Conflicts of Interest, Information Provision and Competition in Banking*

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Abstract

In some markets, such as the market for drugs or for financial services, sellers have better information than buyers regarding the matching between the buyer's needs and the good's actual characteristics. Depending on the market structure, this may lead to conflicts of interest and/or the underprovision of information by the seller. This paper studies this issue in the market for financial services. The analysis presents a new model of competition between banks, as banks' price competition influences the ensuing incentives for truthful information revelation. We compare two different firm structures, specialized banking, where financial institutions provide a unique financial product, and one-stop banking, where a financial institution is able to provide several financial products which are horizontally differentiated. We show that, although conflicts of interest may prevent information disclosure under monopoly, competition forces full information provision for sufficiently high reputation costs. In the presence of switching costs or market power, one-stop banks will always provide reliable information and charge higher prices than specialized banks,

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providing a new justification for the presence of one-stop banks. Also, if independent financial advisers are able to provide reliable information, this increases product differentiation and therefore market power, so that it is in the interest of financial intermediaries to promote external independent financial advice.

1 Introduction

This paper is concerned with the provision of information by sellers of financial services to customers when the financial products are horizontally differentiated. The issue of information provision is timely, as the banking industry is evolving from the traditional business of financial intermediation towards a fee-based industry where information is crucial in providing more added value to customers. In a departure from the standard finance literature, we make the assumption that some investors are partially uninformed in the sense that they don't know the financial product that best suits their needs. This innovative assumption allows for a rich environment where different types of phenomena such as misselling of financial products might occur. Although information is valuable to customers, the sellers face a fundamental conflict of interest problem: should a financial intermediary tell a client that another firm offers a product that better suits the client's needs? Our results directly challenge the conventional wisdom that information is only credible if it is produced from an independent institution that has no conflict of interests. We find that in different environments, competition or consolidation (into one-stop banks) can solve the apparent conflicts of interest.

In addition to horizontal differentiation and customers' imperfect information, our setting is characterized by two additional assumptions that we deem natural in the financial industry: non-verifiable information and reputation costs for misselling. In a heavily regulated environment, the disclosure of verifiable information can be made compulsory and any attempt to falsify it can be heavily penalized. This then leaves open the issue of inducing revelation of non-verifiable information. Since financial institutions often care about establishing a relationship with their clients, however, some discipline can be imposed in the revelation of non-verifiable information through the reputation costs institutions bear for giving misleading advice.

Although our research is originally motivated by the issues relevant to the financial industry, our findings apply to any market where buyers are uncertain about which product is best for them and where sellers face a reputation cost if they provide misleading information. Examples of such markets outside the financial industry could be the market for drugs, where information is provided by physicians, the market for legal advice, and the market for sophisticated technical equipment.

Our main findings can be summarized as follows. Competition among specialized financial intermediaries leads to full credible information disclosure, even for small but strictly positive reputation costs that are bounded away from zero. The basic intuition for this result is that competition may eliminate the potential conflict of interest by reducing the gains from lying and by inducing banks to differentiate their product by providing credible information. Banks can, thus, restore their margins on a smaller base of customers that have a special need for their product. However, the size of reputation costs limit profit margins because of the need to remain credible in giving advice to clients. As a consequence, sellers would gain from the presence of a third party (for instance some independent financial advisor) that could provide information, allowing them to raise prices further.

One-stop banks (defined here as banks that sell multiple products) can also overcome this conflict of interest in certain circumstances. While the usual explanation for the creation of one-stop banks is based on an economies of scope argument that it is more efficient to sell multiple financial products from the same outlet, we find that the ability to credibly provide information is another major motive for consolidation. One-stop banks are able to provide reliable information and charge higher prices than specialized banks when customers face switching costs or, more generally when banks have market power. Otherwise, competition with one-stop banks results in a similar outcome as competition with specialized banks.

The main theoretical novelty of the paper is that firms' actions (the prices they set) define an ensuing signaling game (the advice banks give to customers). These actions commit the firms to credible or non-credible information revelation by providing incentives to tell the truth or not. Most other signaling models have payoffs determined by current or future actions, not past actions as in our model. Moreover, these models have each firm signaling its private information, such as in Mailath (1989). Here, the private information is the information acquired by a bank about its customer's financial profile, which it can reveal as it wishes.

Our model incorporates several elements from the industrial organization literature. As all customers are uncertain of which product they prefer, there are flavors of both horizontal differentiation (Hotelling, 1929) and vertical differentiation (Shaked and Sutton, 1983). In order to provide information to customers, we assume that banks make unverifiable statements about which product is best for the customer. This is a form of information revelation game in which talk is not cheap. In contrast, most other models that have been considered in the literature involve agents providing information that is either cheap talk or verifiable. As is well known, when private information is verifiable, voluntary disclosure often leads to full information revelation(see Grossman and Hart, 1980, Milgrom and Roberts, 1986, and Okuno-Fujiwara, Postlewaite, and Suzumura, 1990). In our setup, we allow for lying, but make it costly by introducing a reputation cost.

The issue of the market provision of information prior to a sale has been discussed in different settings. For example Benabou and Laroque (1992) and Morgan and Stocken (2003) discuss a similar conflict of interest to our paper in the provision of stock recommendations. However, our analysis focuses on direct price competition between information providers, while they consider information providers that benefit from subsequent movements in the secondary market price of a recommended stock.

The environment we discuss resembles in some ways the literature on *credence goods*. For such goods or services the consumer is never able to completely ascertain the quality of the good and must rely on the advice of experts (an example of a credence service is automobile repairs - all one knows is whether the car functions properly, not whether the repair was necessary or well executed). Several papers that discuss credence goods are interested in credible revelation of information (Pitchik and Schotter, 1987) and in competition among credence good providers (Pesendorfer and Wolinsky, 2003). In our model, however, the financial instruments are also partially experience goods, since we allow for a reputation cost for misleading customers. Another difference with the literature on information revelation and credence goods is that prices are not signals in our model, but instead provide incentives for information revelation.

Shavell's (1994) contribution is close to ours in many respects. We focus on the case where information is socially valuable and can only be acquired by sellers, while he allows information also to have no social value and buyers to acquire information. Investment in information is unobservable in Shavell (1994), while we examine both observable and unobservable investment. The largest difference is that we permit Bertrand competition between sellers, whereas he focuses on buyer-seller relations where the seller sets prices.

The paper is organized as follows: Section 2 is devoted to a description of the model. Section 3 studies the benchmark case of monopoly banks. Section 4 considers information production and competition among specialized banks and in Section 5 we study how incentives change when one-stop banks are present. In Section 6 we discuss market structure and switching costs. In Section 7 we study the case where the bank investment in the production of information is not observable. Finally, Section 8 concludes.

2 The model

We consider a model where two financial intermediaries (FIs) compete by offering one or possibly two different types of financial products, which we label simply as A and B. A working example which we will refer to throughout this article is life insurance and pension funds, two substitute savings vehicles with different appeal for different households depending on their tax situation, savings horizon and idiosyncratic income shocks.

2.1 Customers

For simplicity, we take bank customers to be risk neutral households who buy at most one unit of a financial product from an FI.[1]

We assume that customers could be of two different types, A and B, reflecting their different tax status, say. Type A investors matched with product A derive a gross payoff R, while when they get product B they only get a payoff r ($r < R$). Similarly, for type B investors, when matched with product B they get a payoff R and when mismatched they get r. We denote by Δ the difference $R - r$.

Customers do not know which of the two products is best suited for their needs. For example, they may be unaware of important tax advantages of one of the products or they may not be aware of specific contractual clauses such as foreclosure penalties. We model this lack of knowledge as incomplete information about their true type.[2] Thus, all they know is the prior probability of being of type A, which is denoted by q. In addition we assume that

[1] An alternative interpretation may also be that customers are firms choosing between alternative financial structures.

[2] Equivalently, we could interpret this lack of knowledge as incomplete information about the type of the financial product that matches each customer's needs.

this prior probability is equal to the true proportion of type A customers, and that $q > \frac{1}{2}$ (without loss of generality). Given this information and the prices of the financial products posted by the FIs, customers choose which FI to approach. This choice will depend not only on the product's price but also on whether the FI is expected to provide reliable information on the customers' types. Should a customer approaching FI A, say, obtain information that FI B offers the best deal (better matched product at competitive terms) then she will switch to FI B. We assume that the switching cost technology is such that a customer may switch between banks only once.

2.2 Financial Intermediaries

We consider two types of FIs, specialized FIs and one-stop banks. A specialized FI is one that offers only one financial product. A one-stop bank offers both types of financial product[3].

The cost of production for the two products is the same and is normalized to zero. This means that the prices of the two products, p_A and p_B are to be interpreted as **spreads**.

Although customers do not know their type, FIs may know which product best fits the needs of each customer. FIs can offer an advisory service and guide customers to the relevant product but they may face a *conflict of interest* problem in their dual role as financial advisors and sellers of financial products. This conflict of interest puts them in a position where they may not be able to credibly communicate their information about a good match to customers since they have an incentive to peddle their own product. Customers understand this and will only follow an FI's recommendation if it is in the FI's interest to truthfully reveal its information.

An FI's incentive is driven in part by a concern to maintain a *reputation* for honest advice and by competitive pressure, which limits the FI's ability to benefit from its provision of information. To model this reputational concern we assume that an FI suffers a reputation loss of ρ when a lie told to a customer leads to a purchase by that consumer. Obviously, if this reputational loss is very large then the FIs' incentive to peddle their products disappears. This is why we assume that:

[3] The terms *universal bank* or *financial conglomerate* are also commonly used to describe a one-stop bank. We prefer the term one-stop bank since the first term carries a connotation of economies of scope and the second a connotation of regulatory arbitrage, which are both absent from our framework.

Assumption A1: $Min(\Delta, r) > \rho$.

