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Corporate governance, ownership dispersion and efficiency: Empirical evidence from Austrian cooperative banking

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Abstract

The ownership structures of firms are endogenous. This makes it difficult to produce direct evidence on the Berle and Means [Berle, A.A., Means, G.C., 1932. The Modern Corporation and Private Property, New York.] hypothesis that corporate governance becomes less efficient as the degree of separation of ownership and control increases. We address this issue by studying Austrian cooperative banking, an organizational form in which the ownership structure is exogenous. We show that firm performance declines as the number of cooperative members increases, corresponding to a greater separation of ownership and control. We also provide direct evidence on another theory that is difficult to test, namely, the efficiency wage hypothesis. We show that the decline in firm performance as the number of shareholders increases is due to an increase in efficiency wages. © 1999 Published by Elsevier Science B.V. All rights reserved.

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1. Introduction

The dominant paradigm in corporate finance is based on the original contention of Berle and Means (1932) that managerial efficiency depends on the ownership structure of the company. The more dispersed the equity ownership of a firm, the greater are the incentives for the owners to free ride on each other's efforts to monitor the management of the firm. The implications of this separation of ownership and control have been formalized in principal–agent models (e.g., Grossman and Hart, 1983), detailed by Jensen and Meckling (1976) for publicly held corporations, and form the basis of empirical work (e.g., Amihud and Lev, 1981). It does not seem widely appreciated, however, that direct evidence that these 'agency costs' are significant is hard to produce. That the agency costs are large seems to generally be assumed, as in Jensen and Murphy (1990) for example, who argue that the link between pay and performance in U.S. executive compensation contracts is weak – too weak to overcome the assumed size of the agency problem. [2]

Producing direct evidence on the magnitude of agency costs is difficult because the proposition that inefficiency increases as the degree of shareholder dispersion increases may hold, while the conclusion drawn by Berle and Means about the inefficiency of publicly traded stock corporations may not be true. The reason is that, as Demsetz (1983) argues, the ownership structure of the firm (as well as other corporate control mechanisms) is endogenous. [3] It will change as long as there is profit to be made from eliminating managerial inefficiency. In equilibrium, ownership structure may vary across firms, but the degree of managerial inefficiency will not. Although this conclusion is qualified by the existence of transaction costs, it is usually argued that these costs are low for public corporations since their shares can be traded at low cost. [4] According to Demsetz (1983), then, testing the Berle and Means hypothesis reduces to explaining the degree of concentration of the ownership structure (together with all other corporate control mechanisms). Indeed, Demsetz and Lehn (1985) provide some evidence that the degree of dispersion of shareholding in public corporations depends on some exogenous characteristics of the firm. These characteristics may be related to the potential for managerial inefficiency, but firm performance does not depend on the degree of dispersion of the equity ownership structure.

[2] Haubrich (1994) argues that the estimates of the pay-for-performance sensitivity of Jensen and Murphy are consistent with principal–agent models.

[3] Other control mechanisms include the design of the corporate charter which may make takeovers easier, the design of executive compensation, the identity of block holders (e.g., institutions, family, etc.) and so on.

[4] Acquiring a block in a corporation means confronting the free rider problem discussed by Grossman and Hart (1980). But, this issue is the same as the general problem of how information becomes impounded in prices when acquisition of information is costly. Thus, the block is acquired along the lines proposed in Kyle (1985).

It is perhaps surprising then that other researchers claim to have found evidence that the ownership structure does affect firm performance. Viewing the ownership structure as exogenous, Morck et al. (1988) and McConnell and Servaes (1990) find a nonlinear relationship between Tobin's *Q* and the fraction of the shares held by firm insiders. In particular, they find a downward-sloping range of insider holdings over which firm performance is declining. Their interpretation is that, over this range of share holdings, managers have sufficient power, in the form of votes, to extract private benefits at the expense of other shareholders, but not enough stock to induce them to focus solely on maximizing firm value. In light of the Demsetz argument, this evidence is somewhat hard to understand. At low cost, the corporate charter could easily include a provision prohibiting compensation in the form of voting stock, thereby eliminating this inefficiency. This suggests that taking the ownership structure as exogenous is not a convincing assumption. In fact, Agrawal and Knoeber (1994) appear to confirm this suspicion. They also find the same nonlinearity between Tobin's *Q* and the share of equity held by insiders. But the relationship disappears when they examine firm performance in the context of a large number of other control mechanisms, including fractional ownership of insiders, institutions, other block holders, outsider board membership, and takeover costs. Their interpretation is that firms use combinations of control mechanisms such that efficiency with respect to agency costs is equally good in equilibrium, a result consistent with Demsetz and Lehn.

The issue of the endogeneity of the ownership structure problem is also present in debates over the effects of leverage on firm performance. Jensen (1986) argues that increases in firm leverage help to reduce the inefficiencies resulting from the separation of ownership and control. Kaplan (1989) and Smith (1990) examine leveraged buyouts, but the links between performance, ownership, and leverage seem difficult to unravel. Holthausen and Larker (1993) examine the simultaneous determination of firm leverage, managerial equity ownership, and firm accounting measures of performance. They conclude that these variables are all endogenous. Also, see Jensen et al. (1992).

