BANCA D'ITALIA

Temi di discussione

del Servizio Studi

Incentives in universal banks

by Ugo Albertazzi

Number 572 - January 2006

The purpose of the Temi di discussione *series is to promote the circulation of working papers prepared within the Bank of Italy or presented in Bank seminars by outside economists with the aim of stimulating comments and suggestions.*

The views expressed in the articles are those of the authors and do not involve the responsibility of the Bank.

INCENTIVES IN UNIVERSAL BANKS

by Ugo Albertazzi*

Abstract

This paper studies the provision of incentives in a universal bank. This is regarded as a (common) agent serving different clients with potentially conflicting interests: for example, it may buy assets on behalf of investors and sell assets on behalf of issuing firms. The clients offer incentive schemes to the bank and they behave non-cooperatively. The bank decides a level of effort and, when firewalls are absent, a level of collusion, modelled as a costly and unproductive redistribution of wealth among the clients. The main conclusion is that in the absence of firewalls the equilibrium incentive schemes are steeper. This means that the level of effort is higher and may compensate the (ex post) inefficiency of collusion. Moreover, this is shown not to hold in the presence of one naive player who does not recognize the existence of the conflict of interest. The model allows to draw conclusions about the desirability of firewalls or of softer measures like the imposition of transparency requirements.

JEL Codes: G21, G24, and G28.

Keywords: Common Agency, Collusion, Conflicts of Interest, Universal Banks

Contents

* Bank of Italy, Economic Research Department

1. Introduction

This article is about the provision of incentives in the activity of universal banks, generally intended as institutions providing different services to different types of clients, with potentially conflicting interests.[1]

This is an old and important issue; it has motivated a large body of economic literature dating back to the great depression, as a consequence of which American regulators decided to ban universal banks, viewed as one of the main causes.[2] As in previous episodes of financial turmoil, the interest in this topic has been recently revived by the burst of the stock market speculative bubble in March 2000.

Most of the existing works consider specific issues relating to the behaviour of universal banks. Many analyses have been conducted in order to assess under what conditions it is efficient to let commercial banks take equity positions in other firms. An important example is Boyd, Chang and Smith (1998), in which universal banks, by holding also equity, exacerbate the moral hazard afflicting the institution that provides deposit insurance.[3]

More recently, attention has been drawn to other specific instances of conflicts of interest potentially affecting the way universal banks operate. These include virtually any combination of the following activities: underwriting, lending, research, financial advice, and asset management. For example, financial analysts might be tempted to overestimate future earnings of a company which is being taken public by an affiliated investment bank. Alternatively, a bank providing financial consulting could be excessively eager to promote securities of firms that are borrowing from an affiliated commercial bank. Finally, an investment bank underwriting shares could make the affiliated mutual fund buy these securities at unfair conditions.[4]

---

[1] I would like to thank two anonymous referees and Mathias Dewatripont, my supervisor at Ecares. Thanks also to Michel Habib, Giuseppe Grande, Giovanni Guazzarotti, Andrea Lamorgese, Tymofiy Mylovanov, Giuliana Palumbo, Fabio Panetta, Urs Peyer and the other participants at the Bank of Italy seminar, at the CEPR-BBVA conference on universal banks in Madrid, and at the 2005-EEA meeting in Amsterdam for their useful and detailed comments. All errors are mine. The opinions expressed do not necessarily coincide with those of the Bank of Italy. Email address: ugo.albertazzi@bancaditalia.it.

[2] The Glass-Steagall Act was passed in 1933.

[3] An extensive overview of the older literature on universal banks can be found in Benston (1994).

[4] A recent and complete survey on these issues can be found in Crockett, Harris, Mishkin and White (2003).

These remarks raise some important questions. Despite all these potential inefficiencies, why aren't universal banks simply banned? Is it political myopia or does it reflect the fact that these regulations imply some costs? Moreover, why did regulators react to the recent wave of scandals in a softer manner, that is by imposing transparency requirements, rather than imposing tougher measures in the spirit of the Glass-Steagall Act?

The present work develops a general and stylized framework which helps to answer these questions. In this model a bank will serve simultaneously different types of clients with possibly contrasting objectives; protecting one party's interests might therefore mean harming those of the other party. The starting point is the simple observation that if the bank always exploited such a conflict of interest, there would be no way to justify the existence of universal banks (at least with rational market participants). Therefore, the model will look at situations where the bank does not always find it convenient to adopt such a "collusive" attitude, but can also decide to behave more efficiently by pursuing both parties' interest.

In the model, a central role is attached to the level of market sophistication which will be shown to influence the efficiency of a universal bank. It is not clear what is the level of sophistication of real world financial markets.[5] This is likely to be something not uniform across countries and strongly correlated with the level of financial development.[6] The main insight of the model is that the desirability of tough regulations imposing the separation of the different activities of a universal bank is inversely related to the level of rationality of market participants and, therefore, to the level of financial development.

A recent contribution by Bolton, Freixas and Shapiro (2004) analyzes this issue in a quite different set-up. In their model, the seller has better information than the buyer about which

---

Other conflicts of interest, not necessarily connected with universal banks, are those concerning the activities of insurance, auditing, consulting, and rating. After the recent wave of corporate scandals, conflicts of interest at the interior of corporations have also received a lot of attention. On this see Demski (2003).

[5] The existing empirical literature provides unconclusive evidence. Gompers and Lerner (1999), for example, show that investors require a discount for initial public offerings in which the underwriter has an equity stake, supporting the idea that market participants do anticipate the existence of conflicts of interest. Kroszner and Rajan (1997) reach a similar conclusion. On the contrary, Ber, Yafeh, Yosha (2001) shows that the stocks of companies taken public by their lending bank-affiliated underwriter are those with the worst post-issue stock performance. Puri (1996) shows that investors paid higher prices for securities underwitten by commercial banks, though he interprets this finding as evidence that commercial banks provide a certification role the market is willing to pay for.

[6] The quality of the understanding of these mechanisms may even vary across the different segments the entire financial market is composed of.

product is best suited for his needs (the choice could be, for example, between a pension fund and a life insurance). They distinguish between a specialized bank, which sells only one product, and a universal bank, which sells both products. The conflict of interest consists in the fact that the former has incentives to conceal its information when it faces a client whose best choice is not the product it sells (advising correctly would mean losing the client). The interesting point put forward is that more competition, by reducing the mark-up on the individual sale, reduces the incentives to conceal information. The reason why this approach is not fit to analyze the sort of conflicts of interest cited above is simply that these are inherent in the activity of universal banks. In their framework, in fact, the one that is subject to a conflict of interests is the specialized bank rather than the universal bank.[7]

On the contrary, the present model starts from the assumption that it is exactly the pervasive attempt banks are making to supply more and more services, permitted by an intense process of deregulation,[8] that generates conflicts of interest.

To make the exposition more effective, the model is developed keeping in mind the specific example in which the bank is simultaneously acting as an underwriter for firms and as a mutual fund manager for savers/investors. In these circumstances, the bank is supposed to sell assets in the primary market at the highest possible price so that firms' cost of capital is minimized, while at the same time it is supposed to buy assets at the lowest possible price so that savers' portfolio return is maximized. Clearly, there is a conflict of interest between these two activities: the bank can make its mutual fund buy these securities and, depending on the transaction price, it will be protecting one party's interest and harming the other's (a good price for the buyer is necessarily a bad price for the seller). As already pointed out, one important feature of the model is that the bank is not bound to adopt such behaviour (generically defined as "collusive") but can instead decide to execute these transactions with third parties so that mutual fund investors and issuing firms' interests are not always determined by a mere redistribution of the existing wealth.

Beyond its convenience for the exposition, this example has some economic relevance which has been documented in few empirical papers. Ber, Yafeh, and Yosha (2001) look at Israeli IPOs and find that the highest "over-pricing" is recorded in cases in which at least

---

[7] On the other hand, the costs associated with the latter are related to their presumably greater market power.

[8] For the United States see Barth, Brumbaugh, Wilcox (2000).

5 per cent of the total volume of the newly issued shares has been bought by mutual funds controlled by the same underwriters. Guazzarotti (2003) looks at the international market of private bonds to study the differences in the underwriting activity of commercial and (pure) investment banks. One result suggests that when banks sell newly issued bonds to mutual funds they control, this happens at a higher price.[9]

2. Common agency

Common agency is the natural theoretical framework one would normally use to study this kind of issue. This fast growing literature deals with models where one agent is simultaneously supplied incentive schemes (or “menus”) from different principals who take their decisions non-cooperatively.

In the model below, the common agent is the bank; this is a clear-cut departure from classical theories of financial intermediation.[10]

Broadly speaking, any principal is supposed to choose a contract by maximizing his expected utility, subject to incentive compatibility and a participation constraint. The complication with respect to standard moral hazard models is that this is true only for given principal’s expectations about the contracts that other principals are offering and which simultaneously determine the agent’s behaviour. This configures a game where the players are the principals and the strategy space is the set of contracts they can offer.

In the seminal paper by Bernheim and Whinston (1986), the authors use a moral hazard model and show that the lack of coordination among principals is not an issue if the agent is risk neutral. It is well known from standard moral-hazard models that under agent’s risk neutrality (where there are no risk-sharing issues) the agent is given a maximally steep incentive scheme (i.e. is essentially buying the firm). This is true even under common agency but, in this case, the fact that the agent becomes a residual claimant implies that he will internalize not only the inefficiencies stemming from the asymmetric information of the agency relationship, but also

---

9 However, it is important to emphasize that, like Puri (1996), the author interprets this difference as evidence of the certification role carried out by “better informed” banks.

10 In models of delegated monitors (Diamond; 1984), the (commercial) bank is a principal with respect to borrowers and an agent with respect to depositors. In models of maturity transformation (Diamond and Dybvig; 1983), the bank is a principal with respect to both depositors and borrowers (though in the original contribution the contractual relationship on the lending side is not modelled).

the ones related to the lack of coordination among principals. It is worth mentioning this as it will be shown below that there are different ways to generate this efficiency result.

Among others, the more recent work by Martimort (1996), based on an adverse selection model, clearly points out the importance of collusion in common agency. The idea is that one of the principals can make side contracts with the agent on the basis of private information.

The present model offers instead a simple way to define collusion in a moral hazard-common agency set-up. The main point is that it is precisely when collusion is allowed (that is, under a so-called "conflict of interest") that inefficiencies may disappear. The difference with respect to Bernheim and Whinston (1986) is that such an efficiency result is totally independent of the (agent's) risk neutrality. The difference with respect to Martimort (1996) is that there collusion always decrease the principals' pay-off.