This assumption allows us to focus on the more relevant case where a conflict of interest arises. If ρ is too large, then there is no choice but to reveal full information since the firm will be strictly punished for not doing so. Although we have placed an upper bound on ρ, we allow it to be as low as zero, in which case we are analyzing a pure cheap talk game.

We restrict the customers' strategies with the following assumption:

Assumption A2: There is a tiny amount of uncertainty about the actual values of ρ and R, i.e. $\rho \in [\tilde{\rho} - \varepsilon_1, \tilde{\rho} + \varepsilon_1]$ and $R \in [\tilde{R} - \varepsilon_2, \tilde{R} + \varepsilon_2]$ such that $\varepsilon_1, \varepsilon_2 \to 0$.

For any small amount of uncertainty, however small, firms are unable to set prices exactly at levels to make consumers indifferent between choices(or to balance the reputation effect). Thus, this small uncertainty limits customers to pure strategies and eliminates multiple equilibria.

2.3 Timing

1. FIs decide whether to invest in information provision technology.
2. FIs set prices. To simplify the strategic analysis we will give one of the FIs a price leadership role (that is, one of the FIs moves first in setting prices).
3. Investors approach an FI, which then recommends a financial product.
4. Investors make a decision on which product to purchase at which FI, based on observed prices and the FI's recommendation.

We begin with a brief analysis of monopoly banking.

3 Monopoly Banking

3.1 A specialized monopoly

Under no information provision, a specialized monopoly FI sets the monopoly spread at either

$$r + q\Delta$$

for an A bank, or

$$r + (1 - q)\Delta$$

for a B bank. Under full information a specialized bank either serves all customers at a maximum spread of r or it only serves well matched customers at a monopoly spread of R. The latter policy is optimal for FI A if and only if

$$r \leq qR.$$

It is obvious then, that either FI monopoly strictly prefers consumers to be uninformed as it can sell to both types at a sufficiently large spread. Assuming that the specialized bank has the ability to convey information about customer types, the above results indicate that the incentive to reveal information is quite low. Indeed, analyzing the pricing decision and the signaling game (where customers must purchase product i or receive their reservation utility of zero, and the FI can say whether product i is a good or bad match) in the appendix we prove:

Proposition 1 *A monopoly FI A (B) reveals no information (always recommends product A (B)) and sets price* $p_A = r + q\Delta$ $(p_B = r + (1-q)\Delta)$.

For any price above r, the monopoly can't reveal any information because it would get stuck with only the customers of its type and prefer to deviate and grab all of the customers. Given an investment in information provision, the rents from selling to all of the market outweigh the reputation cost of lying to a fraction of the customers (using assumption **A1**). This logic, which is present as well in comparing the no information case to the full information case, disappears when competition is introduced, as we will see in the following sections. The advantage of having a captive audience that has high valuations for the product drives this reversal.

3.2 Monopoly Pricing of a one-stop bank

The key difference between a specialized and a one-stop FI is that the latter will find it much easier to overcome the conflict of interest problem in the provision of information. This can be explained by the fact that provision of information need no longer result in any loss of clientele. This an important potential benefit of one-stop banks emphasized by bankers who deal with the marketing of financial products.

We now assume that one FI, which we will call FI 1, offers both financial products A and B without competition at prices p_{1A} and p_{1B}, and refer to this FI as a one-stop bank. Market power gives the FI leverage in pricing, but it cannot fully extract consumer rents if it is unable to provide information. In this case, the best that the FI can do would be to set p_{1A} equal to $r + q\Delta$, and set p_{1B} so that no one will purchase it (i.e. $p_{1B} > r + (1 - q)\Delta$). The one-stop bank then does not even sell both products, it sells the one for which customers have a higher ex-ante valuation. Its actions emulate those of a specialized bank.

In the case where the one-stop bank can provide information, product B is sold to type B customers. The one-stop bank is able to segment the market and extract full rents by providing full information.

Proposition 2 *A monopoly one-stop bank fully reveals information, customers purchase the product which matches their type, and prices are* $p_{1A} = p_{1B} = R$.

Note that when $\rho > 0$, the one-stop bank can credibly reveal the information it has about customer types. The reason is simply that by making the prices of the two products close to each other, it eliminates the incentive to misdirect the customer, and saves the reputation cost ρ when it tells the truth. By setting the prices equal to R, the bank can tell the truth and simultaneously extract all rents. When $\rho = 0$ the bank is indifferent and one equilibrium is for the bank to tell the truth.

This section highlights a simple but important economic principle, which is that monopoly one-stop banks are better able to overcome the conflict of interest problem in advising their clients on what product is best for them. We shall now see however that when there is competition among banks this general principle is no longer valid. Put simply, competition induces information revelation whether it is between specialized banks or with a one-stop bank.[4]

[4] We take the reputation cost per customer incurred when lying as exogenously fixed at ρ. It might be argued, however, that the reputation cost varies with market structure. To the extent that monopolists extract larger mark-ups they may be more wary of losing future customers. On the other hand, monopolists face a captive demand, which makes them less concerned about losing business to competitiors. How these countervailing effects play out requires a more detailed analysis, which is beyond the scope of this paper.

4 Information Provision and Competition among Specialized FIs

This section is devoted to studying under what conditions a specialized FI has incentives to provide information to its customers in equilibrium. This will be contrasted with the provision of information by one-stop banks considered in the next section. Intuitively, specialized FIs have a conflict of interest in advising their prospective customers to bank at the competitor FI. At the same time, truthful revelation increases the customers' valuations for their own products. These diverging incentives determine the equilibrium amount of revelation. Before analyzing the FIs' incentives for truthful revelation it is helpful to first consider the extreme situations of no information revelation and full information disclosure.

4.1 Competition with no information

In the absence of any additional information, a customer buys product A provided by the FI specialized in A services if and only if:

$$qR + (1-q)r - p_A \geq qr + (1-q)R - p_B \tag{1}$$

That is, if and only if

$$(2q-1)\Delta \geq p_A - p_B$$

Thus, FI A will set a price[5] $p_A = (2q-1)\Delta$, forcing FI B to zero profits. For this price level the customer's participation constraint is satisfied:

$$qR + (1-q)r - (2q-1)\Delta = R - q\Delta \geq 0$$

As is intuitive, the larger the product differentiation Δ and the larger the probability that customers are of type A, the larger the price difference and A's profits. The closer Δ is to zero and/or the closer q is to $\frac{1}{2}$ the more intense the competition between FIs and the larger is the customer's surplus, as the two products become close substitutes from the perspective of uninformed

[5] This is for the case where FI A is the price leader. If FI B is the price leader, there are multiple equilibria which consist of p_B and $p_A = \min[(2q-1)\Delta + p_B, qR + (1-q)r]$ since FI B always makes zero profits. Note that the equilibrium when FI A is the price leader is included in this set.

customers. Absent any information, FI B makes zero profits due to the ex-ante preference of customers for product A.

4.2 Competition under full information

Suppose that a customer knows her true type. All A-customers are then likely to bank at FI A, and all B-customers to bank at FI B. In other words, each FI is then likely to have a captive clientele. This will have the effect of dampening price competition as each FI will be reluctant to cut prices low enough to attract mismatched customers. It is not surprising then that the following proposition should hold:

Proposition 3 *Under full information, if FI A is the price leader, the equilibrium prices are* $p_A = \frac{2-q}{q}\Delta$ *and* $p_B = \frac{2}{q}\Delta$, *and equilibrium profits are* $\pi_A = (2-q)\Delta$ *and* $\pi_B = \frac{2(1-q)}{q}\Delta$.

This is straightforward and is proven in the appendix. Note that if FI B becomes the price leader, the results are symmetric (switch A for B and q for $1-q$).

The comparison with the absence of information case points out the mitigating effect of quality uncertainty (Bester (1998)). Information production increases efficiency (total surplus here is R, compared to $qR + (1-q)r$ in the no information case), but it also decreases competition through higher prices as every firm now has market power over its own type. We will now show however that this monopoly power is impaired by the FIs' conflict of interest problem in advising its customers.

4.3 Competition under credible information production

When FIs must be induced to give honest advice they are in a weaker position to exploit their local monopoly power. The reason is simply that if they charge high prices and also recommend their expensive product to prospective customers, this recommendation is not credible.

Once FIs have set their prices and customers have made their decision on which FI to approach, an FI that has invested in information provision can ascertain the true types of customers. We analyze the incentives of the FI to provide information as a signaling game where the FI's type is its information about the customer.

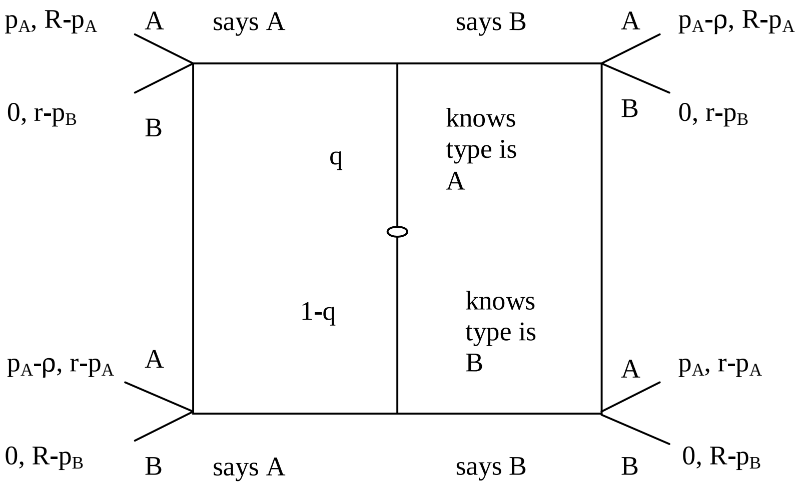

Figure 1: The Information Revelation Game

4.3.1 The information revelation game for a specialized FI

An FI's strategy can be summarized by two variables: the probability α that a type A customer is correctly advised to choose product A and the probability β that a type B customer is wrongly advised to take product A.