The empirical difficulty is clear. If Berle and Means are correct that the separation of ownership and control matters for efficiency, then, following Demsetz, there is an arbitrage opportunity (subject to transaction costs) and control mechanisms, including the ownership structure, should adjust. The proposition that inefficiency is increasing in the degree of equity dispersion is hard to demonstrate since the cross-section variation in all available control mechanisms, including ownership structure, must simultaneously be explained. Aside from the research discussed above, the literature has proceeded by focusing on examples where the transactions costs of adjusting control mechanisms are fairly high. For example, in industries (such as U.S. banking) where government regulations prevent some control mechanisms from operating (e.g., nonbanks can not takeover banks), it seems more compelling that firm performance is related to ownership structure in cross-section since the ownership structure may not be able to completely adjust.

See James (1984), James and Brickley (1987), Schranz (1993) and Gorton and Rosen (1995). [5] Perhaps even more persuasive are the rare examples where the ownership structure is truly exogenous. Thus, Karpoff and Rice (1989) study 13 businesses owned by Eskimos set up under the Alaska Native Claims Settlement (Act of 1971). The shares of these firms cannot be traded. Compared to traded firms, the productivity of these businesses is very low. The authors generally conclude that the transferability of shares is necessary for organizational efficiency.

In this paper, we address the issue of the efficiency of corporate governance structures which entail a separation of ownership and control by focusing on Austrian cooperative banks. As we describe below, these firms originated as true cooperatives, that is, businesses that were owned by the same individuals that transacted with them. Originally, the cooperative members had strong incentives to monitor the performance of the firm. They have since evolved, however, into large firms which transact with many borrowers who are not cooperative members and which are run by professional managers. Currently these firms resemble orthodox profit-maximizing firms, yet their ownership structure cannot adjust. Consequently, these firms provide a useful sample to study. There are two reasons, in particular. First, institutional restrictions make the ownership structures of these cooperative banks essentially exogenous, overcoming the empirical difficulty discussed above. One important institutional restriction is that cooperative shares can only be traded with the cooperative itself and then only at face value. [6] In other words, there can be no hostile takeovers of these firms. Another important restriction is that votes cannot be accumulated into blocks, since regardless of the amount of stock owned each person receives one vote. Thus, there can be no monitoring by block shareholders, since block shareholders cannot exert their voting power. These distinctions are common to cooperatives and to mutual associations. Rasmusen (1988), in fact, argues that a mutual association or cooperative effectively has no stockholders because the managers are completely insulated from any monitoring.

A second reason that Austrian cooperative banks are particularly interesting is that the degree of separation between ownership and control is indexed by the number of cooperative members and hence, is easily measured. As a result, we can analyze how the degree of separation of ownership and control affects firms' performance in cross-section. We can quantify the size of the agency costs as a function of the degree of free-riding. Because of the restrictions on ownership

[5] There is also a large literature that compares the efficiency of different ownership structures. In particular, stock ownership vs. mutual ownership forms has been examined in the thrift industry and in insurance. See, for example, O'Hara (1981) and Mayers and Smith (1986).

[6] Legally, it is possible to transfer shares among cooperative members. However, these transactions require consent of the cooperative's management.

structure, as the number of cooperative members (shareholders) rises, the size of the agency cost should increase, satisfying the Berle and Means hypothesis.

We model the agency problem following Shapiro and Stiglitz (1984) and Milgrom and Roberts (1992) as one of efficiency wages. [7] Efficiency wage theory predicts that a decrease in the intensity of monitoring will result in an increase in the optimal efficiency wage. In terms of the Berle and Means argument, as the number of cooperative members increases, the costs of monitoring rise due to free-riding: the higher the number of cooperative members, the lower the intensity of monitoring. As a result, agency costs, in terms of the required efficiency wages, rise and firm performance declines. Previous work on efficiency wages focuses on settings where it can be argued that the intensity of monitoring varies in cross section. Krueger (1990), for example, focuses on comparing wages paid at fast-food restaurants that are franchises with those that are independently owned. Also, see Krueger and Summers (1988).

We consider the wages of all the employees of a cooperative and ask whether there is a link between the ownership structure (i.e., the degree of free-riding as measured by the number of members) and the level of efficiency wages. Our empirical results, obtained from a panel of 73 Austrian cooperative banks which covers the period 1987–1990, support this observation. The econometric analysis shows that bank performance – as measured by (accounting) return on assets – declines with an increase in the number of cooperative members. The analysis also provides insights into the role of wages as employment incentives in the presence of high monitoring costs. The empirical results support the view that cooperative members rely on efficiency wages as a device to discipline employees. The decline in firm performance as the number of cooperative members increases is due to the higher efficiency wages necessary because of more free-riding. [8]

The paper proceeds as follows. Section 2 provides a brief background on Austrian cooperative banking. Section 3 discusses the incentives for liability-holders of cooperative banks to monitor management. Section 4 develops the specific hypotheses to be tested. The sample data and the results are presented in Section 5. Section 6 concludes.

[7] See Katz (1986) and Stiglitz (1986) for surveys of the literature on efficiency wages.