It is important to note the difference of focus with respect to the model of conflicts of interest developed in Dewatripont and Tirole (1999). While both frameworks refer to situations with multiple tasks, Dewatripont and Tirole (1999) use a multiple agent set-up and study how efficiency changes across the different combinations of tasks that individual agents can be assigned. In this way they leave out the issues of contractual externalities[11] and of collusion[12].

For the sake of simplicity a number of more technical aspects are left out of the picture. One is the distinction between intrinsic or delegated common agency (i.e. the fact that the outside option of the agent does or does not include the possibility to contract with only one of the principals).[13] Another is the difficulty stemming from the fact that the revelation principle (as it is known in the standard agency models) does not hold. This is due to the possibility of offering contracts that depend on the other principals' contracts (and this complicates substantially the analysis since the latter depend, in turn, on the former, creating an infinite regress problem).[14]

---

[11] Any agent is a party to one contract at most.

[12] As already pointed out, the definition of collusion adopted below is intrinsically connected with the fact that the agent is serving more principals simultaneously.

[13] See Calzolari and Scarpa (1999).

[14] On these issues see for example Martimort and Stole (2003) and Peters (2001).

It is worth mentioning the alternative definitions of collusion provided in related strands of the literature.[15] One category of models considers situations with one principal, one agent and one supervisor, whose only role is to diminish the amount of asymmetric information afflicting the principal-agent relationship. Collusion in this context is seen as the possibility for the agent to make side payments to the supervisor in exchange for not revealing the information acquired. A similar category includes the multi-agent models, where each agent has a piece of private information on some underlying variable. Again, the agents might make side payments among themselves, in exchange for not revealing this information.[16] All these definitions of collusion differ from the one introduced below which refers to a moral hazard-common agency framework.

3. The model

Let us consider a bank that is active in the market of fund management and, at the same time, as an underwriter for companies who want to go public or which are issuing bonds. This means that the bank is buying assets on behalf of savers/investors and selling assets on behalf of firms. Denote $D_i > 0$ the sum the bank is entrusted with by principal i, for $i = 1, 2$ (in the example, D_1 can be seen as the value of the shares offered in the IPO and D_2 as the money raised through the mutual fund).

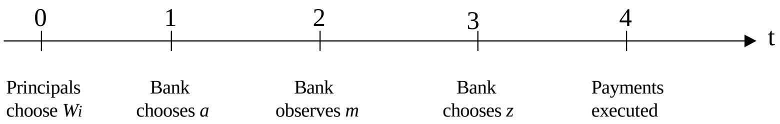
It is plausible to assume the existence of some moral hazard: the bank can carry out these services more or less effectively (by obtaining better or worse terms in the transactions it concludes), and this depends on how much costly effort is spent. Suppose, for the moment, that the bank operates with firewalls so that the two functions are carried out independently and denote Y_i the gross returns the bank is able to generate. In symbols, we assume that $Y_i = D_i (1 + m)$ where m, the rate of return, is a stochastic variable equal to $M > 0$ with probability a and 0 otherwise and that $a \in [0, 1]$, representing non contractible costly effort, is chosen by the bank.

The universal bank, in the absence of firewalls, can exploit its conflict of interest and, instead of trying to find the best counterparts in the market for all its clients, it can execute this transaction internally; in the example, it can make its mutual fund select the shares it is

---

[15] A complete survey on this is in Tirole (1992).

[16] Think of the example of an auction.



1.The time sequence.

selling on behalf of the issuing firm. This is what is called collusion and which models the conflict of interest: if the bank colludes with the issuing firm it sells these shares at a high price to its mutual fund; if it colludes with the mutual fund's investors the price will be low. In symbols, the actual return for principal i when the bank can collude, denoted R_i, can be written as follows:

$$\begin{cases} R_1 = (1 - |c|)\, Y_1 + \max\{0; c\}\,(D_1 + D_2) \\ R_2 = (1 - |c|)\, Y_2 - \min\{0; c\}\,(D_1 + D_2) \end{cases}$$

In these expressions $c \in \{-1, 0, 1\}$ is an indicator of collusion. When $c = 0$ there is no collusion and the gross return to principal i is given by Y_i. When $c = 1$ (respectively -1), the bank is said to collude with principal 1 (2) in the sense discussed above: the former does not go on the market and just transfers the sums D_2 (D_1) from principal 2 (1) to principal 1 (2).

In order not to deal with discrete variables and to capture the idea that collusion can occur with different intensities, the bank is assumed not to choose a value for c, but instead a distribution on its support. We can define $z_1 = prob(c = 1)$, $z_2 = prob(c = -1)$, and $1 - z_1 - z_2 = prob(c = 0)$, which all take values in the interval $[0, 1]$.[17]

The timing is as follows: first, for any possible value of R_i, each principal decides the fee $W_i\,(R_i)$; second, the bank chooses a level of effort a; third, the bank observe the realization of m; fourth; the bank chooses a distribution z which is therefore a function of m.[18] Figure 1 summarizes the time sequence.

---

[17] There are alternative ways to eliminate the model discreteness. An advantage of this formulation is that it allows sensible equilibria with positive "amounts" of collusion with both principals.

[18] The interpretation of this feature relies on the fact that usually these services are provided continuously over time so that, at the moment of the decision about c, the bank possesses some more information. This additional information can change its perception of the returns to be gained on the market upward or downward, and this is something which affects its propensity to collude.

Being risk neutral, at any stage the bank maximizes the expected value of:

$$u_b = W_1 + W_2 - \psi(a) - \phi(z)$$

where $\psi(a)$ and $\phi(z)$ are two positive and increasing functions. $\psi(a)$ represents the cost of effort and $\phi(z)$ the reputation loss the bank can expect to incur if it colludes.[19]

Principals anticipate the moral hazard they face in terms of effort and collusion and try (non-cooperatively) to influence the bank's behaviour through incentive schemes in order to maximize the expected net return $R_i - W_i$. Formally, given W_j, principal i solves:

$$\begin{aligned} \max_{W_i,a,z(m)} E_a E_{z(m)}[R_i - W_i \quad | \quad & m]] \text{ s.t.} \\ a \quad = \quad & \arg\max_{a'} E_{a'}[E_{z(m)}[u_b \mid m]] \\ z(m) \quad = \quad & \arg\max_{z} E_z[u_b \mid m] \end{aligned}$$

$E_a[x]$ denotes the expected value of a variable x which depends on m when $prob\,(m = M) = a$; $E_z[x \mid m]$ denotes the expected value of a variable x which depends on c when $prob\,(c = 1) = z_1$ and $prob(c = -1) = z_2$. The first is a standard incentive compatibility constraint. The second is a peculiar incentive compatibility constraint, requiring principal i to take into account how the bank will determine z.[20]

The solution of the above maximization problem provides the best response of principal i to principal j's strategy. The equilibrium of the model is just the Nash Equilibrium of this "contract game", that is the intersection of the two best responses.[21]

---

19 It is not difficult to interpret a cost function which is defined in terms of probabilities, if one considers that ϕ can be generated as the expected value of an opportune function of c.

20 For the sake of notational simplicity, optimization problems with respect to z do not recall any time that z takes values in the unit simplex $\{z \mid 0 \leq z_1 \leq 1, 0 \leq z_2 \leq 1, 0 \leq 1 - z_1 - z_2 \leq 1\}$. Analogously, given that we will assume $\pi(a) = a$, the latter will also have to be included in the interval $[0, 1]$.

21 It is important to note that this model implicitely assumes the absence of renegotiation between the bank and the two principals. Since collusion is an *ex post* inefficient activity, if renegotiation were possible, collusion would always be avoided. This could be justified by arguing that in more sophisticated environments the presence

Few comments are useful. First, while effort a is never contractible, it will be interesting to compare all possible alternatives concerning the contractibility of z (or equivalently of c) and the case where z is contractible will represent the situation in which effective firewalls are set up in order to eliminate the conflict of interest.

Second, it is useful to point out that implicit in this formulation is the assumption that effort is a public good.[22] This feature is necessary to have clear-cut conclusions of welfare analysis, but it is not indispensable in order to generate the main model's insight.

Third, it is convenient to restrict the analysis to a simplified case in which $M = 1$ and $D_1 = D_2 = D$. The effect of these hypotheses is twofold. On one hand they allow attention to be restricted to symmetric equilibria which are easy to identify for reasons that will be explained.[23] On the other hand, they make both R_is take values in the set $\{0, D, 2D\}$ so that, in principle, W_i (a function of R_i) is a vector of three numbers which, in the present set-up, is the simplest case preserving economic meaning.[24]

Fourth, it is also necessary to assume that the bank benefits of limited liability: $W_i \geq 0$. When $R_i = 0$ one can infer without ambiguity that $c \neq 0$. In such a case, a sufficiently large punishment would prevent the bank from choosing $c \neq 0$ and collusion would just disappear. However, this type of unambiguous inference is possible only thanks to the model simplicity (three outcomes) and not in more general settings. In order to rule out this artificial solution, W_i's are bounded to be non negative.[25]

Finally, in order to obtain analytic solutions, ψ is assumed to take the following form $\psi(a) = \frac{k}{2}a^2$, which is a well-behaved function, standard in the literature. Moreover, in order to

---

of some asymmetric information at time $t = 3$ would prevent renegotiation from taking place.

[22] For example, one can suppose that effort represents the quality of the personnel hired which may have a positive impact on both functions. Alternatively, it may be assumed that effort can be spent in general administrative cost reduction activities or that the common agent may invest in general purpose R&D.

[23] As shown in Appendix A, none of the results depend on the assumption of symmetry.

[24] In standard moral hazard models, two outcome technologies are a the simplest device to study the phenomenon of incentive provision without entering into more technical aspects of mechanism design related to the possibility of using complex shapes for the incentive schemes.

[25] Note that, contrary to what happens in standard moral hazard models, the assumption of limited liability would remain necessary even in case of a risk averse agent.

avoid uninteresting corner solutions it is possible to impose $k \geq 2$. With no loss of generality, it is also possible to fix $D = 1$.

3.1 *The social optimum*

The efficiency of any decentralized equilibrium has to be evaluated against the first best allocation. This is characterized by the values of a and z which maximize the sum of the utilities of the agent and of the principals, the expected value of $E_a E_{z(m)}[R_1 + R_2 - \psi(a) - \phi(z) \mid m]]$.