Having received a recommendation $\widehat{A}$ to purchase product A, or $\widehat{B}$ to purchase product B, a customer's strategy can be described, symmetrically, by the probability a of following the advice to take product A, and the probability b of following the advice to take product B. Figure 1 shows the basic information revelation game structure.

We begin by characterizing Perfect Bayesian Equilibria in the information revelation game of FI A, taking as given the prices quoted by the FIs and the customers' decisions as to which FI to approach. In a second step we shall move back in the game tree and solve for the equilibrium prices and customer decisions on where to bank in the full game. As is standard for a Perfect Bayesian Equilibrium, each agent chooses optimally its strategy given the equilibrium (or out-of-equilibrium) beliefs and the other agents' strategies. For out-of-equilibrium beliefs we rely on the Cho-Kreps (1987) intuitive criterion to pin down beliefs.

In order to compute the solution of the information revelation game, we will consider the optimal strategy of the different agents. FIs maximize their profits net of the reputation cost of lying. So when FI A observes a type A customer the necessary condition for FI A to truthfully reveal $A's$ type is:

$$ap_A \geq (1-b)(p_A - \rho),$$

or equivalently, using the notation $\equiv$ to mean "defined by":

$$\Delta\pi_A(A) \equiv (a+b-1)p_A + (1-b)\rho \geq 0 \tag{2}$$

Symmetrically, when FI A observes a type B customer, the necessary condition for FI A to truthfully reveal B's type is:

$$\Delta\pi_A(B) \equiv -(a+b-1)p_A + a\rho \geq 0 \tag{3}$$

Since in general FIs may play mixed strategies, customers must use equilibrium updated beliefs when they receive a recommendation in order to compute their optimal strategies. We restricted customers' strategies, on the other hand, to pure strategies with assumption **A2**.

Customers react to an FI's announcement by choosing a product. Denote by $\widehat{X}$ the announcement a customer receives and by $p(i \mid \widehat{X})$ the updated belief that an agent receiving the announcement $\widehat{X}$ is of type i (where $i = A, B$ and $\widehat{X} = \widehat{A}, \widehat{B}$). The necessary condition for a customer at FI A receiving a recommendation $\widehat{A}$ to buy product A is then:

$$p(A \mid \widehat{A})R + (1 - p(A \mid \widehat{A}))r - p_A \geq p(A \mid \widehat{A})r + (1 - p(A \mid \widehat{A}))R - p_B$$

This can be simplified to

$$(2p(A \mid \widehat{A}) - 1)\Delta \geq p_A - p_B$$

or equivalently,

$$\Delta U_A(\widehat{A}) \equiv (2p(A \mid \widehat{A}) - 1)\Delta - p_A + p_B \geq 0 \tag{4}$$

Correspondingly, the necessary conditions for a for a customer at FI A receiving a recommendation $\widehat{B}$ to buy product B is:

$$\Delta U_A(\widehat{B}) = (2p(B \mid \widehat{B}) - 1)\Delta - p_B + p_A \geq 0 \tag{5}$$

A Perfect Bayesian Equilibrium will then be defined by a set of posterior beliefs $p(i \mid \widehat{X})$, which are consistent with the optimal behavior of FIs and customers as inferred from the signs of $\Delta\pi_A(A)$, $\Delta\pi_A(B)$, $\Delta U_A(\widehat{A})$ and $\Delta U_A(\widehat{B})$.

The following lemma provides a characterization of the FIs' information revelation in equilibrium. It is the central result of our analysis.

Lemma 4 *Under assumptions A1 and A2, equilibria in the information revelation game of FI A are as follows:*

1. *If $p_A < p_B - \Delta$, then FI A truthfully reveals the customer's type and all customers purchase A.*
2. *If $p_B - \Delta < p_A < \rho$, then FI A truthfully reveals the customer's type and the customers purchase the good that matches their type.*
3. *If $\max[\rho, p_B - \Delta] < p_A < p_B + (2q-1)\Delta$, then FI A always announces $\hat{A}$ and customers purchase A.*
4. *If $p_A > p_B + (2q-1)\Delta$, then either*
   (a) *the FI A mixes its messages for both types of customers ($\alpha, \beta \in (0,1) \times (0,1)$), or mixes its messages for one type of customer ($\alpha = 1, \beta \in (0,1)$) or ($\beta = 1, \alpha \in (0,1)$) within a range defined by*

   $$p_A > p_B + \Delta \max[2\frac{\alpha q}{\alpha q + \beta(1-q)} - 1, 1 - 2\frac{(1-\beta)(1-q)}{(1-\alpha)q + (1-\beta)(1-q)}]$$

   or

   (b) *systematically announces $\widehat{A}$ provided the out-of-equilibrium beliefs $P(B \mid \widehat{B})$ satisfy*

   $$p_A > p_B + \Delta \max\left[2q - 1, 1 - 2P(B \mid \widehat{B})\right]$$

   or

(c) *systematically announces $\widehat{B}$ provided the out-of-equilibrium beliefs $P(A \mid \widehat{A})$ satisfy*

$$p_A > p_B + \Delta \max \left[2q - 1, 2P(A \mid \widehat{A}) - 1 \right]$$

and all customers purchase B.

5. *If $p_A > p_B + \Delta$, then all customers purchase B and any revelation strategy (including full revelation) is an equilibrium*

The proof of the lemma is in the appendix. We can now use it to determine for a given set of parameters ρ, q, Δ, and prices p_A and p_B what information revelation regime a firm is in. In one interval, $p_B + (2q-1)\Delta < p_A < \rho$, there exist multiple equilibria: a fully revealing one where customers follow FI A's advice and many partially revealing equilibria in which all customers purchase product B. However, given that $p_A < \rho$, any partially revealing strategy by a sender type of FI A (where sender types are "Knows customer is type A" and "Knows customer is type B") is weakly dominated by a strategy of full revelation. Hence the partially revealing strategy will not survive any tiny trembles in the customer's decision, and we ignore it[6]. Since FI A and FI B are symmetric except for consumer's ex-ante preferences, we can replicate Lemma 2 for FI B by substituting in $(1-q)$ for q.

In Figure 2 we fix p_B and display FI A's information revelation regime for any possible p_A that it may set. We find that when FI A has very low prices, it has the incentives to reveal information truthfully and can capture the whole market. In contrast, when FI A has high prices, it will not get any customers, and will be willing to say anything. For a middle range of prices, FI A may credibly reveal information but only capture the customers who are good matches, or it may reveal nothing and take advantage of its ex-ante advantage in terms of consumers' preferences.

At this point we have solved the subgame of information revelation given fixed prices. We can now determine how each firm sets its prices and then determine which firm invests in information provision in equilibrium.

[6]More formally, type "Knows customer is type A" gets a payoff of either 0 or p_A by announcing $\hat{A}$ and gets a payoff of either 0 or $p_A - \rho$ by announcing $\hat{B}$. In the interval of parameters, $p_A < \rho$, so weak dominance is clear. Similarly type "Knows customer is type B" gets a payoff of either 0 or p_A by announcing $\hat{B}$ and gets a payoff of either 0 or $p_A - \rho$ by announcing $\hat{A}$. Therefore, any partially revealing equilibrium in this interval does not survive the test of trembling hand perfection.

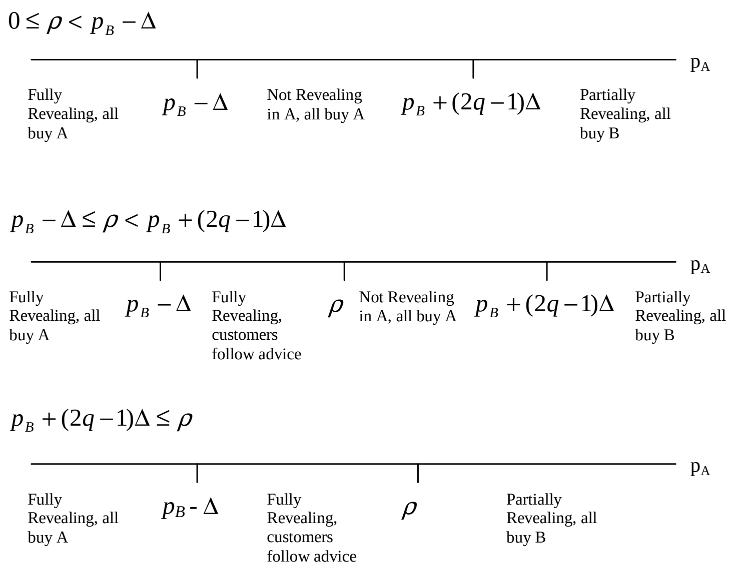

Figure 2: The Information Revelation Regimes of FI A (holding p_B fixed)

4.3.2 The price competition game between specialized FIs

The previous lemma characterizes a number of scenarios where there is either partial or no credible information disclosure given p_A and p_B. This limited information disclosure outcome is what one would expect to see in light of our observation that monopoly specialized FIs are never able to credibly convey information. We now show however that price competition among specialized FIs is likely to bring about equilibrium outcomes where each FI can credibly convey information. To see this, suppose for the sake of argument that specialized FIs are never able to credibly convey information. Then, as we showed earlier, Bertrand competition under no information will result in an equilibrium outcome where $\pi_B = 0$ and $\pi_A = (2q-1)\Delta$. But note that bank B will then have a strict incentive to truthfully reveal the customer's type, as long as $\rho > 0$. This is due to the fact that bank B would be able to raise its price p_B up to ρ, credibly convey information to its well matched customers and make higher profits.