[8] There is a large literature concerning workers' cooperatives. On the theoretical side, there is a long literature concerning what the objective function is for a cooperative firm (for a review, see Hardie, 1969). The empirical evidence suggests that cooperatives do behave differently than orthodox firms. See, e.g., Berman and Berman (1989), Craig and Pencavel (1992), and Pencavel and Craig (1994). However, there is some evidence that the principal–agent problem will be more severe in a cooperative than in an orthodox firm since the ability of members to monitor management seems more limited. Previous work on the efficiency of cooperatives compared to orthodox firms suggests that cooperatives are less efficient. For example, Porter and Scully (1987) conclude that ''the average cooperative fluid-milk-processing firm is only 75.5 percent as efficient as its proprietary, for-profit counterpart'' (p. 511).

2. The institutional framework of Austrian cooperative banking

The cooperative banks on which we focus have their origin in two major 19th century cooperative movements initiated by the German social reformers Hermann Schulze-Delitzsch (1809–1883) and Friedrich Wilhelm Raiffeisen (1818–1888). In postwar Germany, these two cooperative associations merged, but their Austrian counterparts still operate as separate organizations, each with its own group of banks. An important question concerns why cooperatives form. We do not address this question here, but focus on a brief historical description of the evolution of the firms we study. Our description below, however, is consistent with the leading explanations for the formation of cooperatives. One explanation is that early cooperatives formed for explicitly social or ideological reasons. Another, nonmutually exclusive, explanation concerns the desire of cooperative members to overcome monopoly power that they would otherwise face. See Hansmann (1988).

The Austrian cooperative banks originated in the middle of the last century when lending to small farmers in the Germanic countries was dominated by (possibly monopolistic) moneylenders.[9] Private bankers and the emerging big public banks did not operate branches in the rural areas. The basic idea of Raiffeisen was to organize small farmers into local credit associations. In the beginning, these associations were loose organizations without charters or equity. Large farmers provided collateral (as acts of charity) and this allowed these credit associations to borrow money from banks in the cities, which, in turn they lent to their members. Eventually, the German state provided a legal framework for cooperative banking and these associations became more formal. Membership was obtained by taking (generally a small amount of) equity in the banks. Liability was mutual and indefinite. Lending was restricted to members. By retaining earnings, the cooperative banks became independent from outside assistance.

The Schulze-Delitzsch banking group originated around the same time as the Raiffeisen group, but its ideological and economic background is different. Raiffeisen was motivated by the Christian ideal of charity while Schulze-Delitzsch based his movement on the principle of self-help. His cooperatives aimed to improve the creditworthiness of businessmen in the cities. As industrialization took off, small businesses came under economic pressure from firms that operated on a large scale and were financed by big banks. In order to keep up with the changing economic environment, small businesses that used to be dominated by craftsmanship had to introduce machines into the production process. This created a demand for capital which could not be backed by sufficient collateral to make

[9] On the history of the German cooperative movement, see Faust (1977). For a detailed economic analysis of the institutional features of the historic credit cooperative and the present-day cooperative bank, see Bonus (1986), Bonus and Schmidt (1990) and Schmid (1997).

these businessmen creditworthy, a problem similar to the situation of small farmers. However, unlimited liability for the business of the cooperative induced mutual monitoring, making lending to members feasible. [10]

Today, both cooperative banking groups in Austria are organized as multi-tier institutions: Raiffeisen has three organizational levels while Schulze-Delitzsch is a two-tier system. The banks on the bottom, the successors of the early credit cooperatives, are called 'primary banks.' The primary banks are organized into a second level, cooperative associations, which are owned by the primary banks. The associations audit the member primary banks and provide them with data processing and consulting services. Also, there are clearing houses at the state level (only Raiffeisen) and on the federal level (both Schulze-Delitzsch and Raiffeisen). Generally, the lower level banks own the upper level banks. The clearinghouses offer services to the lower level banks such as transactions on the money market and the foreign exchange market. This enables the primary banks to offer the full range of banking services despite their small size. In recent years, the top level banks as well as the medium level banks of Raiffeisen have entered the retail banking business by taking over financially distressed primary banks.

Historically, cooperative banks offered credit exclusively to their members. Today, apart from a few institutions that still specialize in certain specific customer groups (like gardeners or pharmacists), cooperative banks have no restrictions with respect to their clients. Still, members are usually customers, but not all customers are members. Cooperative banks offer the full range of commercial and investment banking services, making them universal banks. In practice, however, their main line of business remains that of financing small manufacturing businesses (Schulze-Delitzsch) and farmers (Raiffeisen). Their concentration in rural areas and their small size give cooperative banks a bias towards commercial (as opposed to investment) banking. Despite that, however, even small institutions hold equity positions in companies. Some of these positions are due to their own nonbanking business and sometimes they are the result of joint ventures with other cooperative banks. In still other cases, these equity positions resulted from financial restructuring of distressed borrowers.

Measured by total assets in 1990, the Raiffeisen group held a 19% share of the Austrian banking market, while the corresponding figure for the Schulze-Delitzsch group was 4%. [11] In the same year, Raiffeisen had 843 member banks which ran 1662 branches. There were 97 banks registered as members of the Schulze-Delitzsch cooperative association at this time with a total of 459 branches. Because

[10] The law has permitted limited liability for members of credit cooperatives in Germany since 1889.