In aggregate, having $c \neq 0$ is an unproductive redistribution of wealth if $m = 0$, while it is a loss if $m = 1$ (total return would be 2 instead of 4). Having $prob\,(c \neq 0)$ is always costly ($\phi > 0$). These two remarks are sufficient to show that the optimal collusion policy in the first best is $z_1 = z_2 = 0$. With this result, the optimal level of a is given by the solution to:

$$\max_a a4 + (1-a)\,2 - \frac{k}{2}a^2$$

The first order condition of the above maximization problem is $2 = ka$.[26] The interpretation is standard: on the left of the sign of equality there is the marginal benefit of a, which is the difference from the total return in state $m = 1$ and in state $m = 0$. Optimality requires this quantity to be identical to the marginal cost of effort. The explicit solution is the positive quantity $a^{FB} = 2/k$, a decreasing function of k, which is the parameter measuring how costly effort is.

3.2 *Equilibrium with firewalls*

It is instructive to solve the model assuming that z is exogenously set to its efficient level ($z_i = 0$ for $i = 1, 2$). This case represents the situation where the presence of conflicts of interest is contrasted by the introduction of effective barriers between the different activities carried out by the universal bank, and which prevent it from adopting collusive strategies at the expense of some of its clients. In the financial press, these are often referred to as “firewalls”.[27]

---

[26] Second order conditions are satisfied.

[27] The actual separation of the activities can take place in different forms implying different levels of effectiveness. Between the extreme cases of universal and specialized banks, one can consider the holding company with separate subsidiaries, or the company with operating subsidiaries. A discussion on this is in Shull and White (1998). The term “firewalls” here has an even more general connotation, denoting any kind of organizational

In these circumstances, R_i takes value in the set $\{1,2\}$. Given that the only reason for paying something to the bank is to induce the desired level of a, one can solve by imposing $W_i(1) = 0$. Calling $w_i = W_i(2)$, the bank solves:

$$\max_a a(w_1 + w_2) - \frac{k}{2}a^2$$

The first order condition gives $a = (w_1 + w_2)/k$. The problem of principal i which becomes:

$$\max_{w_i} \frac{w_i + w_j}{k}(2 - w_i) + \left(1 - \frac{w_i + w_j}{k}\right)$$

which produces a best response for principal i of the form $w_i(w_j) = (1 - w_j)/2$ for $i = 1,2$ and $j \neq i$. Using this equality and focusing on the symmetric equilibrium where $w_1 = w_2 = w$, the equilibrium fees are equal to $w = 1/3$.

The equilibrium level of effort turns out to be $a^{NC} = 2/(3k)$.

3.3 *Equilibrium with one principal*

Suppose that the two principals coordinate so as to behave as one. This is equivalent to a model where a single principal maximizes the sum of the two payoffs, choosing both w_1 and w_2. Even though this case is not meant to represent any real world situation, it is instructive to compare the allocation of its equilibrium with other cases.

Given that, whatever the realization of m, having $c \neq 0$ can at most leave the sum R_1+R_2 unchanged, imposing $z = 0$ is without loss of generality. This gives, as above, $W_i(1) = 0$ and $a = (w_1 + w_2)/k$, where w_i still denotes $W_i(2)$. The problem can be written:

$$\max_{w_T} \frac{w_T}{k}(4 - w_T) + \left(1 - \frac{w_T}{k}\right)2$$

device capable, at least to some extent, of eliminating the conflict of interest.

where $w_T = w_1 + w_2$. Now the solution is $w_T = 1$ with an implied level of effort $a = a^{1P} = 1/k$.

The comparison of the three cases gives $a^{FB} = 2/k > a^{1P} = 1/k > a^{NC} = 2/(3k)$. This clearly shows that beyond the standard moral hazard loss of efficiency ($a^{FB} > a^{1P}$) there is an additional loss due to the lack of coordination among the principals ($a^{1P} > a^{NC}$). As argued above, the source of this inefficiency is the positive contractual externality that an increase of one w_i creates on the other principal, given that a enters both utilities (effort is a public good).

3.4 *Equilibrium without firewalls*

In this case principals behave non-cooperatively and the bank can collude with any one of them. In order to get an analytical solution ϕ is taken to be equal to $\phi(z) = \frac{h}{2}(z_1 + z_2)^2$ with $h > 0$, a natural extension of the cost function ψ if z_1 and z_2 are perfect substitutes. Moreover, it is assumed that the bank cannot receive a positive fee if the net rate of return for the client is negative. Taken together these two assumptions bring a remarkable simplification. In particular, they imply the following restrictions on the contract space: $W_i(0) = W_i(1) = 0$ and $w_i \in [0, 1]$. Appendix A shows that none of them is necessary to get the model results.

Now, it is possible to compute the equilibrium of this case by backward induction. First, we compute the optimal collusion policy for any given level of effort and couple of contracts. Second, we compute the optimal level of effort anticipating the implied collusion policy. Third, we find the equilibrium of the contract game.

3.4.1 *The choice of collusion ($t = 3$)*

At this stage, for any given realization of m and for a fixed a, the bank solves $\max_z E_z[u_b \mid m]$. If $m = 0$, this is equivalent to:[28]

$$\max_z z_1 w_1 + z_2 w_2 - \frac{h}{2}(z_1 + z_2)^2$$

[28] For notational simplicity, the formulas in the text will only be those for the case in which the constraint $z_1 + z_2 \leq 1$ is not binding. The propositions will also provide the results for the case in which it is binding (h small).

Perfect substitutability among z_1 and z_2 implies that if $w_i > w_j$, then $z_j = 0$. With this restriction, the first order condition with respect to z_i gives the solution $z_i = w_i/h$. If $w_i = w_j = w$, then the above objective function can be seen as depending only on $z_T = z_1 + z_2$ and its optimal level is $z_T = w/h$. In principle, any couple (z_1, z_2) summing up to z_T is admissible but, given that we will focus on symmetric equilibria, the bank is assumed to choose $z_i = z_T/2$.[29]

If $m = 1$, the maximization problem is:

$$\max_z z_1 w_1 + z_2 w_2 + (1 - z_1 - z_2)(w_1 + w_2) - \frac{h}{2}(z_1 + z_2)^2$$

For any value of w_1 and w_2, the partial derivatives of this objective function with respect to both z_is is always negative so in this case the solution is $z_1 = z_2 = 0$.

The interpretation is intuitive: whenever market conditions are good (and how likely this is depends on how much effort the bank has previously exerted), the bank chooses not to collude and to accomplish both tasks it has been assigned. On the contrary, when m is low, it will decide to collude with the party that is granting it the highest payoff.

This simple result expresses the idea that conflicts of interest can have a negative impact on financial stability. Given that returns from collusion do not depend on market conditions, it is precisely when m is already low that collusion becomes a dominant strategy, thereby exacerbating initial difficulties.

Before going to the next step it is useful to calculate the value function of this problem. Using labels so that $w_1 \geq w_2$, this can be written as:

$$E_{z(m)}[u_b \mid m] = \begin{cases} w_1^2/(2h) & \text{if } m = 0 \\ w_1 + w_2 & \text{if } m = 1 \end{cases}$$

[29] As shown in Appendix A, dropping the assumption of perfect substitutability also eliminates this indeterminacy.

3.4.2 *The choice of effort ($t = 1$)*

At this stage the bank has to decide a level of a anticipating that, once m is observed ($t = 2$), it will find it optimal to play z as above. The program to be solved is $\max_a E_a\left[E_{z(m)}[u_b \mid m]\right]$. Still keeping the convention $w_1 \geq w_2$, this can be written as:

$$\max_a a\left(w_1 + w_2\right) + (1-a)\left(w_1^2/\left(2h\right)\right) - \frac{k}{2}a^2$$

The solution is given by the quantity $a = [w_1 + w_2 - w_1^2/\left(2h\right)]/k$, which is decreasing in k as intuition would suggest. The sign of the derivatives with respect to the w_is deserves a comment. The derivative with respect to w_2 is, as in the previous cases, equal to $1/k$. The derivative with respect to w_1 is positive, (weakly) decreasing, and always smaller than in the case without conflicts of interest. Now, an increase in w_1 (by definition the larger of the two) has two effects. On the one hand, as before, it makes effort more productive since it increases the pay-off the bank receives with $m = 1$. On the other hand, it also increases the pay-off from collusion and this in turn reduces the benefit of a higher effort, since the bank colludes only with $m = 0$.

3.4.3 *Contract game ($t = 0$)*

At this stage the two principals play the contract game simultaneously, deciding w_i while taking into account how this is going to affect a, z and taking as given the opponent's action w_j. For any i and $j \neq i$, principal i maximizes:

$$\max_{W_i, a, z(m)} E_a[E_{z(m)}[R_i - W_i \quad | \quad m]] \text{ s.t.}$$

$$\begin{aligned} a &= [w_i + w_j - \max\left\{w_i; w_j\right\}^2 / \left(2h\right)]/k \\ z_i\left(m\right) &= \begin{cases} 0 & \text{if } m = 0 \text{ or } w_i < w_j \\ w_i/\left(2h\right) & \text{if } m = 1 \text{ and } w_i = w_j \\ w_i/h & \text{if } m = 1 \text{ and } w_i > w_j \end{cases} \end{aligned}$$

In general we should proceed by computing the best responses and finding their intersection. The simplifying assumptions used bring the following proposition which avoids a lot of awkward algebra.

Proposition 1 *In the contract game that principals play in the case with conflicts of interest, there does not exist a symmetric equilibrium with* $w_1 = w_2 < 1$.

Proof. First, $z_i(1) = 0$ implies that $E_{\pi(a)}[E_{z(m)}[R_i - W_i \mid m]] = a(2 - w_i) + (1 - a)(1 - w_i + z_i - z_j)$. Second, while a is a continuous function of both w_is, z has a discontinuity precisely at $w_i = w_j$. At this point, $z_i - z_j = 0$ a deviation to $w_i + \varepsilon$, with ε an arbitrarily small positive quantity, makes $z_i - z_j$ jump to $(w_i + \varepsilon)/h > 0$. This means that from $w_i = w_j < 1$ there are always profitable upward deviations. ■

The intuition underlying this result is that of the Bertrand competition: the strategy of overbidding the opponent by offering a slightly higher fee is always dominant, since it makes the bank shift its collusion strategy in favour of one principal and not of the other (like the firms in a Bertrand duopoly that get all the market by slightly underbidding the competitor).

This proposition is useful since it naturally suggests that the only candidate for a symmetric equilibrium is precisely $w_1 = w_2 = 1$, the upper bound for the w_is thanks to the restrictions on the contract space. The conditions under which this is true are collected in the following proposition.

Proposition 2 $w_1 = w_2 = 1$ *is an equilibrium of the contract game under the following conditions:*

A. if $h \geq 1$, whenever $k \geq 2h - 1 + 5/(8h)$;
B. if $h < 1$, whenever $k \geq 1 + h(4 + h)/8$.[30]

The proof simply consists in checking that from $w_1 = w_2 = 1$ there are no profitable downward deviations and it is presented only for the case $h \geq 1$ (the case $h < 1$ can be proved in the same manner).