In our formal analysis of the price competition stage game we begin by assuming that firm A is the price leader and firm B is the price follower. This means that FI A essentially defines the choice set of possible information revelation regimes (with their accompanying profits) and FI B decides where to locate in the choice set. Clearly this gives FI B an advantage it never had when customers did not have access to information - it can force some information to be revealed credibly and increase its sales.

Our simple observations above lead us to conclude:

Proposition 5 *1) When A invests in information and B does not, there are two possible equilibria. If $\rho > (2q-1)\Delta$, equilibrium is $p_A = \rho, p_B = \rho + \Delta$, all customers approach FI A and are revealed their true types. Customers then purchase at the bank that matches their type, so profits are $\pi_A = q\rho$, $\pi_B = (1-q)(\rho+\Delta)$. If $\rho < (2q-1)\Delta$, equilibrium is $p_A = (2q-1)\Delta, p_B$ undetermined, all customers approach FI A, are all told they are type A, and purchase at FI A. Profits are $\pi_A = (2q-1)\Delta$, $\pi_B = 0$.*

2) When B invests in information and A does not, the equilibrium is $p_A = \min[(1-q)\rho + \Delta, \rho + (2q-1)\Delta], p_B = \rho$, all customers approach FI B and are revealed their true types. Customers follow the advice of FI B and profits are $\pi_A = qp_A$, $\pi_B = (1-q)\rho$.

3) When both A and B invest in information, the equilibrium is $p_A = \min[(1-q)\rho+\Delta, \rho+(2q-1)\Delta], p_B = \rho$, just as in the case of only B investing in information. All customers approach FI B or are indifferent between approaching FI A or FI B and are revealed their true types. Customers follow the advice of the bank they approach and profits are $\pi_A = qp_A$, $\pi_B = (1-q)\rho$.

The proof is in the appendix.

Thus, for almost all of the cases the types of customers are completely revealed, and prices are such that they purchase the product which matches their type. This results from the following intuition: FI B can almost always set its price low enough so that FI A will have zero profits. Therefore FI A must set its price such that FI B will find it more attractive not to undercut. This must be a regime where both FI A and FI B make positive profits. The only area where both firms may profit is where they can commit to fully revealing types and customers find the price differential small enough to purchase the product which matches their type. The only case in which information is not revealed occurs when ex-ante valuations are so biased towards product A ($(2q-1)\Delta > \rho$) that FI A can extract higher rents by not revealing information. The role of reputation is quite critical here - in order to commit to full revelation, the payoff from deviating must be non-positive, hence the size of ρ strictly limits the payoff for the firm that is providing information. Therefore, information revelation becomes a survival strategy to relax price competition by increasing product differentiation. However, unlike the conclusion reached by Bester (1998) here the incentive constraints for credible information provision limit the extent to which FIs can exploit their monopoly power.

4.3.3 The information provision game between specialized FIs

We are now in a position to roll back to the first stage of the game, where FIs make their investment in information-provision decisions. We have so far taken the information structure as given (which bank provides information). Now we let banks choose whether they want to invest in an information provision technology (hire analysts, build IT systems, etc.) at some fixed cost $f > 0$. To the extent that information provision is a public good and is costly to produce it is efficient for at most one bank to provide this information. We now show that in equilibrium no more than one bank will provide information, and that it is the disadvantaged bank that is likely to provide that information. That is, that bank B is most likely to provide that information. This is not entirely surprising given that the value of information is highest for that bank. Putting together this observation with our previous finding that the disadvantaged bank is the one with the strongest incentives towards truthful revelation of information we are able to obtain the remarkable result that, as long as investment in information provision is profitable in equilibrium, there always will be full information disclosure under competition between specialized FIs.

The basic logic leading us to this conclusion runs as follows. Under no information provision, the unique equilibrium in profits is such that $\pi_B = 0$ and $\pi_A = (2q-1)\Delta$. If bank A were to provide information and communicate it credibly to its customers it would have to set its margin p_A no higher than ρ. Thus, bank A's profits under full credible information revelation would be no more than $q\rho - f$. Therefore bank A would not want to provide information whenever

$$(2q-1)\Delta \geq q\rho - f.$$

Our earlier analysis also leads us to conclude that when $(2q-1)\Delta \geq \rho$ and only bank A is in a position to provide information then there will be no credible information disclosure in equilibrium. This appears to set a limit to the amount of credible information disclosure we should expect to see in an equilibrium with competition among specialized FIs.

However, since bank B has, if anything, even more to gain from providing information there will be full credible information disclosure in equilibrium for a much larger set of parameter values.

Proposition 6 *There is full credible information disclosure in equilibrium when* $\rho \geq \frac{f}{1-q}$*. Otherwise, no information will be disclosed.*

Proof. The decision to invest is a two by two game summarized by the following matrix[7]:

		FI B	
		No Info	Info
FI A	No Info	$(2q-1)\Delta, 0$	$qp_A, (1-q)\rho-f$
	Info if $\rho>(2q-1)\Delta$	$q\rho-f, (1-q)(\rho+\Delta)$	$qp_A-f, (1-q)\rho-f$
	Info if $\rho<(2q-1)\Delta$	$(2q-1)\Delta-(1-q)\rho-f, 0$	$qp_A-f, (1-q)\rho-f$

Figure 3: Matrix for Competition among Specialized Banks (A is the price leader)

When ρ is small ($\frac{f}{1-q} < \rho < \frac{(2q-1)\Delta+f}{q}$), there is a unique equilibrium: FI B provides information and FI A does not. All customers approach FI B first, are revealed their true type, and purchase the product meant for them. When ρ is large ($\rho > \frac{(2q-1)\Delta+f}{q}$), not providing information is no longer a dominant strategy for FI A, and there are two equilibria: one where only FI A provides and one where only FI B provides. There can be no mixed strategy equilibrium here due to assumption **A2**, which makes it impossible to be indifferent. Lastly, when ρ is tiny or zero ($\rho < \frac{f}{1-q}$), the unique equilibrium is for both firms to not provide information. ■

[7] For presentation purposes, we place a strict upper bound such that $f < (1-q)(2q-1)\Delta$. This incorporates the case where the fixed cost is close to zero.

Reputation proves quite important since firms can commit to full revelation where they share the market by setting a price just below the reputation cost. FI B has a strong incentive to provide information since the information gives it the market power it was lacking when all customers ex-ante preferred product A. FI A can free ride on this information provision as its own investment in information would not change its returns. In fact, for intermediate values of ρ, FI A has a dominant strategy not to provide information since if FI B doesn't provide information FI A can still enjoy its inherent advantage. Once ρ gets larger, FI A can possibly credibly provide information, because it receives a high enough rent to justify its provision. Lastly, notice that as ρ approaches zero, all of FI B's rents disappear in every scenario. The lack of a reputation cost eliminates the ability to credibly reveal information, which FI B used to achieve positive profits.

Total welfare is actually maximized in the equilibria where full information is provided, since each customer is able to realize more utility due to the match. When information is not provided, as is the case when ρ is tiny, matching efficiency is not realized and welfare decreases.

When FI B is the price leader, the qualitative results do not change substantially. The payoffs are given by the following matrix (the proof is in the appendix):

FI B

		No Info	Info
FI A	No Info	$(2q-1)\Delta+p_B^{NI,NI}$, 0	$q(\rho+\Delta)$, $(1-q)\rho-f$
	Info if $\rho>(2q-1)\Delta$	$q\rho-f$, $(1-q)(\rho-(2q-1)\Delta)$	$q(\rho+\Delta)-f$, $(1-q)\rho-f$
	Info if $\rho<(2q-1)\Delta$	$(2q-1)\Delta-(1-q)\rho+p_B^{I,NI}-f$, 0	$q(\rho+\Delta)-f$, $(1-q)\rho-f$

Figure 4: Matrix for Competition among Specialized Banks (B is the price leader)

A few things are interesting to observe here. First, the (No Information, No Information) and the (Information if $\rho < (2q-1)\Delta$, No Information) cases are not determined, since for any p_B announced by FI B, FI A will be able to grab all of the customers and leave FI B with zero profits. For the purposes of comparison, we assume p_B is the same in both cases ($p_B^{NI,NI} = p_B^{NI,I}$). Second, the (Information, Information) case is more complex here, since FI A's advantage in ex-ante preferences allows it to free ride on FI B in the sense that FI A may keep its prices high and allow FI B to inform customers of their types. Indeed, the equilibrium has FI A partially revealing, FI B fully revealing, all customers approaching FI B first but then following FI B's advice.

Third, it is clear from the (Information, Information) case, and the (No Information, Information) case that FI A is able to exploit its role as a price follower to its advantage in achieving higher payoffs.

We find that for reputation cost that is tiny or equal to zero ($\rho < \frac{f}{1-q}$), the unique equilibrium is that neither firm provides information. For larger reputation costs, the unique equilibrium is that only FI B provides information. All customers go to FI B, are revealed their true type, and purchase the product which matches their type.

5 Competition between a one-stop bank and a specialized FI

Suppose that a one-stop bank, FI 1, competes against another FI that remains specialized and offers product B. Since both banks have product B, competition is much tougher in a certain sense. We will first look at the case where FI 1 is the price leader.

When neither FI provides any information, the equilibrium is the same as in the case of competition between specialized FIs. This is also true under full information (i.e. where customers know their type). Hence the one-stop bank does not profit strategically or directly from having product B.

In the case of competition when information revelation is endogenous, FI 1 will always be undercut on product B by FI B. This implies we can use Lemma 4 since the elements of the signaling game remain the same. However, FI 1 can use the price p_{1B} strategically to limit FI B from imposing an information revelation regime that is not advantageous to FI 1. This is the main difference between this case and the one in which FI A and FI B compete with FI A as the price leader. Therefore, profits here will be at least as large as in that case, if not larger.

