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Different contracts in the Civil Code for different organizations in the market: comparing co-operative and stock banks using a cost frontier approach

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Abstract: In this paper, I propose an empirical test of the main prediction of the theoretical literature on the firm as an incentive structure using data on the Italian markets, where two types of co-operative banks co-exist together with stock banks. I estimate a standard translog cost frontier and I derive cost efficiency scores. Kruskall–Wallis tests indicate that mean efficiency scores are statistically different among the three types of banks, providing empirical support to the theoretical prediction that different organizations represent different incentive structures. Moreover, co-operatives banks appear more efficient than stock banks. These results are robust also after controlling for the size of banks and the quality of their credit policies in a second-stage analysis. Hence, the efficiency gains stemming from the presence of scale economies seem to be dominated by the efficiency losses caused by the agency relationships within the bank in a more complex organization.

1. Introduction

It is well known that in a Walrasian economy setting, competitive equilibrium exhibits desirable properties from a social standpoint. Besides the absence of inefficiencies, stemming from the hypotheses of perfectly competitive and complete markets, there are two other consequences almost neglected in the traditional economic analysis. The first one is that the ownership of enterprises (i.e., the class of stakeholders to whom firms' property rights are assigned) is completely irrelevant in terms of economic efficiency (e.g., Drèze, 1976). In a world of complete contracts like the Walrasian framework, whether workers or investors are the

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firms' owners does not affect the efficiency of the optimal equilibrium allocation. The second consequence, easily obtainable from the first one, is that how firms are financed does not impact on economic efficiency (the renowned Modigliani and Miller theorem, 1958). In other words, since workers' or investors' ownership produces no effects on efficiency, a worker-owned co-operative completely financed with debt is indistinguishable – from an efficiency viewpoint – from an investor-owned stock company completely financed with own capital.

The striking feature of this economy without imperfections is that the existence of different 'contracts' envisaged by the law is difficult to explain in terms of economic efficiency. To put it starkly, suppose that the Walrasian model is a good *positive* theory; thence, whether firms are organized in the form of a joint stock company or a partnership (and whether the joint stock company is investor-owned and the partnership worker-owned) is totally irrelevant for the efficiency properties of the equilibrium outcome. However, when one explicitly recognizes contracts incompleteness and the existence of various forms of transaction costs, previous conclusions dramatically change. According to the theoretical literature, in a world where transaction costs exist, firms' owners do affect the equilibrium outcome, and ownership is regarded as one mean (among others) to provide incentives to different stakeholders (e.g., Hansmann, 1988, 1996; Holmstrom and Milgrom, 1994). The common idea underlying these contributions is that the observed pattern of ownership (if we exclude explicit provisions and limitations by the law) should be guided by economic principles of efficiency. Hence, ownership should be assigned to the class of stakeholders that minimizes the overall transaction costs involved in the nexus-of-contracts established by the firm. From an empirical point of view, the observed pattern of ownership seems indeed to be linked to the existence of different categories of transaction costs (e.g., Hansmann, 1996, for US; Pittatore and Turati, 2000, for the Italian case).

The theoretical proposition implicit in the results provided by this literature (Hansmann 1988, 1996; Holmstrom and Milgrom, 1994) is that different 'contracts' – by implying different owners of the firms – are characterized by different levels of transactions costs; hence, firms are characterized by different levels of economic efficiency. This theoretical proposition can be tested exploiting the literature on production and cost frontiers estimation (e.g., Lovell, 1993, for a survey). After estimating a *common* frontier for all the firms operating in a certain industry, one can easily obtain average measures of economic inefficiency characterizing each 'contract'.

Given the availability of the relevant data and the presence of different 'contracts', an industry that can be particularly fruitful for this kind of analysis is the banking industry. In Italy (but the situation is similar to other countries as well; see, e.g., Fonteyne, 2007, on Europe, and Altunbas *et al.*, 2001, for the German banking industry) at least three different types of organizations operate in the market: private commercial banks (stock banks), and two different types of co-operative banks, namely the *Banche Popolari* and the *Banche di Credito*

Cooperativo. The striking difference among the three groups is *the class of stakeholders to whom property rights are assigned*. In Italy, these stakeholders are respectively investors, workers, and borrowers. Besides the class of owners, other differences among the three types of 'contracts' can be observed: for instance in terms of the transaction costs for both depositors and borrowers, of the 'lending technology', of the size and branching, and of the governance structure. All these elements, in principle, can influence banks' efficiency, and can characterize each contract as a *specific* institution.

In this paper, I propose an empirical test of the theoretical prediction that different 'contracts' are characterized by different levels of efficiency using data on the Italian banking industry. After briefly reviewing the theoretical literature and considering the transaction costs relevant for the different stakeholders, I estimate a common cost frontier and compare average levels of inefficiency among the three different groups of firms active in the Italian banking market. The main result is that different 'contracts' are indeed characterized by different levels of overall inefficiency, and this reflects a *pure* organizational effect (i.e., robust also after controlling for a *size* effect). Hence, the different 'contracts' designed by the law seem to be helpful in solving an economic efficiency problem, providing economic agents different specific institutions.

The paper is linked to at least two different strands of literature. As it represents an exercise to empirically assess the validity of the theoretical approach that looks at firms as 'incentive structures', it falls within the empirical research in transaction costs economics (e.g., Shelanski and Klein, 1995, and Masten, 2002, for a survey; Carter and Hodgson, 2006, for a critical review). However, differently from the basic empirical model that considers the organizational form as the dependent variable, here I estimate a cost frontier and look at differences in the levels of inefficiency across different types of firms. The basic idea is to consider inefficiency as a proxy measure for transaction costs typifying each organization, and to show that different organizations are indeed characterized by different levels of transactions costs.

As it is based on data about Italian banks and uses established methodologies to measure efficiency, the paper is also related to the huge research on efficiency and its determinants in banking. Berger and Mester (1997) provide a survey of this literature, by concentrating on the different concepts of efficiency, the different measurement techniques, and the potential correlates with efficiency scores. This paper employs the cost efficiency concept and the parametric approach to analyse the potential role of the organizational structure (mutual versus stock) as a determinant of bank efficiency. The novelty within this literature is the use of Italian data: similar exercises have been already provided, for example, by Altunbas *et al.* (2001) using German data, and by Mester (1993) considering the US savings and loans industry.

The remainder of the paper is structured as follows. In Section 2, I briefly discuss the theoretical literature on the modern theory of the firm as an 'incentive

structure' within the context of the banking industries, in order to define a theoretical framework useful for the empirical analysis. Section 3 is devoted to the empirical methodology and to data description, while Section 4 discusses the results. Section 5 summarizes the main conclusions.

2. Theoretical background: social transaction costs in banking

I work here on the general theoretical approach proposed separately by Hansmann (1988, 1996) and Holmstrom and Milgrom (1994) that models firms as 'incentive structures'. The basic intuition of this theoretical approach is that all stakeholders bear transaction costs when they relate to firms, both through contracts as non-owners, and through ownerships' rights when they are the owners. Each firm in the economy can assume a number of different organizational structures, by choosing among the different 'contracts' envisaged by the law. An organizational structure is defined as an allocation of the firms' property rights to a specific class of stakeholders s_j. Since this allocation influences the incentives of the remaining classes, we are in a world where – following Holmstrom (1999) – there are 'contractual externalities', and the Coase theorem applies.

The social transaction costs SC associated to a firm when the class s_j is the class of stakeholders to whom property rights have been assigned can be defined as:

$$SC^j = CO_j + \sum_{i \neq j} CC_i^j \tag{1}$$

where CO are the transaction costs associated to stakeholders s_j for being the owners of the firm (the costs of ownership), and CC are the transaction costs faced by the remaining $s_i \neq s_j$ stakeholders for their contractual relations with the firm (the costs of contracts) when the stakeholders s_j are the owners.