[11] In Austria, there are six types of banks: (1) stock corporations and private bankers; (2) savings banks; (3) state mortgage banks; (4) home loan associations; (5) cooperative banks; and (6) special-purpose banks.

the cooperative movement adheres to the principle of 'Subsidiarität', the banks have generally been small. [12] Each cooperative bank operates in a well-defined geographical area and is not allowed to set up branches in the market of a competitor of the same cooperative association. Exceptions to this rule concern special-purpose banks (e.g., installment credit institutions) and banks which define their market segments by the economic activity of their members (such as the above mentioned gardeners' and pharmacists' banks). The primary banks, at the bottom level, use few purchased funds. Cooperative banks tend to be large net suppliers of funds in the Austrian money market.

The rules for the operation of cooperatives are specified in the Austrian cooperative law. Also, additional regulations of the Austrian banking law apply. A cooperative is run by a management board that is elected by the 'general assembly'. There is also a supervisory board if the number of the employees of the cooperative amounts to at least 40. The management board, which oversees the daily operations of the firm, is responsible to the supervisory board. Although the supervisory board can suspend members of the management board, only the general assembly can actually fire them. The general assembly meets once a year. If the cooperative has fewer than 1000 members, then the general assembly consists of all cooperative members. Otherwise, the cooperative charter can restrict the general assembly to a subset of cooperative members and define how these representatives are to be elected. Each cooperative bank must have two executive directors. Formally, they are equally powerful, but often one of them is the only member of the management board of the cooperative and he dominates bank decision-making.

Each cooperative group has its own deposit insurance fund. The fund is required by law and covers losses up to a certain amount per deposit. By splitting up their deposits, customers effectively get full insurance coverage. If the deposit insurance fund of one of the banking associations fails, the other groups become liable. In addition to this deposit insurance fund, each cooperative group has a 'support fund' which is used to rescue distressed banks (without drawing public attention). When financial support is granted to a distressed member, the one-man-one-vote principle is usually suspended and extra voting rights are given to the cooperative association for providing support. In addition, the association provides 'management support' which amounts to restricting the managerial decision rights of the managers of the distressed bank. Bank failures are also prevented through arranged takeovers. Legally, these are organized as mergers.

[12] The political principle of 'Subsidiarität' ('subsidiarity') demands that the lowest organizational level that is capable of doing so solve any problem. Although both cooperative movements followed it, it was more closely followed by Schulze-Delitzsch. While Raiffeisen appealed for state support in improving social conditions, Schulze-Delitzsch rejected this idea.

3. Incentive structures in cooperative banking

Historically, cooperative banks were operated as nonprofit enterprises. The businesses of the members were promoted by granting credit terms which competing banks and moneylenders would not match. When individuals became members by acquiring equity and taking on the liability that came with it, they did it to get access to bank loans. These cooperatives were local organizations where members knew about each other's economic activities. When a member applied for credit, the cooperative voted on whether the loan should be approved. The one-man-one-vote rule was consistent with the fact that these members all had about the same wealth at stake. The information asymmetry between the borrower and the lender (i.e., the cooperative) about the standing of the borrower was small. Also, the borrower had little incentive to behave opportunistically since this could easily be detected and result in a loss of reputation. [13] By distributing the votes evenly among members, no single member was able to impose his own interests on the bank.

The modern economic reality of cooperative banks in Austria and Germany differs from the early days of the credit cooperatives. Now the vast majority of cooperatives are so large that they are not run by the cooperative members themselves, but by a professional management. Also, the cooperatives do not function as their historical counterparts did in most important respects. For example, the customers of present-day cooperative banks comprise nonmembers and members. Products and services are not priced differentially based on membership or lack of membership in the cooperative. [14] At the same time, members no longer depend solely on their cooperative bank. With big banks spreading their branches over the rural areas, competition in retail banking has increased substantially in postwar Austria and Germany. The cooperative ownership structure of these banks has lost its historical importance. As a consequence, the performance of a cooperative bank can now be measured by the same criteria as any other for-profit bank.

The particular agency problem in these organizations emanates from the rigidity of the ownership structure, as briefly discussed in Section 1. The rigidity is due to two main restrictions. First, equity can only be traded at face value and only between the bank and the member. Second, cooperative banks usually follow the

[13] In this regard, cooperatives historically had some elements in common with rotating savings and credit associations (Roscas) which some have argued were the forerunner of more formal mutual organizations. See Besley et al. (1993, 1994) and Besley and Coate (1995).

[14] As a consequence, the member service requirement (i.e., the legal requirement that a cooperative serve its members) manifests itself in dividend payments. Grosskopf (1990) reports that according to a survey among German cooperative banks, more than 90% of the CEOs regard favorable service conditions for members as impractical for competitive reasons. Again, over 90% of CEOs regard dividend payments as a legitimate way of meeting the member service requirement.

rule of one-man-one-vote regardless of the amount of equity held. As a consequence of these restrictions, the costs of changing control over these banks are high. Among the three types of control changes discussed by Manne (1965) only mergers and proxy contests are feasible. Since equity can only be traded with the cooperative itself, a takeover by means of an equity acquisition is not possible. Moreover, the one-man-one-vote rule distributes the voting power equally over all cooperative members and makes it independent of the amount of equity owned. Thus, there is no incentive to accumulate equity to increase one's voting power. Besides, the cooperative charter typically puts a ceiling on the amount of equity attainable per member.