Proof. Given $h \geq 1$, fixing $w_j = 1$, we have $a = (1 + w_i - 1/(2h))/k$ and $z_i - z_j = -1/h$ for any $w_i < 1$. Using these expressions, it can be seen that the maximum utility that principal i achieves in the region $[0, 1[$ is at $w_i = 3/(4h)$. The implied (constrained) value function is at most equal to the utility at $w_i = 1$, where $a = (2 - 1/(2h))/k$ and $z_i - z_j = 0$, if $k \geq 2h - 5/(8h)$. ■

30 It can be seen that, given $k \geq 2$, the inequality $k \geq 1 + h(4 + h)/8$ is always satisfied for any $h < 1$.

The conditions for the existence of the symmetric equilibrium $w_1 = w_2 = 1$ can be interpreted in the following manner. By deviating to $w_i = 3/(4h)$ (the local maximum in the region $0 \leq w_i < 1$ and $w_j = 1$), principal i's net pay-off increases when $m = 1$ (he pays less to the bank) and decreases when $m = 0$ (the bank colludes with principal j). This deviation is not an improvement only if the probability of $m = 1$ is sufficiently low, which is the case when k is large. On the other hand, for given k, this is more likely the lower h is, that is the higher the probability that the collusion with j actually takes place. The properties of the equilibrium found are collected in the following proposition.

Proposition 3 *Given the conditions of proposition 2, the case without firewalls has the following symmetric equilibrium:*

A. $w_1 = w_2 = 1;$

B. $a = a^{CO} = \begin{cases} (2 - 1/(2h))/k & \text{if } h \geq 1 \\ (1 + h/2)/k & \text{otherwise} \end{cases}$

C. $z_i = z_i^{CO} = \begin{cases} 1/(2h) & \text{if } h \geq 1 \\ 1/2 & \text{otherwise} \end{cases}$

In equilibrium, effort is a decreasing function of k and collusion a decreasing function of h. A less intuitive result is that, for given k, effort is an increasing function of h: by decreasing h, the bank's payoff for $m = 0$ increases since it is less costly to exploit the conflict of interest and the benefits of effort diminish. The following proposition compares the allocations of the different cases studied.

Proposition 4 *The following relationships hold:*

A. $a^{FB} > a^{CO} > a^{1P} > a^{NC};$

B. $a^{CO} \underset{h \to 0}{\longrightarrow} a^{1P}$, and $prob\,(c = 0) = 1 - z_1 - z_2 \underset{h \to 0}{\longrightarrow} 0;$

C. $a^{CO} \underset{h \to \infty}{\longrightarrow} a^{FB}$, and $prob\,(c = 0) = 1 - z_1 - z_2 \underset{h \to \infty}{\longrightarrow} 1.$

The main result to be emphasized is that the equilibrium without firewalls is characterized by a level of effort which is greater than the one obtained with firewalls ($a^{CO} > a^{NC}$) but also by a higher level of collusion ($z_i > 0$). In other words, it can be said that conflicts of interest pose a trade-off between ex ante and ex post efficiency.[31]

---

[31] In a different context, Kofman and Lawarrée (1996) also design a model where allowing some collusion is optimal. Models with equilibrium collusion are also those with a principal-supervisor-agent structure where there is some uncertainty about the collusion technology; see Tirole (1992). However, in these models collusion

It is also interesting to note that the allocation without firewalls can be made arbitrarily efficient, both in terms of the z_is and of a, as long as the bank can be made arbitrarily attached to its "reputation", though these results depend on the assumption of perfect substitutability across the z_is.[32]

Until now the direct costs of collusion have been neglected. Depending on the specific case considered or on the interpretation of the function $\phi(z)$, this could be unsatisfactory. Taking into account the direct costs of collusion simply means considering that an increase in h, beyond the positive (indirect) effect through a and z, also determines a negative (direct) effect through $\phi(z) = \frac{h}{2}(z_1 + z_2)^2$. Since a priori it is not clear what the net result of these effects is, it becomes interesting to compare the different allocations on the basis of the level of social welfare achieved. The result of this comparison is presented in the following proposition, where U^e is the sum of expected utility of the two principals and of the bank in equilibrium e, for $e \in \{FB, NC, 1P, CO\}$.

Proposition 5 *Given the conditions of proposition , the following relationships hold:*

A. $U^{FB} > U^{1P} > \max(U^{CO}, U^{NC})$;

B. if $h \geq 1$: $U^{CO} > U^{NC}$ whenever $k < \frac{16}{9}h - \frac{1}{4h}$;

C. if $h < 1$: $U^{CO} > U^{NC}$ whenever $k < 1 - \frac{h}{4} + \frac{7}{9h}$.

The interesting results of the above proposition are those concerning the comparison between U^{CO} and U^{NC}, which say that the introduction of firewalls can reduce total welfare. This is more likely, the smaller k is: when k is large, the optimal a is anyway so small that the indirect benefits associated with the conflict of interest (which takes a closer to its first best level) are also small, while the costs remain unchanged.

3.5 *Equilibrium with a naive player*

This section considers the case where one principal (say $i = 2$) plays as if he were in the case without conflicts of interest (or as if the firewalls were completely reliable), while the

is always inefficient in the sense that, if contractible, the principal would always set it equal to zero. Optimal collusion can instead be obtained in multi-agent models if the agents share some private information (for example, if agents can monitor each other's level of effort). See Holmström and Milgrom (1990), and Varian (1990).

[32] See Appendix A for a detailed discussion on this point. Moreover, the results about the comparative statics with respect to h are less powerful than they look: the comparison, in fact, should be done only in the portion of the parameter space in which the existence conditions of proposition 2 are satisfied, so the approach of the equilibrium without firewalls to the first best cannot be complete.

other correctly anticipates both the conflict of interest and the equilibrium strategy of principal 2.

The solution of this case is meant to show the effect on the overall efficiency of the equilibrium when some of the players are naive and do not realize that the bank might collude with other parties.

In the previous sections the allocative efficiency of the equilibrium is preserved (if not increased) even in the presence of conflicts of interest. On the contrary, this will generally not be true with naive players. By comparing the two cases, one obtains a theory on the role played by policies to improve market transparency (for example, better and more detailed financial reports or standardized contracts), which can reasonably be regarded as means to increase the level of market participants' sophistication.

It should also be emphasized that the term naive must not be taken literally since it is subject to different and more general interpretations. For example, it could also represent a situation in which one of the parties is formed by a multitude of small agents (in the usual example these could be individual savers investing in a mutual fund) suffering from some coordination failure (for instance, because there are costs to obtain information or to take actions which are negligible for the entire set of agents but not for individual ones).

Under these circumstances, the equilibrium strategy of principal 2 is easily found since, by definition, the naive player plays as in the model without conflicts of interest: $w_2 = w_2^{NC} = 1/3$.

Similarly, the strategy for a followed by the bank is as in paragraph 3.4:[33]

$$\begin{aligned} a &= \left(w_1 + \frac{1}{3} - \frac{w_1^2}{2h} \right) / k \\ z_1(m) &= \begin{cases} 0 & \text{if } m = 0 \text{ or } \; w_1 < 1/3 \\ w_1/h & \text{if } m = 1 \text{ and } \; w_1 \geq 1/3 \end{cases} \end{aligned}$$

[33] The expression for a uses the conjecture $w_1 \geq 1/3$, which is checked in the proof. We avoid all possible issues caused by the discontinuity of the utility function of principal 1 at $w_1 = 1/3$ by assuming that the bank colludes only with principal 1 even for $w_1 = 1/3$. When the solution turns out to be exactly equal to $w_1 = 1/3$ (as will be the case in some regions of the parameter space), it will have to be meant as $1/3$ plus a positive and arbitrarily small quantity.

On the one hand, the way in which a depends on w_1 and w_2 remains unchanged; on the other hand, the principals play w_is strictly smaller than the equilibrium levels of proposition 2 ($w_2 = 1/3 < 1$ and $w_1 \leq 1$). This is sufficient to establish that the level of effort in the equilibrium with one naive principal, denoted a^{NA}, will always be smaller than a^{CO}.

The following proposition states under what conditions the loss of efficiency is so great that effort drops even below a^{NC}, the lowest level of the different cases studied above.

Proposition 6 *Given the existence conditions of proposition 2, a^{NA} satisfies the following properties:*

A. if $h \leq 3/4$ then $a^{NA} < a^{NC}$;

B. if $h > 3/4$ then there exists a function $d = d(h)$ (with $d'(h) < 0$ and $d(h) \underset{h \longrightarrow \frac{3}{4}^{+}}{\longrightarrow} +\infty$) such that $a^{NA} < a^{NC}$ if and only if $k < k_{\min}(h) + d(h)$, where $k_{\min}(h)$ is the minimum level of k satisfying the existence conditions of .

Proof. See Appendix B. ■

The main result is that, even neglecting the direct costs of collusion (ϕ), in the case with a naive player the loss of efficiency can be considerable: effort can be even smaller than a^{NC} (the lowest level until now) with, at the same time, a positive level of collusion. Only for some choice of the parameters, the presence of second order effects of the choice of z_1 make sure that a^{NA} can be greater than a^{NC}.

To obtain the intuition of this result it is useful to note that now principal 1 knows that by deviating even slightly above $1/3$ he can reap all the benefits of the conflict of interest (the bank will collude only with him). However, principal 1's best response is not necessarily equal (or, more precisely, arbitrarily close) to $1/3$ since he could be interested in raising w_1 to a higher level. This is done not so much in order to increase the level of effort, but rather to raise the level of collusion (if principal 1 cared only about a and not about z, he would also play as in the case without conflict of interest, where $w_1 = 1/3$). Nonetheless, such an increase in w_1 can have a positive effect on the level of effort. This (second order) effect is larger, the larger h is, that is the larger the w_1 that principal 1 has to pay in order to get the desired level of collusion.

4. Conclusions

The paper develops a suitable framework to analyze the incentives driving the activity of universal banks, generally intended as institutions providing services to different parties with potentially contrasting interests, that is under a so-called conflict of interest.

From a purely methodological perspective, the novelty consists in having introduced an intuitive way to define collusion in a moral hazard common agency model, previously defined only with adverse selection. A common agent that is allowed to collude in this sense is said to be subject to a conflict of interest.

More precisely, the conflict of interest is modelled as a technology which allows the bank (the common agent) to operate a costly redistribution of wealth from one client to another (the principals). The bank has alternative options other than just exploiting the conflict of interest (that is, other than actually colluding). In particular, it can decide instead to exert costly effort and try to pursue the interest of both principals.

