Bonn Econ Discussion Papers

Discussion Paper 8/2002

Common and Separate Ownership of Projects

by

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March 2002

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Abstract

This note points out the differences between conducting several projects within one big firm (common ownership) and conducting each project within an independent firm (separate ownership).

JEL Codes: D23, L22, G31, G32.
Key words: Conglomerate, Nature of the firm, Market Vs hierarchies.

1 Introduction and presentation of the model

This note points out the differences between conducting several projects within one big firm (common ownership) and conducting each project within an independent firm (separate ownership). Under common ownership the allocation of resources among the competing projects is centralized by the corporate headquarter, while under separate ownership, it is decentralized on a market. I show that a big firm concentrating many projects provides different incentives and invests differently in the projects than separated firms conducting a single project.

The following problem is considered: ex-post, scare resources should be allocated among competing projects and ex-ante the project managers should receive proper incentives to create these resources. There are three differences

*I would like to thank R. Amir, G. Nöldeke and X. Wauthy for useful comments and suggestions. The financial support from the German Research Foundation (DFG) is gratefully acknowledged.

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between conducting these two operations under common or separate ownership. First, redistribution is done inside the firm, directed by the corporate owner or on a market where the firms trade resources at a price p. Second, managerial contracts are centralized by a single corporate owner[1] or the contracting process is done in each firm separately. Last, the surplus created by the redistribution of resources goes to a single owner or it is split between several project owners. In separate ownership, the sharing of the surplus between the project owners (and also the size of the surplus) depends on the price that prevails on the market.

Contract centralization, together with the appropriation of the surplus from redistribution by a single owner imply that the contracting process is more efficient under common ownership. When the surplus is split between several project owners, there are distortions in the choices of managerial efforts as none of these owners is able to buy up the entire surplus. Nevertheless, it does not mean that common ownership is more efficient. Efficient contracting is associated with higher costs of managerial effort. Redistribution of resources under common ownership smooths managerial income. If there is moral hazard at the project level, income smoothing reduces the managerial incentives to make effort. Conversely, redistribution through the market does not smooths managerial income as more redistribution also implies higher repayments to the fund provider. Hence, there is less insurance and more incentives under separate ownership and, consequently, inducing managers to do effort is less expensive.

This work is related to Coase (1937) who distinguishes two alternative ways of conducting transactions: on a market where the allocation of factors is determined by the price system and within firm where the entrepreneur directs production and allocates the factors of production without using the price system. Since this work, there were several attempts to characterize the distinguishing features of the firm. That is, in what respect market transactions differ from transactions within firm. Klein et al. (1978) and Grossman and Hart (1986) have shown that integrated firms (common ownership) invest differently than non-integrated one (separate ownership) when the investment is relation-specific.[2]

[1] Alchian and Demsetz (1972) consider that a distinguishing feature of firms is the centralization of contractual agreements.

[2] This problem has come to be known as the hold-up problem. In the property right literature (Hart, 1995), ownership confers residual control rights over assets. When the specific investment cannot be contracted for, the allocation of ownership determines ex-

This note gives elements to understand the differences in between firms and markets. I do not raise the questions of why do firms merge and break-up[3] or of the superiority of common ownership over separate ownership.[4]

The model.

Consider two projects, projects 1 and 2. The projects could be conducted either in one big firm or within two independent firms. Project $i = 1, 2$ gives a sure payoff of $V_i(y_i)$ at time $t = 2$, when y_i is invested at $t = 1$. The function V_i is increasing and concave. I suppose that the two projects have different returns: $V_1(y) \neq V_2(y) \ \forall \ y$.

To each project is associated a manager. The project managers create the resources used for investment. If the manager of project i exerts an effort of e_i at $t = 0$, he creates x_i units of resources at $t = 1$. The distribution of outcomes x_i as a function of effort is given by a density function $f(x_i \mid e_i)$ that satisfies the monotone likelihood property. An effort e_i costs $C(e_i)$ to the manager. For simplicity, I suppose that managers are identical.

The resources x_i created by managers are observable but not contractible. The corporate owner compensates the manager for its effort by giving up a fraction ω_i of the total project value.[5] Managers are risk neutral and have a reservation utility normalized to zero. I consider the cases of contractible and non-contractible effort levels.