There are different types of costs of contracts and costs of ownership, i.e. different types of inefficiencies with respect to a frictionless world.[1] Here I follow Hansmann, who defines three main categories for both the costs of contracts

1 Before describing these two categories further, it is worth noting that each type has been separately analysed by two different strands of research: the literature on the choice between markets and firms and the literature on the internal organization of firms. The former is related to the presence of relationship-specific investments in a contract between two parts, and it groups the transaction cost economics approach and the property rights approach (see, e.g., Williamson, 2000, for a recent comparison of the two approaches). The latter can be referred to the standard principal–agent framework, and to the derived literature on the provision of incentives in organizations. It collects both a positive approach (e.g., Fama, 1980; Fama and Jensen, 1983a, 1983b), and a normative approach (starting with Grossman and Hart, 1983). Hence, by considering the social transaction costs, Hansmann (1988, 1996) and Holmstrom and Milgrom (1994) put together these two strands of literature, and provide a *unitary framework* to explain endogenously when it is socially efficient for a certain class of stakeholders to own a firm in a certain industry.

and the costs of ownership. The costs deriving from the existence of *ex-ante* and *ex-post* market power and from the existence of asymmetric information represent the main *costs of contracts*. The costs of controlling managers (in all the firms where ownership and control are separated), the costs related to collective decision making, and the costs stemming from risk bearing are the main *costs of ownership*. Note that these are all categories of transaction costs well known in the economic literature. For instance, the transaction costs inherent in the existence of *ex-ante* market power simply resemble the inefficiency related to monopoly and other non-competitive market structures, namely higher prices and lower quantities for buyers with respect to the efficient competitive equilibrium. The existence of asymmetric information brings about transaction costs deriving from both adverse selection and moral hazard. The costs of controlling managers are well represented by all the normative solutions designed to solve the standard principal–agent problem, and to provide incentives to agents operating inside a firm. The difference with the previous literature is that *all* these transaction costs are now considered *together* in order to define the social transaction costs for all the stakeholders (i.e., the *sum* of all inefficiencies characterizing an organization).

When one moves from the general theoretical framework developed by Hansmann to the banking industry, it must be recognized that a unified analysis of the transaction costs related to each class of stakeholders of a bank is lacking.[2] There are, of course, numerous contributions that study the transaction costs (and the possible normative solutions) for depositors and borrowers, probably the two most important classes of stakeholders when thinking of a bank. Diamond (1984) is a common reference in this case. The author shows that – given asymmetric information between lenders and borrowers – a financial intermediary (i.e., an organization that collects funds from depositors and lends these funds to entrepreneurs) has a cost advantage in monitoring and enforcing a financial contract of debt with respect to direct lending. A financial intermediary enjoys returns to scale in producing monitoring effort, and these cost savings exceed the delegation costs (i.e., the transaction costs that sustain depositors, who 'delegate' the bank to monitor on their behalf the contract with the entrepreneur). An interesting point in Diamond's analysis, not sufficiently stressed in the literature, is that *two different models* of financial intermediary are economically viable: 'one model increases the number of agents working together within the intermediary organization as the intermediary monitors a larger number of entrepreneurs. The second model assumes that the intermediary consists of a single agent who monitors a large number of entrepreneurs

2 An unintentional exception is represented by Cerasi and Daltung (2000). The authors extend Diamond (1984) by assuming that a banker can monitor effectively only a *finite* number of investment projects, somewhat considering the internal organization of the bank. However, they do not explore the effects of different allocations of property rights on monitoring costs.

with independent projects' (see Diamond, 1984: 404). Even though Diamond does not recognize this explicitly, it seems possible to relate the first type of intermediary to the model of a co-operative bank, where the agents working together within the organization are simply the borrowers. For instance, Banerjee *et al.* (1994) refer to this model as an organizational structure characterized by *peer monitoring* among the members of the co-operative.[3] Notice that, in this case, each borrower has the incentive to monitor fellow borrowers, providing – in turn – higher incentives to repay the loan. In Hansmann's terminology, this 'risk sharing' model of a bank is that of an organization in which the property rights are assigned to borrowers. On the contrary, the second model of financial intermediary envisaged by Diamond is that of a typical stock bank, an organization owned by investors.

The costs of contracts

Assigning ownership to a certain class of stakeholder changes the cost of contracts for the remaining classes. Let us consider three different groups of stakeholders: providers of external finance (depositors and other investors), borrowers, and workers, which help identify the three patterns of ownership for banks operating in the Italian markets (i.e., respectively, stock-banks, *Banche di Credito Cooperativo*, and *Banche Popolari*). When depositors and other providers of funds to be invested *are not* the owners, they clearly face costs deriving both from the existence of market power and from the existence of asymmetric information in the use of funds. The banking literature has focused mainly on the second category, generally looking for normative solutions. For example, Diamond (1984) proves that when depositors delegate monitoring to a bank, the debt contract is the optimal contractual solution. Rajan (1998), surveying the incomplete contract approach to banking, suggests that fractional reserve banking was a second-best solution to protect depositors against the misappropriation of funds from the banker. The introduction of deposit insurance schemes displaced this organizational arrangement, as observed also by Rasmusen (1988), who argues that assigning ownership to depositors is a solution that helps explain the historical evidence on the evolution of banking in the United States.

However, when depositors and other investors *are* the owners, they can draw on an array of normative solutions (including monitoring) to partially overcome problems of adverse selection and moral hazard. These solutions include the request for collateral, the signalling power of the personal capital of the entrepreneur directly invested in the project, and the borrower's reputation.

3 For a more formal analysis of the peer monitoring mechanism, see, e.g., Armendariz and Murdoch (2007) and the references therein. Notice that the mechanism is relevant for solving both adverse selection and moral hazard problems that can arise within a bank. As for adverse selection, control by peers will prevent 'bad' firms becoming owners. As for moral hazard, control by peers will prevent owners from choosing 'bad' projects. Also, free-riding in controlling is curbed by this mechanism.

Obviously, all these solutions are costly for borrowers; but one needs to distinguish between two broad categories of borrowers, namely large firms and small firms. These two categories are characterized by a different level of opacity of the relevant information for the banker. In particular, while information on large firms is usually available in the form of financial statements (the so-called 'hard' information), information on small firms is not, and must be gathered by the loan officer over the course of the relationship (the so-called 'soft' information). This enables large firms to collect funds also directly from the market, whilst small firms are highly dependent on internal finance and bank debt as a primary source of external finance (see, e.g., Berger and Udell, 2002); hence, small firms bear a higher volume of transaction costs than large ones. These transaction costs are higher also if one thinks of the other normative solutions that can be used by investors and depositors to mitigate the problems of asymmetric information: small firms do not typically have real assets to be used as collateral, they are characterized by a lower level of capitalization, and they lack reputation on traditional banking markets. In all these cases, developing a relationship with a bank might represent a possibility for small firms to obtain funds. However, Angelini *et al.* (1998) point out two different theoretical effects stemming from developing such a relationship. On the one hand, there is a virtuous effect on the price and the availability of credit, since more information becomes accessible the longer is the relationship; this contributes to decreased transaction costs for borrowers. On the other hand, small firms become 'informationally captured', and the bank can exploit this rent by worsening contractual conditions; this effect works in the direction of increasing the transaction costs for borrowers.

The last category of stakeholders that can contract with a bank is that of workers. However, cost of contracts seems to be relatively low for this group, since it is reasonable to think of a competitive labour market also for bank employees. On the contrary, workers are responsible for increasing costs of ownership for the owners, a category of transaction costs to which now I turn.

