

WHAT DO NOTARIES DO?

Overcoming Asymmetric Information in Financial Markets:

The Case of Paris, 1751

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Abstract

Using evidence from eighteenth-century Paris, we examine how financial intermediaries resolved problems of asymmetric information in financial markets. The intermediaries in Paris were notaries, and after examining their role in asset markets, we develop a more general model of intermediaries' behavior and then confront the model with a rich set of data from Paris. (JEL D23, D82, G29, N23)

1 Introduction

Throughout history, brokers and other intermediaries have brought buyers and sellers together and solved the knotty problems of asymmetric information that bedevil asset markets. In markets for financial assets, for instance, brokers can reduce the risk of adverse selection by transmitting accurate information about investment opportunities. Whatever the particular asset, though, transmitting accurate information will usually require overcoming a moral hazard problem between the intermediaries and their clients. The difficulty is that if intermediaries play a substantial role they will soon acquire important information about the various participants in asset markets--in particular, about their clients. Normally an intermediary will have more information about one of his clients than other intermediaries, who, without access to such privileged information, may offer the client services of lower value. As a result the client may be unable to switch intermediaries if his own broker fails to provide optimal services. And because the client's broker will undoubtedly know this, he may well seek to take advantage of his client. Our paper examines how the problem of privileged information is surmounted both in a theoretical and an empirical context.

In the past, obviously, the moral hazard problem was at least partially overcome, because

long before the Industrial Revolution every city in Europe had numerous intermediaries for a variety of assets. However, the scope of intermediation remained quite limited, suggesting that the threat of moral hazard remained serious. Again, financial markets illustrate the continuing difficulty quite clearly: until well into the nineteenth century financial intermediation of long term private credit was relatively rare, and most long term private loans remained bilateral. Nor is the problem merely historical. Indeed, it persists to this day, as the behavior of banks and brokerage houses demonstrates. Brokerage firms keep a jealous hold over their list of clients and may steer investors toward in house mutual funds rather than competing products. Similar complications even afflict mundane sales of residential real estate, as anyone who has dealt with real estate brokers can testify.

Exploring the problem of moral hazard with contemporary data would be nearly impossible, for neither intermediaries nor clients would desire to provide information about their relationships to researchers. Fortunately, a good deal of historical data survives, particularly for Old-Regime France, where the most important intermediaries were notaries. In France, the notaries drew up a wide variety of documents and contracts, from loan agreements to wills and property transfers. They were required by law to keep a copy of most of the documents that they drew up, and their records now form one of the largest holdings in the French archives. We are fortunate enough to have an extraordinary document--a complete enumeration of surviving notarial contracts for Paris in 1751 prepared by the French National Archives--which we can use to study how notaries and their clients interacted.

Our approach here is one that is becoming more common in economic history: we marry theory and data (Greif, 1989, 1993, forthcoming; Levenstein, 1991). On the theoretical side we appeal to the literature on second sourcing to develop a model of information diffusion. Although the model fits the details of our particular case and sharpens our hypotheses about the interaction between the notary and their clients, it is relevant to a broad range of contexts. As for the data, they serve to narrow the range of investigation and they then help us to discriminate among the

theoretical model's different equilibria. It is worth stressing here that neither theory nor data alone would be enough here: we need them both. The theory suggests that our problem will have several solutions, while the data help distinguish among them. At the same time, the data are so abundant that we need the theory to gain a toe hold for statistical analysis.

In our example of eighteenth-century France, much of the notaries' business involved financial contracts. As intermediaries they matched borrowers and lenders and dominated the long term credit market. Our focus here will therefore be on credit, both because of its importance to the notaries and because the problems of asymmetric information loom particularly large in financial transactions. But the same issues rear their heads in all asset markets. We proceed as follows. After surveying the literature on financial markets and asymmetric information problems in section 2, we furnish necessary background material on credit in eighteenth-century Paris in section 3. Section 4 then analyzes the interaction between notaries, borrowers, and lenders using data from Paris in 1751. Section 5 discusses information transmission between notaries and their clients, and the discussion is formalized in a more general model of intermediaries' behavior in section 6. In section 7 we test the model's predictions.

2 Liquidity and Asymmetric information

Resolving the problems of asymmetric information is clearly essential in asset markets, and in financial markets in particular. One solution would be to segment the population into tiny markets so that each participant is fully informed about the activities of all his potential partners. Such a procedure has an obvious drawback, though, because it makes a secondary market difficult to establish and restricts the liquidity of investments. And in general, because information will not be free, capital markets will face a trade off between information and liquidity.

Historically, these problems have been overcome in a variety of ways. Most frequently, as Larry Neal has pointed out, it is the creation of a formal market for government debt that paves

the way for a major expansion of private markets (Neal, 1990). For several reasons, government debt does not suffer from all the complications that affect private debt. In the first place, the risks associated with public debt are usually public knowledge. Furthermore, the very amount of the government debt that is issued makes most investors' placements liquid. The trade off between information and liquidity is thus avoided. In private credit markets, by contrast, borrowers are heterogeneous, and some of them will certainly be untrustworthy. Each private loan therefore represents a different stream of uncertain income. There are two ways of skirting this obstacle: one could pool private loan contracts as in a mutual fund or a bank's portfolio of loans. Alternatively, one could accurately match borrowers and lenders. While the dramatic development of banks and other institutions after 1850 testifies to the importance of the first solution, bilateral markets have an even longer history and they still remain important today.

Both for banks and bilateral markets, scope is obviously important. Greater scope allows banks to reduce the fixed costs they face. It also creates a large pool of contractants so that efficient matching can occur. But greater scope can aggravate adverse selection, particularly with intertemporal contracts like loans. Indeed, as Stiglitz and Weiss first showed, in the worst case, the price mechanism may not succeed in allocating capital (Stiglitz and Weiss, 1981). While individuals may collect some of the necessary information on their own, as the markets expand the amount of information required to price capital increases and soon individuals must rely on specialized intermediaries.

Intermediaries will reduce information costs so long as they do not take advantage of their clients--so long, that is, as institutions constrain them to provide high service quality. The high service quality here can have different meanings depending on the structure of the financial industry, so we will focus henceforth on the bilateral markets that are relevant to our notaries. The intermediary's task is then to match lenders with suitable borrowers and do so swiftly. But the intermediary bears no direct risk from the outcome of the loan he negotiates. He may therefore be tempted to match a lender with a borrower who is likely to go bankrupt. He may

also make borrowers wait while he seeks a lender within his own clientele, rather than sending the borrower off to another intermediary.

True, intermediaries may be obliged to provide high quality service by legal constraints. But in many cases it will be impossible to prove in court that an intermediary has mistreated his client. Clearly, it will take more than the law to ensure high quality service. One might assume that competition would force the intermediaries to offer high quality service, but again the intermediaries might be tempted to make unsatisfactory matches and drive up (at least in the short run) their volume of activity. An alternative solution would be for intermediaries to post a bond, a bond that might be reputational or material. And as we shall see, there are still other possible solutions.

3 Credit in Eighteenth-Century Paris

In eighteenth-century France, the dominant financial intermediaries were notaries. Appointed by medieval courts to record transactions, they were in high demand for all sort of intertemporal contracts, from debt to trade ventures, from probate records to marriage contracts. They owned their positions and could sell them or bequeath them to their heirs. The positions (*études*) were quite valuable: by the middle of the eighteenth century they were worth several hundred times what a skilled craftsman would earn in a year (Limon, 1992, 142).

Notaries charged fees for their services according to a schedule that varied by type of contract, length of document, and the value of the transaction. Both the fee schedule and the number of notaries were set by public authorities, and in eighteenth-century Paris neither the fee schedule nor the number of the notaries varied (Limon, 1992; cf. Gaston, 1991, 329, 342). The king also taxed notarial contracts and the notaries' transfers of their positions, but these taxes were but a tiny portion of the royal revenues. For the remainder of the discussion we will take the taxes, the fee schedule, and the number of notaries as fixed and leave to future work the analysis

of the interaction between the notaries and the state.

Notaries were required to keep a copy of the contracts they drew up, and their archives were a precious source of information about private wealth. It was from their archives and their notarial business that they acquired the information needed to match borrowers and lenders. The information was the notaries' property: their archives were closed to outsiders, even royal tax officials.