This logic changes the solution somewhat anytime when FI B provides information. Remember that in this situation, we found $p_A = \min[(1-q)\rho + \Delta, \rho + (2q-1)\Delta]$. This represented the fact that FI A wanted to make sure FI B would have higher profits by pricing in a region which would commit FI B to full revelation (with customers following its advice) as well as make sure that FI B could not raise its price and enter a non-revealing regime. The issue of keeping FI B from raising its price is one that the one-stop bank can solve easily by setting its price for product B appropriately and hence creating an upper bound for p_B. Therefore $p_{1A} = (1-q)\rho + \Delta$ and $\pi_1 = q((1-q)\rho + \Delta)$.

The information provision game remains similar for smaller values of ρ. When ρ is tiny, no one provides information. When ρ is small, only FI B provides information. When ρ is large, the result is undetermined. This is due to the fact that the payoff for FI B depends on what price p_{1B} FI 1 sets, and FI 1 is indifferent over a range of prices ($p_{1B} < \rho + \Delta$) since it will not sell any of product B.

In contrast, when FI B is the price leader, results change in the information revelation game from when there were just two specialized banks competing. Let's assume FI B chooses some price p_B. Hence in the environment where no information is provided, the equilibrium is $p_{1A} = (2q-1)\Delta + p_B$ and $p_{1B} > p_B$, with all profits going to the one-stop bank and all consumers purchasing product A. When customers know their type ex-ante, the one stop bank gets all of the profits and consumers purchase the product which matches their type[8].

When information provision is endogenous, the signaling game changes significantly from section 4. First of all, the game for FI 1 can look like the game where a one-stop bank has no competition if it undercuts FI B and sets $p_{1B} = p_B - \delta$ (where δ is small). In this case we can apply the results from the signaling game of Proposition 2 to find the solution. It is straightforward to show that if FI 1 undercuts FI B, it will set $p_{1A} = p_{1B} + \rho = p_B - \delta + \rho$ and achieve profits of $p_B - \delta + q\rho$ when $\rho > (2q-1)\Delta$, or set $p_{1A} = p_{1B} + (2q-1)\Delta = p_B - \delta + (2q-1)\Delta$ and achieve profits of $p_B - \delta + (2q-1)\Delta - (1-q)\rho$ when

[8] Restricting attention to pure strategies, if $p_B > r$, $p_{1A} = R$ and $p_{1B} = p_B - \delta$ (where δ is small), while if $p_B < r$, $p_{1A} = \Delta + p_B - \delta$ and $p_{1B} = p_B - \delta$.

$\rho < (2q-1)\Delta$. This gives FI 1 weakly larger profits than a specialized FI A gets when FI B does not provide information (compare with Figure 4). When FI B provides information, however, it may choose p_B strategically to avoid undercutting behavior and make positive profits. Basically, it can choose p_B^* such that it satisfies the incentive constraint of FI 1 to prefer not to undercut on product B. Using this logic and the solution from the case of FI A vs. FI B[9], this implies $p_B^* = \min[\rho, \frac{q}{1-q}(\Delta-\rho)]$ if FI 1 provides information and $\rho > (2q-1)\Delta$, and $p_B^* = \rho$ otherwise. This yields the following payoff matrix:

		FI B: No Info	FI B: Info
FI A	No Info	$(2q-1)\Delta + p_B^{NI,NI}$, 0	$q(\rho+\Delta)$, $(1-q)\rho-f$
	Info if $\rho>(2q-1)\Delta$	$p_B^{I,NI} + q\rho - f$, 0	$q(p_B^* + \Delta) - f$, $(1-q)\, p_B^* - f$
	Info if $\rho<(2q-1)\Delta$	$(2q-1)\Delta - (1-q)\rho + p_B^{I,NI} - f$, 0	$q(\rho+\Delta)-f$, $(1-q)\rho-f$

Figure 5: Matrix for Competition between a One-Stop and a Specialized FI (B is the price leader)

Despite the differences in the potential strategies, we find equilibria that are similar to our previous ones[10]. For $\rho < \frac{f}{1-q}$, the unique solution is that neither FI provides information. For larger values of ρ, their may either be one equilibrium, where only FI B provides information, or two equilibria, each where only one FI provides information[11].

[9]Note that in this case, one part of the no-undercutting constraint is that $\rho < p_{1A} - (2q-1)\Delta$. This implies $(1-(1-q)(2q-1))\Delta > \rho$, which we assume to be true here.

[10]Also assuming that $p_B^{NI,NI} = p_B^{I,NI}$ as before.

[11]Specifically, if $\rho < q\Delta$, there is only one equilibrium in the high range (FI B provides information). If $\rho > q\Delta$, for $\frac{f}{1-q} < \rho < \hat{\rho}$, there is only one equilibrium (FI B

6 Switching Costs

Changing the structure of switching costs within our model would change results dramatically. Imagine that instead of the ability to switch between banks once for free, it was impossible to switch at all. This creates more market power and highlights a different role for information revelation. First, consider our basic model of competition between FI A and FI B. With high switching costs, there is no room for information provision:

Proposition 7 *With high switching costs and FI A as the price leader, neither firm invests in information provision and $\pi_A = (2q-1)\Delta$ and $\pi_B = 0$.*

The equilibrium is the same as was described in the section on competition under no information. The reason is quite simple. The switching costs eliminate the effect of firm i's prices on firm j's signaling regime. Each firm thus acts like a monopoly specialized bank in signaling. Since the highest utility that can be offered to customers when they are deciding which firm to approach is the same as their uninformed ex-ante utility, there is no incentive for either firm to invest in information provision. Switching costs thus lead to a reduction in total surplus, as the lack of information causes matching inefficiency.

Next, consider competition between a one-stop bank (denoted before as FI 1) and FI B. FI B will find it useless to provide information for the same reason as above, i.e. even with information it can't increase the expected valuations of customers. This ruins its potential to strategically force FI 1 into softer competition. FI 1, on the other hand, has an incentive to reveal information and raise customers' ex-ante valuations for banking there. It can accomplish this credibly by setting $p_{1A} = p_{1B}$ (see Proposition 2) as in the case when it is a monopoly.

Proposition 8 *With high switching costs and the one-stop bank as the price leader, the one-stop bank fully reveals its information and $\pi_A = q\Delta$ and $\pi_B = 0$.*

The profits are derived from the fact that expected valuations of approaching the one-stop bank for customers is R, while for approaching FI B

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provides information), while for $\rho > \hat{\rho}$ there are two equilibria (one where only FI B provides information, and one where only FI A provides information). Here we define $\hat{\rho} = \max[\frac{(2q-1)\Delta+f}{q}, \frac{q\Delta-f}{q}]$.

it is $qr + (1 - q)R$. Here switching costs allow for matching efficiency for all levels of reputation costs.

7 Market Structure

We have found that in all equilibria when the reputation cost is significant, competition between firms creates the incentives not only to provide information, but to provide full information to all customers.

For very small costs of reputation, no information is provided when there is competition. However, when the market is dominated by a one-stop bank, as long as the reputation cost is positive the one-stop bank can credibly provide information and extract the customers' rents. Hence, the gains from reducing competition/increasing market power are much larger when reputation costs are low. As we saw in the previous section, switching costs can implicitly create market power.

Adding a product (going from a specialized bank to a one-stop bank) while competing can yield added profits in certain circumstances. Clearly, it softens competition if the market is already homogeneous (such as competition between two FI Bs). However, another product can also be used as a strategic buffer, keeping the other firm from entering a disadvantageous information revelation regime and therefore allowing more profits (we see this when the reputation cost is low ($\rho < \frac{2(1-q)}{q}\Delta$) in competition between FI 1 and FI B).

The conditions under which one-stop banks can prosper are quite interesting given current trends. The abolition of the Glass-Steagall act in 1999 paved the way in the United States for the creation of one-stop banks. In Europe, such banks, called "universal banks" have existed for many years, but are now undergoing a shake-up as mergers across borders are seen as necessary for survival[12]. The traditional explanation for the trend towards consolidation are the economies of scope realized by selling multiple financial products from the same outlet. However, by analyzing these banks from an information provision perspective, we open up a richer understanding of market structure.

From a welfare perspective, when customers are ex-ante fully informed, welfare is maximized at the expense of consumer surplus. When customers

[12] This is echoed in Banking Surveys by The Economist (April 4, 2002) and The Financial Times (May 24, 2002).

are uninformed, welfare is low as all B types purchase product A. Endogenizing information revelation comes close to maximizing welfare (within the cost f of information provision) at the expense of lower firm profits due to competitive pressure. Market power due to conglomeration restores full extraction of the maximized surplus by the FI when information revelation is possible[13].

While market power extracts full rents, we find that in the absence of market power, ex-ante full information yields the largest profits. The FIs must take losses in order to be able to commit to credible revelation of information. Although we do not model heterogeneity among clients, it is likely that larger and wealthier customers have more information about (or more advisers to counsel them on) their specific needs. Interestingly, by being better informed, they could be forced to pay more in terms of higher prices per product. These types of clients may be large money-makers for banks in terms of not only volume, but per-unit return. Indeed, there is a large focus in the banking industry on catering to these higher end customers ('private banking'). We elaborate on the effect that we describe here in the next section.

8 Unobservable Investments in Information Provision

In the previous sections it was assumed that customers were able to check that the bank had made the necessary investment to provide them with reliable information. Nevertheless, these investments may be difficult and/or undesirable for banks to demonstrate. If so, the banks' investments in information provision are subject to moral hazard. Banks will invest in information provision if and only if this leads to higher profits, while customers will only infer the investment has been made when the bank profits from the investment. As a consequence, the nature of the equilibrium is modified.