The costs of ownership

Beside the costs of contracts, social transaction costs include the costs of ownership. In this case, the most important differences arise between small local banks and banks with a large network of branches, a typical discrepancy between borrower-owned co-operative banks (like the *Banche di Credito Cooperativo* in Italy), and stock banks. Of course, the larger the organization, the more important the agency problems of controlling managers and workers, and of delegating authority within the organization when the ownership is in the hands of borrowers or investors. On the contrary, this argument loses some of its power when ownership is assigned to workers, as in the original model of *Banca Popolare* in Italy. However, following Hansmann, it is worth noting that if there are substantial differences among workers' tasks (and this is more likely the

larger and more layered the bank), then the costs of collective decision making could be increased. This is mostly important when banks are organized as co-operatives, due to their particular governing structure (the voting mechanism and the mechanisms for selecting new members that makes the choice highly discretionary).[4] Finally, as far as the managers are concerned, Rasmusen (1988) recalls that assigning property rights to investors/depositors partially contributes to solve agency problems, because managers have incentives to pursue a safe investment policy in order to maintain their rents.[5]

The dimension of the bank influences not only the transaction costs arising within the organization for the agency relationships, but also the ability of the bank to collect, process, and use different kinds of information. In particular, an argument put forward by Berger and Udell (2002) suggests that there is an organizational diseconomy of scale in activities requiring the use of 'soft' information. Small banks reduce agency costs in the use of this kind of information with their loan officers, by eliminating layers of management. Moreover, the banks' president usually has very tight links to the local community, and this further helps mitigate the problems. On the contrary, large banks alleviate the agency costs by reducing the amount of relationship lending, hence reducing the delegation of authority within the organization. Indeed, Berger *et al.* (2001) find empirical support for this argument, by showing that large banks develop relationships that are more impersonal with their borrowers than small banks.

The size and the organization of banks are relevant also in explaining transaction costs related to collective decision making. While for investors, this category of costs is relatively small compared to other transaction costs, it can be very important for both workers and borrowers, especially when the group of owners is characterized by heterogeneous preferences. This is likely to happen in the presence of small and large borrowers, or of bank-tellers, bookkeepers, and branch managers. In all these cases, heterogeneous preferences can lead to inefficient decisions, and make the decision process really troublesome.

The social transaction costs

Before turning to the empirical part of the paper, I try now to put together all these suggestions from the theoretical literature to find an explanation of when the co-operative solution (and, in particular, the borrowers owned co-operative) can constitute a *socially efficient* incentive structure for a bank (since it minimizes the sum of all the inefficiencies related to the organization). Table 1 provides a structured map of transactions costs for different stakeholders in the

4 For all these reasons, the model of *Banca Popolare* has probably become inadequate in recent years, and the governance structure needs to be redefined. Reforms, however, seems particularly difficult to implement.

5 In light of the recent financial crisis, this argument needs at best to be profoundly re-evaluated.

Table 1. Social transaction costs in banking for different allocations of property rights

	Ownership assigned to:		
	Borrowers (Banca di Credito Cooperativo)	Investors/depositors (Società per Azioni)	Workers (Banca Popolare)
Transaction costs for:			
Borrowers	Costs of ownership: increase with size and organizational layers, both for collective decision making and agency costs	Costs of contracts: relatively higher for small firms than for large firms, for market power (*ex-ante* and *ex-post*)	Costs of contracts: relatively higher for small firms than for large firms, due to market power (*ex-ante* and *ex-post*)
Investors/depositors	Costs of contracts: can be high because of the misappropriation of funds by owners	Costs of ownership: increase with size and organizational layers, both for agency costs and diseconomies in processing 'soft' information	Costs of contracts: can be high because of the misappropriation of funds by owners
Workers	Cost of contracts: relatively small because of competitive labour market	Cost of contracts: relatively small because of competitive labour market	Costs of ownership: increase with size and organizational layers, both for collective decision making and diseconomies in processing 'soft' information

presence of three different types of banks: a borrower-owned co-operative bank (i.e., the *Banca di Credito Cooperativo* in Italy), an investor-owned bank (i.e., a stock bank, or *Società per Azioni*), and a worker-owned credit co-operative (i.e., the *Banca Popolare*). Several considerations emerge from observing this map. First, transaction costs characterizing the three organizations are different; hence, the efficiency losses characterizing each organization are different. Second, by looking at the costs of ownership, assigning property rights to workers and borrowers is less likely the more layered is the organization, because of higher transaction costs related to collective decision making. On the contrary, the costs of ownership are problematic for investors because of agency costs, and the diseconomies in processing 'soft' information when the bank's size increases. Third, turning to the costs of contracts, these are usually small for workers, making their ownership almost always an inefficient solution in banking. On the contrary, considering borrowers, these costs can be extremely high for small firms, because of the need to process 'soft' information. And the same is true for investors/depositors, because of the possible misappropriation of funds by the owners.

When then are borrower-owned credit co-operatives an efficient institutional arrangement? In terms of transaction costs for investors, the literature suggests that small business lending is the most costly activity for banks, due to the need of collecting 'soft' information. The co-operative contract limits these costs by assigning ownership to borrowers, and favouring the peer monitoring among co-operative members. Given the need to collect 'soft' information, the organization must be small and locally based: this is guaranteed by the particular governing structure envisaged by the law, in particular by the voting mechanism and the process of selecting new members. Hence, from a theoretical point of view, the co-operative contract seems to define an optimal incentive structure for a lending activity based on 'soft' information among peers. Whether the volume of social transaction costs involving the co-operative contract is higher than that characterizing stock ownership is, however, not possible to define *a priori*. In the empirical part of the paper, to which now I turn, I provide a measure of social transaction costs by exploiting the literature on cost frontier estimation, and test:

(a) whether the three types of banks are characterized by different levels of social transaction costs (i.e., of economic efficiency);
(b) which of the three types is characterized by the lower level of social transaction costs.

3. The empirical analysis

The methodology

To empirically assess whether the co-operative bank really constitutes a different incentive structure with respect to the stock bank, and is characterized by a lower level of efficiency losses, I exploit the literature on frontiers estimation (e.g., Lovell, 1993, for a survey). Since the basic test is whether the two 'contracts' are characterized by different levels of efficiency (hypothesis (a) above), I estimate a *common* frontier and compare the average levels of efficiency characterizing the types of banks operating in the Italian market. I assume that banks have access to a common stochastic technology in the production of banking services, represented by the following 'extended' production set:

$$\mathbf{y} = f(\mathbf{x}, SC^j, \varepsilon) \tag{2}$$

where $\mathbf{y}$ and $\mathbf{x}$ represent respectively the vector of outputs and the vector of inputs; SC^j are the social transaction costs related to the organization when property rights are assigned to the class of stakeholders s_j;[6] ε represents pure random noise that picks up the impact of variables outside the control of the firm (plus potential measurement errors that could plague the data). This approach

6 See equation (1) above. It is worth noting that in the terminology of frontiers estimation, this is the term representing inefficiency.

resembles Jensen and Meckling (1979), who argue that 'the maximum attainable output of a firm is ... *not* purely a matter of 'physical' possibilities given the technology and knowledge; the production function depends on the contracting and property-rights system within which the firm operates'.

In the empirical analysis of the banking industry, it is often argued that a common frontier approach is misleading, because it can cause the researchers to confuse technological differences with inefficiency. However, as the theoretical discussion on the firm as an incentive system should have made clear, organizational differences reflect *choice variables* of banking firms, and not differences in the production set. In other words, this means that having access to a common 'extended' production set, each bank chooses the ownership structure *and* the organizational structure (that together define its objective function), beyond inputs and outputs of the production process.[7] A similar argument is made by Altunbas *et al.* (2001); they state that 'if a priori all firms are faced with the same opportunities to combine labor, physical capital and financial capital to produce outputs that are virtually identical, then the adoption of a technology that results in higher costs or lower profits is the result of a management choice'.

Here I model the banking production process described by equation (2) following the so-called 'intermediation approach' proposed by Sealey and Lindley (1977). I assume that banks use labour (L), physical capital (K), and deposits (D) as inputs in order to produce three outputs: loans (LO) and investments in securities (OEA) that together define the traditional activity of banks, plus financial services for customers (SER), as part of the innovative activity of commercial banks.