The higher the transaction costs of changing control, the greater the inefficiency must be to trigger such a change. In cooperative banking, control changes are usually proposed by the cooperative association that operates the auditing institution and therefore, is the first to learn about managerial failures. The power of the cooperative association is limited and it depends on the cooperative members deciding to dismiss the management and approve a merger. In cases of gross management failure or fraud, the management can be formally discharged and a merger avoided. In cases of less apparent failures and inefficiencies, mergers may be the only means to replace the management. Then, the incumbent management is usually offered a golden parachute in terms of a second-ranked (but equally paid) position in the new and larger bank. Although proxy contests are rare, there are cases where the management has competed with the cooperative association for the members' votes and there is at least one case where the management won and the bank left the cooperative group.

When a primary bank gets into financial distress, the cooperative group has an incentive to protect this bank from default. Otherwise, the other member banks suffer a loss of reputation. Thus, depositors can rely on rescue operations within the cooperative group. Even in the worst case of resorting to the deposit insurance fund, they can expect full coverage if they have split up their deposits appropriately. Thus, depositors also have no reason to monitor management.

For these reasons a cooperative bank is characterized by a 'separation of ownership and control' in the way envisioned by Berle and Means. By distributing the control rights over the bank equally across the cooperative members, power is actually passed to the management. Since the equity ownership structure is exogenous, it cannot adjust to eliminate managerial inefficiency.

4. Monitoring costs and employee compensation

Berle and Means argue that the separation of ownership and control means that there exists an agency problem. Firm owners must design a managerial compensation contract to induce effort and monitor performance. In general, there are two schemes for employee compensation within such an agency relationship. First,

incentive payments can relate compensation explicitly or implicitly to performance. Second, there is the efficiency wage approach in which the firm owners pay the worker a rent that is lost if he is fired. Milgrom and Roberts (1992) argue that efficiency wages are preferred if the employee can not rely on the promise of performance-based compensation. Such a promise may not be credible because it may be difficult to assess the performance of the employee objectively, creating a moral hazard on the part of the principal since there is then an incentive to deliberately underrate the performance of the agent. Another problem arises from a possible breach of trust when performance pay is implicit. Again, the principal has an incentive to renege on any promise made, expropriating the employee.

Cooperative banking is a setting where the efficiency wage view is most appropriate. First, the owners of these banks cannot reasonably be viewed as insiders who are able to judge the employees' performance on objective grounds. Moreover, the dispersed and anonymous ownership structure does not support implicit contracts with the employees. In the case of a breach of trust there is nobody the employee can hold responsible. Second, we will analyze the wages of *all the employees of the bank* not just the CEO. There is no explicit performance pay at bottom level banks. In the following, the hypotheses to be tested will be derived from a simple efficiency wage model based on Shapiro and Stiglitz (1984) and Milgrom and Roberts (1992).

Let θ be the wage the bank employee can get in an alternative occupation (net of switching costs). The owners of the bank are incompletely informed about the actions of the employee. As a result, the employee can engage in unobserved consumption on the job (sometimes referred to as achieving 'private benefits'). Call this consumption 'cheating.' The value the employee attaches to this consumption is denoted B. If the employee is found to be cheating, he is fired. The probability of this happening is p $(0 < p < 1)$. In order to make the actions of the employee compatible with the owners' interests, the employee must face opportunity costs of cheating which he values at least as highly as his consumption benefit, B. If the employee is paid a wage greater than his reservation wage, $w > \theta$, he puts the rent $w - \theta$ at risk when he cheats. Thus, the incentive compatibility constraint is

$$p(w - \theta) \geq B.$$

The monitoring technology of the owners is described by a cost function $M(p, n)$ which relates the probability of detecting consumption on the job to the costs of supervision, for a given number of cooperative members, n. Marginal costs of monitoring are positive and increasing in the number of cooperative members. (Assume that monitoring costs go to infinity as p approaches one.) For a given n, the bank owners must choose p and w to:

$$\text{Minimize: } M(p, n) + w,$$

$$\text{subject to: } p(w - \theta) \geq B.$$

Let p^* solve the above program. As discussed above, the marginal costs of supervising the bank employees rises with the number of cooperative members, n, because of free-riding. If the marginal costs of monitoring rise with n for a given value of p, monitoring intensity will decline, i.e., $\mathrm{d}p^*/\mathrm{d}n < 0$. But then in order to meet the incentive compatibility constraint, the efficiency wage, w, must rise. This leads to the following testable hypothesis: H_A: The mean wage paid by the bank increases with the number of cooperative members, holding the reservation wage constant.

By receiving the higher wages, the employees of a bank with a higher number of cooperative members have the same incentive to perform as their colleagues in a bank with fewer members and hence, more intensive supervision. However, since higher wages translate into higher operating costs, bank performance deteriorates. This leads to a second testable hypothesis: H_B: The performance of cooperative banks decreases with the number of members.

We now turn to testing these hypotheses.

5. Empirical analysis

The panel consists of annual observations on 73 cooperative banks over the period 1987–1990. The panel banks are exclusively cooperative banks in the narrow sense, that is, banks that are run as stock corporations (with the stock owned by cooperatives) are excluded. [15] The banks belong to the Schulze-Delitzsch cooperative association and are spread over all nine Austrian states. They enjoy the same degree of autonomy. That implies that the panel does not cover institutions for which autonomy has been restricted by the top-level bank or by the cooperative association as a result of a rescue operation. Also, there are no special purpose banks (e.g., installment credit institutions) included.