A natural question that then arises is what impact the observability of information provision services has on the industry. This question becomes

[13] How realistic is the notion of market power among financial intermediaries? "A handful of familiar names - Citigroup, J.P. Morgan Chase, Goldman Sachs, Merrill Lynch - dominates these businesses, either because it takes a huge investment to build them, or because only top names are trusted. Yet only Citigroup offers corporate and institutional clients the full range of services..." (The Economist, April 4th, 2002)

even more salient when we discuss the nature of Independent Financial Advisors, advisors separate from banks who may or may not be providing "good" information.

8.1 Unobservable investments with competition between specialized FIs

The basic timing of the game remains the same, except that the investment in stage 1 in information provision is observable only to the firm making the investment. The values of all parameters of the game are common knowledge among all participants. For brevity, we will only focus on the case of competition between specialized banks where FI A is the price leader.

FI B will invest in information when it is better than the outside option and has no profitable deviation. A profitable deviation would be not to invest in information, holding the subsequent price and customers' beliefs that FI B invested in information fixed. In this case, customers believing that FI B has information will approach FI B to solicit advice, and all will be recommended to purchase product B (this is a best response for FI B). We summarize this logic in an incentive constraint:

$$(1-q)p_B - f > p_B - q\rho \tag{6}$$

This implies an upper bound for p_B of $\rho - \frac{f}{q}$. Notice that this is strictly lower than the upper bound for credible information provision when investment in information is observable (ρ).

Adding the participation constraint:

$$(1-q)p_B - f > 0$$

Setting p_B equal to its upper bound $\rho - \frac{f}{q}$, and plugging the value into the participation constraint implies:

$$\rho > \frac{f}{(1-q)q}$$

This condition on the reputation cost is strong. It means there is an interval for values of ρ, $(\frac{f}{(1-q)}, \frac{f}{(1-q)q})$, where information would be provided when investment is observable but would not under unobservable investment. Thus, the unobservability, perhaps unsurprisingly, decreases total surplus.

Similarly, we look for equilibria where FI A is willing to invest in information. We can derive an incentive constraint for FI A by substituting $1-q$ for q in equation 6 and set FI A's price equal to the maximum of this interval, $\rho - \frac{f}{1-q}$. The participation constraint for FI A is not symmetric, though, since FI A's payoff from not investing in information and all customers knowing this would be positive: $(2q-1)\Delta$. Thus the participation constraint reduces to:

$$qp_B - f > (2q-1)\Delta \qquad \Longrightarrow \rho > \frac{f}{(1-q)q} + \frac{(2q-1)\Delta}{q}$$

Like the case of observable investment, an equilibrium that has FI A investing only occurs when the reputation cost is larger, because then the payoff is substantial enough. It is also clear that the cutoff for which there are equilibrium where either FI A or FI B provide information is higher here than in the case of observable investment (where it was $\frac{f}{q} + \frac{(2q-1)\Delta}{q}$).

An equilibrium where no firm invests in information is always an equilibrium, for all parameter values. This is clear when we look at the incentive constraint. If the FI does not invest in information and the customers know this, it gets some non-negative payoff $\tilde{\pi}$. By deviating and investing in information, given customers believe it will not provide any, its payoff will be $\tilde{\pi} - f$. We call this the "Cassandra effect", as the FI may have valuable information to reveal, but no customer is listening.

Therefore, the set of equilibria resembles that of observable information with two main differences. First, there is a larger interval for which no information provision is the unique equilibrium. Second, due to the "Cassandra effect", no information provision is always an equilibrium.

8.2 Independent Financial Advisors

A discussion about potential conflicts of interest across the financial sector has been opened recently, in part due the large scandal recently settled by the SEC and 10 prominent Wall Street firms for \$1.4 billion. Separating financial advisors from the products they sell is a remedy that seems obvious[14] . This can come in two forms: creating a so-called "Chinese wall" between the analytical and sales areas of each bank, or allowing the analytical areas to

[14] Indeed, it is one of the immediate remedies called for by the SEC in the aforementioned case.

be spun off into independent financial advisors (IFAs). Interestingly enough, in the framework of our model, this separation can be strictly beneficial to the financial intermediaries. However, we find that it is not always clear that IFAs will actually provide more information than the banks themselves. As in the previous section, we will focus on competition between two differentiated specialized banks.

The fact that financial intermediaries will benefit from credible information provision by IFAs is easy to see. Suppose that the financial advisor has the correct incentives to tell the truth[15]. Then customers have perfect information before they approach the banks. As shown earlier in the paper, when competition exists between specialized banks, profits are larger under full information than when information must be provided by the banks directly. The banks charge lower prices when they must provide their own information in order to credibly convey that information. In either case, total surplus is the same, since all customers match perfectly, although consumer surplus is clearly lower when financial advice is delivered separately[16]. Therefore, the competition policy implication is that, in order to protect customers interests, a regulatory body should be cautious in advocating information provision by IFAs.

The previous point argues that information provision by IFAs will be beneficial to FIs, but ignores the question of when the advisors will invest in information provision. This is an issue of some importance, as the quality of information provided by IFAs has been called into question. To look at this issue, we suppose, as in the previous section, that investment in information provision is unobservable. Since the payment to the advisor is the same irrespective of the information the advisor provides, the incentive constraint consists of comparing the costs of provision to the reputation cost. When the fixed cost of providing information is lower than the reputation cost of lying, we have an equilibrium where information is provided. Notation-wise

[15] This can be easily accomplished if the independent financial advisor charges a fixed amount for each customer, but suffers a positive reputation cost if she lies. Alternatively, the advisor may be paid a fixed amount irrespective of the number of customers by an FI, but still suffer some reputation cost (such as firing when customers complain), and the results will go through.

[16] The benefits of separation may not exist when a one-stop bank is competing against a specialized bank. Moreover, when the specialized bank is a monopoly, we have seen that it prefers customers to have no information. In this case, making financial advice independent would increase both total surplus (improve matching) and increase consumer surplus (higher valuations and lower prices).

(where ρ_I is the reputation cost for the IFA) :

$$\rho_I > \frac{f}{1-q}$$

If $\rho_I = \rho$, we find that the IFAs will provide information for the same range of parameters as specialized banks with *observable* investments. The IFAs will provide information in some cases when specialized banks with unobservable investments do not, namely $\rho \in (\frac{f}{(1-q)}, \frac{f}{(1-q)q})$. In this case, IFAs help the specialized banks by revealing information where the banks couldn't, as well as allowing the banks to extract more rents. As a caveat, however, it seems that in reality ρ_I would be less than ρ, due to the fact there is much less at stake in a continuing relationship between an IFA and a customer. This could reduce the provision of information by IFAs relative to specialized banks. We also note that for all parameters there exists a "Cassandra effect" equilibrium where the IFA does not invest in information, as in the previous section.

9 Conclusion

This paper considers several aspects of market structure from the perspective of information provision to customers. By using this alternative road we obtain a new perspective on conflicts of interest and consolidation in the banking industry. We have found that competition foments information provision when reputation costs are present. The fact that a specialized FI has incentives to provide information may surprise, since it will always lose to its competitor the customers that are not of its type. Still, if we consider as the starting point a situation where absent information a FI will get no customers, providing information appears as an additional tool in the competition for market share.

We have also found that the gains from increasing the number of financial products offered and becoming a one-stop bank are largest when market power can be exerted or customers have switching costs. Without these built in customer bases, competition erodes the incentives to provide information. Finally, financial intermediaries may actually have an incentive to separate advice from sales as it could allow them to differentiate their products and receive higher margins.

It would be interesting to extend this line of research in a dynamic direction in order to quantify the potential reputation costs that banks may incur. Another aspect that is worth further examination is allowing for heterogeneity in customer's knowledge of their types. With the advent of the internet and private banking, it is probable that certain clients have better information about which investments best match their needs. Our results in this context suggest that if customers have more information, market power and rents can actually increase, making this topic quite relevant to policy discussions.

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11 Mathematical Appendix

11.1 Monopoly Banking

11.1.1 Specialized Monopoly (Proposition 1)

We examine only the case of a monopoly specialized in product A (one specialized in B is a simple extension). If the customer does not purchase at FI A, he receives a utility of zero and the bank makes zero profits. FI A can make two statements, "recommend product A" ($\hat{A}$) and "don't recommend product A" ($\sim \hat{A}$). Lying when the customer purchases the product costs the FI ρ per customer. Note that this proof is quite similar (though simpler) to that of the competing specialized banks, which we analyze in detail in the next section. Hence we only sketch the proof here. We consider only pure strategies for the customers, using assumption **A2**.

It can never be that customers who hear $\hat{A}$ choose $\sim A$ and customers who hear $\sim \hat{A}$ choose A. If $p_A > \rho$, then the FI would announce $\sim \hat{A}$ always. By the Cho-Kreps intuitive criterion, the probability of hearing $\hat{A}$ given type $\sim A$ $(P(\hat{A} \mid \sim A))$ equals zero. Hence, a customer who hears $\hat{A}$ will always choose A and type A would deviate. If $p_A < \rho$, there should be full revelation, but then upon hearing $\hat{A}$, the customer prefers A.

When customers who hear $\hat{A}$ choose A and customers who hear $\sim \hat{A}$ choose $\sim A$, then if $p_A < \rho$ the FI will fully reveal. However, since $\rho < r$ from **A1** a customer hearing $\sim \hat{A}$ will always choose A. When $p_A > \rho$, the equilibrium will be non-revealing, with the additional requirements that $p_A < qR + (1-q)r$ and (using Cho-Kreps) $p_A < r$. When customers who hear $\hat{A}$ choose A and customers who hear $\sim \hat{A}$ choose A, there is a fully revealing equilibrium when $p_A < r$. Lastly, when customers who hear $\hat{A}$ choose $\sim A$ and customers who hear $\sim \hat{A}$ choose $\sim A$, we have partially revealing equilibria (where type A and type $\sim A$ mix their strategies). These are possible when $p_A > \max[r + P(A \mid \hat{A})\Delta, r + P(A \mid\sim \hat{A})\Delta]$. The minimum of this maximum is $qR + (1-q)r$ (we derive a very similar result in the proof of Lemma 4 below).