From the production function represented in equation (2), it is easy to derive the associated cost frontier:

$$c = f(\mathbf{y}, \mathbf{w}, SC^j, \varepsilon) \tag{3}$$

where $\mathbf{w}$ represents the input price vector and the remaining variables are defined as before. Besides the hypothesis of a common production set, concentrating on a common cost frontier requires that the objective function of all the types

7 Cummins *et al.* (1999) test – using cross-frontier analysis – whether stock and mutual insurers are characterized by a different technology in producing insurance. They define technology 'as including the contractual relationships that constitute the firm as well as physical technology choices'. They conclude that 'stocks and mutuals are using different technologies and that the stock (mutual) technology is superior on average to the mutual (stock) technology for producing the stock (mutual) firms' output vector'. However, considering the theoretical framework presented here, estimated differences by Cummins *et al.* simply reflect the presence of inefficiencies *in the choice of ownership structure*. For instance, some allocations may be unattainable for stock firms, because ownership has been *inefficiently* obtained by investors. In other words, the 'extended' production (and cost) function considered here describes the technology available to all stakeholder classes *before* ownership has been assigned. Notice that the organizational structure, like every input and output, can be chosen each year. Indeed, in Italy also some banks are changing their co-operative nature and adopting the stock contract when increasing their branch network.

of banks operating in the industry incorporate total cost minimization. While this is commonly accepted as true for stock banks (even though the separation between ownership and control can make the objectives of managers diverge from those of the owners), it is sometimes questioned in the literature for co-operative banks. An argument frequently mentioned is that while market forces are expected to discipline managers who run stock banks to minimize costs, the same does not apply to managers of co-operative banks. However, this does not need to be true, and other mechanisms (for instance, reputation) can be at work in a co-operative bank to discipline managers that usually share special connections with the local community. Moreover, as also Altunbas *et al.* (2001) note, 'competition between banks is likely to emphasize cost minimization as an important managerial objective'; and competition intensified in the Italian banking markets during the 1990s.

I specify equation (3) as a standard translog cost frontier. The specification to be estimated can then be written as:

$$\begin{aligned}\ln c = \beta_0 + \sum_{i=1}^{3} \beta_i \ln w_i + \sum_{j=1}^{3} \alpha_j \ln y_j \\ + 1/2 \sum_{i=1}^{3}\sum_{j=1}^{3} \beta_{ij} \ln w_i \ln w_j + 1/2 \sum_{i=1}^{3}\sum_{j=1}^{3} \alpha_{ij} \ln y_i \ln y_j \\ + \sum_{i=1}^{3}\sum_{j=1}^{3} \gamma_{ij} \ln y_i \ln w_j + \eta \end{aligned} \tag{4}$$

where the input price vector is $\mathbf{w} = [w_L, w_K, w_D]$, the output vector is $\mathbf{y} = [LO, OEA, SER]$, and η is a composed error term that includes both inefficiency (the social transaction costs) and pure random noise. Homogeneity of degree one in prices requires the following restrictions on the parameters of the cost function:

$$\sum_{i=1}^{3} \beta_i = 1; \quad \sum_{i=1}^{3} \beta_{ij} = 0, \quad \forall j; \quad \sum_{i=1}^{3} \gamma_{ij} = 0, \quad \forall i \tag{5}$$

whereas equality of cross partial derivatives entails $\alpha_{ij} = \alpha_{ji}$ and $\beta_{ij} = \beta_{ji}$. As is usual in the literature, I impose both sets of restrictions in equation (4).

From equation (4), one can also derive indicators for scale and scope economies. In particular, returns to scale characterizing production can be obtained by considering global elasticity of size:

$$\xi = \left(\sum_{i=1}^{3} \frac{\partial \ln c}{\partial \ln y_i} \right)^{-1} \tag{6}$$

$\xi > 1$ ($\xi < 1$) implies that the bank is operating under increasing (decreasing) returns to scale; hence, the optimal production scale can be obtained by increasing (decreasing) the volume of funds intermediated.

Scope economies between output y_i and y_j can instead be measured by considering the definition of cost complementarities (in this sense, e.g., Ferrier and Lovell, 1990):

$$\zeta = \frac{\partial^2 \ln c}{\partial \ln y_i \partial \ln y_j} + \left(\frac{\partial \ln c}{\partial \ln y_i} \times \frac{\partial \ln c}{\partial \ln y_j} \right) \tag{7}$$

Scope economies (diseconomies) between output y_i and y_j exist whenever $\zeta < 0$ ($\zeta > 0$).

The data

The empirical analysis is based on a sample of more than 700 Italian banks in 1999. Data are obtained from the *BilBank 2000* database managed by the Italian Association of Banks (*Associazione Bancaria Italiana*). It includes banks' balance sheet information on three different types of banks, namely stock banks (*Società per Azioni*, *SPA*), and two types of co-operatives (*Banche Popolari*, *POP*, and *Banche di Credito Cooperativo*, *BCC*). The final sample includes 175 *SPA*, 39 *POP*, and 495 *BCC*; this reproduces pretty well the presence of each type of bank in the Italian markets.

The three types of banks are characterized by different contracts regulated in the Italian Civil Code. This, in turn, implies other differences, for instance with respect to the group of stakeholders who own the firm, size, and balance sheet structure. As for the group of stakeholders who own property rights, as already mentioned above, the literature usually recognizes that *SPA* are investor-owned firms, *POP* are worker-owned co-operatives, and *BCC* are borrower-owned co-operatives. Notice that these ownership structures are sustained also by the particular governing mechanisms envisaged by the law. In the typical stock bank, every share carries one vote; but, in the typical co-operative contract, every member has one vote. This reflects also the historical roots of the co-operative movement, discussed for instance by Fonteyne (2007), to help solve a number of market imperfections. However, an important distinction has to be made between the two types of co-operatives operating in Italy: while *BCC* maintained their mutual nature, the latest regulation on *POP* strongly mitigated their mutualistic aim. On the one hand, as Presti (1998) puts it, the Italian Banking Law (*T.U. Bancario*) does not prescribe the mutualistic aim for the *Banche Popolari*, and does not stress those rules that are normally used in the general law either to favour it or to compress the lucrative aim. On the other hand, the mutual nature of *BCC* is emphasized by two provisions: (a) loans must be granted mostly (even if not only) to members (which makes the *BCC* a contractual arrangement very close to the theoretical model of an organization

Table 2a. Descriptive statistics (mean values, 1999)

	All	BCC	POP	SPA
Total assets (bn It. lire)	3,850.280	259.284	7,787.622	13,130.205
Physical capital (% total assets (T.A))	2.4	1.9	1.8	3.7
Loans (% T.A.)	61.8	60	67.7	65.6
Other earning assets (% T.A.)	11.2	10.1	14.4	13.5
Deposits (% T.A.)	58.1	57.7	59.7	58.9
Managed securities (% T.A.)	84.8	75.7	86.6	110.6
Bad loans (% loans)	3.8	3.8	3.6	3.6
Nr. banks	709	495	39	175

Note: BCC = borrower-owned cooperative; POP = worker-owned cooperative; SPA = investor-owned bank.
Source: our calculations on BilBank data.

Table 2b. Descriptive statistics (mean values, 1999)

			Belonging to a group	
	All	Independent	Head	Subsidiary
Total assets (bn It. lire)	3,850.280	404.320	20,113.176	12,475.66
Physical capital (% total assets (T.A.))	2.4	1.9	4.5	3.3
Loans (% T.A.)	61.8	60.7	62.7	67.5
Other earning assets (% T.A.)	11.2	10.4	14.5	13.4
Deposits (% T.A.)	58.1	58.1	57.4	58.4
Managed securities (% T.A.)	84.8	79.1	106.3	99.2
Bad loans (% loans)	3.8	3.7	3.3	4.3
No. banks	709	548	56	105

Source: our calculations on BilBank data.

characterized by peer monitoring); (b) acceptance of new members is highly discretionary, and this contributes to sustaining a homogeneous membership (see, e.g., Angelini *et al.*, 1998; Presti, 1998).