All panel banks provide the same range of services. The composition of these banking services, however, varies in cross-section. Some of this variation is correlated with the size and the location of the bank. Size and location are highly correlated: small banks tend to operate in rural areas while the larger ones are located in the cities. The most distinct cross-sectional variation in the business structure of the panel banks is the degree of banking with nonbanks (other than the government). This is reflected on both the asset and the liability side of the banks' balance sheets. Small banks tend to exhibit large ratios of nonbank deposits (including savings deposits) to total assets. They tend to be net suppliers on the

[15] If a takeover is organized by more than one cooperative bank, then the distressed bank may be transformed into a stock corporation with the stock then being acquired by the rescuing banks. As a result, there is a small (but growing) number of banks which are run as stock corporations although they are members in one of the two cooperative associations.

interbank market. Larger banks have a smaller fraction of their assets financed by deposits of nonbanks and tend to be small suppliers or even borrowers on the interbank market. Also, larger banks tend to have higher ratios of loans to nonbanks (other than the government) in total assets.

The empirical model consists of a wage equation and a performance equation, corresponding to the two hypotheses to be examined. The wage equation relates the log ratio of the wage paid by the bank and the reservation wage, i.e., $\ln(w/\theta)$, to the (log of the) number of cooperative members, n.[16] The performance equation relates the performance of the bank, measured by the (log of the) return on total assets (ROA), to the (log of the) number of cooperative members, n. Both equations also include sets of normalizing regressors (x_1, x_2). The equations to be estimated are:

$$\ln(w/\theta) = f(n, x_1) + e_1,$$

$$\text{ROA} = g(n, x_2) + e_2.$$

with e_i $(i = 1,2)$ being error terms. We now turn to describing the data in more detail. Then we turn to empirically testing the two hypotheses.

The wage paid by the bank (w) is measured by summing the yearly income statement positions 'wages and salaries' and 'expenditures for statutory social contributions and compulsory contributions' of the bank and dividing this sum by the number of bank employees. This number is calculated as a weighted sum of the number of persons that were on the payroll of the bank in the respective year. The weights are the fraction of a year's work time that these employees actually were at the bank. Thus, the weighting corrects for employees who work part-time or who joined or left during the year.

The model also requires a measure of the reservation wage, θ. Two different reservation wage concepts were used. If employees are not geographically mobile, but are mobile across industries of the same region they may compare their wage with the wages paid to employees in these other industries. In that case, the relevant reservation wage is the median income in the corresponding Austrian state (Bundesland), calculated over all industries.[17] If bank employees are instead geographically mobile, they may compare their wage with the wage of their bank colleagues in other states. The mean wage over all panel banks in the corresponding year is then the relevant measure of comparison. The mean annual income of

[16] The specification relating the log ratio of wage to reservation wage is based on tests for normality of the residuals.

[17] The mean wage is divided by the median regional wage because the median is the only available measure.

Table 1
Yearly income of employees of panel banks and of all industries

	Mean income of employees of panel banks (median income of employees of all industries)[a]				
	1987 (×1000 ATS)[b]	1988 (×1000 ATS)	1989 (×1000 ATS)	1990 (×1000 ATS)	Number of panel banks
Burgenland	396(194)	421(198)	423(205)	451(215)	4
Carinthia	397(208)	385(211)	412(220)	420(232)	10
Lower Austria	399(209)	391(213)	413(222)	451(235)	22
Salzburg	356(213)	367(218)	379(227)	419(240)	2
Styria	395(206)	413(209)	501(218)	452(232)	9
Tirol	411(207)	417(212)	419(220)	445(231)	5
Upper Austria	380(218)	394(222)	401(231)	429(244)	18
Vienna	437(231)	435(237)	474(246)	471(260)	2
Vorarlberg	404(240)	424(247)	403(255)	410(270)	1
Republic of Austria	394(218)	398(223)	422(232)	440(245)	73

[a]Hauptverband der österreichischen Sozialversicherungsträger, Vienna, Austria; provided on request.
[b]ATS: Austrian Schilling.

Table 2
Descriptive statistics of return on assets (ROA)

	1987 ($\times 10^{-2}$)	1988 ($\times 10^{-2}$)	1989 ($\times 10^{-2}$)	1990 ($\times 10^{-2}$)
Minimum	3.99	3.55	3.65	4.45
First quartile	4.63	4.34	4.49	5.27
Median	4.93	4.61	4.80	5.60
Mean	4.96	4.65	4.86	5.67
Third quartile	5.25	4.85	5.25	6.08
Maximum	5.96	5.81	5.95	7.14
Standard deviation	0.45	0.48	0.55	0.58

the employees of the panel banks and the median annual income of employees of all industries, differentiated by states, are shown in Table 1.

The performance of the bank is measured by the log of the return on total assets (ROA). The denominator of ROA is calculated as the sum of 'interest and related expenditures' (i.e., payments to debt holders) and operating profit. (For details see Appendix A.) The numerator equals the balance sheet total. [18] Descriptive statistics on ROA, differentiated by years, are given in Table 2.

The number of cooperative members that enters both regression equations refers to the beginning of the business year. [19] Table 3 presents descriptive statistics on the number of cooperative members. It shows that the number of members varies from a few hundred to about 20,000.