The model is built by keeping in mind a specific example of conflict of interest (between the activities of mutual fund management and securities underwriting) but it offers more general insights concerning universal banks and, after due reinterpretation, even institutions operating in different environments.[34]

These are the main conclusions. (1) With sophisticated (rational) players, the presence of a conflict of interest increases the slope (the power) of the incentive schemes provided in equilibrium. (2) In situations where these would otherwise be too flat (for instance because effort is a public good), the conflict of interest can produce ex ante benefits (greater effort) which have to be balanced with its ex post costs (the probability that the bank actually colludes). (3) These beneficial effects disappear in situations where at least one of the principals is naive and does not take into account the presence of the conflict of interest.

[34] For instance, instead of having principals providing explicit incentive schemes in the form of fees, they might be carrying out some costly monitoring which directly affects agent behaviour in terms of effort choice and collusion. Moreover, although the model uses explicit incentive provision, it could be adapted to a version with implicit incentives (where the agent works hard in order to raise market perception about his quality). If the results for the different tasks (the services provided to the different principals) are not unrelated (for example, because effort can be spent in generic cost reduction activities), the attempt by the individual principal to make inference about the agent's ability by using information on the results obtained for all tasks would generate the positive externality leading to an overall higher level of effort.

The model can help to shed some light on important aspects of the policy debate. A first basic question is why institutions subject to conflicts of interest do exist despite the presence of those conflicts of interest. The model supplies two alternative explanations. If market participants are sophisticated, this can happen because these institutions actually are efficient. As also emphasized in Crocket *et al.* (2003), the existence of conflicts of interest does not necessarily imply that they will be exploited given that the bank is also interested in maintaining its market reputation. On the contrary, with naive players, although these institutions are not (socially) efficient they are likely to get extra-profits and to survive in competition with the efficient ones. A similar conclusion can be found in Rajan (1998), who argues that if the product market is not perfectly competitive it does not lead to a selection of efficient firms.

A second question concerns the desirability of some regulatory intervention. Again, if market participants are not naive, any intervention is irrelevant or even detrimental for allocative efficiency. For example, it is documented that before the Glass-Steagall Act commercial banks' securities affiliates sold assets with lower default rates than pure investment banks.[35] An important piece of evidence is that the market seemed able to detect situations where the conflict of interest was acute and responded by requiring higher yields. On the other hand, more recent experience of the conflict of interest afflicting the activity of equity research in investment banks shows that these institutions have occasionally been able to mislead clients on initial pubic offerings.[36] In the case of naive players, the model states that public intervention in terms of transparency requirements or in the more fierce form of firewalls and separation, is always desirable.

Third, the model helps to understand what kind of intervention is best. In this regard it shows that policies for transparency (if interpreted as those which let unsophisticated players realize the existence of a conflict of interest[37]) improve efficiency with naive players, and

---

[35] Kroszner and Rajan (1997).

[36] See The Economist (2002).

[37] There are several examples, some already adopted in some legislations. Financial analysts could be forced to declare if they have any direct or indirect connection with the companies they follow. Mutual funds could be be forced to reveal if they invest in shares of companies which have relevant business relationships with affiliated commercial banks. If the naive principal is a metaphor for a set of dispersed and small players suffering from some lack of coordination, measures of this type are those which help them to coordinate (for example, by imposing the nomination of a representative).

are irrelevant with rational players.[38] On the other hand, firewalls (which are defined as all organizational measures effectively preventing collusion from taking place, as happens with specialized banks) are welfare improving only with naive players but can be harmful with sophisticated agents.

Overall, it seems possible to state that while transparency requirements are always (at least weakly) beneficial, the desirability of more drastic measures such as firewalls and separation is likely to be greater in less financially developed economies.[39] This could explain why, differently from what happened in the United States after the 1929 financial crisis which brought in 1933 to the passing of the Glass-Steagall Act imposing the separation of functions, the reaction to the recent wave of financial scandals has been much more oriented towards policies of transparency requirements and information disclosure.[40]

A further interesting insight is that universal banks can generate some concern about financial stability. An immediate result of the model is, in fact, that the universal bank's incentives to collude are low when market conditions are good ($m = 1$) and are high when they are bad ($m = 0$). Increasing inefficiencies in the financial sector during periods of low expectations may exacerbate natural economic fluctuations.[41] This remark is interesting since it shows a mechanism which can counterbalance the positive effect universal banks would exert on financial stability thanks to their more diversified revenues and more stable profits.

5. Appendix A

This section deals with the case $\phi(z) = \frac{h}{2}\left(z_1^2 + z_2^2\right)$, in which z_1 and z_2 are not perfectly substitutable. It will be shown that this simple change makes the model not as tractable

[38] This conclusion neglects the direct costs for the implementation of these measures, which can be substantial.

[39] This reasoning presumes that in the model a small h and a large k is a metaphor for an economy with an underdeveloped financial sector. While k could be seen as a proxy of the level of productivity of the financial sector, h could measure the capacity to enforce contracts.

[40] It could be argued that the feasibility of trasparency requirements is related to the level of technological progress in the financial industry. On the types of intervention adopted after the recent wave of scandals see, for example, The Economist (2004).

[41] From the observation of recent episodes one could argue that all misbehaviors took place when markets were bullish, in contradiction with this feature of the model. This incongruity vanishes if one takes into consideration that, as many times reported in the financial press, during the upsurge of the speculative bubble investment bankers were conscious that many of the assets promoted would have eventually caused losses.

as when $\phi(z) = \frac{h}{2}(z_1 + z_2)^2$, but also that the main conclusions remain unaltered. The usefulness of this version is connected with the fact that, contrary to what happens with perfect substitutability, its solution does not require the assumption that payments can be positive only if returns are also positive.

First, it can be noted that the allocations of the first best, of the case with firewalls, and of the case with one principal remain unchanged since they are not affected by the shape of $\phi(z)$ ($z_1$and z_2 are always set to zero). In order to study the case with collusion we start by keeping the assumption that $W_i(1) = 0$.

When $m = 1$ the bank never colludes. On the contrary, when $m = 0$, the bank chooses a level of collusion equal to $z_i = w_i/h$ (we keep the notation $W_i(2) = w_i$) no matter whether w_i is greater or smaller than w_j (this is the direct effect of having abandoned the assumption of perfect substitutability).[42] With these values for the z_is, the optimal level of effort amounts to $a(w_1, w_2) = ((w_1 + w_2) - (w_1^2 + w_2^2)/(2h))/k$. For given principal j strategy, principal i best response is given by the following maximization:

$$\max_{W_i, a, z(m)} E_a E_{z(m)}[R_i - W_i \quad | \quad m]] \text{ s.t.}$$

$$\begin{aligned} a &= \left((w_1 + w_2) - \left(w_1^2 + w_2^2\right)/(2h)\right)/k \\ z_i &= w_i/h \qquad \text{for } i = 1, 2 \end{aligned}$$

with $E_a E_{z(m)}[R_i - W_i \mid m]] = a(2 - w_i) + (1 - a)[z_i(2 - w_i) + (1 - z_i - z_j)]$. The FOC for this problem, together with the assumption of symmetry $w_i = w_j$, leads to an equilibrium level for w_i and w_j which is denoted w^*.[43] This, in turn, implies an equilibrium level of effort which is denoted $a^* = a(w^*, w^*)$. It can be seen that for any admissible choice of h and k, $a^* > 2/(3k)$, which is the level of effort in the case with firewalls. This simple

---

[42] To avoid corner solutions we assume $k \geq h \geq 2$.

[43] In particular, $w^* = \sqrt[3]{D}/18 - 2F + (1 + 7h)/9$ where: $D = -156h - 444h^2 + 756kh - 1512kh^2 + 476h^3 + 8 + 36\sqrt{d}$; $d = 12kh - 15h^2 - 270kh^2 - 351h^6 + 288k^3h^3 + 708k^2h^4 + 180kh^5 + 606h^5 - 1140k^2h^3 - 585h^4 + 393k^2h^2 + 414kh^3 + 66kh^4 + 306h^3$; $F = \frac{13h+18kh-22h^2-1}{9\sqrt[3]{D}}$. It can also be verified that the second order conditions are satisfied.

remark corroborates the main result found in the case with perfect substitutability, which is the existence of a trade-off between the level of effort and the level of collusion.

The main difference with respect to the case with perfect substitutability concerns the sign of the derivatives da^*/dh, which now is negative. In general, there are two countervailing effects. One is the direct effect already pointed out: by decreasing h, the bank's pay-off for $m = 0$ increases since it is less costly to exploit the conflict of interest and the benefits of effort diminish. The other (indirect) effect goes through the determination of w^*: if h increases, for a given wage schedule, the amount of collusion decreases. This implies that the returns for principal i of paying w_i conditional on $m = 0$ (the returns obtained when the bank colludes in his favour) diminish. The optimal w_i therefore diminishes and this also has a negative effect on a. This indirect effect was absent in the case with perfect substitutability since Bertrand competition implied a w which is invariant with respect to h ($w = 1$, for any h and k satisfying the existence conditions).[44]

Although for simplicity we have maintained the assumption of symmetry, this appendix also shows that the main conclusions are robust in this respect as well. In fact, this version of the model does not present the discontinuity of the z_is highlighted in section 3.4.1; accordingly, it can be argued that the above equilibrium will change only marginally if, in order to introduce some asymmetry, the set of parameters is marginally changed.[45]

Finally, in order to show that the results are not intrinsically dependent on the restriction $W_i(1) = 0$,[46] we can give a numerical example: suppose that $h = 4$ and $k = 5$. It can be seen that if principal j's is forced to play the equilibrium strategy ($W_j(0) = W_j(1) = 0$ and $W_j(2) = w^*$), the partial derivative of principal i's expected utility with respect to $W_i(1)$ is

---

[44] Furthermore, having a decreasing in h eliminates an apparent incongruence (or discontinuity) of the model with perfect substitutability. Having the condition $a^{CO} \underset{h \longrightarrow \infty}{\longrightarrow} a^{1P}$ (with $a^{1P} > a^{CO}$) may be seen in contrast with the fact that the allocation with firewalls (which is characterized by a level of effort a^{NC} such that $a^{NC} < a^{CO}$) could be seen as the allocation where it is infinitly costly to collude ($h \longrightarrow \infty$).

[45] This does not mean that asymmetry does not play any role in the model but only that the equilibrium found is not strictly connected with the assumption of symmetry, as one could suspect by looking at the case with perfect substitutability.