Once the managers have created resources x_1 and x_2, the corporate owners decide how much to invest in each project. If the two projects are located into one big firm, the corporate owner can make costless transfer in between the two projects. If the two projects are carried on into independent firms, the owners of these two firms can trade z units of resources at unit price p. A trade of z units at $t = 1$ calls for a repayment of zp at $t = 2$.

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post the sharing of the surplus. And investment decisions ex-ante depend on how the surplus is shared ex-post i.e. depends on ownership patterns.

[3] Maksimovic and Phillips (2002) consider a similar problem of resource allocation across different projects but the number of segments (projects) within a firm is endogenously determined by comparative advantages in segment-specific managerial talent.

[4] The hold-up literature emphases on costs and benefits of control and ultimately derives the optimal ownership structure. There is also a large part of the literature that compares the value of diversified and focused firms to determine if the pooling of activities under common ownership creates or destroys value (Stein (1997), Gautier and Heider (2001) and empirical evidences by Berger and Ofek (1994)).

[5] Or if the two projects are located within one firm, the managerial reward could be based on the total firm value.

2 Common ownership

Under common ownership, given that the project managers produced a total amount of resource equals to $x_1 + x_2$, the corporate owner allocates those resources in order to maximize its total profit. The following optimization program determines the transfer z^c from/to division 1[6]:

$$\max_{z^c}(1-\omega_1)V_1(x_1+z^c)+(1-\omega_2)V_2(x_2-z^c).$$

Subject to: $z^c \leq x_2$ and $-z^c \leq x_1$.

The two constraints reflect the fact that the transfer from/to division 1 cannot exceed the available resources.

Proposition 1 *The transfer under common ownership $z^c(x_1, x_2)$ is determined by the following first order condition:*

$$(1-\omega_1)V_1'(x_1+z^c) = (1-\omega_2)V_2'(x_2-z^c). \tag{1}$$

Within a firm, the corporate owner allocates the available resources $(x_1 + x_2)$ to equate its marginal profit in the two projects.

The firm redistribution rule $z^c(x_1, x_2)$ determines the level of investment in each project y_1 and y_2 as a function of the x_1 and x_2. Given that x_1 and x_2 depend on efforts e_1 and e_2, it is possible to compute the distributions of y_1 and y_2 conditional on the efforts. Call $g_1^C(y_1 \mid e_1, e_2)$ and $g_2^C(y_2 \mid e_1,\, e_2)$ the marginal distributions of y_1 and y_2 conditional on efforts.

The expected value of project i is defined as $EV_i(y_i) = \int V_i(y_i) g_i^C(y_i \mid e_1, e_2) dy_i$. The corporate owner maximizes its profit by selecting the managerial shares ω_i and the effort levels e_i in the following way:

$$\max_{\omega_1,\omega_2,e_1,e_2}(1-\omega_1)EV_1(y_1)+(1-\omega_2)EV_2(y_2).$$

Subject to:

$$\omega_1 EV_1(y_1) - C(e_1) \geq 0. \tag{IR_1}$$

$$\omega_2 EV_2(y_2) - C(e_2) \geq 0. \tag{IR_2}$$

[6]If the transfer z^c is positive, division 1 receives funds from division 2, while if $z^c < 0$, division 1 gives funds to division 2.

Proposition 2 *Under common ownership, the effort levels are identical* ($e_1 = e_2 = e$) *and given by:*

$$EV_1'(y_1) + EV_2'(y_2) = C'(e). \tag{2}$$

and the payments are given by the individual rationality constraints:

$$\omega_1 = \frac{C(e)}{EV_1(y_1)}; \omega_2 = \frac{C(e)}{EV_2(y_2)}. \tag{3}$$

Proof. When the managerial efforts are contractible, the corporate owner pays the managers just enough to ensure their participation: $\omega_i EV_i(y_i) = C(e_i)$. The problem is then to maximize $EV_1(y_1) + EV_2(y_2) - C(e_1) - C(e_2)$ with respect to e_1 and e_2. Under common ownership, the amounts (y_1 and y_2) invested in each project depend only on the total amount of resources $x_1 + x_2$. Hence, the derivative of the expected profit EV_i with respect to e_i is equal to the derivative of EV_i with respect to e_j. Therefore, the two first order conditions of the problem are equivalent and given by equation (2). It implies that both managers do the same level of effort. ■

When a single contract designer collects the entire surplus from the redistribution of $x_1 + x_2$ among the two projects, he requires that the managers makes an that maximizes the total surplus net of efforts costs. With a convex cost of effort and identical managers, the total amount of effort is equally split between the two managers.