The set of normalizing regressors of the wage equation (x_1) comprises variables that control for the business structure of the bank, its size and organizational complexity. It also includes a constant regressor, three yearly and eight regional dummy variables. [20] The business structure of the bank was measured by two variables, one from each side of the balance sheet. These variables mirror the degree of business the bank conducts with nonbanks (other than the government). The asset structure of the bank was characterized by the fraction of loans to nonbanks (other than the government) in total assets. Correspondingly, the composition of liabilities of the bank was represented by the fraction of the sum of savings deposits and the position 'due to nonbanks' in total assets. The log number of employees and the log of total assets represent organizational complexity and

[18] Since the banks in the panel did not do any trustee business (which would show up on both sides of the balance sheet) total assets can be directly measured by the balance sheet total.

[19] This comprises the relevant set of potential voting rights for the business year in question since new members are approved at the year-end meeting and do not yet have voting rights at this meeting.

[20] Since there is a constant regressor, no dummy variable was included for the year 1987 and the state Vorarlberg.

Table 3
Descriptive statistics on the number of cooperative members

	1987 (×1000)	1988 (×1000)	1989 (×1000)	1990 (×1000)
Minimum	0.2	0.3	0.3	0.2
First quartile	2.9	3.0	3.2	3.2
Median	5.3	5.3	5.3	5.3
Mean	5.9	6.0	6.2	6.3
Third quartile	7.9	8.1	9.1	8.7
Maximum	18.4	18.4	18.6	20.9
Standard deviation	3.9	3.9	4.0	4.2

bank size in the regression equation, respectively. The set of normalizing regressors in the performance equation (x_2) includes all the control variables of the wage equation with the exception of the number of employees.

Table 4 presents descriptive statistics on the size variable. [21] The table shows that the sample banks vary from small local banks with total assets of about $10 million to regional banks whose dollar value of assets amounts to a few hundred million. As mentioned above, bank size explains some of the cross-sectional variation in the business structure. However, there is also a great deal of business structure variation that is independent of the size of the bank. The correlation coefficients between the two business structure variables and (the log of) total assets amount to 0.144 (loans to nonbanks) and −0.255 (deposits of nonbanks).

The empirical results for the wage equation are given in Table 5. [22] For both reservation wage concepts the influence of the number of cooperative members is positive and statistically significant. The results support hypothesis H_A which predicts that the efficiency wage increases with the number of cooperative members. Based on the wage differential to the regional mean, the average wage in the bank increases by 5.5% for a hundred percent rise in the number of cooperative members. When using the sample mean as a reference wage, a doubling of the number of members leads to a 6.1% increase in the average wage paid by the bank.

[21] Total assets were measured in Austrian Schilling (ATS) in the regression equations. It is the only nominal variable in the model. Since log values were used, it was not deflated. (Changes in the deflator are picked up by the time dummy variables.)

[22] *F*-values and *t*-values in Tables 5 and 6 are based on White (1980)-corrected standard errors. (On the White-correction of *F*-values see Greene, 1997, pp. 280–282.) We tested for serial correlation using the Ljung–Box statistics (see Greene, 1997, p. 595) with various lag lengths. Serial correlation is never significant.

Table 4
Descriptive statistics on bank size

Balance sheet total	1987 ×1 Mill. ATS[a] (×1 Mill. USD)	1988 ×1 Mill. ATS (×1 Mill. USD)	1989 ×1 Mill. ATS (×1 Mill. USD)	1990 ×1 Mill. ATS (×1 Mill. USD)
Minimum	89 (7)	96 (8)	108 (8)	124 (11)
First quartile	465 (37)	484 (39)	532 (40)	586 (51)
Median	754 (59)	805 (65)	874 (66)	1000 (87)
Mean	977 (77)	1056 (85)	1180 (89)	1330 (116)
Third quartile	1174 (93)	1254 (101)	1344 (101)	1530 (134)
Maximum	4813 (380)	5296 (427)	6002 (453)	7039 (616)
Standard deviation	789 (62)	878 (71)	989 (75)	1136 (99)

[a]ATS: Austrian Schilling; USD: U.S. Dollar.

Table 6 provides the empirical results for the performance equation. The influence of the number of cooperative members is negative and significant. This result supports hypothesis H_B that states that bank performance decreases with the number of cooperative members. As the regression coefficient shows, ROA decreases by 7% (not seven percentage points) for a hundred percent increase in the number of members. Based on the median value of ROA in 1990 of 5.6%, this implies that a doubling of the number of members will reduce ROA to 5.2%.