The results of the signaling game give us a profit function for every possible value of p_A. It is easy to see that there are two possible prices that could maximize the FI's profit: $p_A = r$ which yields $\pi_A = r$ and $p_A = qR + (1-q)r$ which yields $\pi_A = r + q\Delta - (1-q)\rho$. Hence, since $q > \frac{1}{2}$, the highest profits result when FI A sets $p_A = qR + (1-q)r$ and does not reveal any information.

11.1.2 One-stop Monopoly (Proposition 2)

When information revelation is possible, the one-stop bank engages in a signaling game in which it can recommend product A or product B. The reputation cost ρ is incurred when the one-stop bank lies to the customer and the customer makes a purchase (of either product). Again, since this proof is quite similar to the one above and to the competing specialized bank proof (which we go over in detail), we only summarize the main points.

First, there can never be any equilibrium where customers who hear $\hat{A}$ choose B and customers who hear $\hat{B}$ choose A. When customers who hear $\hat{A}$ choose A and customers who hear $\hat{B}$ choose A, there is a fully revealing equilibrium where $p_A - p_B < -\Delta$. When customers who hear $\hat{A}$ choose B and customers who hear $\hat{B}$ choose B, there is a fully revealing equilibrium where $p_A - p_B > \Delta$. Finally, when customers who hear $\hat{A}$ choose A and customers who hear $\hat{B}$ choose B, there are two ranges of equilibria[17]: when

[17] Note that there doesn't exist an information revelation equilibrium for certain parameter values because we don't allow for mixed strategies on the part of firms and workers here due to Assumption 2. We assume that the FI will not price in these regions

$-\rho < p_A - p_B < \rho$ the equilibrium is fully revealing and if $\rho < (2q-1)\Delta$, then when $\rho < p_A - p_B < (2q-1)\Delta$ the equilibrium is non-revealing with both types saying $\hat{A}$.

Since prices can never be larger than R without violating individual rationality, the maximum profits from setting prices in the intervals $p_A - p_B < -\Delta$ and $p_A - p_B > \Delta$ is r. Maximum profits from setting prices in the interval $\rho < p_A - p_B < (2q-1)\Delta$ come from setting $p_A = R$ (and $p_B \geq R - (2q-1)\Delta$), which yields profits $R - (1-q)\rho$. In the interval $-\rho < p_A - p_B < \rho$ setting $p_A = p_B = R$ yields profits of R, which maximizes profits in the interval and overall.

11.2 Proof of Proposition 3 (Full information)

If $p_B < p_A - \Delta$, both type A and type B customers prefer to purchase product B, yielding profits $\pi_A = 0$ and $\pi_B = p_B$ (and FI B should set price $p_B = p_A - \Delta$). If $p_A - \Delta < p_B < p_A + \Delta$, type A customers prefer product A and type B customers prefer product B, yielding profits $\pi_A = qp_A$ and $\pi_B = (1-q)p_B$ (and FI A should set price $p_B = p_A + \Delta$). If $p_B > p_A + \Delta$, both types of customers prefer to purchase product A, and therefore $\pi_B = 0$ and FI B will never price in this range. Given p_A, FI B must decide on its best response, yielding profits of either $p_A - \Delta$ or $(1-q)(p_A + \Delta)$. FI A clearly prefers the latter, which leaves it positive profits, so it will set p_A at the highest possible level such that FI B prefers the latter, which is $p_A = \frac{2-q}{q}\Delta$, proving the proposition.

11.3 Proof of Lemma 4

We will consider successively the different possible equilibria, which can be completely ordered by customer strategies ($a = 1, b = 1$; $a = 0, b = 1$; $a = 1, b = 0$; and $a = 0, b = 0$) since assumption **A2** allows us to disregard equilibria with interior values for a or b.

- **Case 1** ($a = 1, b = 0$) Replacing these values in equations (2) and (3), we obtain $\Delta\pi_A(A) > 0$ and $\Delta\pi_A(B) > 0$ and there is full revelation with all customers buying A. The condition $\Delta U_A(\widehat{A}) > 0$ implies then $p_A < p_B + \Delta$, while $\Delta U_A(\widehat{B}) < 0$ implies the stronger condition $p_A <$

$(-\Delta < p_A - p_B < -\rho$ and $\max[\rho, (2q-1)\Delta] < p_A - p_B < \Delta)$.

$p_B - \Delta$. As a consequence, the necessary and sufficient condition for this equilibrium to occur is $p_A < p_B - \Delta$, as stated in part 1 of the Lemma.

- **Case 2** ($a = 1, b = 1$) Replacing these values in equations (2) and (3), we obtain $\Delta\pi_A(A) = p_A$ and $\Delta\pi_A(B) = -p_A + \rho$. As a consequence two cases are to be considered: $p_A < \rho$ and $p_A > \rho$ (equality is ruled out by assumption A2). In the first case, the equilibrium is fully revealing and the conditions for $a = 1, b = 1$ to be a solution is that $\Delta U_A(\widehat{A}) > 0$ and $\Delta U_A(\widehat{B}) > 0$ is fulfilled, so that $p_B - \Delta < p_A < p_B + \Delta$. Using $\Delta > \rho$ (from assumption A1) allows us to establish part 2 of the Lemma. On the other hand, if $p_A > \rho$ the sign of $\Delta\pi_A(B)$ is negative and there is no equilibrium revelation as every agent is given the message $\widehat{A}$. As a consequence, the conditional probability $p(A \mid \widehat{A}) = q$, and, by Cho-Kreps $p(B \mid \widehat{B}) = 1$. Conditions $\Delta U_A(\widehat{A}) > 0$ and $\Delta U_A(\widehat{B}) > 0$ imply $\Delta U_A(\hat{A}) = (2q-1)\Delta - p_A + p_B > 0$ and $\Delta U_A(\widehat{B}) = \Delta - p_B + p_A > 0$, proving part 3 of the lemma.

- **Case 3** ($a = 0, b = 1$, Zero profits for FI A)

  i) Replacing these values in equations (2) and (3), we obtain $\Delta\pi_A(A) = \Delta\pi_A(B) = 0$: These conditions permit the FI to choose any strategy. To begin with, the FI may play a mixed strategy, with $\alpha, \beta \in (0, 1)$. The inequalities $\Delta U_A(\hat{A}) < 0$ and $\Delta U_A(\widehat{B}) > 0$ hold for these values of α and β if and only if $p_A > p_B + \max[(2P(A \mid \hat{A}) - 1)\Delta, -(2P(B \mid \hat{B}) - 1)\Delta]$. By definition, for $(\alpha, \beta) \neq (0, 0)$ and $(\alpha, \beta) \neq (1, 1)$, $P(A \mid \hat{A}) = \frac{\alpha q}{\alpha q + \beta(1-q)}$ and $P(B \mid \hat{B}) = \frac{(1-\beta)(1-q)}{(1-\alpha)q + (1-\beta)(1-q)}$. Define$\psi(\alpha, \beta)$ by $\psi(\alpha, \beta) \equiv \max[2\frac{\alpha q}{\alpha q + \beta(1-q)} - 1, 1 - 2\frac{(1-\beta)(1-q)}{(1-\alpha)q + (1-\beta)(1-q)}]$. It can be easily shown that for $\alpha > \beta$, $\psi(\alpha, \beta) = 2\frac{\alpha q}{\alpha q + \beta(1-q)} - 1$. This expression is increasing in α, implying that the minimum occurs when $\alpha = \beta$, when $\psi(\alpha, \alpha) = 2q - 1$. Similarly if $\beta > \alpha$, $\psi(\alpha, \beta) = 1 - 2\frac{(1-\beta)(1-q)}{(1-\alpha)q + (1-\beta)(1-q)}$. This expression is increasing in β, and its minimum occurs when $\beta = \alpha$, for which $\psi(\beta, \beta) = 2q - 1$. Finally, the maximum of $\psi(\alpha, \beta)$ is 1. The necessary and sufficient condition for an equilibrium where FI A uses a mixed strategy regarding revelation while customers buy B is $p_A > p_B + \psi(\alpha, \beta)$. Using the minimum and maximum values for $\psi(\alpha, \beta)$ establishes part 4a of the Lemma and the range of values (α, β) for which the mixed strategy equilibrium holds.

ii) If, instead, the FI strategy is ($\alpha = 1$, $\beta = 1$), announcing systematically $\widehat{A}$, $P(B \mid \widehat{B})$ is defined by out-of-equilibrium beliefs, and for each set of out-of-equilibrium beliefs we will obtain a different equilibria. Symmetrically, if ($\alpha = 0$, $\beta = 0$), it is $P(A \mid \hat{A})$ that will be defined by out of equilibrium beliefs. Since on the equilibrium path the condition $p_A > p_B + (2q - 1)\Delta$ holds, we now have the second and third parts of part 4 of the Lemma.

iii) Combining the conclusions of i) and ii) we find that if the condition $p_A > p_B + \Delta$ holds, any FI strategy ($\alpha, \beta \in [0, 1]$) will be an equilibrium where all customers purchase B. This is part 5 of the Lemma.

- **Case 4** ($a = 0, b = 0$) This is never an equilibrium. Indeed, it implies $\Delta U_A(\widehat{A}) < 0$ and $\Delta U_A(\widehat{B}) < 0$. Equations (2) and (3), become $\Delta\pi_A(A) = -p_A + \rho$ and $\Delta\pi_A(B) = p_A > 0$. Two cases are therefore to be considered. If $\rho > p_A$, the equilibrium is fully revealing; if $\rho < p_A$, the FI only announces $\widehat{B}$ but the Cho-Kreps criterion allows us to infer that $P(A \mid \widehat{A}) = 1$ .So, whatever the case, replacing $P(A \mid \widehat{A}) = 1$ in expressions (4) and (5) leads to $\Delta U_A(\widehat{A})+ \Delta U_A(\widehat{B}) = \Delta(2P(B \mid \widehat{B})) \geq 0$, which is a contradiction.