[46] $W_i(0)$ is equal to zero in any case since there is no reason to pay when returns are at their lowest level.

negative for any $(W_i(1), W_i(2)) \in [0,1]^2$.[47] Values of $W_i(2) \in [1,2]$ can be neglected since these can never be optimal.[48]

6. Appendix B

This section presents the proof of proposition 6. Suppose $h > 1$ and make the conjecture that $w_1 \geq 1/3$. Compute the expected utility for principal 1, denoted $U_1(w_1)$, using the expressions for a and z given in paragraph 3.5. It can be seen that $U_1(w_1)$ is a fourth degree polynomial with a unique maximum in the interval $w_1 \in [1/3, 1]$. Then compute the level of w_1, denoted w°, in the interval $[0,1]$ satisfying $a = 2/(3k)$, the level of effort in the equilibrium with firewalls. It can be seen that $U_1'(w^\circ) < 0$ (which is equivalent to $a^{NA} < a^{NC}$) if and only if $k - k_{\min}(h) < d(h)$, where $d(h)$ is the solution to the equation $U'(w^\circ) = 0$ once the parameter k is substituted with the expression $k = d + k_{\min}(h)$ (the root is unique since in the region $d > 0$ and $h > 0$, which is where the existence conditions are satisfied, $U'(w^\circ)$ is increasing both in h and in d). To see that $w_1 < 1/3$ (which implies a change of the collusion strategy of the bank since $w_1 < w_2 = 1/3$) cannot be optimal, it is sufficient to verify that $U_1'(w_1)$ is positive for any $w_1 \in [0, 1/3]$. If $h < 1/3$, it is immediate to verify that $a^{NA} < a^{NC}$ no matter the value of w_1. For $h \in [1/3, 2/3]$, it is sufficient to verify that even the maximum level of a that can be achieved in this region (this is $\left(\frac{1}{3} + \frac{h}{2}\right)/k$, which is the level of a for any w_1 in the interval $[h, 2/3]$) cannot be greater than $2/(3k)$. For $h \in]2/3, 3/4]$ by proceeding as in the case $h > 1$ it can be seen that $U_1'(w^\circ) < 0$ for any h and d (given that $h < 1$, the expression for $k_{\min}$ change as indicated in proposition 2). Finally, for $h \in]2/3, 1]$, we are in a case which is similar to that of $h > 1$; again, the only difference is in the expression for $k_{\min}$ as indicated in proposition 2.

---

[47] This check requires taking into consideration that bank's behaviour changes when $W_i(1) > 0$.

[48] They imply an expected pay-off which is less than 1 and therefore lower than the level achieved by playing $W_i(1) = 0$ and $W_i(2) = w^*$.

References

Barth, J.R., R.D.J. Brumbaugh, and J.A. Wilcox (2000) "The repeal of Glass-Steagall and the Advent of Broad Banking", *Journal of Economic Perspectives*, Vol.14 No.2.

Benston, G.J. (1994) "Universal Banking", *Journal of Economic Perspectives*, Vol.8 No.3.

Ber, H., Y. Yafeh and O. Yosha (2001) "Conflicts of Interest in Universal Banking: Bank Lending, Stock Underwriting and Fund Management", *Journal of Monetary Economics*,Vol.47 No.1.

Bernheim, B. D. and M.D. Whinston (1986) "Common Agency", *Econometrica*, Vol.54 No.4.

Bolton, P., X. Freixas and J. Shapiro (2004) "Conflicts of Interest, Information Provision and Competition in Banking", *mimeo*.

Boyd, J.H., C. Chang and B.D. Smith (1998) "Moral Hazard under Commercial and Universal Banking", *Journal of Money, Credit, and Banking*, Vol.30 No.3.

Calzolari, G. and C. Scarpa (1999) "Non-Intrinsic Common Agency", *mimeo*.

Crockett, A., T. Harris, F. Mishkin and E. White (2003) "Conflicts of Interest in the Financial Services Industry: What Should We Do About Them?" *Geneva Reports on the World Economy 5*, CEPR and ICMB.

Demski, J. (2003) "Corporate Conflicts of Interest", *Journal of Economic Perspectives*, Vol. 17, No.2.

Dewatripont, M. and J. Tirole (1999) "Advocates", *Journal of Political Economy*, Vol.107 No.1.

Diamond, D. W. (1984) "Financial Intermediation and Delegated Monitoring", *Review of Economic Studies*, Vol. 51 No. 3.

Diamond, D. W. and P. H. Dybvig (1983) "Bank Runs, Deposit Insurance, and Liquidity", *Journal of Political Economy*, Vol. 91 No.3.

Gompers, P. and J. Lerner (1999) "Conflict of Interest in the Issuance of Public Securities: Evidence from Venture Capital", *Journal of Law and Economics*, Vol. 42 No. 1.

Guazzarotti, G. (2003) "Bank Underwriting of Debt Securities: Evidence from International Market", Banca d'Italia, manuscript.

Hoernig, S. (2002) "Mixed Bertrand Equilibria under Decreasing Returns to Scale: an Embarrassment of Riches", *Economic Letters*, Vol. 74 No.3.

Holmström, B. and P. Milgrom (1990) "Regulating Trade Among Agents", *Journal of Institutional and Theoretical Economics*, Vol. 146 No. 1.

Kofman, F. and J. Lawarrée (1996) "On the Optimality of Allowing Collusion", *Journal of Public Economics*, Vol. 61 No. 3.

Kroszner, R. and R. Rajan (1997) "Organization Structure and Credibility: Evidence from Commercial bank securities activities before the Glass-Steagall Act", *Journal of Monetary Economics*, Vol. 39 No. 3.

Martimort, D. (1996) "The Multiprincipal Nature of Government", *European Economic Review*, Vol. 40 No.3-5.

Martimort, D. and L. Stole (2003) "Contractual Externalities and Common Agency Equilibria", *Advances in Theoretical Economics*, Vol. 3.

Peters, M. (2001) "Common Agency and the Revelation Principle", *Econometrica*, Vol. 69 No. 5.

Puri, M. (1996) "Commercial banks in investment banking. Conflict of interest or certification role?", *Journal of Financial Economics*, Vol. 40 No. 3.

Rajan, R. (1998) "An Investigation into the Economics of Extending Bank Powers", *mimeo*.

Shull, B. and L. White (1998) "Of Firewalls and Subsidiaries: the Right Stuff for Expanded Bank Activities" New York University, Salomon Brothers Center for Study of Financial Institutions, *Stern School of Business working paper*, No.10.

The Economist, "The Price of Atonement", November 14th, 2002.

The Economist, "The Information Gap", March 18th, 2004.

Tirole, J. (1992) "Collusion and the Theory of Organizations", in J.J. Laffont (eds.) *Advances in Economic Theory*, Vol. II, Cambridge University Press.

Varian, H. (1990) "Monitoring Agents With Other Agents", *Journal of Institutional and Theoretical Economics*, Vol. 146 No. 1.

RECENTLY PUBLISHED "TEMI" (*).

- N. 548 – *The Basel Committee approach to risk weights and external ratings: what do we learn from bond spreads?*, by A. Resti and A. Sironi (February 2005).
- N. 549 – *Firm size distribution: do financial constraints explain it all? Evidence from survey data,* by P. Angelini and A. Generale (June 2005).
- N. 550 – *Proprietà, controllo e trasferimenti nelle imprese italiane. Cosa è cambiato nel decennio 1993-2003?,* by S. Giacomelli and S. Trento (June 2005).
- N. 551 – *Quota dei Profitti e redditività del capitale in Italia: un tentativo di interpretazione,* by R. Torrini (June 2005).
- N. 552 – *Hiring incentives and labour force participation in Italy,* by P. Cipollone, C. Di Maria and A. Guelfi (June 2005).
- N. 553 – *Trade credit as collateral,* by M. Omiccioli (June 2005).
- N. 554 – *Where do human capital externalities end up?,* by A. Dalmazzo and G. de Blasio (June 2005).
- N. 555 – *Do capital gains affect consumption? Estimates of wealth effects from italian households' behavior,* by L. Guiso, M. Paiella and I. Visco (June 2005).
- N. 556 – *Consumer price setting in Italy,* by S. Fabiani, A. Gattulli, R. Sabbatini and G. Veronese (June 2005).
- N. 557 – *Distance, bank heterogeneity and entry in local banking markets*, by R. Felici and M. Pagnini (June 2005).
- N. 558 – *International specialization models in Latin America: the case of Argentina,* by P. Caselli and A. Zaghini (June 2005).
- N. 559 – *Caratteristiche e mutamenti della specializzazione delle esportazioni italiane*, by P. Monti (June 2005).
- N. 560 – *Regulation, formal and informal enforcement and the development of the household loan market. Lessons from Italy*, by L. Casolaro, L. Gambacorta and L. Guiso (September 2005).
- N. 561 – *Testing the "Home market effect" in a multi-country world: a theory-based approach*, by K. Behrens, A. R. Lamorgese, G. I. P. Ottaviano and T. Tabuchi (September 2005).
- N. 562 – *Banks' participation in the eurosystem auctions and money market integration*, by G. Bruno, M. Ordine and A. Scalia (September 2005).
- N. 563 – *Le strategie di prezzo delle imprese esportatrici italiane*, by M. Bugamelli and R. Tedeschi (November 2005).
- N. 564 – *Technology transfer and economic growth in developing countries: an economic analysis*, by V. Crispolti and D. Marconi (November 2005).
- N. 565 – *La ricchezza finanziaria nei conti finanziari e nell'indagine sui bilanci delle famiglie italiane*, by R. Bonci, G. Marchese and A. Neri (November 2005).
- N. 566 – *Are there asymmetries in the response of bank interest rates to monetary shocks?*, by L. Gambacorta and S. Iannotti (November 2005).
- N. 567 – *Un'analisi quantitativa dei meccanismi di riequilibrio del disavanzo esterno degli Stati Uniti*, by F. Paternò (November 2005).
- N. 568 – *Evolution of trade patterns in the new EU member States,* by A. Zaghini (November 2005).
- N. 569 – *The private and social return to schooling in Italy,* by A. Ciccone, F. Cingano and P. Cipollone (January 2006).
- N. 570 – *Is there an urban wage premium in Italy?,* by S. Di Addario and E. Patacchini (January 2006).
- N. 571 – *Production or consumption? Disentangling the skill-agglomeration Connection,* by Guido de Blasio (January 2006).

(*) Requests for copies should be sent to:
Banca d'Italia – Servizio Studi – Divisione Biblioteca e pubblicazioni – Via Nazionale, 91 – 00184 Rome (fax 0039 06 47922059). They are available on the Internet www.bancaditalia.it.