In Paris--the case that concerns us--the notaries were organized in a self governing corporation with special privileges. Among their privileges, two were particularly important: the Parisian notaries marketed nearly all of the governments long-term debt and they had the right to draw up contracts anywhere in France. Notaries elsewhere in France usually had to restrict their operations to the confines of particular jurisdictions. While the Parisian notaries could thus draw up contracts anywhere, there were limits to what they could do. Of particular interest to us were regulations that prohibited them from carrying out full financial intermediation--they could not pool deposits and then lend the money out. As a result, they evolved as brokers of long-term assets offering information and management expertise, but unlike banks and modern mutual funds, they did not create money or pool financial risks.

The notaries, it should be stressed, functioned within a credit market whose regulations were unusual by modern standards. The most obvious peculiarity was the prohibition against usury. It limited borrowers and lenders to three types of loan contracts: perpetual annuities, life annuities, and obligations. In a perpetual annuity, the lender could specify an annual interest payment, but the interest rate could not exceed the legal maximum, which was 5 percent in the middle of the eighteenth century. Furthermore, the lender could never demand repayment of the loan; that decision was up to the borrower or his heirs, who could inherit the annuity. With a life annuity, interest rates could vary over a wider range. But once again the lender could not control the duration of the loan, which lasted until a person named by the lender died. Once the person died, the borrower was no longer obliged to make further payments to the lender.

The third type of contract, the obligation, suited lenders who wished to control the duration of the loan. Usually the obligations had a much shorter life than either type of annuity. In theory, the obligations were interest free. They simply specified a sum that the borrowers had to pay the lender by a given date, with no mention of interest due. But in fact, interest was paid on the obligations, at rates which could easily exceed the 5 percent limit on annuities (Hoffman, Postel-Vinay, and Rosenthal, 1992).

Clearly, Parisians faced serious constraints when contracting for capital. Given the 5 percent interest cap, lenders would agree to perpetual annuities only for borrowers who could post adequate collateral, because the perpetual annuities often lasted generations. Information rather than price served to allocate resources in that market, since most annuities paid the usury limit of 5 percent. In the life annuity market, where interest rates were free to vary, part of the variation reflected varying odds of default. Most, though, resulted from differential mortality risk of the nominee--the individual whose death brought payments to an end. Since mortality risk is a function of age and health status, screening the nominees was crucial for life annuity contracts, as was screening the borrowers' collateral.

Ex ante screening was thus important for both types of annuities, but once the *ex ante* screening was completed, the annuities needed little in the way of additional recontracting. They demanded little interim monitoring either, because the quality of the collateral made that unnecessary.¹ For both types of annuities, therefore, transactions costs were borne up front. Obligations, by contrast, entailed less in the way of initial costs but more monitoring. Their short duration (they lasted about 3 years in 1751) and the possibility of renewal acted as a mechanism for interim monitoring. Establishing collateral *ex ante* was therefore less important.

In Parisian credit market, brokers had to take into account the different preferences lenders had over the three types of loans. Other things being equal, a lender with children preferred perpetual annuities to life annuities, because he could bequeath the perpetuities to his heirs. A lender with capital to place temporarily, such as a businessman, eschewed both sorts of

annuities, because their duration could not be controlled. He typically favored shorter term obligations. The notaries took such preferences into account, screened borrowers and matched them with lenders in both the annuity and the obligation market.

Given the different tasks involved, one might assume that different intermediaries would have served each of the two markets. Yet such specialization did not develop, and as we shall see, the notaries operated in both markets. The reason was that the notaries had access to information that was crucial in allocating individuals to all types of contracts. Because they stood at the apex of the information network, it was natural that they would end up at the center of the entire financial system. Nor did their role seem to hold the financial system back. Indeed, as we show elsewhere, financial markets (and asset markets in general) were quite active and provided Parisians with highly diversified portfolios (Hoffman, Postel-Vinay, and Rosenthal, 1994).

4 Notaries and Information

4.1 Reputation

Before constructing a formal model of the notary's role, we should first consider alternative ways of solving the problems of asymmetric information in credit markets. First of all, one might argue that the notaries were really superfluous. There was no need for them to match borrowers and lenders, for the borrowers and lenders could do this themselves. That hypothesis we can reject for a number of reasons. The size and anonymity of Paris made it difficult to find trustworthy partners.² Moreover, many of a notary's clients were wealthy yet not economically active--among them widows, clerics, and unmarried women. They would need information about appropriate investments; they would unlikely find suitable borrowers on their own. Other clients might have information about borrowers but would be too busy to manage their affairs themselves. They would seek the notary's help in managing their portfolios.

Here an extraordinary historical document can rebut the argument that notaries did little besides drawing up documents, while borrowers and lenders solved the problems of asymmetric information on their own. The document is an enumeration of nearly all the notarial records drawn up in Paris in 1751--some 59,000 of them, involving 137,000 individuals.³ If notaries provided no informational services, individuals would presumably deal repeatedly with the same partners in loans and other financial contracts in order to reduce information costs. In this situation, we might suppose that an individual would interact with only a small number of partners in a reputational game and that he would keep them honest by denying them his business if they ever misbehaved. But that is only one possible outcome, for as recent research has shown, there is also the possibility of individuals' banding together in small or medium sized groups--coalitions--which can apply collective sanctions such as exclusion (Greif, 1993, forthcoming). The ability to monitor and punish members for wrong doing (and thus maintain information at a high level without any intermediaries) would determine just how large such coalitions could be. In either case, whether it was the threat of losing an individual's business or that of sanctions applied by an entire coalition, reputation would play a central role. The threat of a tarnished reputation would keep an individual's partner's from misbehaving, and a similar--though more powerful--threat of exclusion from a coalition would keep the coalition's members in line

If reputation played a central role in Paris in 1751--whether via individual sanctions or coalitions--then clients would presumably return to the same notary only for reasons of convenience. They might do so, for example, if something went wrong and a copy of a contract had to be recovered. We might therefore expect some loyalty to notaries, especially by lenders and other clients whose dealings involved buying future streams of income. Since they might want to produce copies of their contracts in the future, they would presumably wish to consolidate all their records in one place. And if reputation worked via coalitions, we might also expect that individuals' portfolios to be more diversified the larger the coalitions were.

The evidence, though, seems to argue against such reputational stories for Paris in 1751.

Individuals did not interact repeatedly with a small number of partners, and the city did not seem to be fragmented into tiny coalitions. Either alternative--individual level reputations or small coalitions--would have made repeated dealings with the same partners common in both loans and other financial contracts. But such repeated business with the same partners was extremely rare. That was particularly true of loans: the probability that borrowers and lenders dealt with one another more than once was trivial. Each time that a borrower or lender engaged in a new loan he in effect matched himself with a new partner. We can see as much by regressing the number of different lenders that borrowers used on the number of loans they took out (Table 1). The coefficient is nearly 1, a sign that each new loan meant a different lender. The addition of a quadratic term shows that the coefficient did not drop noticeably for frequent borrowers, and a regression for the number of borrowers per lender leads to similar results (Table 1).

It is more difficult to rule out the existence of larger coalitions--ones large enough enough to make repeated interaction among two members unlikely. It is nonetheless clear that transactions were not segmented along occupational, status, or residential lines--the natural rifts in the society (Hoffman, Postel-Vinay, and Rosenthal, 1992). With a data set spanning a longer period of time it might be possible to test for segmentation among clients in the same way that we test for segmentation among notaries in section 4.2C below. The very large number of individuals who appear only once make this test for coalitions inconclusive. While we cannot therefore rule out such large coalitions in Paris in 1751, we can find little trace of them in the data, and their existence would run counter to the qualitative evidence suggesting that asset transaction were organized around notaries. Individuals simply could not retain the information generated by the city's half a million people.