Other differences between the two types of co-operative banks and the stock banks can be spotted by looking at the data. For instance, *BCC* are very small compared both to *POP* and to *SPA*, either when considering total assets (Table 2a) or when considering the number of employees (Table 3a); their small dimensions emphasize their local nature. The balance sheet structure is also different: *BCC* employ a lower share of total assets in loans and other earning assets with respect to the other two types of banks, probably because of more prudential managerial choices that, however, are not apparently reflected in the proportion of bad loans (Table 2a).

A relevant difference concerns the composition of employment in the three organizations: *BCC* have the highest share of executives and the lowest share of officers; hence, the distance between the two extreme layers of the organization seems to be reduced in *BCC* (Table 3a). A huge diversity is observed also for profitability as measured by the ROE: the lowest performance is obtained by

Table 3a. Descriptive statistics: personnel (mean values, 1999)

	All	BCC	POP	SPA
Employees (no.)	462	42	1,065	1,487
of which: executives (%)	*3.1*	*3.7*	*2*	*1.8*
of which: officers (%)	*10.9*	*9.9*	*11.3*	*13.7*
of which: other employees (%)	*86.4*	*87.3*	*86.7*	*83.9*
Personnel expenses (% Operating income)	39.4	40	37.9	38.1
Intermediated funds per employee (bn It. lire)	7.915	6.295	7.614	12.430
No. banks	709	495	39	175

Note: BCC = borrower-owned cooperative; POP = worker-owned cooperative; SPA = investor-owned bank.
Source: our calculations on BilBank data.

Table 3b. Descriptive statistics: personnel (mean values, 1999)

			Belonging to a group	
	All	Independent	Head	Subsidiary
Employees (no.)	462	67	2,348	1,472
of which: executives (%)	*3.1*	*3.6*	*1.9*	*1.5*
of which: officers (%)	*10.9*	*10.1*	*13.4*	*14*
of which: other employees (%)	*86.4*	*87.1*	*84.7*	*83.7*
Personnel Expenses (% Operating income)	39.4	39.9	32.5	40.9
Intermediated funds per employee (bn It. lire)	7.915	6.378	22.051	8.054
No. banks	709	548	56	105

Source: our calculations on BilBank data.

BCC with 3.27%, whereas *POP* obtained 9.94% and *SPA* 8.07%. Again, this seems to reinforce the idea that while *BCC* are still characterized by a mutualistic structure, *POP* are not.

Estimation of the cost function in equation (4) requires the definition of the input price vector $\mathbf{w} = [w_L, w_K, w_D]$ and the output vector $\mathbf{y} = [LO, OEA, SER]$. Following the literature on banks' efficiency, price of labour has been obtained by dividing personnel expenses by the number of employees. As the structure of employment is different among the three types of banks, I also computed a *weighted* price of labour by assuming that executives' compensation is three times the basic compensation, and officers' compensation is two times the basic one. Price of physical capital is simply the ratio between administrative expenses and the book value of fixed assets, while price of funds is the ratio between total interest expenses and the volume of funds. Mean values for input prices are collected in Table 4a: only narrow differences can be observed with respect to input prices faced by the three types of banks; one exception is represented by the higher price of physical capital for *POP* with respect to both *BCC* and *SPA*. As far as the outputs are concerned, *LO* and *OEA* are represented respectively by the total aggregate loans and the total aggregate securities, whereas *SER* are

Table 4a. Descriptive statistics: input prices (mean values, 1999)

	All	BCC	POP	SPA
Labour (m. It. lire)	104	103	99	108
Labour weighted (*) (m. It. lire)	89	88	86	91
Physical capital (m. It. lire)	1.132	1.092	1.736	1.112
Funds (%)	3.27	3.35	3.06	3.11
No. banks	709	495	39	175

Note: BCC = borrower-owned cooperative; POP = worker-owned cooperative; SPA = investor-owned bank.
Labour = Personnel expenses/No. employees; Physical capital = administrative expenses/book value of fixed assets; Funds = total interest expenses/volume of funds.
Source: our calculations on BilBank data. (*) Considering the number of executives, officers and other employees.

Table 4b. Descriptive statistics: input prices (mean values, 1999)

			Belonging to a group	
	All	Independent	Head	Subsidiary
Labour (m. It. lire)	104	103	117	104
Labour weighted (*) (m. It. lire)	89	88	98	89
Physical capital (m. It. lire)	1.132	1.144	1.162	1.055
Funds (%)	3.27	3.28	3.51	3.09
No. banks	709	548	56	105

Note: Labour = Personnel expenses/No. employees; Physical capital = administrative expenses/book value of fixed assets; Funds = total interest expenses/volume of funds.
Source: our calculations on BilBank data. (*) Considering the number of executives, officers and other employees.

proxied by the total aggregate securities managed for clients, an off-balance sheet item that is directly related to the flow of services supplied to customers.

4. Results

I estimate the cost function in equation (4), and I derive individual cost efficiency scores following the methodology introduced by Jondrow *et al.* (1982).[8] These cost efficiency scores are a proxy for the social transaction costs characterizing

8 Estimates of the two cost frontiers are included in the Appendix. Regularity conditions have been checked following the approach by Salvanes and Tjøtta (1998). Marginal costs are positive for the vast majority of the observations for both models. Moreover, the Hessian matrix with respect to input prices is found to be negative semidefinite, again for both models, confirming the concavity in input prices of the estimated cost frontiers. I also estimate these models on the two sub-samples of BCC and POP/SPA – i.e. of small and large banks – and check the robustness of results to the composition of the sample by computing the correlation between efficiency scores. Correlation coefficients suggest that results discussed below are not biased by the sample composition. When re-estimating the models on the BCC sub-sample only, I find correlation between the two efficiency scores series to be respectively 0.8857 and 0.9092 for Models 1 and 2 considered in the paper. Correlations are somewhat lower, but still very high, when

Table 5a. Profitability, efficiency, scale and scope economies (mean values, 1999)

	All	BCC	POP	SPA
ROE (%)	4.83	3.27 (^)	9.94 (^)	8.07 (^)
Efficiency mod. 1 (*)	83.1	83.7 (^)	84.1 (^)	80.9 (^)
Scale economies mod. 1 (*)	**1.13**	**1.15** (^)	**1.05** (^)	**1.08** (^)
Scope economies (LO-OEA) mod. 1 (*)	**0.02**	**0.01** (^)	**0.05** (^)	**0.04** (^)
Scope economies (LO-SER) mod. 1 (*)	**0.08**	**0.08** (^)	**0.06** (^)	**0.07** (^)
Scope economies (SER-OEA) mod. 1 (*)	**0.003**	**0.002** (^)	**0.004** (^)	**0.005** (^)
Efficiency mod. 2 (**)	78.6	79.7 (^)	79.2 (^)	75.3 (^)
Scale economies mod. 2 (**)	**1.15**	**1.16** (^)	**1.11** (^)	**1.11** (^)
Scope economies (LO-OEA) mod. 2 (*)	**0.008**	**0.003** (^)	**0.02** (^)	**0.02** (^)
Scope economies (LO-SER) mod. 2 (*)	**0.08**	**0.08** (^)	**0.05** (^)	**0.07** (^)
Scope economies (SER-OEA) mod. 2 (*)	**−0.001**	**−0.002** (^)	0.0001 (^)	−0.0001 (^)
No. banks	709	495	39	175

Notes: (*) Using non-weighted price of labour.
(**) Using weighted price of labour.
(^) Indicates that group specific means (BCC, POP, SPA) are stat. diff. at the 5% lev. according to Kruskall-Wallis test.
Bold typeface for values indicates significantly different from 1 and 0 (respect. for scale econ. and scope econ.) at the 5% lev. (t-test).
LO = loans; OEA = other earning assets; SER = securities managed for clients.
Source: our calculations on BilBank data.

each organization. Mean values for the efficiency scores are collected in Tables 5a–5c: model 1 considers the non-weighted price of labour, whilst model 2 considers the weighted price of labour. The correlation between the two set of estimates is 0.92; hence, results obtained from model 1 are in accordance with those obtained from model 2. *BCC* and *POP*, the two types of co-operatives banks operating in the Italian market, are more efficient than *SPA* (Table 5a). As *BCC* are independent banks, this result is also reflected in the finding that independent banks are more efficient than banks belonging to a group (Table 5b).