"TEMI" LATER PUBLISHED ELSEWHERE

1999

L. GUISO and G. PARIGI, *Investment and demand uncertainty*, Quarterly Journal of Economics, Vol. 114 (1), pp. 185-228, **TD No. 289 (November 1996)**.

A. F. POZZOLO, *Gli effetti della liberalizzazione valutaria sulle transazioni finanziarie dell'Italia con l'estero*, Rivista di Politica Economica, Vol. 89 (3), pp. 45-76, **TD No. 296 (February 1997)**.

A. CUKIERMAN and F. LIPPI, *Central bank independence, centralization of wage bargaining, inflation and unemployment: theory and evidence*, European Economic Review, Vol. 43 (7), pp. 1395-1434, **TD No. 332 (April 1998)**.

P. CASELLI and R. RINALDI, *La politica fiscale nei paesi dell'Unione europea negli anni novanta,* Studi e note di economia, (1), pp. 71-109, **TD No. 334 (July 1998)**.

A. BRANDOLINI, *The distribution of personal income in post-war Italy: Source description, data quality, and the time pattern of income inequality*, Giornale degli economisti e Annali di economia, Vol. 58 (2), pp. 183-239, **TD No. 350 (April 1999)**.

L. GUISO, A. K. KASHYAP, F. PANETTA and D. TERLIZZESE, *Will a common European monetary policy have asymmetric effects?*, Economic Perspectives, Federal Reserve Bank of Chicago, Vol. 23 (4), pp. 56-75, **TD No. 384 (October 2000)**.

2000

P. ANGELINI, *Are banks risk-averse? Timing of the operations in the interbank market*, Journal of Money, Credit and Banking, Vol. 32 (1), pp. 54-73, **TD No. 266 (April 1996).**

F. DRUDI and R. GIORDANO, *Default Risk and optimal debt management,* Journal of Banking and Finance, Vol. 24 (6), pp. 861-892, **TD No. 278 (September 1996)**.

F. DRUDI and R. GIORDANO, *Wage indexation, employment and inflation,* Scandinavian Journal of Economics, Vol. 102 (4), pp. 645-668, **TD No. 292 (December 1996)**.

F. DRUDI and A. PRATI, *Signaling fiscal regime sustainability,* European Economic Review, Vol. 44 (10), pp. 1897-1930, **TD No. 335 (September 1998)**.

F. FORNARI and R. VIOLI, *The probability density function of interest rates implied in the price of options,* in: R. Violi, (ed.) , Mercati dei derivati, controllo monetario e stabilità finanziaria, Il Mulino, Bologna, **TD No. 339 (October 1998)**.

D. J. MARCHETTI and G. PARIGI, *Energy consumption, survey data and the prediction of industrial production in Italy,* Journal of Forecasting, Vol. 19 (5), pp. 419-440, **TD No. 342 (December 1998)**.

A. BAFFIGI, M. PAGNINI and F. QUINTILIANI, *Localismo bancario e distretti industriali: assetto dei mercati del credito e finanziamento degli investimenti,* in: L.F. Signorini (ed.), Lo sviluppo locale: un'indagine della Banca d'Italia sui distretti industriali, Donzelli, **TD No. 347** (**March 1999)**.

A. SCALIA and V. VACCA, *Does market transparency matter? A case study*, in: Market Liquidity: Research Findings and Selected Policy Implications, Basel, Bank for International Settlements, **TD No. 359 (October 1999)**.

F. SCHIVARDI, *Rigidità nel mercato del lavoro, disoccupazione e crescita*, Giornale degli economisti e Annali di economia, Vol. 59 (1), pp. 117-143, **TD No. 364 (December 1999)**.

G. BODO, R. GOLINELLI and G. PARIGI, *Forecasting industrial production in the euro area*, Empirical Economics, Vol. 25 (4), pp. 541-561, **TD No. 370 (March 2000)**.

F. ALTISSIMO, D. J. MARCHETTI and G. P. ONETO, *The Italian business cycle: Coincident and leading indicators and some stylized facts*, Giornale degli economisti e Annali di economia, Vol. 60 (2), pp. 147-220, **TD No. 377 (October 2000)**.

C. MICHELACCI and P. ZAFFARONI, *(Fractional) Beta convergence*, Journal of Monetary Economics, Vol. 45, pp. 129-153, **TD No. 383 (October 2000)**.

R. DE BONIS and A. FERRANDO, *The Italian banking structure in the nineties: testing the multimarket contact hypothesis*, Economic Notes, Vol. 29 (2), pp. 215-241, **TD No. 387 (October 2000)**.

2001

M. CARUSO, *Stock prices and money velocity: A multi-country analysis,* Empirical Economics, Vol. 26 (4), pp. 651-72, **TD No. 264 (February 1996)**.

P. CIPOLLONE and D. J. MARCHETTI, *Bottlenecks and limits to growth: A multisectoral analysis of Italian industry*, Journal of Policy Modeling, Vol. 23 (6), pp. 601-620, **TD No. 314 (August 1997)**.

P. CASELLI, *Fiscal consolidations under fixed exchange rates,* European Economic Review, Vol. 45 (3), pp. 425-450, **TD No. 336 (October 1998)**.

F. ALTISSIMO and G. L. VIOLANTE, *Nonlinear VAR: Some theory and an application to US GNP and unemployment,* Journal of Applied Econometrics, Vol. 16 (4), pp. 461-486, **TD No. 338 (October 1998)**.

F. NUCCI and A. F. POZZOLO, *Investment and the exchange rate*, European Economic Review, Vol. 45 (2), pp. 259-283, **TD No. 344 (December 1998)**.

L. GAMBACORTA, *On the institutional design of the European monetary union: Conservatism, stability pact and economic shocks,* Economic Notes, Vol. 30 (1), pp. 109-143, **TD No. 356 (June 1999)**.

P. FINALDI RUSSO and P. ROSSI, *Credit costraints in italian industrial districts,* Applied Economics, Vol. 33 (11), pp. 1469-1477, **TD No. 360 (December 1999)**.

A. CUKIERMAN and F. LIPPI, *Labor markets and monetary union: A strategic analysis,* Economic Journal, Vol. 111 (473), pp. 541-565, **TD No. 365 (February 2000)**.

G. PARIGI and S. SIVIERO, *An investment-function-based measure of capacity utilisation, potential output and utilised capacity in the Bank of Italy's quarterly model*, Economic Modelling, Vol. 18 (4), pp. 525-550, **TD No. 367 (February 2000)**.

F. BALASSONE and D. MONACELLI, *Emu fiscal rules: Is there a gap?,* in: M. Bordignon and D. Da Empoli (eds.), Politica fiscale, flessibilità dei mercati e crescita, Milano, Franco Angeli, **TD No. 375 (July 2000)**.

A. B. ATKINSON and A. BRANDOLINI, *Promise and pitfalls in the use of "secondary" data-sets: Income inequality in OECD countries*, Journal of Economic Literature, Vol. 39 (3), pp. 771-799, **TD No. 379 (October 2000)**.

D. FOCARELLI and A. F. POZZOLO, *The determinants of cross-border bank shareholdings: An analysis with bank-level data from OECD countries*, Journal of Banking and Finance, Vol. 25 (12), pp. 2305-2337, **TD No. 381 (October 2000)**.

M. SBRACIA and A. ZAGHINI, *Expectations and information in second generation currency crises models*, Economic Modelling, Vol. 18 (2), pp. 203-222, **TD No. 391 (December 2000)**.

F. FORNARI and A. MELE, *Recovering the probability density function of asset prices using GARCH as diffusion approximations*, Journal of Empirical Finance, Vol. 8 (1), pp. 83-110**, TD No. 396 (February 2001)**.

P. CIPOLLONE, *La convergenza dei salari manifatturieri in Europa,* Politica economica, Vol. 17 (1), pp. 97-125, **TD No. 398 (February 2001)**.

E. BONACCORSI DI PATTI and G. GOBBI, *The changing structure of local credit markets: Are small businesses special?,* Journal of Banking and Finance, Vol. 25 (12), pp. 2209-2237, **TD No. 404 (June 2001)**.

CORSETTI G., PERICOLI M., SBRACIA M., *Some contagion, some interdependence: more pitfalls in tests of financial contagion,* Journal of International Money and Finance, 24, 1177-1199, **TD No. 408 (June 2001)**.

G. MESSINA, *Decentramento fiscale e perequazione regionale. Efficienza e redistribuzione nel nuovo sistema di finanziamento delle regioni a statuto ordinario,* Studi economici, Vol. 56 (73), pp. 131-148, **TD No. 416 (August 2001)**.

2002

R. CESARI and F. PANETTA, *Style, fees and performance of Italian equity funds,* Journal of Banking and Finance, Vol. 26 (1), **TD No. 325 (January 1998)**.

L. GAMBACORTA, *Asymmetric bank lending channels and ECB monetary policy*, Economic Modelling, Vol. 20 (1), pp. 25-46, **TD No. 340 (October 1998)**.

C. GIANNINI, *"Enemy of none but a common friend of all"? An international perspective on the lender-of-last-resort function*, Essay in International Finance, Vol. 214, Princeton, N. J., Princeton University Press, **TD No. 341 (December 1998)**.

A. ZAGHINI, *Fiscal adjustments and economic performing: A comparative study*, Applied Economics, Vol. 33 (5), pp. 613-624, **TD No. 355 (June 1999)**.

F. ALTISSIMO, S. SIVIERO and D. TERLIZZESE, *How deep are the deep parameters?,* Annales d'Economie et de Statistique,.(67/68), pp. 207-226, **TD No. 354 (June 1999)**.

F. FORNARI, C. MONTICELLI, M. PERICOLI and M. TIVEGNA, *The impact of news on the exchange rate of the lira and long-term interest rates,* Economic Modelling, Vol. 19 (4), pp. 611-639, **TD No. 358 (October 1999**).

D. FOCARELLI, F. PANETTA and C. SALLEO, *Why do banks merge?*, Journal of Money, Credit and Banking, Vol. 34 (4), pp. 1047-1066, **TD No. 361 (December 1999)**.

D. J. MARCHETTI, *Markup and the business cycle: Evidence from Italian manufacturing branches,* Open Economies Review, Vol. 13 (1), pp. 87-103, **TD No. 362 (December 1999**).

F. BUSETTI, *Testing for stochastic trends in series with structural breaks*, Journal of Forecasting, Vol. 21 (2), pp. 81-105, **TD No. 385 (October 2000)**.

F. LIPPI, *Revisiting the Case for a Populist Central Banker,* European Economic Review, Vol. 46 (3), pp. 601-612, **TD No. 386 (October 2000)**.