3 Separate ownership

Consider two firms, endowed with resources x_1 and x_2 respectively. The firms could trade z^s units of resources at a unit price p (for simplicity, we suppose that the firms take the price as given). Assume that the amount of trade is determined by joint profit maximization, z^s is the solution of:

$$\max_{z^s}(1-\omega_1)(V_1(x_1+z^s)-z^s p)+(1-\omega_2)(V_2(x_2-z^s)+z^s p).$$

Subject to: $z^s \leq x_2$ and $-z^s \leq x_1$.

Proposition 3 *The transfer under separate ownership* $z^s(x_1, x_2)$ *is determined by the following first order condition:*

$$(1-\omega_1)V_1'(x_1+z^s)+\omega_1 p = (1-\omega_2)V_2'(x_2-z^s)+\omega_2 p. \tag{4}$$

The market redistribution rule z^s differs from the firm redistribution rule z^c as it takes into account the impact of the price p on the profits. This reflects the fact that market transfers are not neutral with respect to the total profit. When one unit is transferred from firm i to firm j, $\omega_j p$ is repaid by the manager of firm j and $\omega_i p$ is received by the manager of firm i. Transferring one unit of resources from i to j changes the total profit by $(\omega_j - \omega_i)p$.[7] Hence, the marginal benefit of market transfer includes the cost of transferring resources in between firms. Given that, the next result is immediate.

Corollary 4 *For a given amount of resources $x_1 + x_2$, $z^s \geq z^c$ if $\omega_1 \geq \omega_2$ and $z^s \leq z^c$ if $\omega_1 \leq \omega_2$.*

The market redistribution rule is identical to the firm redistribution rule if either the managerial shares in the profits are equal across firms or if the price is equal to zero. The next lemma shows that $p = 0$ is not feasible.

Lemma 5 *(i) The firms accept to trade z^s units of resources at price p if:*

$$(1 - \omega_1)(V_1(x_1 + z^s) - z^s p) \geq (1 - \omega_1)V_1(x_1). \tag{5}$$

$$(1 - \omega_2)(V_2(x_2 - z^s) + z^s p) \geq (1 - \omega_2)V_2(x_2). \tag{6}$$

(ii) A price $p > 0$ such that participation constraints (5) and (6) are satisfied always exists.

Proof. part (ii): The constraints are equivalent to:

$$z^s p \leq V_1(x_1 + z^s) - V_1(x_1). \tag{7}$$

$$z^s p \geq V_2(x_2) - V_2(x_1 - z^s). \tag{8}$$

which define a lower and upper bond on p. ■

With all these elements, the non-equivalence between the two ownership structures can be established. The non-equivalence result means that either the redistribution rules differ ($z^s \neq z^c$) or that the incentives provided to managers differ (the effort levels are not the same). It is also possible that both the incentives and the redistribution rules differ.

[7] If the firms do not take the price as given, the transfer of one unit has an additional effect on total profit captured by $z^s(\omega_j - \omega_i)p'$.

Proposition 6 *Common ownership is not equivalent to separate ownership.*

Proof. Given the assumptions on the return functions V_i, the expected returns from both projects are different: $EV_1 \neq EV_2$. It implies that under common ownership $\omega_1 = \frac{C(e)}{EV_1}$ is not equal to $\omega_2 = \frac{C(e)}{EV_2}$. Then, if under separate ownership the firms owners replicate the common ownership incentive system (with ω_1 different from ω_2), the redistribution rule is different ($z^s \neq z^c$).