However, since no clear theoretical results are available on the relative ranking of the different 'contracts', the main prediction to be tested here is that different incentives structures are characterized by different transaction costs, i.e. by different levels of economic efficiency (hypothesis (a) above). I test this prediction by simply checking whether group-specific means are statistically different. Indeed, the Kruskall–Wallis test indicates that mean efficiency scores are statistically different among *SPA*, *POP*, and *BCC* at the 5% level of significance. Thence, different organizations seem to constitute different incentives structures in the banking market.

An interesting point to be made is that these differences probably stem from the ownership structure, which influences – for instance – the structure of

taking into account the SPA/POP sub-sample: correlation coefficients are respectively 0.7464 and 0.7020 in this case.

Table 5b. Profitability, efficiency, scale and scope economies (mean values, 1999)

			Belonging to a group	
	All	Independent	Head	Subsidiary
ROE (%)	4.83	3.76 (^) (§)	10.24 (#)(+)	7.31 (#) (+)
Efficiency mod. 1 (*)	83.1	83.7 (^) (§)	82.3	80.6
Scale economies mod. 1 (*)	**1.13**	**1.15** (^) (§)	**1.05**	**1.06**
Scope economies (LO-OEA) mod. 1 (*)	**0.02**	**0.02** (^) (§)	**0.04**	**0.04**
Scope economies (LO-SER) mod. 1 (*)	**0.08**	**0.08** (^) (§)	**0.08**	**0.09**
Scope economies (SER-OEA) mod. 1 (*)	**0.003**	**0.002** (^)(§)	**0.005**	**0.006**
Efficiency mod. 2 (**)	78.6	79.6 (^) (§)	76.6	74.6
Scale economies mod. 2 (**)	**1.15**	**1.16** (^) (§)	**1.09**	**1.09**
Scope economies (LO-OEA) mod. 2 (*)	**0.008**	**0.005** (^)(§)	**0.02**	**0.01**
Scope economies (LO-SER) mod. 2 (*)	**0.08**	**0.08** (^) (§)	**0.08**	**0.08**
Scope economies (SER-OEA) mod. 2 (*)	**−0.001**	**−0.002**	−0.0006	0.0007
No. banks	709	548	56	105

Notes: (*) Using non-weighted price of labour.
(**) Using weighted price of labour.
(^) Indicates that group specific means (INDEP., GROUP) are stat. diff. at the 5% lev. according to Mann–Whitney test.
(§) Indicates that group specific means (INDEP., GROUP) are stat. diff. at the 5% lev. according to Kolmogorov–Smirnoff test.
(#) Indicates that group specific means (HEAD, SUBS.) are stat. diff. at the 5% lev. according to Mann–Whitney test.
(+) Indicates that group specific means (HEAD, SUBS.) are stat. diff. at the 5% lev. according to Kolmogorov–Smirnoff test.
Bold typeface for values indicates significantly different from 1 and 0 (respect. for scale econ. and scope econ.) at the 5% lev. (t-test).
LO = loans; OEA = other earning assets; SER = securities managed for clients.
Source: our calculations on BilBank data.

employment, and the size of the bank. From Table 5b, one can see that efficiency score means are statistically different between independent banks and banks belonging to a group, but differences are not statistically significant between head and subsidiary banks. On the contrary, from Table 5c – that collects efficiency scores for banks classified according to their size – group-specific means are statistically different among all classes. Since relationship banking is related to the size of the organization, it would be important to understand whether the higher efficiency stems from the loan technology or is related to other factors (on this point, see the recent contribution by Berger and Udell, 2006). Lacking the relevant data, I do not explore this issue further here.

As expected, *BCC* are found to operate under increasing returns to scale in both models, whereas *POP* and *SPA* can exploit only marginal economies of scale; on the contrary, scope (dis)economies are very small for all the three types of banks (Table 5a). As can be seen from Table 5c, economies of scale are clearly related to banks' size. By coupling this last result with efficiency scores, one is then left with the conclusion that the efficiency gains from increasing bank's size

Table 5c. Profitability, efficiency, scale and scope economies (mean values, 1999)

		Total assets (bln It. Lire)			
	All	*< 104*	*> 104 < 258*	*> 258 < 769*	*> 769*
ROE (%)	4.83	−4.76 (^)	7.4 (^)	7.3 (^)	9.4 (^)
Efficiency mod. 1 (*)	83.1	84.1 (^)	84.1 (^)	82.1 (^)	81.9 (^)
Scale economies mod. 1 (*)	**1.13**	**1.18** (^)	**1.15** (^)	**1.12** (^)	**1.05** (^)
Scope economies (LO-OEA) mod. 1 (*)	**0.02**	**0.01** (^)	**0.02** (^)	**0.02** (^)	**0.04** (^)
Scope economies (LO-SER) mod. 1 (*)	**0.08**	**0.07** (^)	**0.08** (^)	**0.09** (^)	**0.08** (^)
Scope economies (SER-OEA) mod. 1 (*)	**0.003**	**0.001** (^)	**0.002** (^)	**0.003** (^)	**0.006** (^)
Efficiency mod. 2 (**)	78.6	79.6 (^)	80.4 (^)	77.7 (^)	76.7 (^)
Scale economies mod. 2 (**)	**1.15**	**1.17** (^)	**1.16** (^)	**1.14** (^)	**1.1** (^)
Scope economies (LO-OEA) mod. 2 (*)	**0.008**	**0.007** (^)	**0.003** (^)	**0.006** (^)	**0.01** (^)
Scope economies (LO-SER) mod. 2 (*)	**0.08**	**0.07** (^)	**0.08** (^)	**0.08** (^)	**0.08** (^)
Scope economies (SER-OEA) mod. 2 (*)	**−0.001**	**−0.001** (^)	**−0.002** (^)	**−0.002** (^)	0.00003 (^)
No. banks	709	176	179	177	177

Notes: (*) Using non-weighted price of labour.
(**) Using weighted price of labour.
(^) Indicates that group specific means are stat. diff. at the 5% lev. according to Kruskall–Wallis test.
Bold typeface for values indicates significantly different from 1 and 0 (respect. for scale econ. and scope econ.) at the 5% lev. (t-test).
LO = loans; OEA = other earning assets; SER = securities managed for clients.
Source: our calculations on BilBank data.

are lower than the efficiency losses stemming from the agency relationships in a more layered organizational structure.

A second-stage analysis

The preceding analysis suffers from one main shortcoming: it does not take into account that results may be driven by the correlation between organizational structure and the size of banks. If smaller banks are the most efficient and choose also to organize themselves as co-operative banks, then the fact that co-operative institutions are more efficient may simply result from their size, and does not reflect any organizational advantages. Indeed, differences in size are often quoted when discussing banks' heterogeneity. For instance, Dewatripont and Tirole (1994) explicitly refer to the differences between small and large banks, and not to differences in the organizational structures. These authors also point out that large banks have a different asset composition, they are more involved in off-balance sheet activities, they use more managed liabilities, and they have lower interest margins. Notice that these are some of the differences between co-operative banks and stock banks previously discussed in Section 3.2.