F. PANETTA, *The stability of the relation between the stock market and macroeconomic forces*, Economic Notes, Vol. 31 (3), **TD No. 393 (February 2001)**.

G. GRANDE and L. VENTURA, *Labor income and risky assets under market incompleteness: Evidence from Italian data,* Journal of Banking and Finance, Vol. 26 (2-3), pp. 597-620, **TD No. 399 (March 2001)**.

A. BRANDOLINI, P. CIPOLLONE and P. SESTITO, *Earnings dispersion, low pay and household poverty in Italy, 1977-1998,* in D. Cohen, T. Piketty and G. Saint-Paul (eds.), The Economics of Rising Inequalities, pp. 225-264, Oxford, Oxford University Press, **TD No. 427 (November 2001)**.

L. CANNARI and G. D'ALESSIO, *La distribuzione del reddito e della ricchezza nelle regioni italiane,* Rivista Economica del Mezzogiorno (Trimestrale della SVIMEZ), Vol. XVI (4), pp. 809-847, Il Mulino, **TD No. 482 (June 2003)**.

2003

F. SCHIVARDI, *Reallocation and learning over the business cycle,* European Economic Review, , Vol. 47 (1), pp. 95-111, **TD No. 345 (December 1998)**.

P. CASELLI, P. PAGANO and F. SCHIVARDI, *Uncertainty and slowdown of capital accumulation in Europe,* Applied Economics, Vol. 35 (1), pp. 79-89, **TD No. 372 (March 2000).**

P. ANGELINI and N. CETORELLI, *The effect of regulatory reform on competition in the banking industry,* Federal Reserve Bank of Chicago, Journal of Money, Credit and Banking, Vol. 35, pp. 663-684, **TD No. 380 (October 2000)**.

P. PAGANO and G. FERRAGUTO, Endogenous growth with intertemporally dependent preferences, Contribution to Macroeconomics, Vol. 3 (1), pp. 1-38, **TD No. 382 (October 2000).**

P. PAGANO and F. SCHIVARDI, *Firm size distribution and growth,* Scandinavian Journal of Economics, Vol. 105 (2), pp. 255-274, **TD No. 394 (February 2001)**.

M. PERICOLI and M. SBRACIA, *A Primer on Financial Contagion,* Journal of Economic Surveys, Vol. 17 (4), pp. 571-608, **TD No. 407 (June 2001)**.

M. SBRACIA and A. ZAGHINI, *The role of the banking system in the international transmission of shocks,* World Economy, Vol. 26 (5), pp. 727-754, **TD No. 409 (June 2001)**.

E. GAIOTTI and A. GENERALE, *Does monetary policy have asymmetric effects? A look at the investment decisions of Italian firms,* Giornale degli Economisti e Annali di Economia, Vol. 61 (1), pp. 29-59, **TD No**. **429 (December 2001)**.

L. GAMBACORTA, *The Italian banking system and monetary policy transmission: evidence from bank level data*, in: I. Angeloni, A. Kashyap and B. Mojon (eds.), Monetary Policy Transmission in the Euro Area, Cambridge, Cambridge University Press, **TD No. 430 (December 2001).**

M. EHRMANN, L. GAMBACORTA, J. MARTÍNEZ PAGÉS, P. SEVESTRE and A. WORMS, *Financial systems and the role of banks in monetary policy transmission in the euro area*, in: I. Angeloni, A. Kashyap and

B. Mojon (eds.), Monetary Policy Transmission in the Euro Area, Cambridge, Cambridge University Press, **TD No. 432 (December 2001)**.

F. SPADAFORA, *Financial crises, moral hazard and the speciality of the international market: further evidence from the pricing of syndicated bank loans to emerging markets*, Emerging Markets Review, Vol. 4 (2), pp. 167-198, **TD No. 438 (March 2002)**.

D. FOCARELLI and F. PANETTA, *Are mergers beneficial to consumers? Evidence from the market for bank deposits*, American Economic Review, Vol. 93 (4), pp. 1152-1172, **TD No. 448 (July 2002)**.

E.VIVIANO, *Un'analisi critica delle definizioni di disoccupazione e partecipazione in Italia*, Politica Economica, Vol. 19 (1), pp. 161-190, **TD No. 450 (July 2002)**.

M. PAGNINI, *Misura e Determinanti dell'Agglomerazione Spaziale nei Comparti Industriali in Italia*, Rivista di Politica Economica, Vol. 3 (4), pp. 149-196, **TD No. 452 (October 2002)**.

F. BUSETTI and A. M. ROBERT TAYLOR, *Testing against stochastic trend and seasonality in the presence of unattended breaks and unit roots*, Journal of Econometrics, Vol. 117 (1), pp. 21-53, **TD No. 470 (February 2003)**.

2004

F. LIPPI, *Strategic monetary policy with non-atomistic wage-setters*, Review of Economic Studies, Vol. 70 (4), pp. 909-919, **TD No. 374 (June 2000)**.

P. CHIADES and L. GAMBACORTA, *The Bernanke and Blinder model in an open economy: The Italian case*, German Economic Review, Vol. 5 (1), pp. 1-34, **TD No. 388 (December 2000)**.

M. BUGAMELLI and P. PAGANO, *Barriers to Investment in ICT*, Applied Economics, Vol. 36 (20), pp. 2275-2286, **TD No. 420 (October 2001)**.

A. BAFFIGI, R. GOLINELLI and G. PARIGI, *Bridge models to forecast the euro area GDP*, International Journal of Forecasting, Vol. 20 (3), pp. 447-460,**TD No. 456 (December 2002)**.

D. AMEL, C. BARNES, F. PANETTA and C. SALLEO, *Consolidation and Efficiency in the Financial Sector: A Review of the International Evidence*, Journal of Banking and Finance, Vol. 28 (10), pp. 2493-2519, **TD No. 464 (December 2002)**.

M. PAIELLA, *Heterogeneity in financial market participation: appraising its implications for the C-CAPM*, Review of Finance, Vol. 8, pp. 1-36, **TD No. 473 (June 2003)**.

E. BARUCCI, C. IMPENNA and R. RENÒ, *Monetary integration, markets and regulation*, Research in Banking and Finance, (4), pp. 319-360, **TD No. 475 (June 2003)**.

E. BONACCORSI DI PATTI and G. DELL'ARICCIA, *Bank competition and firm creation*, Journal of Money Credit and Banking, Vol. 36 (2), pp. 225-251, **TD No. 481 (June 2003)**.

R. GOLINELLI and G. PARIGI, *Consumer sentiment and economic activity: a cross country comparison*, Journal of Business Cycle Measurement and Analysis, Vol. 1 (2), pp. 147-172, **TD No. 484 (September 2003)**.

L. GAMBACORTA and P. E. MISTRULLI, *Does bank capital affect lending behavior?*, Journal of Financial Intermediation, Vol. 13 (4), pp. 436-457, **TD No. 486 (September 2003)**.

F. SPADAFORA, *Il pilastro privato del sistema previdenziale: il caso del Regno Unito*, Rivista Economia Pubblica, (5), pp. 75-114, **TD No. 503** (**June 2004**).

G. GOBBI and F. LOTTI, *Entry decisions and adverse selection: an empirical analysis of local credit markets*, Journal of Financial services Research, Vol. 26 (3), pp. 225-244, **TD No. 535 (December 2004)**.

F. CINGANO and F. SCHIVARDI, *Identifying the sources of local productivity growth*, Journal of the European Economic Association, Vol. 2 (4), pp. 720-742, **TD No. 474 (June 2003)**.

C. BENTIVOGLI and F. QUINTILIANI, *Tecnologia e dinamica dei vantaggi comparati: un confronto fra quattro regioni italiane*, in C. Conigliani (a cura di), *Tra sviluppo e stagnazione: l'economia dell'Emilia-Romagna*, Bologna, Il Mulino, **TD No. 522 (October 2004)**.

E. GAIOTTI and F. LIPPI, *Pricing behavior and the introduction of the euro:evidence from a panel of restaurants*, Giornale degli Economisti e Annali di Economia, 2004, Vol. 63(3/4):491-526, **TD No. 541 (February 2005)**.

2005

L. DEDOLA and F. LIPPI, *The monetary transmission mechanism: evidence from the industries of 5 OECD countries,* European Economic Review, 2005, Vol. 49(6): 1543-69, **TD No. 389 (Decembre 2000)**.

G. DE BLASIO and S. DI ADDARIO, *Do workers benefit from industrial agglomeration?* Journal of regional Science, Vol. 45 n.4, pp. 797-827, **TD No. 453 (October 2002).**

M. OMICCIOLI, *Il credito commerciale: problemi e teorie,* in L. Cannari, S. Chiri e M. Omiccioli (a cura di), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 494 (June 2004)**.

L. CANNARI, S. CHIRI and M. OMICCIOLI, *Condizioni del credito commerciale e differenzizione della clientela*, in L. Cannari, S. Chiri e M. Omiccioli (a cura di), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 495 (June 2004)**.

P. FINALDI RUSSO and L. LEVA, *Il debito commerciale in Italia: quanto contano le motivazioni finanziarie?*, in L. Cannari, S. Chiri e M. Omiccioli (a cura di), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 496 (June 2004)**.

A. CARMIGNANI, *Funzionamento della giustizia civile e struttura finanziaria delle imprese: il ruolo del credito commerciale,* in L. Cannari, S. Chiri e M. Omiccioli (a cura di), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 497 (June 2004)**.

G. DE BLASIO, *Credito commerciale e politica monetaria: una verifica basata sull'investimento in scorte,* in L. Cannari, S. Chiri e M. Omiccioli (a cura di), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia,* Bologna, Il Mulino, **TD No. 498 (June 2004)**.

G. DE BLASIO, *Does trade credit substitute bank credit? Evidence from firm-level data.* Economic notes, Vol. 34 n.1, pp. 85-112, **TD No. 498 (June 2004).**

A. DI CESARE, *Estimating Expectations of Shocks Using Option Prices*, The ICFAI Journal of Derivatives Markets, Vol. II (1), pp. 42-53, **TD No. 506 (July 2004).**

M. BENVENUTI and M. GALLO, P*erché le imprese ricorrono al factoring? Il caso dell'Italia,* in L. Cannari, S. Chiri e M. Omiccioli (a cura di), *Imprese o intermediari? Aspetti finanziari e commerciali del credito tra imprese in Italia*, Bologna, Il Mulino, **TD No. 518 (October 2004)**.

P. DEL GIOVANE and R. SABBATINI, *L'euro e l'inflazione. Percezioni, fatti e analisi,* Bologna, Il Mulino, **TD No. 532 (December 2004).**