Instead of coming back to the same lender, borrowers in Paris in 1751 returned to the same notary. Some 80 percent of all loans were drawn up before a borrower's or lender's favorite notary (Table 2).⁴ And a regression shows that the number of different notaries used by borrowers rises only slightly with the number of loans they took out. The borrowers thus kept

most of their business with the same notary, and a regression for lenders leads to the same conclusion (Table 1). As the regressions demonstrate, there was not even a tendency for large scale borrowers and lenders to use many notaries, as they presumably would if they could convey information independently of their notaries. Furthermore, clients were not faithful to their notary simply because he lay close at hand. Indeed, there is no indication that notaries and their clients were neighbors, at least in the eighteenth century. Many notaries were in fact clustered in the center of the city, within a stone's throw of one another but far from most of their rich clients. All of this suggests that notaries did serve as intermediaries, as do contemporary descriptions of the notaries' activities.⁵ Credit contracts in the 1751 enumeration provide further evidence in favor of intermediation. Borrowers and lenders did 80 percent of their business with the same notary, while parties in other contracts were less faithful.⁶ This pattern of loyalty is consistent with the notion that as information became more important--as in credit dealings--loyalty increased.

If notaries served as intermediaries in credit markets, they had to persuade their clients that they could resolve adverse selection problems between borrowers and lenders. They also had to overcome a problem of moral hazard when they decided how much effort to devote to matching borrowers and lenders. Faced with such concerns, one might maintain that a notary's good behavior would be guaranteed by the value of his offices--in effect a bond for performance. Or it might be insured by the courts and by the notaries' own corporate organization. Here one must distinguish between the actions of a notary that are observable and those that are not. To convict a notary in court or to remove him from his office would require proof--proof that could only concern observable actions. Yet there were a host of unobservable decisions that each notary made. He reached decisions, for instance, on the basis of private information in his archives, to which he alone had access. It would be difficult for a client or another notary to know how the notary used that information. It would be even more difficult for clients to show that their notary had misbehaved.

Even if courts were ineffective, one might argue that notaries would still have an incentive to build a reputation for good service because they were involved in a repeated game with their clients (Kreps, 1990). They would want to maintain the value of their offices and to do so they have to serve their clients well, for poor service would only drive clients away. One can imagine a variety of such reputational models. In the simplest, clients would remain loyal to the same notary so long as their interactions with him were satisfactory. If mistreated, the clients would jump to a competitor, and the threat of leaving would keep the notaries from offering bad service. The result would be near perfect loyalty. Alternatively, one might imagine that clients would move from notary to notary, seeking one who treated them well. Or the notary might send his own clients to a colleague whenever it was efficient, in order to protect his reputation. Or perhaps clients monitored notaries' behavior imperfectly, as in Green and Porter's model of oligopolistic collusion. (Green and Porter, 1984; Abreu, Pearce, and Stacchetti, 1986) Given the imperfect monitoring, clients would punish their notaries periodically, either by mistake or to prevent misbehavior; the punishment would consist of taking their business elsewhere. Yet notaries would still cultivate reputations for quality service.

There are in fact so many possible reputational models (and so many equilibria in the related repeated games) that one can tell a reputational story about nearly any pattern of client defections from their favorite notary. That is one problem with the reputational models, but there are others as well. At bottom the reputational models depend on two assumptions that remain quite dubious insofar as the notaries in eighteenth century Paris are concerned. The first assumption is that clients can switch notaries at low cost. If clients cannot switch at low cost, then they cannot quit (or even threaten to leave) a notary who mistreats them; they thus have no credible way of inducing him to provide high quality service. For nearly all Parisian clients, though, switching costs were clearly high. Apart from a few extremely wealthy individuals, most clients were tied to their notary because of his private information about them (the "lock-in" problem). Shifting to another notary would be costly unless something besides reputation was at

work.

Beyond the difficulties of conveying information about themselves, clients might well find it hard to punish a notary who had mistreated them or even to tarnish his reputation by spreading tales of his misdeeds. Indeed, moral hazard would undermine the credibility of a report about the notary's misconduct, and the size of the city would limit the report's impact. A notary could thus abuse many of his clients--though probably not all--at low cost. Some clients would leave, but the rest would remain either unaware of the problem or unconvinced by its announcement. Such a problem would be particularly taxing for the many individuals who carried out asset transactions only rarely. The notary would be tempted to abuse such episodic clients because their future business was limited. They in turn would have to exert themselves to report any wrong doing, and their efforts would in all likelihood be unwarranted given the limited use they made of notarial services. To be sure, a notary would be easiest to police if his clients could threaten to leave as a block, as soon as a single one of them was mistreated. But as noted earlier in the paper, we have found little trace of such coalitions.

4.2 Alternative mechanisms

Reputation thus seems to offer at best an incomplete account of the interaction between notaries and their clients in eighteenth-century Paris. Instead of relying on reputation, we will therefore pursue a different path and attempt to document how information flowed among notaries and their clients. The information flows will then suggest what allowed clients to keep notaries honest. From what was said above, it seems that clients knew little about each other and little about notaries other than their favorite one. With such limits on knowledge, several hypotheses come to mind about the way information flowed among notaries and their clients:

- A. The notaries formed a cartel, sharing information and profits.

- B. Notaries were specialized by type of client and contracts.
- C. Notaries were grouped into small coalitions held together by reciprocity.
- D. Notaries brokered deals with one another. Returns to these contracts were not split. Notaries allowed a client to defect to other notaries temporarily in order to keep him loyal the rest of the time.

Again, our interest here is the interaction between notaries and their clients, rather than the organization of their industry. In discussing cartels, we therefore limit ourselves to a single issue: determining whether the notaries formed a cartel so powerful that they exercised overwhelming power over their clients. Obviously, any pattern of client notary interaction is consistent with such a cartel. We thus need to establish that the hold of notaries over their clients was based in their private information rather than the workings of a cartel. Let us confront each of our hypotheses about notary-client relationships in turn.⁷

A. Cartelization

One could easily imagine that notaries operated as a cartel. They possessed a collective organization, and existing notaries could veto replacements, although only the state could fix the number of notaries (Limon, 1992, 18, 149-60). They had acted as a cartel in the brokering of government loans in the seventeenth century, sharing the profits equally among themselves (Limon, 1992, 109). But that arrangement had not endured. By the late seventeenth century, the amount of government lending a notary did in any given year bore little relation to what he had done in the past, evidence against the existence of a stable cartel. Furthermore, there were 113 notaries active in Paris in 1751. That many members is extremely large for a cartel.

Furthermore, if the notaries had formed a cartel in 1751, we might expect profits and business to be distributed evenly among them, yet that does not appear to have been the case. The

études in fact look rather different from one another, with the coefficient of variation of loans brokered exceeding 100%. Conceivably, this heterogeneity might have resulted from returns to tenure as a notary, but we could find no correlation between the length of time a notary had been in office and either the number of loans he brokered in 1751 or the total volume of his notarial activity. At best there was a small relationship between tenure and the number of government bonds he brokered, but because government bonds were the most unstable component of an étude's dealings, this finding could easily be a statistical fluke (Figure 1).

One might imagine that a notary's growing stock of information would yield returns to tenure, but the fact that notaries sold their études argues to the contrary. Notaries must have invested significant resources in screening their successors and in transmitting their clientele seamlessly in order to increase the value of their offices. Young successor notaries would thus resemble their old predecessors. Hence returns to tenure cannot explain the heterogeneity of the études, heterogeneity that is difficult to reconcile with the existence of a cartel. If the notarial system had functioned as a cartel, there would presumably have been great pressure to distribute profits--and particularly the returns from government lending--in an equitable or stable fashion. Yet, different notaries were able to hog the bulk of government issues at different times in the eighteenth century. Nor is there any evidence that notaries made side payments to one another. And even if the notaries did manage to make secret payments to one another, it would have been impossible to hold an enormous cartel of 113 members together without spats and cheating, spats and cheating that would have left a clear mark in the historical record.

B. Specialization

Brokers of assets are frequently specialized. Real estate brokers, for instance, do not peddle financial instruments, while stock brokers do not sell houses. There are two likely reasons for this specialization, efficiency and regulation. In the case of Paris in 1751, the crown licensed

various types of asset brokers, from agents in the stock market to notaries. Since the notaries arranged a dizzying variety of transactions, from sales of real estate to loans, one might expect that they would specialize. A notary would acquire a reputation for efficiency in the particular type of transaction he knew well. His reputation would then bring him additional business, and it might also explain defections, for a client might leave his usual notary for a specialist in order to carry out a particular type of transaction. At the extreme, clients might change notaries every time they entered into a different type of transaction.