To test if there are *pure* organizational advantages stemming from the co-operative contract, one needs to show that – *controlling for size* – co-operative banks are more efficient than stock banks. To this aim, I then regress efficiency scores obtained with the two models against a set of covariates, including both

proxies for size and organizational dummies. In particular, given the nature of the data ($EFF_i \geq 0$), I consider the following tobit model:

$$EFF_i = \boldsymbol{X}_i'\beta + u_i; \tag{8}$$

where the vector $\boldsymbol{X}$ includes controls for size, organizational structure, and the quality of credit policies, and u is a $N(0, \boldsymbol{\sigma}^2)$ error term. Estimates of model (8) are in Table 6. The emerging picture is fairly consistent across all specifications, showing how efficiency correlates with variables in $\boldsymbol{X}$.[9] Coefficients on *organizational dummies* are always significant, suggesting that – after controlling for a proxy for size – there are indeed differences related to contracts in terms of social transaction costs. This confirms previous results on the different roles played by the different contracts envisaged by the Civil Code. Quite interesting findings emerge however also for *size*. First, when size is proxied by the volume of total assets, I find a positive correlation with efficiency, but that is statistically significant only for stock banks (only the coefficient on the interaction term $Log(Size) \times SPA$ is positive and significant). Second, when size is proxied by the number of employees, a negative correlation with efficiency emerges, but that is statistically significant only for co-operative banks, and marginally significant for stock banks. This differential impact of the two proxies for size seems indeed to reinforce the interpretation of efficiency scores as a measure of transaction costs: as for stock banks, the result emphasizes the role of scale economies; as for co-operative banks, the finding points toward the role of agency relationships within the organization. In the former case, the result suggests that – given the choice of organizing the bank as a stock company – efficiency gains can be obtained by increasing the volume of assets intermediated. On the contrary, in the latter case – given the choice of organizing the bank as a co-operative firm – efficiency gains can be obtained by limiting the number of agency relationships within the organization. Finally, *bad loans* as a share of total loans do have a significant negative correlation with efficiency scores, confirming previous results in the literature that more frail banks, with poorer credit policies, also are the less efficient institutions (e.g., Wheelock and Wilson, 1995).

5. Conclusions

The basic idea outlined by the theoretical literature on the firm as an incentive structure is that the ownership of the firm – in the absence of specific provisions by the law that limit the choice – should be efficiently assigned to the class of stakeholders that minimizes the social transaction costs, i.e. the efficiency losses

9 Notice that we talk here about efficiency correlates, *without assuming any causal relationship*. As discussed in Berger and Mester (1997), there are two main problems with this two-stage approach: first, *EFF* is an estimate, so that a one-stage approach might be more appropriate; second, some variables (e.g., size) might be endogenous.

Table 6. Second-stage analysis: the determinants of efficiency

	Size measured by TA				Size measured by EMPL			
	LogEFF1		LogEFF2		LogEFF1		LogEFF2	
BCC	4.440***	4.665***	4.222***	4.502***	4.571***	4.632***	4.553***	4.630***
	(0.083)	(0.135)	(0.109)	(0.178)	(0.026)	(0.039)	(0.034)	(0.051)
SPA	4.349***	4.133***	4.042***	3.775***	4.553***	4.500***	4.501***	4.441***
	(0.101)	(0.139)	(0.134)	(0.183)	(0.044)	(0.060)	(0.059)	(0.079)
POP	4.457***	4.563***	4.156***	4.282***	4.663***	4.523***	4.617***	4.406***
	(0.107)	(0.307)	(0.141)	(0.405)	(0.055)	(0.130)	(0.073)	(0.172)
LogSIZE	0.004		0.019**		−0.026***		−0.031***	
	(0.007)		(0.009)		(0.007)		(0.009)	
LogSIZE × BCC		−0.015		−0.004		−0.044***		−0.054***
		(0.011)		(0.015)		(0.011)		(0.015)
LogSIZE × SPA		0.019**		0.037***		−0.016*		−0.021
		(0.009)		(0.012)		(0.010)		(0.013)
LogSIZE × POP		−0.003		0.010		−0.001		0.005
		(0.021)		(0.027)		(0.021)		(0.028)
LogBAD	−0.072***	−0.073***	−0.079***	−0.081***	−0.071***	−0.072***	−0.079***	−0.080***
	(0.007)	(0.007)	(0.009)	(0.009)	(0.007)	(0.007)	(0.009)	(0.009)
Sigma (a)	0.231***	0.230***	0.305***	0.304***	0.229***	0.228***	0.303***	0.302***
	(0.006)	(0.006)	(0.008)	(0.008)	(0.006)	0.006	(0.008)	(0.008)
No. obs.	695	695	695	695	695	695	695	695
Log-L	31.773	34.442	−160.653	−158.290	38.158	40.562	−157.165	−154.823
LM [df] (b)	.000[5]	.000[7]	.000[5]	.000[7]	.000[5]	.000[7]	.000[5]	.000[7]

Notes: (a) Estimated St.Dev. of disturbance term

(b) p-value and degrees of freedom of LM test for model

Note: BCC = borrower-owned cooperative; POP = worker-owned cooperative; SPA = investor-owned bank.

SIZE = total assets (TA) or number of employees (EMPL); BAD = bad loans/total loans

EFF1 = efficiency scores from Model 1 (unweighted price of labour); EFF2 = efficiency scores from Model 2 (weighted price of labour)

stemming from the presence of contractual incompleteness. Social transaction costs are defined as the sum of two components: the transaction costs stemming from a contractual relation with the firm for all the stakeholders who are not the owners, and the transaction costs arising within the firm for the class of stakeholders who are the owners. The main prediction of this literature is that different organizations (i.e., firms with different allocations of property rights) are characterized by different levels of social transaction costs, hence by different levels of economic inefficiency. Moreover, each organization plays a *specific* role in the economy, so that the provision of different contracts by the law pursue an efficiency aim.

In this paper, I propose a simple test of this prediction, focusing on the banking industry, where different organizations co-exist together. I use data on the Italian markets, where two types of co-operative banks – namely *Banche Popolari* and *Banche di Credito Cooperativo* – supply banking services together with stock banks. I estimate a standard translog cost frontier, with three inputs (labour, physical capital, and deposits) and three outputs (loans, investments in other earning assets, and the flow of services proxied by the volume of securities managed for clients) common to the three types of banks, and I derive cost efficiency scores. Kruskall–Wallis tests indicate that mean efficiency scores are statistically different among the three types of banks, providing empirical support to the theoretical prediction that different organizations represent different incentive structures. Moreover, co-operatives banks appear to be more efficient than stock banks. This result reflects a *pure* organizational advantage that is robust also after controlling for a *size* effect and the quality of credit policies. Hence, the efficiency gains stemming from the presence of scale economies seem to be dominated by the efficiency losses caused by the agency relationships within the bank in a more complex organization. From a theoretical point of view, a possible explanation is based on the idea that borrower-owned co-operative banks are an optimal incentive structure for a lending activity based on 'soft' information. However, whether relationship banking is the source of efficiency or other factors are at work is an important point that deserves further scrutiny.

References

Altunbas, Y., L. Evans and P. Molyneux (2001), 'Bank Ownership and Efficiency', *Journal of Money, Credit, and Banking*, **33**: 926–954.

Angelini, P., R. Di Salvo, and G. Ferri (1998), 'Availability and Cost of Credit for Small Businesses: Customer Relationships and Credit Cooperatives', *Journal of Banking and Finance*, **22**: 925–954.

Armendariz, B. and J. Murdoch (2007), *The Economics of Microfinance*, Cambridge, MA: MIT Press.

Banerjee, A. V., T. Besley, and T. W. Guinanne (1994), 'The Neighbor's Keeper: The Design of a Credit Cooperative with Theory and a Test', *Quarterly Journal of Economics*, **109**: 491–515.

