate in a clearing agent's lower-cost, second-tier network. Clearing agents choose to operate second-tier networks to obtain scale economies and additional fee revenue. There are, however, some questions about the efficiency of pricing in service markets in tiered networks.

In a tiered payments system, a clearing agent has the ability, and may have the incentive, to raise the marginal cost for an indirect clearer in order to gain a competitive advantage in the market for retail payment services. Because of data-processing lags and distribution problems in the flow of settlement funds, the process of settling payments combines settlement services with credit services to network participants. For example, clearing agents provide overdraft credit to indirect clearers. We investigate the impact of uncollateralized overdrafts provided by a clearing agent in a second-tier system on the pricing strategy for its payment services, and on equilibria in the wholesale and retail markets.

If we abstract from inter-network competition to focus on within-network competition, the analysis indicates that the incentive for the clearing agent to raise the indirect clearer's costs is mitigated by the credit risk from the uncollateralized overdrafts that the clearing agent provides to its indirect clearer. In fact, in the model, the wholesale service fee charged by the clearing agent is always lower when credit risk is a meaningful consideration. The results also indicate that a clearing agent would then alter the price of its retail services to allow

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its indirect clearer to acquire a greater share of the retail service market and higher profits. Furthermore, with a sufficiently high degree of competition in the retail market, customers are charged lower service fees by both the clearing agent and the indirect clearer.

## Approach to the Analysis

The analytical approach builds on the existing research on the vertical integration of firms in wholesale and retail markets and on settlement credit. It links and extends these separate bodies of literature.

The literature on vertical integration establishes that where there is imperfect competition in both upstream and downstream markets (Spengler 1950), and even where competition is perfect in the downstream retail market (Salop 1998), incentives exist for a firm to vertically integrate the production of complementary services in both markets. Vertical integration eliminates double markups in the integrated firm's retail price and gives the integrated firm an opportunity to raise its rival's costs. Economides (1998), for example, demonstrates that when the price of upstream (input) services is regulated, a vertically integrated firm has an incentive to impose non-price costs on its downstream rivals. In the absence of input-price regulation, Bustos and Galetovic (2003) show that a vertically integrated firm prefers to increase a downstream rival's costs through the input price.

Similar modelling approaches have been applied to securities settlement systems. In particular, Holthausen and Tapking (2004) demonstrate that a central securities depository (CSD), vertically integrated with a custodian bank, will raise the costs of a rival custodian bank. Rochet (2005) shows that a CSD has an incentive to vertically integrate with a custodian bank and would either refuse to provide a rival bank with settlement services or, if regulation prevents exclusion, would raise the rival's costs.

None of this literature models the joint provision of settlement services and credit by the service provider, which is the case in a payments settlement system. Kahn and Roberds (1998) construct a single-network model for banks facing uncertain payment inflows and outflows

through the period, with final settlement at the end on a net basis. In this system, network participants exchange intraday credit bilaterally or multilaterally to settle payments but, in doing so, also face the prospect of credit default.

## Key Model Features

By combining the survey information with relevant studies on vertical integration, tiered systems, and settlement credit, we construct a model of a vertically integrated bank (the clearing agent) that competes downstream with a rival bank (the indirect clearer) in the end-user market for retail payment services. The clearing agent and the indirect clearer are Cournot competitors in the market for retail payment services,[1] but the indirect clearer purchases clearing and settlement services, and acquires overdraft credit, from the clearing agent. The clearing agent first chooses a clearing and settlement fee to charge the indirect clearer. Then, the clearing agent and indirect clearer simultaneously choose a desired volume of payment services in the end-user market and charge the corresponding retail service fee. Since each unit of service is measured by a payment transaction, and since the net value of these transactions is allowed to be random, net payment flows and settlement overdrafts from the clearing agent to the indirect clearer are uncertain at the time of their wholesale and retail pricing decisions.