The evidence, though, suggests that notaries offered a broad range of services. Only small and seemingly unsuccessful notaries were heavily specialized. Furthermore, specialization did not bring notaries a net gain in clients. We can see as much by regressing the share of a notary's business coming from clients who had temporarily left their favorite notary on an index of the notary's specialization. If we perform the regression, the relationship turns out to be weak. And a similar regression shows that, whatever business specialization brought in was swamped by the loss of clients who temporarily left the notary and addressed themselves to his colleagues.⁸

C. Coalitional reciprocity

In coalitional structures, the relationship between contractant and notary would resemble that in a cartel. But a coalition has radically different--and testable--implications for the links among notaries. Here, if a notary cannot find a satisfactory partner for a client among the rest of his clientele--if he cannot find a suitable lender for a borrower, for instance--then he turns to a select group of colleagues to find a partner for the deal, be it a loan or any other asset transaction. If his colleagues cannot furnish an appropriate partner, then the client will unfortunately have to wait, for the notary never refers business to notaries outside the select group. The notary and the select group of colleagues thus form a coalition, with cooperation in the coalition sustained via reciprocity. The advantage of this scheme over the cartel is that it involves less monitoring by

notaries and requires no formal rules for apportioning returns. Yet although this scheme is theoretically attractive, it is roundly rejected by the data. We traced the notaries' referrals, and for any subset of notaries, a substantial proportion of their referrals went to notaries outside the subset. The referrals never showed a tendency to segment the notarial corporation into coalitions. There is, moreover, little evidence of reciprocity, little evidence of back and forth referrals. In short, we can find no signs of coalitions within the notarial corporation.

5 A theory of information transmission

We are left with the final hypothesis: notaries competed and cooperated, while temporary defections formed an essential part of the notary-client relationship. If a client temporarily dealt with another notary, his defection was not necessarily a sign of disloyalty; indeed, he may well be encouraged to do so by his usual notary. Such defections were the very mechanism that allowed notaries to guarantee clients quality service, for neither reputation nor a monetary bond could secure the relationship.

The patterns of notarial activity support the argument that clients who appeared unfaithful to their usual notary were in fact relying on him to carry out cross-étude activity. If notaries did not consent to such cross-étude activity, it would not have accounted for 30 percent of all notarial contracts; nor would loyalty have been constant across all social groups. Women, for instance, were nearly as likely as men to contract outside their favorite étude, and while slightly more women than men were perfectly loyal to their principal notaries, the proportion is hardly staggering (28 percent instead of 25 percent). Women are a particularly interesting case, for in the mid-eighteenth century, few women were as immersed in commerce as men. Presumably women would therefore depend more heavily on their favorite notary for information. Yet it is impossible to find any statistical difference in loyalty by sex (Table 3). Similarly, social status does not appear to matter, except for merchants and artisans who are only marginally less loyal to

their usual notary. Their behavior is not altogether surprising, since they were the most involved in economic activity and thereby the most likely to have channels of information other than notaries. Their business may have also made it imperative that asset transaction be finalized quickly--thereby requiring more frequent shifts from one notary to another. In any event, if the evidence from 1751 is any indication, cross étude agreements were part and parcel of the relationship between a notary and his clients.

Yet there remained problems in assuring that cross étude agreements would occur when necessary because a notary had privileged information about his clients. On the one hand, the notary could use his information to hold the client up. Or he could also use it to provide his clients better service. Better service had two characteristics, rapidity and proper matching, whether it was of borrowers or lenders or parties in any other contract. A notary could try to find the match within his own clientele, but that might force the client to wait. More rapid service depended on referring clients to another notary. Such links required cooperation among notaries because they could communicate information about clients more reliably than the clients themselves. A notary had incentives to keep his clients to himself because referring clients created competition in notarial services. Indeed for a referral to work, a notary had to share information about his client. The notary to whom he referred the client would then be in a position to attract the client if the original notary failed to provide satisfactory services. The resulting scheme, it should be noted, is the one that is the most flexible and the least burdensome to assure that notaries provide high quality service.⁹

One can formalize this intuition by appealing to the industrial organization literature on hold-up problems and second-sourcing (Farrell and Gallini, 1988). In the case of hold-up problems, an innovator holds rights to a new technology that his client would like to adopt. If the clients do adopt it, though, the innovator can take advantage of them in the future--for example, when they needed replacement parts for their new machines. Because they are locked in to the new technology, the innovator can thus hold them up for ransom. To allay their fears about the

hold-up problem--and thereby encourage adoption of the new technology--the innovator may well license his competitors to distribute the new technology.

In these cases a beneficial long-term relationship will form only if it does not create a hold-up problem--in other words, only if it prevents the innovator from taking advantage of his clients. When faced with a hold-up problem, the parties will not cooperate and both will be worse off. To avoid such an unfortunate outcome, the innovator has an incentive to provide the client with a threat, thereby creating a commitment mechanism that insures he will not engage in a hold-up. That is one reason why monopolists may license new technologies to their rivals. With such a license, if the monopolist did try to hold the client up, the client could easily switch suppliers. Yet there is an essential difference between our model and the second sourcing literature. In the second sourcing literature, an innovator can license a competitor without experiencing any significant decline in market share because switching in itself is not part of the commitment mechanism; only the possibility of switching matters. Notarial activity is quite different, because it is only with regular referrals that the client's usual notary can commit to high quality service. Only by making regular referrals can the usual notary provide other notaries with information about his clients and thus ensure his clients that they can jump études if necessary.

To avoid a lock-in, clients must encounter low switching costs when switching between notaries. We focus on one mechanism that reduces switching costs, yet we realize that other mechanisms may have been at work as well. For some clients, for instance, switching costs were probably low even in the absence of any second sourcing of informational services. Extraordinary clients with public reputations, like the archbishop of Paris or the duke of Orleans, were so well known that they could probably switch freely from notary to another. But focusing on such elite individuals neglects the thousands of smaller scale clients who lacked a public reputation. For them, second sourcing was a mechanism that lowered switching costs and did so independently of their social identity. By contrast, most other mechanisms only lowered switching costs for a fraction of the population. Since patterns of activity are not strongly correlated with any social

characteristics that we can recover from the enumeration, we strongly favor second sourcing as the dominant mechanism for lowering switching costs.

While an eighteenth-century notary's interaction with his clients reflects a particular institutional structure, his problem is no different from that faced by twentieth-century investors and entrepreneurs and the intermediaries they deal with. The investors and entrepreneurs rely on intermediaries (such as brokers, venture capitalists and lawyers) to reduce informational asymmetries. If the intermediary misbehaves, though, the investors and entrepreneurs may have little recourse because the quality of the intermediary's service is difficult to demonstrate in court. Here too the intermediary may come to have a significant hold over his clients, such as entrepreneurs who are raising capital. With the notaries, though, this problem was resolved by information sharing that permitted competition.

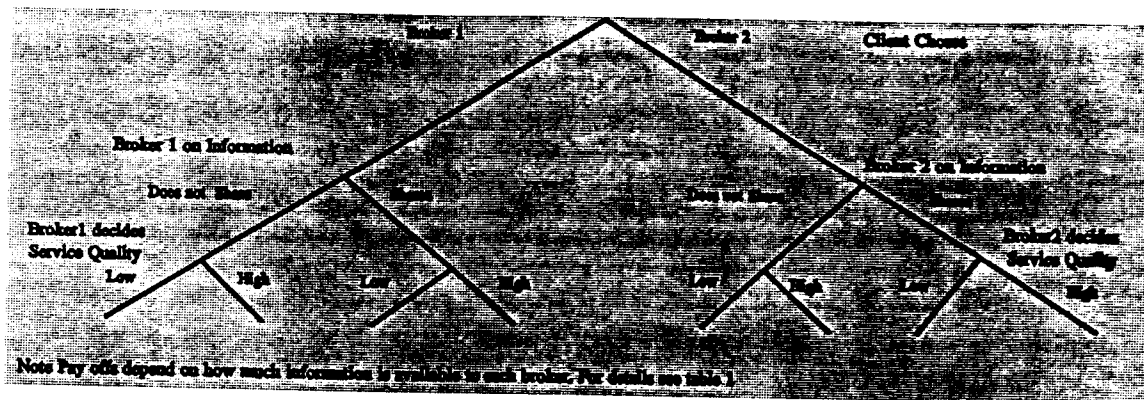
6 The Model

The ideas here can be formalized by modeling the interaction between two brokers and a client. Each time the client wants to carry out a transaction he or she must hire a broker. Each broker can either be informed or uninformed about the client's current financial situation, and the client can either rehire the first broker or switch to the second. The client faces fees that are either low or high depending on whether the broker he chooses is informed or uninformed about him. If he switches his business from the first to the second broker he also faces a switching cost. Only the hired broker is active. A hired broker can either share information about the client with the other broker or keep it to himself; he can also either provide low or high quality service. Both sharing information and providing high quality service reduce broker profits. The client however care only about quality of service.