11.4 Proof of Proposition 5 (Competing Specialized Banks, FI A is the price leader)

1) First assume that $p_B > \rho + \Delta$. Then the only region where FI B makes positive profits is $p_B < p_A - (2q - 1)\Delta$. In this region FI A makes zero profits, so FI A must lower p_A such that $p_B < \rho + \Delta$. It can do this by setting $p_A - (2q - 1)\Delta < \rho + \Delta$, or $p_A < \rho + 2q\Delta$.

For $\rho < p_A < \rho + 2q\Delta$, prices will be such that the equilibrium is non-revealing and all customers purchase A, or partially revealing and all customers purchase B. FI B will manipulate its price so that the second interval pertains if it can, which then implies FI A should set its price such that $p_A < \rho$. However, if $\rho < (2q-1)\Delta$ and FI A sets its price equal to $(2q-1)\Delta$, FI B is unable to maneuver its price.

For $p_A < \rho$, the prices will determine whether A fully reveals and everyone purchases at A ($p_B > p_A + \Delta$) or whether A fully reveals and everyone purchases at the bank which matches their type ($p_B < p_A + \Delta$). Clearly the second has more interest for FI B, which then proves our conjecture.

2) First consider the situation where $p_A > \rho + \Delta$. Here FI B will clearly not choose to be in the partially revealing interval where it gets zero profits ($p_B > p_A - (2q-1)\Delta$), but the other two regions involve FI A getting zero profits, so it must be that $p_A < \rho + \Delta$.

Now consider $\rho + (2q-1)\Delta < p_A < \rho + \Delta$. Unlike above, there is one region where both firms make positive profits: $p_A - \Delta < p_B < \rho$. Full information is revealed and customers follow the advice. The highest profits for FI B come from setting its price at the maximum of the interval (ρ) and earning $(1-q)\rho$. However, the region above is a non-revealing one, in which all customer purchase at FI B. Profits are maximized for B by choosing the highest price in the interval, $p_A - (2q-1)\Delta$, which yields expected profits $p_A - (2q-1)\Delta - q\rho$. These profits are larger than $(1-q)\rho$ (taking into account that we are in the region $\rho + (2q-1)\Delta < p_A < \rho + \Delta$), which means that p_A should be set even lower.

Lastly, setting $p_A < \rho + (2q-1)\Delta$ can produce two possible responses from FI B. If FI B sets $p_B = p_A - \Delta$, FI B fully reveals information and gets all of the customers. If FI B sets $p_B = \rho$, it fully reveals and gets the customers who are the best match at this higher price. FI A only makes positive profits in this second region, so the solution has FI A setting its price so that FI B prefers this choice.

3) The proof has the same flavor of the proof when only FI B offers information, but we need to check at each point what information revelation regime FI A is in, and whether customers might approach FI A first instead.

Consider the situation where $p_A > \rho + \Delta$. FI B will not choose to be in its partially revealing interval ($p_B > p_A - (2q-1)\Delta$) since it can be shown that customers will always go to FI A and purchase there, leaving FI B with zero profits. FI B will choose to be in one of the other two regions, both of which involve FI A getting zero profits, so it must be that $p_A < \rho + \Delta$.

Now consider $\rho + (2q-1)\Delta < p_A < \rho + \Delta$. Unlike the previous interval, there is one region where FI B fully reveals and customers follow its advice, i.e. both firms will make positive profits: $p_A - \Delta < p_B < \rho$ (in this region FI A is in partial revelation regime - $p_B < \rho$ and $\rho + (2q-1)\Delta < p_A$ imply $p_B + (2q-1)\Delta < p_A$ - so all customers will visit FI B first). The highest profits for FI B come from setting its price at the maximum of the interval (ρ) and earning $(1-q)\rho$. However, the region above is a non-revealing one, in which all customer approach FI B first and purchase there. Profits are maximized for B by choosing the highest price in the interval, $p_A - (2q-1)\Delta$, which yields expected profits $p_A - (2q-1)\Delta - q\rho$. These profits are larger than $(1-q)\rho$ (taking into account that we are in the region $\rho + (2q-1)\Delta < p_A < \rho + \Delta$), which means that p_A should be set even lower.

Lastly, we look at $p_A < \rho + (2q-1)\Delta$. As before, if FI B sets $p_B < p_A - \Delta$, FI B fully reveals information and gets all of the customers. For the region $p_A - \Delta < p_B < \rho$, FI B is in a fully revealing regime where customers follow its advice. Note that for this given range of p_B it is weakly dominant for customers to approach FI B first (in fact the only time there is indifference is if FI A is in a fully revealing regime as well). Therefore both FI A and FI B make positive profits in this region. FI A consequently would like to insure that FI B prefers this region. It is possible hat FI B may want to set its price even higher than ρ here. If it does so, it will be in a partial revelation regime. Since it will make zero profits if customers approach it first, FI B needs FI A to be in a full revelation following regime to make profits. For FI A to be in a full revelation regime there are two possibilities.

The first possibility occurs when $\rho - (2q-1)\Delta < p_B < \rho + \Delta$ and $p_B - \Delta < p_A < \rho$. Here it is clear that FI A prefers to set p_A as high as possible (ρ) and FI B can then follow by setting p_B as high as possible ($\rho + \Delta$). Notice here that FI B is free riding off of the information of FI A in order to set a higher price. However, profits for FI A would be less than it would get by pricing higher and forcing FI B to be the information provider ($q\rho < q \min[(1-q)\rho + \Delta, \rho + (2q-1)\Delta]$).

The second possibility occurs when $p_B < \rho - (2q-1)\Delta$ and $p_B - \Delta < p_A < p_B + (2q-1)\Delta$. The maximum return for FI B would be setting $p_B = \rho - (2q-1)\Delta$, in which case $p_A = \rho$, however this is also dominated by the above equilibrium.

11.5 Proof of the payoffs in Figure 4 (Competing Specialized Banks, B is the price leader)

1) Only FI B invests in information: As long as $p_B > \rho$, FI A has an incentive to set its price just below $p_B + (2q-1)\Delta$, which leads to zero profits for FI B. If $p_B < \rho$, FI must price below $p_B + \Delta$ in order to make positive profits. Therefore the equilibrium is $p_B = \rho$, $p_A = \rho + \Delta$.

2) Only FI A invests in information: When $p_B > \rho - (2q-1)\Delta$, the best response for FI A is always to price slightly under $p_B + (2q-1)\Delta$ and not reveal any information (always say $\hat{A}$). Since all customers then purchase A,

this yields profits of zero for FI B. If $\rho < (2q-1)\Delta$, this is what occurs and the price of FI B is undetermined, as any price yields zero profits. If $\rho > (2q-1)\Delta$, then FI B will set its price below $\rho - (2q-1)\Delta$. FI A has two options, setting a price of $p_B - \Delta$, fully revealing, and getting all of the customers, or setting a price of ρ, fully revealing but sharing the customers. FI B clearly prefers the second option and must set p_B such that $p_B - \Delta < q\rho$ (FI A prefers the second option). Since $\rho - (2q-1)\Delta < q\rho + \Delta$, FI B sets its price at $\rho - (2q-1)\Delta$.

3) Both FIs invest in information: When $p_B > \rho + \Delta$, any price that FI A charges which gives it positive profits gives FI B zero profits.

When $\rho - (2q-1)\Delta < p_B < \rho + \Delta$, we must look carefully at the possible best response of FI A :

- If $p_B - \Delta < p_A < \rho$, FI A will fully reveal with customers taking its advice. Indeed, FI B will do the same (since $p_A - (2q-1)\Delta < \rho$), so it does not matter where customers go first and the solution (restricting FI A to this interval) is $p_B = \rho + \Delta$ with profits $(1-q)(\rho + \Delta)$ and $p_A = \rho$ with profits $q\rho$.

- If $\rho < p_A < p_B + (2q-1)\Delta$, FI A reveals nothing and the only possible chance for both to make positive profits is for FI B to be in a fully revealing regime. Since the interval for p_A implies that $p_B > p_A - (2q-1)\Delta$, to get a fully revealing regime we must have $p_A - (2q-1)\Delta < \rho$. Hence a candidate solution here is $p_B = \rho$ with profits $(1-q)\rho$ and $p_A = \rho +$ $(2q-1)\Delta$with profits $q(\rho + (2q-1)\Delta)$.

- If $p_A > p_B + (2q-1)\Delta$, FI A is partially revealing. Hence it will only choose this interval if FI B is fully revealing. The maximum price for FI B to fully reveal is ρ which limits FI A to a price of $\rho + \Delta$ (the profits are $(1-q)\rho$ and $q(\rho + \Delta)$ for FI B and FI A respectively).

- Lastly, if $p_A < p_B - \Delta$, FI A fully reveals and gets all of the customers. Hence its profits are $p_B - \Delta$.

The profits of $p_B - \Delta$ for FI A proves that there is a profitable deviation from the $p_B = \rho + \Delta$ candidate solution. Since FI A prefers to set $p_A = \rho + \Delta$ (rather than $\rho +$ $(2q-1)\Delta$) and a deviation downward as before (to $\rho - \Delta$) is impossible, the solution for this interval of p_B is $p_B = \rho$ and $p_A = \rho + \Delta$.

Finally, any profits gained from FI B setting $p_B < \rho - (2q-1)\Delta$ will be lower than those when $p_B = \rho$ because of the lower price and the fact that FI A will only either share or take all of the customers.