## Results

The results are derived from both analytical and numerical solutions to the model. The model shows that, to maximize expected net worth, the clearing agent will take advantage of its upstream position as an essential provider of clearing and settlement services to raise the indirect clearer's costs relative to its own marginal cost of clearing and settling these payments. Consequently, the indirect clearer offers its services at a higher price than those of the clearing agent, which enables the clearing agent to attract a greater share of the retail market and a relatively higher overall profit than the indirect clearer. This is the "integration" effect.

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1. Cournot competitors select optimal strategies that take account of the rival's market reaction.

Credit risk to the clearing agent from the provision of overdrafts to its indirect clearer mitigates the clearing agent's incentive to raise the indirect clearer's costs. A default by the indirect clearer on its overdraft credit, resulting from insufficient profits and available assets, will lower the clearing agent's expected net worth. In selecting its pricing strategy, a forward-looking clearing agent will therefore take account of the prospect of overdraft credit to the indirect clearer, the probability of credit default by the indirect clearer, and the possible impact of higher pricing on the indirect clearer's default probability. The clearing agent must balance its potential gains in net worth from vertical integration against the potential losses it might incur by indirectly increasing its credit risk through its own pricing strategy. Therefore, recognizing that a decrease in the indirect clearer's profits implies that the indirect clearer is more likely to default, the clearing agent lowers its service fee. This is the "credit-risk" effect.

Numerical techniques help to determine whether the integration effect or the credit-risk effect dominates under different market conditions. For a broad range of parameter values, the credit-risk effect dominates. Specifically, when credit risk is meaningful to the clearing agent, it selects a wholesale service fee that is lower than the risk-free price. This allows the indirect clearer to acquire market share and earn higher expected profits, which lowers the probability of default on any overdraft credit that it may incur. There is, however, a level of retail competition below which the indirect clearer's profits are sufficiently high (with greater market power) that it can easily repay the settlement overdrafts provided by the clearing agent. Below this critical level of retail competition, credit risk is no longer a meaningful concern to the clearing agent, which allows the agent to charge a higher wholesale service fee. But the range of parameter values for which the integration effect dominates the credit-risk effect is very small. The presence of credit risk generally results in the clearing agent lowering its wholesale service fee relative to the risk-free case.

In addition to lowering its wholesale service fee when faced with sufficient credit risk, the clearing agent also selects a retail service price that lowers its own volume of retail payments. This pricing strategy allows the indirect clearer to raise the volume of its retail payments. Despite the loss of retail market share and a lower wholesale service fee, the clearing agent earns higher expected profits from combining clearing and settlement services with overdraft credit. The indirect clearer also earns higher profits, except where the degree of competition between the indirect clearer and the clearing agent is so low that the credit risk imposed on the clearing agent is insufficient to encourage the agent to lower its fee.

While the price of retail payment services charged by the indirect clearer is always lower in the presence of sufficient credit risk, the clearing agent's price is lower only when there is a high degree of competition between the two. In other words, significant competition is required for credit risk to lower the clearing agent's fee for retail payment services and, thus, make consumers unambiguously better off.

## Conclusion

In a tiered payments system, a clearing agent provides its indirect clearer with an essential input (clearing and settlement services), but may also compete against the indirect clearer in the retail market for payment services. In the stylized model developed for this analysis, the clearing agent could take advantage of its position as operator of the second-tier network by strategically pricing its wholesale clearing fee so as to raise its rival's costs. But when the credit effect dominates, the clearing agent's incentive to raise the indirect clearer's costs is mitigated by the provision of overdraft settlement loans to the indirect clearer.

When clearing agents provide uncollateralized overdraft credit to indirect clearers and credit risk is significant, wholesale service fees are generally lower and the market for retail payment services can be more competitive. Furthermore, when there is a high degree of competition between clearing agents and indirect clearers, a tiered arrangement with credit is welfare-superior, from a consumer-price perspective, to one without credit and meaningful credit risk.

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