It is easy to show that the first broker and the client cannot jointly maximize their profits in a one-shot game. We thus focus on a process of infinite duration, for although the three players

will not live forever, their families and successors will. If a client is old, his notary will nonetheless be concerned about retaining his family's business, because families most often remained loyal to the same notary for generations. Similarly, if a notary is about to retire, he will wish to preserve the value of his business, because he will sell it or bequeath it to his heirs. In each period the client moves first by choosing a broker and then the broker decides on sharing information and quality of service. The sequence of moves is displayed in figure 2.

Figure 2: The stage game of the repeated game



More formally the assumptions of the model are as follows:

- (1) The fees of uninformed brokers are F while those of an informed broker are f and the costs of switching to another broker are s . Here $F > f$.

(2) High quality service yields the client R^h before fees, while low quality gets him R^l ($R^h > R^l$).

(3) The profits of an unhired broker are 0. If service quality is high (low) the broker's profits are π and (π') with $\pi' > \pi > 0$. A hired broker who shares information loses a fraction $(1-\alpha)$ of these profits ($\alpha \leq 0.5$) to the broker with whom he shares.

(4) The gains to a broker for providing low quality service are small relative to his client's losses; in other words, $\pi' - \pi < R^h - R^l$. Hence, it is socially efficient to for brokers to provide high quality services.

(5) Lock in can occur if the first broker is informed but the second is not ($R^l - f > R^h - F - s$). Switching can occur if brokers are equally informed ($R^l - f < R^h - f - s$).

(6) All parties share the same discount rate d .

(7) A broker who receives no information for n periods is uninformed.

Proposition: If $n > 1$ and both brokers are informed at the beginning of the game, the infinitely repeated game described above has three pertinent Nash subgame perfect equilibria. Not all equilibria occur for a given parametrization of the model.

(I) Lock-in. Clients never switch and brokers always provide low quality service.

(II) Periodic Switching. Clients switch between brokers every $n-1$ periods. Brokers provide high quality service only for $n-1$ periods after being hired. Should clients

remain too long with the same broker they would receive low quality service.

(III) Information sharing. Clients switch after any period where the broker has either provided low quality service or failed to share information with a potential rival. In equilibrium, brokers share information and provide high quality service, and clients are loyal.

For a proof see appendix 2.

The three equilibria have strikingly different implications for notary-client relationships. The first equilibrium features complete segmentation, in the sense that clients are tied to brokers. The second equilibrium involves switching by clients. The third is one of partial segmentation and release of information by notaries. Intuitively, the existence of each of these equilibria depends on the client's switching costs. If switching costs are low enough ($R^h - R^l > s$), then equilibrium I can be ruled out. Indeed in our model the client can provide information to brokers by moving his business regularly. But he will only want to move regularly if he values high quality service enough (enough, that is, relative to low quality service) to warrant paying the switching costs. Conversely if switching costs are high enough, then equilibrium II can be ruled out because the client will never want to carry out information transmission on his own. Equilibrium III is subgame perfect only if s is below the same critical value ($R^h - R^l$), otherwise Equilibrium III is only Nash because the client would not want to carry out his threat of switching if the broker failed to share information or provide high quality service.

To understand the second and third equilibrium, we must add detail to the process of information sharing. In doing so, we should think of periods as units of time within which a client will carry out multiple financial transactions. The information sharing is a by-product of engineering deals with other brokers in a proportion $2(1-\alpha)$ of a client's transactions. In such transactions, half of the time the original broker is the leader and he records the transaction so the

other broker's clients appear to be defecting. In this case the broker retains the transaction so he receives the full fee. The other half of the time the broker is the follower and refers the transaction to another broker and he loses the fee. We would thus observe defections in $(1-\alpha)$ of a brokers' records. The pattern implied by equilibrium III is one of regular defection from a principal broker followed nearly always by a return to him. Equilibrium II, in contrast would involve both periodic loyalty and major switches.

Our model ignores one important rationale for cross broker transaction--namely, heterogeneous assets. When the demand for and supply of a given asset do not balance within the confines of a broker's clientele, he can either engineer cross clientele transactions or make clients wait. But because cross clientele transactions create competition, brokers prefer to avoid them. They may well prefer to hold clients since doing so provides much greater profits than reinforcing competition via cross-études transactions. One solution to this problem would be to focus on the broker-client relationship or on the relationships between brokers. We could build a model in which clients were passive but brokers interacted in a repeated game that required them to participate in cross-clientele transactions for a certain proportion of their business. Failure to do so would risk a penalty from the other brokers--namely, a broker would be denied access to other brokers' clienteles. If the rewards for participating in this bigger game were large enough relative to the short term gains from holding up clients, then in equilibrium brokers would provide high quality service. The only problem is that this model supposes that a broker's activity is observable; only with observability can a broker's colleagues decide whether he is fulfilling his obligations. Unfortunately, as we noted above, the activities of our brokers--the Parisian notaries in 1751--were confidential, effectively ruling out such a solution to the problem.¹⁰

7 Discussion

Several remaining questions require a detailed knowledge of how the Parisian notaries

operated. To begin with, were they informed or uninformed at the beginning of play? Could they commit to high quality service for one period? In eighteenth-century Paris, the beginning of play was the moment a client first entered into a relationship with a notary. It might be the beginning of adulthood, when a client married or secured an economic position, such as a government office, trade mastership, or commercial license. Both marriage and professional independence began with a visit to the notary. Clearly, at least one notary would henceforth be informed about the client. But this sort of contract was in fact likely to involve several notaries. Marriage contracts typically involved the bride's notary and the groom's as well. Purchase of a government office or a commercial license brought in the buyer's notary and the sellers.¹¹ All the notaries present would come to know the client's social and economic position, and the client would enter active life with both a primary notary and an obvious fall back.

What then about a notary's ability to commit to high quality service? Would a client who contemplated leaving his notary for a competitor be confident that he would receive high quality service? The competing notary knew that he could only attract the client if he could make a commitment to high quality service. Now that might appear to be a problem if switching took place before service quality could be determined. But in reality a client who considered leaving his notary would take his list of desired transactions to the competitor in order to determine if he would in fact receive better service. Only if he were offered better service would he switch. The act of switching would involve signing the transactions engineered by the competing notary; the client would not be acting on a promise that could be retracted. He could easily observe the service quality of the initial deal before he switched. It thus appears reasonable to assume an initial period of high quality service.

Our analysis has highlighted three equilibria. In the first no switching ever occurs, and clients receive low quality service. Such an equilibrium will arise if switching costs (s) are high enough. But since it has the strong feature of perfect loyalty to notaries, it is easily testable, and the data reject it decisively. Indeed, less than 40 percent of the clients who appeared in more than

one contract remained perfectly loyal to their favorite notary during the twelve months of our sample (Table 4). On average individuals defected from their favorite notary about 30 percent of the time.

The second equilibrium features constant switching. It too is subgame perfect, but it requires that switching costs remain low enough to permit switching if notaries do not share information. This equilibrium features a run of contracts carried out with one notary, then a switch just before the quality of service is about to decline (or when information begins to decay), then a run of contracts with another notary, and finally a return to the first notary. Note here that the frequency depends on the minimum of the time needed for information to decay and quality assurance to waver. The resulting equilibrium has three strong implications for the data. First, if we can observe activity for several periods, then the subgroup of notaries who oversee a particular client's activity ought to share that activity roughly equally. As a result, clients will not have primary notaries. Second, because keeping notaries informed is costly--it requires switching--a client only interacts with one notary at a time. If the information decay process and the time of quality assurance are similar, then over the long run the client only uses two notaries and he shuttles back and forth between them. Third, because the client bears the costs of keeping alternative notaries informed, he should only interact with two notaries.