There is some cross-sectional co-variation among the explanatory variables of the regression equations. Total assets are positively correlated with the numbers of members and employees and negatively correlated with the fractions of nonbank deposits and nonbank loans in total assets. From an economic point of view, we are interested in isolating the influence of the number of members on wages and bank performance, holding all other firm characteristics constant. This restricts our possibilities of dropping explanatory variables to keep the problem of multicollinearity small. One sign of multicollinearity is the insignificance of several individual regression coefficients that at the same time are statistically significant as a group (see Greene, 1997). This is obviously not the case here. Another problem is that regression coefficients may represent the influence of more than one explanatory variable. This leads to large changes in the regression coefficients when some of the variables are dropped from the equation (see Greene, 1997). The pairs of regressors with the highest correlation coefficients (r) are (the logs of) the number of members and total assets ($r = 0.76$), (the logs of) the numbers of

Table 5
Wage equation results

Explanatory variable	Dependent variable			
	Wage difference (relative to regional median)		Wage difference (relative to sample mean)	
	Coefficient	*t*-value	Coefficient	*t*-value
Number of members	5.532×10^{-2}	2.474**	6.073×10^{-2}	2.086**
Loan to nonbanks	1.125×10^{-1}	2.467**	1.010×10^{-1}	2.391**
Due to nonbanks	-4.138×10^{-1}	−2.881***	-4.501×10^{-1}	−2.570**
Number of employees	-4.896×10^{-1}	−6.109***	-5.018×10^{-1}	−4.424***
Total assets	4.547×10^{-1}	6.573***	4.620×10^{-1}	4.939***
Year 1988	1.049×10^{-3}	0.067	5.762×10^{-4}	0.038
Year 1989	-4.622×10^{-2}	−2.793***	-3.949×10^{-2}	−2.431**
Year 1990	-6.666×10^{-2}	−3.673***	-7.020×10^{-2}	−3.442***
Constant	−7.963	−6.345***	−8.080	−4.821***
F-statistic	9.952***		9.809***	
F-statistic (state dummies)	12.49***		13.34***	
F-statistic (state dummies)	15.16***		8.144***	
R^2	0.424		0.390	
adj. R^2	0.390		0.354	
Number of observations	292		292	

** /***: Significant at 5/1% level (*t*-tests two-tailed).

members and employees ($r = 0.77$) and (the logs of) the number of employees and total assets ($r = 0.97$). Although positively correlated, all three pairs of variables have, with one exception, (statistically significant) regression coefficients of opposite signs. Thus, there is little concern that these regression coefficients may have picked up part of the influence of the correlated variable. The mentioned exception is (the logs of) the number of members and total assets in the wage equation.

To investigate the sensitivity of the regression coefficient to the number of members, we dropped total assets from the wage equations. The regression coefficients for the number of members are now slightly higher (0.068 for the regional reference wage; 0.074 for the industry reference wage). They are significant at the 5% level. The regression coefficients for the number of employees and the fraction of deposits of nonbanks in total assets remain significant, while the influence of the fraction of loans to nonbanks in total assets does not.

The empirical results show that the greater the separation between ownership and control, as measured by the number of cooperative members, the greater are

Table 6
Performance equation results

Explanatory variable	Dependent variable	
	Return on assets	
	Coefficient	*t*-value
Number of members	-7.002×10^{-2}	-4.655^{***}
Loan to nonbanks	2.968×10^{-1}	3.667^{***}
Due to nonbanks	3.620×10^{-1}	2.804^{***}
Total assets	5.571×10^{-2}	3.393^{***}
Year 1988	-6.677×10^{-2}	-4.592^{***}
Year 1989	-3.241×10^{-2}	-2.124^{**}
Year 1990	1.157×10^{-1}	8.062^{***}
Constant	−3.957	-11.655^{***}
F-statistic	22.32^{***}	
F-statistic (state dummies)	15.38^{***}	
F-statistic (time dummies)	11.66^{***}	
R^2	0.494	
adj. R^2	0.467	
Number of observations	292	

$^{**}/^{***}$: Significant at 5/1% level (*t*-tests two-tailed).

the agency costs, resulting in a decline in performance. Cooperative banking is characterized by high agency costs which market forces cannot eliminate. Over the period 1987–1990 the number of cooperative banks decreased by 16% as a result of mergers. Most of these mergers were triggered by managerial inefficiencies. Although these control changes may cause temporary relief, they do not eliminate the systematic inefficiencies that result from the high transaction costs of adjusting the ownership structure of the firm.

6. Conclusion

Berle and Means (1932) argue that inefficiency results from the separation of ownership and control. But since stock corporations are characterized by low transaction costs of trading their equity, their ownership structures can adjust to the needs of control imposed by the agency problem between equity holders and management. As a result, Demsetz (1983) and Demsetz and Lehn (1985) argue that firm performance should be uncorrelated with ownership structure. Thus, it is difficult to empirically examine the Berle and Means thesis. Our analysis overcomes the difficulties by focusing on an organizational form in which the ownership structure cannot adjust. Moreover, the degree of separation of ownership and control can be measured by the number of cooperative members. For Austrian cooperative banks the transactions costs of adjusting the ownership

structures to the optimal control pattern are high. We document that agency costs, as measured by efficiency wages, are increasing in the degree of separation or dispersion of the ownership structure.

Appendix A. Income statement of Austrian cooperative banks

	interest and related income
−	interest and related expenditures
+	balance of income from service transactions
	operating income [Betriebserträge]
−	operating expenses
	operating profit [Teilbetriebsergebnis]
+	balance of ordinary income from non-banking transactions
+	balance of income from the valuation and disposal of loans and securities and from trading activities
+	balance of extraordinary income and expenses
−	provisions made in anticipation of losses
	income for the year (before taxes and changes in reserves) [Jahresüberschuß (vor Steuern und Rücklagenbewegung)]
−	taxes paid on income, earnings and assets
−	changes in reserves
	profit for the year [Jahresgewinn]
−	profit carried forward from the previous year
	net profit [Reingewinn]

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