Berger, A. N. and L. Mester (1997), 'Inside the Black Box: What explains the Differences in the Efficiencies of Financial Institutions', *Journal of Banking and Finance*, **21**(7): 895–947.
Berger, A. N., N. H. Miller, M. A. Petersen, R. G. Rajan, and J. C. Stein (2001), 'Does Function Follow Organizational Form? Evidence from the Lending Practices of Large and Small Banks', *Journal of Financial Economics*, **76**(2): 237–269.
Berger, A. N. and G. F. Udell (2002), 'Small Business Credit Availability and Relationship Lending: The Importance of Bank Organizational Structure', *Economic Journal*, **112**: F32–F53.
Berger, A. N. and G. F. Udell (2006), 'A More Complete Conceptual Framework for SME Finance', *Journal of Banking and Finance*, **30**: 2945–2966.
Carter, R. and G. M. Hodgson (2006), 'The Impact of Empirical Tests of Transaction Cost Economics on the Debate on the Nature of the Firm', *Strategic Management Journal*, **27**: 461–476.
Cerasi, V. and S. Daltung (2000), 'The Optimal Size of a Bank: Costs and Benefits of Diversification', *European Economic Review*, **44**: 1701–1726.
Cummins, J. D., M. A. Weiss, and H. Zi (1999), 'Organizational Form and Efficiency: The Coexistence of Stock and Mutual Property-Liability Insurers', *Management Science*, **45**: 1254–1269.
Dewatripont, M. and J. Tirole (1994), *The Prudential Regulation of Banks*, Cambridge, MA: MIT Press.
Diamond, D. W. (1984), 'Financial Intermediation and Delegated Monitoring', *Review of Economic Studies*, **51**: 393–414.
Drèze, J. H. (1976), 'Some Theory of Labour Management and Participation', *Econometrica*, **44**: 1125–1139.
Fama, E. F. (1980), 'Agency Problems and the Theory of the Firm', *Journal of Political Economy*, **88**: 288–307.
Fama, E. F. and M. C. Jensen (1983a), 'Separation of Ownership and Control', *Journal of Law and Economics*, **26**: 301–325.
Fama, E. F. and M. C. Jensen (1983b), 'Agency Problems and Residual Claims', *Journal of Law and Economics*, **26**: 327–349.
Ferrier, G. D. and C. A. K. Lovell (1990), 'Measuring Cost Efficiency in Banking', *Journal of Econometrics*, **46**: 229–245.
Fonteyne, W. (2007), 'Cooperative Banks in Europe – Policy Issues', IMF Working Paper, no. 159
Grossman, S. and O. Hart (1983), 'An Analysis of the Principal–Agent Problem', *Econometrica*, **51**: 7–45.
Jensen, M. C. and W. H. Meckling (1979), 'Rights and Production Functions: An Application to Labour Managed Firms and Codetermination', *Journal of Business*, **52**: 469–506.
Jondrow, J., C. A. K. Lovell, I. S. Materov, and P. Schmidt (1982), 'On the Estimation of Technical Inefficiency in the Stochastic Frontier Production Function Model', *Journal of Econometrics*, **19**: 233–238.
Hansmann, H. (1988), 'Ownership of the Firm', *Journal of Law, Economics and Organization*, **4**: 267–304.
Hansmann, H. (1996), *The Ownership of Enterprise*, Cambridge, MA: Harvard University Press.
Holmstrom, B. (1999), 'The Firm as a Subeconomy', *Journal of Law, Economics and Organization*, **15**: 74–102.

Holmstrom, B. and P. Milgrom (1994), 'The Firm as an Incentive System', *American Economic Review*, **84**: 972–991.

Lovell, C. A. K. (1993), 'Production Frontiers and Production Efficiency', in H. O. Fried, C. A. K. Lovell, and S. Schmidt (eds.), *The measurement of productive efficiency*, Oxford: Oxford University Press.

Masten, S. E. (2002), 'Modern Evidence on the Firm', *American Economic Review Papers and Proceedings*, **92**: 428–432.

Mester, L. (1993), 'Efficiency in the Savings and Loan Industry', *Journal of Banking and Finance*, **17**: 267–286.

Modigliani, F. and M. Miller (1958), 'The Cost of Capital, Corporation Finance, and the Theory of Investment', *American Economic Review*, **48**: 261–297.

Pittatore, S. and G. Turati (2000), 'A Map of Property Rights in Italy and the Case of Co-operatives: An Empirical Analysis of Hansmann's Theory', *Economic Analysis*, **3**: 23–48.

Presti, G. (1998), 'Il governo delle banche popolari e di credito cooperativo', *Banca Impresa Società*, **17**: 147–181.

Rajan, R. G. (1998), 'The Past and Future of Commercial Banking Viewed through an Incomplete Contract Lens', *Journal of Money, Credit, and Banking*, **30**: 524–550.

Rasmusen, E. (1988), 'Mutual Banks and Stock Banks', *Journal of Law and Economics*, **31**: 395–421.

Salvanes, K. G. and S. Tjøtta (1998), 'A Note on the Importance of Testing for Regularities for Estimated Flexible Functional Forms', *Journal of Productivity Analysis*, **9**: 133–143.

Sealey, C. W. and J. T. Lindley (1977), 'Inputs, Outputs and a Theory of Production and Cost at Depository Financial Institutions', *Journal of Finance*, **32**: 1251–1266.

Shelanski, H. A. and P. G. Klein (1995), 'Empirical Research in Transaction Cost Economics: A Review and Assessment', *Journal of Law, Economics, and Organization*, **11**: 335–361.

Wheelock, D. C. and P. W. Wilson (1995), 'Explaining Bank Failures: Deposit Insurance, Regulation, and Efficiency', *Review of Economics and Statistics*, **77**: 689–700.

Williamson, O. E. (2000), 'The New Institutional Economics: Taking Stock, Looking Ahead', *Journal of Economic Literature*, **38**: 595–613.

Appendix: Stochastic frontiers estimates

	Mod. 1		Mod. 2	
	Coeff.	S.E.	Coeff.	S.E.
Constant	−7.44***	(1.09)	−6.69***	(1.43)
LO	1.11***	(0.21)	1.15***	(0.25)
OEA	−0.29**	(0.12)	−0.36***	(0.14)
SER	0.30***	(0.05)	0.22***	(0.08)
WL	1.65***	(0.15)	1.29***	(0.22)
WK	−1.01***	(0.11)	−1.07***	(0.13)
LO×LO	0.04***	(0.01)	0.02	(0.01)
OEA×OEA	0.01**	(0.01)	0.002	(0.006)
SER×SER	0.02***	(0.002)	0.02***	(0.003)
LO×OEA	−0.002	(0.007)	0.005	(0.008)
LO×SER	−0.02***	(0.003)	−0.01***	(0.003)
SER×OEA	−0.002	(0.002)	−0.001	(0.003)
WL×WK	0.0003	(0.01)	0.06***	(0.02)
WL×WD	−0.04	(0.03)	−0.10***	(0.03)
WK×WD	−0.106***	(0.01)	−0.11***	(0.02)
LO×WK	0.03**	(0.01)	0.007	(0.01)
LO×WD	0.07***	(0.02)	0.06**	(0.02)
OEA×WK	0.02**	(0.009)	0.03**	(0.01)
OEA×WD	−0.04***	(0.01)	−0.05***	(0.01)
SER×WK	0.02***	(0.005)	0.01**	(0.007)
SER×WD	0.01***	(0.006)	0.01	(0.009)
No. obs.	709	–	709	–
Lambda (§)	1.17***	(0.107)	1.19***	(0.096)
Sigma-sq. (v)	0.04	–	0.07	–
Sigma-sq. (u)	0.06	–	0.10	–
Model log-L	−20.06	–	−205.97	–
Adj. R-squared (#)	0.98	–	0.96	–

Notes: LO = loans; OEA = other earning assets; SER = securities managed for clients.
WL = price of labour; WK = price of physical capital; WD = price of funds.
Lev. of sign.: (*) 10%, (**) 5%, (***) 1%.
(§) Std. Dev. (ineff.) / Std. Dev. (noise).
(#) R-squared from OLS estimates.