None of the three implications is consistent with the data. First, clients do not divide their activity equally among several notaries. Over 55 percent of the clients reserved two-thirds or more of their business for a single notary. Second, individuals do not interact with notaries sequentially. Rather, their dealings with alternative notaries are isolated incidents in runs of activity with their favorite notary. Third, a surprisingly large number of individuals deal with more than two notaries (Table 4).

The final equilibrium also requires a low cost of switching because switching is used as threat, but the process of information sharing is carried out by the notaries. As a result clients remain loyal to a particular notary for most of their contracts, but their defections may be broadly

spread out across a number of notaries. Defection here is not the result of an anticipated fall in the quality of service; rather, it is a means to ensure that high quality service will continue. The resulting equilibrium fits what we observed in Paris in 1751. To be sure, one would like to have direct evidence of information sharing among notaries, but that sort of qualitative evidence we have been unable to find--despite considerable searching. Since it had no bearing on legal cases (unlike the notaries formal records), it was not the sort of documentation notaries would tend to preserve, and since it may have carried evidence about usurious loans, it may well have been the first thing they destroyed. In any event, the pattern of activity in the 1751 enumeration is consistent with this third equilibrium and this third equilibrium alone.

Faithfulness thus has a complex interpretation. For some contracts loyalty depended on custom: marriage contracts, for instance, tended to be signed before the notary of the bride's family, forcing grooms' families to defect. But no such custom governed asset contracts, where loyalty to notaries was greatest. Individuals remained loyal because they relied on the notary to transmit information essential to their transactions. The information, our analysis implies, had to flow both within and across notarial businesses. The flows allowed rapid matching of heterogeneous clients and permitted clients to police their notaries. Information rather than custom thus seems to explain the rhythm of loyalty and defection.

8 Conclusion

We have highlighted one method of resolving problems of asymmetric information, one device in a larger set of solutions that would include bonds, reputational effects, and informational coalitions. We plan to investigate the relative importance of these other solutions in a book on the development French capital markets, for if we move forward or backward a century, the means of coping with asymmetric information in capital markets become quite different. But for the moment let us consider the solution that seemed to be at work in Paris in

1751. It revolved about notaries. They were effective because they were reliable and because they created a mechanism to solve potential hold up problems. A notary allowed his clients to defect periodically, in order to give them a credible threat in case he misbehaved. The great virtue of this mechanism was its availability to all social classes: it protected clients both rich and poor, those with public reputations and those without. It even worked for clients who rarely visited a notary. What the resulting notarial clientele were like and how they changed over time are topics we plan to investigate in future work, via time series data that we are currently collecting.

Our paper has implications for the development of asset markets. The structure of asset markets inevitably involves a trade-off between liquidity and heterogeneity. Economists have emphasized the importance of liquidity in expanding the scope of asset markets, suggesting that heterogeneity is something of an obstacle. But the example of Paris in 1751 demonstrates that when intermediaries overcome the problem of asymmetric information, even heterogeneous assets can be actively traded. In such markets, though, much information remains known only to the intermediaries, who can take advantage of their clients. Escaping such problems requires mechanisms like defections to another notary.

Appendix 1: Parisian Notarial Records and the 1751 Enumeration

Historians have long urged greater use of notarial records, but the notaries drafted so many documents that their archives are extraordinarily cumbersome. In eighteenth-century Paris, for example, a busy notary might fill a meter's worth of paper in year. Since the records of 122 notarial businesses (*études*) survive for Paris, a year's worth of notarial archives for the city might easily stretch the length of a football field. Within each notarial *étude*, the documents are usually arranged chronologically and tied together in bundles. As a result, the only feasible way to sample the notarial records in a city such as Paris is to select a limited number of *études*.¹²

Fortunately, for notarial records drafted in Paris in the year 1751, we have an extraordinary source at our disposal: a detailed computerized enumeration compiled by the French Archives Nationales. Because this source is so unusual and because its peculiarities derive from the way it was assembled, it deserves a brief discussion. The enumeration was put together for historical reasons. During the insurrection of 1871, the archival records in Paris suffered serious damage. In particular, the parish registers of Old-Regime Paris disappeared, a loss that is the bane of every genealogist in France. Without parish registers for the city of Paris, genealogical research--genealogists being the archives' major clients--can proceed only via notarial records.

In an effort to aid genealogical research, the Archives Nationales proposed to create a data base--called *Minotaure*--which would contain information on every person named in a Parisian notarial contract for the fifty-first year of every century (Poisson, 1985, 297-308). Genealogists and historians would then be able to use the data base to find specific individuals in other years because individuals and families were usually very loyal to their notaries.

The year 1751 was the first selected for enumeration. The enumeration for 1751 lists 137,000 participants and 59,000 contracts--or slightly more than two persons per private contract. That appears to be an enormous amount of data, but the number of participants who are not principal parties in the contracts is small--less than 15 percent--even though many contracts mention

numerous additional parties, from witnesses to the principal parties' relatives. It thus appears that at some point the ambitious project of enumeration was scaled down, and only principal parties were recorded. Fortunately, the omission of the other parties has little effect on financial and asset transactions, where typically the only individuals who appear in contracts are the principal parties: the borrower and lender in a loan, for example, or the buyer and seller in a land sale. But the omission makes it difficult to link such economic dealings with social records such as marriage contracts and wills.¹³ It is well known, for instance, that marriages were times of intergenerational transfers that frequently involved cash. Given the data at hand, though, it is impossible to ascertain how frequently families went into debt or sold assets in order to finance weddings, because the parents of the bride and groom generally do not appear in the marriage contracts listed in the 1751 enumeration. Every marriage contract in fact mentions the bride and groom's parents, but the enumeration omits the parents over 80 percent of the time.

Still, the enumeration is nearly complete for principal parties, and it includes almost every contract signed in Paris in 1751. Only four types of contracts turn out to be missing from the enumeration. First, four études had their records destroyed in 1870. Second, notaries drew up some contracts for which they were not required to keep a copy--contracts in brevet. Various estimates suggest these amount to less than 15 percent of all the contracts the notaries drafted (Poisson, 1985, 298). Third, the enumeration omits contracts involving foreign investment in government debt, perhaps because these were thought to be of little interest to Gallic genealogists. Finally, it also leaves out suburban notaries. Most of the omissions, though, are minor, and apart from the lack of brevets the 1751 enumeration contains the bulk of all notarial activity in Paris. Furthermore, nearly all of the long term asset contracts are likely to be enumerated since they were rarely recorded as brevets.

Since we wanted to have both contracts and individuals as units of observations, we faced a significant recoding and matching task, a task complicated by certain lacunae. The enumeration provides little evidence, for example, about women's occupations or social positions. And because

no information on subsidiary participants was recorded, it was impossible to use husbands' occupations when women appeared as principals. Another problem, derived from the very detail of the enumeration, concerned the task of recognizing individuals who appeared more than once in the notarial contracts. Names and occupational descriptions frequently ran to more than 100 characters, subjecting automated matches to the vagaries of eighteenth-century spelling and modern typographical errors. In short, perfect matches of names, occupations, and residences were rare. Faced with this problem, we adopted a conservative matching procedure that turned the 132,000 people in the enumeration into slightly less than 87,000 distinct individuals.

Undoubtedly, more matches could have been made, especially for women and the common people. We also faced difficulties in ascertaining what role individuals played in contracts--who was the tenant and the landlord in rental contracts, for instance. Because the code books were particularly vague about this issue, we had to infer meaning of participation codes from subsamples of contract we had collected. Finally, despite the great individual detail of the enumeration, it unfortunately omits the monetary value of transactions, and it does not record the age of participants. Nonetheless, the very breath of the enumeration makes it an invaluable source for research--a unique opportunity to grasp the records of every notary in Paris for an entire year.