The argument would no longer be true if under common ownership the managerial rewards are proportional to the total firm value EV_1+EV_2, where in this case $\omega_1 = \omega_2 = \frac{C(e)}{EV_1+EV_2}$. To replicate this incentive system under separate ownership, and given that the managerial rewards are determined by the binding individual rationality constraint (otherwise managers would be over-compensated): $\omega_1 = \frac{C(e)}{EV_1(x_1+z^s)-z^s p}$ and $\omega_2 = \frac{C(e)}{EV_2(x_2-z^s)+z^s p}$, the surplus should be equally shared between the two firms: $pz^s = \frac{EV_1(x_1+z^s)-EV_2(x_2-z^s)}{2}$. At that price, $\omega_1 = \omega_2$ and $z^s = z^c$. And the two firms have the same profit function: $\frac{EV_1(x_1+z^s)+EV_2(x_2-z^s)}{2} - C(e)$. In this case, the firms owners optimally decide to lower the level of managerial efforts. The efforts are determined by the following optimization programs: for $i = 1, 2$

$$\max_{e_i} \frac{EV_1(x_1 + z^s) + EV_2(x_2 - z^s)}{2} - C(e_i).$$

Which have as solution:

$$\frac{EV_1'(x_1 + z^s) + EV_2'(x_2 - z^s)}{2} = C'(e).$$

From this last expression, it can be seen that when the surplus from trade is equally redistributed between the two project owners, they requires that the managers do less effort than in the case in which a single owner collects the entire surplus. ■

Proposition 4 and its proof establish that conducting several projects within a big firm is not equivalent to conduct these projects into separated entities. Within a big firm, the owner determines the levels of effort by maximizing the total profit net of effort costs while, within independent firms, the effort levels are determined by maximizing the firm´s share of the total surplus net of effort cost. The fact that effort decisions are not based on the total surplus creates inefficiencies.

However, I do not claim that firm always out-performs the market. Larger organizations have specific problems on their own.[8] In addition, if the managerial efforts cannot be observed i.e. if there is moral hazard at project level, it is more difficult to motivate the managers to do effort under common ownership.[9] With unobservable efforts, the managers privately determine their levels of effort by equating the marginal cost of effort with its marginal benefit. When projects are conducted under common ownership, managers are, somehow, insured by the internal redistribution of resources and the marginal benefit of effort is lower. Should a manager creates few resources (a low x_i), the corporate owner transfers resources from the other project (if there are enough resources in this project). Hence, a bad performance, due to low effort (or bad luck), does not necessarily imply a low payment for the manager. It is only when both managers low perform that the managerial payment is low. The insurance provided by the internal redistribution of resources reduces the managerial incentives to do effort (this insurance-efficiency trade-off is well-known in moral hazard problems[10]). While, under separate ownership, if a manager has a low performance, there will be a transfer z^s from the other firm but $z^s p$ should be paid back to the fund provider. A low performance will then result in a low payment for the manager.[11] Under separate ownership, managers receives less insurance. Hence, the managers have more incentive to make effort when projects are conducted within independent firms because their payments are more closely linked to their individual performances. It results that effort is more costly under common ownership.

Does separate ownership dominates common ownership depends on the costs and benefits of the two structures. Integrating the two projects into a big firm allows the owner to centralizes the contracts but managerial effort is more costly. The good side of common ownership is effort coordination, the bad side is that managers respond less to incentives. The importance of these two opposite effects ultimately determines the optimal level of project

[8] For Milgrom (1987) and Scharfstein and Stein (2000), in large corporations, managers spend more time in non-productive activities (influence activities).

[9] Gertner et al. (1994) and Gautier and Heider (2001) have models in which integration of projects under common ownership lowers the managerial incentives.

[10] Hart and Holmström (1987).

[11] The reasoning is the same for a manager that performs well. If the owner transfers z^s from his project, $z^s p$ is paid back at the end. Hence, a high managerial performance results in a high payment.

concentration within firms.

4 Concluding remarks

This note has pointed three differences between common and separate ownership. First, redistribution of resources across projects depends on ownership. Second, common ownership has the advantage of contract centralization and third, it is more expensive to provide incentives under common ownership.

To conclude, I show that a firm cannot replicate the market solution by setting an internal transfer price. A big firm would be equivalent to the market if the internal transfer price is equal to the market price. However, this is not feasible because the corporate owner could not commit ex-ante to set the transfer price equals to the market price as I assumed that the resources x_i cannot be contracted for. Then the transfer price should be set ex-post. But ex-post, the corporate owner selects the transfer price that maximizes the revenues from transfers: $((1-\omega_2)-(1-\omega_1))z^c p$. Hence, a firm cannot mimic the market.

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