The peculiarities of 1751 could conceivably have important implications for the notaries' business, because their affairs were highly sensitive to the social, political and economic developments. Happily, 1751 was a calm year, one afflicted neither by war nor by significant crop failures. Demographically, baptisms were normal, while marriages rose 15 percent above the decennial average and death hovered about 5 percent below. The year was also one of limited government debt issue. The gap between private and public interest rates was at an all time low, suggesting that the public had little fear of a proximate default (Baulant, 1968; Charlot and Dupâquier, 1967; Velde and Weir, 1992; Luckett, 1992). In short, 1751 was probably a slightly more prosperous year than most in the mid-eighteenth century.

Appendix 2: Equilibria

We can describe actions in each period via a triplet (A,B,C.). Here A = 1,2 is the broker whom the client hires. B = 0 if the broker does not share information and 1 if he does. C = l if the broker provides low quality service and C = h if he provides high quality service.

We can summarize the information situation at the beginning of any period with a pair (i_1, i_2) where i_j is 1 if broker j is informed or 0 if he is uninformed (while strategies may depend on history payoffs in each period do not). The period payoffs are sketched in Table 5, with payoffs of the first broker first, those of second broker next, and the payoff of the client last. Given information there are five possible outcomes corresponding to the five rows of Table 5.

Table 5: Payoffs To The Three Types Of Stage Games

Actions	Information								
	(0,0)			(1,0)			(1,1)		
	Both brokers uninformed			Only broker 1 informed			Both brokers informed		
	Broker 1	Broker 2	Client	Broker 1	Broker 2	Client	B1	B2	Client
(1,0,l)	π^l	0	R^l-F	π^l	0	R^l-f	π^l	0	R^l-f
(1,0,h)	π^h	0	R^h-F	π^h	0	R^h-f	π^h	0	R^h-f
(1,s,h)	$\alpha\pi$	$(1-\alpha)\pi$	R^h-F	$\alpha\pi$	$(1-\alpha)\pi$	R^h-f	$\alpha\pi$	$(1-\alpha)\pi$	R^h-f
(2,0,h)	0	π	R^h-F-s	0	π	R^h-F-s	0	π	R^h-f-s
(2,s,h)	$(1-\alpha)\pi$	$\alpha\pi$	R^h-F-s	$(1-\alpha)\pi$	$\alpha\pi$	R^h-F-s	$(1-\alpha)\pi$	$\alpha\pi$	R^h-f-s

In a repeated game, a strategy for the client is simply a probability of choosing a broker

which depends on the past. A strategy for the chosen broker is a function that maps the past and the client's action into probabilities of sharing information and providing high service quality. An important part of the history of the game involves how much information has been shared. In a repeated game context we must face the fact information decays. A broker has less information at time $t+i$ than at time t unless he receives new information. To simplify the analysis, we examine a simple information structure where brokers are either informed or uninformed and the cost of informing an uninformed broker is $(F-f)$. However, we do allow brokers to share information: an informed broker can reliably share his knowledge with another broker in a cross clientele deal. Doing so costs him a fraction, $(1-\alpha)$ of his commission, which he gives to the other broker. There is no social cost to transmitting information, but the process redistributes $(1-\alpha)P$ from one broker to the other.

In the repeated game, histories at time t involve 4 vectors, $Q_{1t}, Q_{2t}, K_{1t}, K_{2t}$. Here $Q_{it}=(q_{i1}, \dots, q_{it})$ is defined as follows ($i = 1, 2$):

$q_{ij}=0$ if broker i was not hired in period j of the repeated game

$q_{ij}=l$ if broker i was hired in period j and offered low quality service, and

$q_{ij}=h$ if broker i was hired in period j and offered high quality service.

As for $K_{it}=(k_{i1}, \dots, k_{it-1})$, k_{ij} is the number of periods for which broker i 's information in period j would last provided he receives no information. If $k_{ij}>0$ the broker is informed at time j ; if it is 0, he is uninformed.

For the sake of simplicity, we limit ourselves to the cases where information decays in either one or two periods. Extending the model to more than two periods is straightforward but provides little further insight.¹⁴ Let us begin with the case where information decays quickly: a

broker is uninformed if he has not interacted with his client in the previous period or received information in the previous period. It is easy to show that provided $F-f$ is large enough in the resulting equilibria clients never switch and only low quality service is provided.¹⁵

Now let us turn to the more interesting case of two-period information decay, assume further that both brokers are informed at the outset. Let us first consider strategies of clients which do not condition on history--in other words, strategies such that the probability of switching in any period is independent of past behavior. The equilibria will then depend on the broker's ability to commit to high quality services for at least one period after a client switches over to him.

If the broker cannot make such a commitment and if the client employs a history independent strategy then all the Nash equilibria involve low quality service. In this case brokers have a dominant strategy to provide low quality service. Faced with switching costs, no client ever changes brokers, leading us to observe perfect loyalty. The equilibria also turn out to be subgame perfect.¹⁶

If the brokers can commit to high quality service, then switching yields the client (R^h-f-s) in each period, which is better than staying (R^l-f) . We must therefore consider the strategy of switching all the time. It would leave both brokers informed, but they would be purely passive players. Any strategy that involved staying with a broker with a positive probability could never be part of an equilibrium because it would yield (R^l-f) per period when the client stayed, which would always be dominated by switching.¹⁷ We have then an equilibrium of perpetual switching; in it the client rather than the brokers transmits information between brokers.

While perpetual switching is thus a Nash equilibrium, we need to determine whether it is subgame perfect. Consider a one period deviation from the client's strategy of perpetual switching. The deviation necessarily involves remaining for two periods with the same broker, but as a result the client faces lock-in, for

$$\sum d^t (R^l - F) > R^h - F - s + d \sum d^t (R^h - F - s)$$

and the rehired broker will provide low quality services forever. In short, a client has nothing to gain from such a deviation. What about a broker? Since he is committed to furnishing high quality service, a one-period deviation on his part necessarily involves sharing information. Despite the information sharing, the client will still fear getting low quality service in the next period. He will still switch, returning us to the equilibrium strategy. It follows that switching all the time is subgame perfect.

Let us now examine history dependent strategies. We restrict our attention to trigger strategy equilibria.¹⁸ Assume that the client pays attention only to the past quality of service. The broker initially hired has a dominant strategy of giving high quality service for two periods but he will not share information. After the two initial periods, the broker will have locked the client in and he can offer low quality service. On the other hand, if the client pays attention only to past sharing of information then his broker will share information, but the client will receive low quality service. In other words, if clients concern themselves only with one part of the history, then the equilibria are identical to those with history independent strategies and lock-in. They only arise when notaries do not commit to an initial period of high quality service.

There is one final class of trigger strategies that depend on both quality of service and sharing of information.¹⁹ Suppose the client uses the strategy of switching whenever the quality of service has been low or no information has been shared: a broker's best response is then to share information and to provide high quality service. The reason is that if the broker fails to share information or to provide high quality service then he loses profits ($\alpha\pi$) from the next period to his colleague. The loss is greater than the difference in profits in the short term ($\pi' - \alpha\pi$) or in a discounted sense ($\alpha\pi(1+d) > \pi'$). The broker's best strategy is therefore to share and provide high quality service. The client's strategy is an optimal response, yielding a Nash equilibrium.

If brokers can commit to an initial round of high quality service, we have subgame

perfection as well provided ($s < R^h - R^l$). If one broker, changing his strategy, fails to share or to provide high quality service, then the client will switch ($R^l - f < R^h - f - s$). Because the client is willing to switch until the broker shares and offers high quality service, it pays the broker to do so in order to retain the client. In all other case this equilibrium is not subgame perfect.

1. With the life annuities a lender did have to demonstrate that the nominee was living each year in order to receive continued payments from the borrower, but often the nominee was the lender himself, a family member, or person whose death was public knowledge.
2. For remarks on the anonymity of Paris, see Mercier (1783-88, 1:61-64).
3. The year 1751 was chosen at random for the enumeration by Archives Nationales and was a normal year economically. For further description of the enumeration, see appendix 1.
4. We define a person's favorite notary to be notary that he used most frequently during the year 1751.
5. See, for example, Mercier (1783-88, 2:31-32); Archives Nationales (Paris) Y 9529 (11 April 1777); Archives départementales de la Côte d'Or (Dijon) C4565 (15 Septembre 1742).
6. The loyalty indexes equalled the fraction of a person's contracts that were drafted by his favorite notary. For lenders and borrowers we limited the calculation to loans and to individuals who were involved in more than one loan. For other contracts, we restricted ourselves to individuals taking part in more than one contract of any type.
7. Obviously, there are other avenues that one could explore as well. In particular, one might base the interaction between notaries and clients on the clients' need for diversification. Our view is that nearly all individuals are risk averse, but transaction costs prevent full diversification of individual portfolios. In a particular asset market, the extent of diversification indicates how well that market's structure reduces asymmetric information and other transactions costs. Here our aim is to uncover the mechanisms that made it possible for individuals to diversify their portfolios in 1751 Paris. In the monograph that we are currently writing we will take up the issue of diversification at greater length and greatly expand our analysis of individual portfolios.

8. The two regressions here are as follows:

Percentage of business		
	Attracted from other notaries	Lost to other notaries
Constant	23.3 (1.6)	37.3 (4.3)
Specialization index for the notary	4.3 (9.5)	-29.3 (25.1)
Number of contracts witnessed by the notary	-0.002 (0.002)	-0.002 (0.006)
N	109	109
R ²	0.008	0.02

Source: See appendix 1.

Note: We excluded five notaries who were outliers in having only minute levels of activity. The largest witnessed 53 contracts. The smallest notary that we included witnessed 243 contracts and the median 537. Means for the specialization index and the number of contracts were 0.11 and 574 respectively; standard deviations were 0.05 and 217. Standard errors for the regression coefficients are in parentheses.

9. In contrast to the other hypotheses we examined, the important relationship here is the one between the notary and his clients. Notaries communicate information honestly to each other because they can easily publicize to the rest of the notarial corporation the ill-doings of a dishonest colleague. While such publicity might not lead to any explicit sanction, it would cost a misbehaving notary the ability to broker cross étude transactions. He would lose clients and ruin the value of his office. One other virtue of the scheme is also worth noting: because notaries communicate only a part of the

information they have, the one who knows the client best is likely to do most of the clients business-- just what we observe in 1751.

10. Unlike most of their provincial counterparts, Parisian notaries were not obligated to register their contracts with the government, which would have provided aggregate information about their business to other notaries. Thus even aggregate information was unavailable to a Parisian notary's colleagues.
11. Stendhal (Mina de Vanghel) argued that notaries rather than love were the prime forces behind French match making.
12. For two studies based on such samples of études, see Hoffman, Postel-Vinay, Rosenthal (1992, 1994).
13. Leaving out additional parties also makes it impossible to explore the role of procureurs, who acted as agents and perhaps as intermediaries for borrowers and lenders.
14. It is easy to show that slower information decay processes lead to qualitatively similar equilibria as the two period information decay process.
15. Suppose neither broker is informed at the beginning of play. It then pays for a client to inform a broker ($R^l - F > 0$) but the broker has no incentive to share and it never pays for the client to change brokers ($R^l - f > R^h - F - s$). If both brokers are informed, the client still picks one and gets locked in. If only one broker is informed, the client will interact with him alone. The point is that the client is the prisoner of the first broker he interacts with, because information decays too quickly to allow for switching at low cost. Since the client cannot credibly threaten to switch, he cannot force the first broker he hires to share information.
16. If a broker changes his strategy from low to high quality service or from sharing to not sharing information, it has no effect on the client's best response. If a client suddenly switches, his new broker will provide low quality services because the other broker cannot commit to high quality service.

17. The brokers have dominant strategies of providing low quality service when the clients ignore their behavior.
18. We can restrict our attention to trigger strategies, for, given the lock-in problem it is easy to show that only the immediate past matters.
19. Long term sanctions do not work because of the lock-in effect. Indeed, suppose the client decides to punish a bad broker--call him broker A--by moving to broker B for a certain number of periods and then returning to broker A. He will then face a problem with broker B in his final period, for given switching costs, the client cannot commit to switching back to A. The equilibrium we explore is thus likely to be the unique history dependent equilibrium.

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TABLE 1

**Regression of the Number of Etudes Used
and Number of Partners in Loan Contracts**

<i>Dependent Variable</i>	Number of Different Lenders per Borrower	Number of Different Borrowers per Lender	Number of Notaries Used per Borrower	Number of Notaries Used per Lender
<i>Independent Variables</i>				
Constant	0.083 (1.88)	0.263 (2.40)	1.125 (16.36)	0.981 (7.91)
Number of Loans per Borrower or Lender	0.935 (52.55)	0.779 (13.73)	0.175 (6.21)	0.202 (3.15)
Number of Loans Squared	-0.004 (-4.33)	0.010 (1.94)	-0.0006 (-0.41)	-0.002 (-0.38)
Dummy Variable for Individuals Appearing in More than 20 Notarial Contracts	—	—	-0.079 (0.53)	0.116 (0.61)
R ²	0.933	0.796	0.168	0.12
Number of cases	920	564	925	592

Source: See text

Note: The regressions were run only for borrowers or lenders who appeared in two or more credit contracts. The quadratic term (loans squared) was included to see if the number of études or partners would change for large scale borrowers and lenders. The dummy variable for people appearing more than twenty times was included in the number of études regressions to see if individuals who appeared frequently could convey information independently of their notaries. If so, they should have used more notaries than other people, and the dummy variable's coefficient would presumably be large, positive, and statistically significant. Since it is not large and significant in either regression, the implication is that individuals did not convey information independently of their notary.

TABLE 2
Loyalty by Type of Contract

Number of Total Contracts per Individual	All Contracts	Credit Contracts: Private Borrowers	Credit Contracts: Private Lenders	Credit Contracts: Private and Government Lenders
2-3	0.73	0.77	0.81	0.81
4-9	0.66	0.77	0.80	0.84
10-19	0.67	0.80	0.83	0.74
20>	0.70	*	-	-
All	0.71	0.77	0.81	0.82

* only 3 individuals borrowed more than 20 times: their loyalty indices were 0.29, 0.59, and 0.70.

Source: See text

Note: Loyalty for all contracts equals the fraction of each individual's contracts drafted by the notary who records most of the individual's contracts. For credit contracts, the definition is analogous, except that for borrowers we restrict the calculation to contracts in which the individual appears as a borrower and for lenders we restrict it to contracts in which the individual is a lender.

TABLE 3**Tobit Analysis of Defection Rate for Notarial Clients**

<i>Dependent Variable</i>	Defection Rate
<i>Independent Variables</i>	
Constant	0.13 (10.32)
Dummy Variable: for merchants and artisans	0.026 (3.94)
Dummy Variable: women	-0.011 (-1.56)
Number of Loans	0.022 (18.7)
Number of Loans Squared	-0.00015 (-12.3)
s^2	0.149
Log likelihood	-12659
n	20253

Source: See text

Note: The defection rate y equals the fraction of each individual's contracts drafted by notaries other than his primary notary. The individual's primary notary was the one who drew up more contracts for the individual than any other notary. Since the defection rate is non negative and frequently 0, we estimated a tobit equation $y = bx + u$ if $bx + u > 0$ and $y = 0$ otherwise. Here y is the vector of defection rates, x is the matrix of observations of the independent variables, b is the matrix of their coefficients, and u is the error term, which is normally distributed with standard deviation s . T -statistics are in parentheses. The observations here concern individuals who appear in more than 1 contract.

TABLE 4

**Frequency of Loyalty Rates and the Use of over 2 Notaries
By the Number of a Client's Contracts
(Percent)**

Number of Contracts	Percent of Clients with Perfect Loyalty	Percent of Clients with Loyalty $\geq .66$ and < 1	Percent of Clients with Loyalty $\geq .33$ and $< .66$	Percent of Clients with Loyalty ≥ 0 and $< .33$	Percent of Clients Using over 2 Notaries
2-3	45.4	11.0	43.6	0.0	6.9
4-9	21.3	29.5	39.9	9.3	49.6
10-19	13.0	40.9	35.3	10.9	72.1
>20	3.8	56.6	32.1	7.5	83.9
All Clients	39.5	15.7	42.6	2.2	17.6

Note: All the calculations are restricted to individuals involved in more than 1 asset contract. Loyalty equals the fraction of a client's contracts drawn up by his favorite notary, the one who does the largest number of his contracts. Perfect loyalty means that all the contracts are drawn up before the favorite notary.

