Renegotiation of Asset Ownership

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Abstract

Asset reallocation is often observed in disintegration, divestures, and dissolution of business firms. Yet the property right theory of the firm assumes that asset ownership cannot be renegotiated when business relationships are severed. This paper shows that this assumption is quite innocuous: allowing renegotiation of asset ownership has essentially no effects on the standard model.

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1I am very grateful to Lars Stole for encouraging me to think about renegotiation of asset ownership. All remaining errors are of course mine.
1 Introduction

The central argument of the property right theory of the firm (Grossman and Hart, 1986; Hart and Moore, 1990; Hart, 1995) is that asset ownership affects marginal returns of relation-specific investments and hence provides incentives to make such investments through its effects on disagreement payoffs (i.e., payoffs from trades outside the relationship). In this literature, it is assumed that when business relationship is broken up, asset ownership cannot be renegotiated: each party simply takes whatever assets assigned to her in the initial ownership agreement and trades with a third party. However, this assumption is very strong on both theoretical and empirical grounds. Theoretically the issue is whether it is credible to commit not to renegotiate asset ownership once parties break up their relationship. For example, suppose party 1 initially owns an asset and party 2 has made a great deal of human capital investment specific to the asset. Now if they are to sever their relationship, most likely party 2 will attempt to buy the asset from player 1 since it is worth much more to her than to player 1, and player 1 will likely be tempted by a favorable price for the asset. The commitment issue can be even more relevant when the asset is initially jointly owned. The usual default rule for jointly owned assets is to sell them on the asset market, but often one of the co-owners has higher valuations for the assets than the outside market due to specific investments she has made. In such cases the co-owners of the assets may very well attempt to reach a deal to reassign the assets. Empirically, asset reallocation is often observed in disintegration, divestures, and dissolution of firms. It seems hard to believe that in those ownership changes business firms would forgo valuable opportunities to achieve greater value by reshuffling asset ownerships.

In this short paper we relax the assumption of non-renegotiation of asset ownership in the standard framework of the property right theory of the firm. Surprisingly, we find the following equivalence result: as long as the relative bargaining power of the players in the model remains unchanged, the model with non-renegotiable asset ownership is essentially identical to that with renegotiable asset ownership, so the assumption of non-renegotiable asset ownership is quite innocuous.
The idea behind the equivalence result is quite simple. Initial asset ownership determines the parties’ payoffs if they break up their relationship, which serve as the disagreement point in their bargaining over distribution of the total surplus from trade. How much surplus each player eventually gets depends on her disagreement payoff and a share of the net surplus from trade that is proportional to her relative bargaining power. Renegotiation of asset ownership following the breakup of business relationship amounts to moving the disagreement point upwards, where each player’s gain in this renegotiation of asset ownership is proportional to her relative bargaining power in the renegotiation. According to the standard bargaining theory, the relative bargaining power of the parties is determined by their discount factors or probabilities of bargaining breakdown following rejections of offers. There do not seem to be good reasons to suggest why those factors would be different in bargaining over trade surplus and over asset ownership. If the relative bargaining power of all parties remains unchanged, then the new disagreement point after asset ownership renegotiation will lie on the line connecting the initial disagreement point and the agreement point. Consequently, under the new disagreement point, efficient bargaining will lead to exactly the same agreement point as under the initial disagreement point. Therefore, the players will have the same payoffs as long as they trade with each other, whether or not asset ownership can be renegotiated.

Baker, Gibbon and Murphy (2002) allow renegotiation of asset ownership in their novel analysis of relational contracts and vertical integration. In their model, renegotiation of asset ownership affects the final payoffs, because the final payoffs are not determined by the Nash Bargaining Solution from the new disagreement point. Rather, they are determined as a feasible equilibrium outcome of the repeated game supported by trigger strategies using disagreement payoffs as punishments. Clearly, when punishments differ, the payoffs that can be supported in equilibria of the repeated game can change.
2 The Model

2.1 The Set-up

Two parties, M1 and M2, are engaged in a business relationship. There are $n$ assets ($a_1, a_2, ..., a_n$).

The timing of the model is as follows.

- At date 0, an asset ownership structure is chosen by the two parties. We assume that the two parties bargain efficiently so that ownership structure is chosen to maximize the ex ante joint net surplus.

- At date 1, M1 and M2 make investment decisions simultaneously and noncooperatively. The investment technology will be specified below.

- At date 2, after investments have been made and observed by both parties, M1 and M2 bargain over whether and how to trade with each other. If they agree to trade with each other, the surplus is realized and then divided according to their agreement, at which point the game ends. If they cannot reach an agreement, the game proceeds to the next date.

- At date 3, M1 and M2 dissolve the business relationship. At issue is how to dispense the assets. We assume that there is an active outside market for each of the assets, and let the market price of asset $a_i$ be $V_i$. We suppose that M1 and M2 can renegotiate the asset ownership structure efficiently so that the highest total value will be achieved under the new ownership structure.

Except the last stage of asset ownership renegotiation, the model is standard in the literature of the property right theory of the firm. Renegotiation of asset ownership reflects the notion of “bygone is bygone” embedded in all contract renegotiation: no matter what caused the failure of their business relationship, the parties will look forward and focus on how to get the best value out of the assets. In situations where no clear commitment mechanisms (not to renegotiate) are in place, this seems to be a reasonable assumption.
We consider incomplete contract environments in which the only feasible contracts at date 0 are ownership contracts, contracts that specify who can control the assets at date 3. Following GHM, asset ownership is defined as residual rights of control over assets. Specifically, for example, if M1 owns an asset, he can unilaterally decide how to dispense the asset at date 3 in the case that M1 and M2 break up the relationship. He can either keep the asset to himself and find another trade partner, or sell the asset to M2, or sell it to the outside asset market. If M1 and M2 jointly own the asset, then they must jointly decide how to dispense the asset. If they cannot reach an agreement, then the asset will be sold in the outside market. We suppose that revenue from asset sale is verifiable and hence is contractible ex ante. Formally, for any asset $a_i$, write $\beta_i = a_i$ and $\gamma_i = \phi$ if M1 owns $a_i$, write $\beta_i = \phi$ and $\gamma_i = a_i$ if M2 owns $a_i$. If M1 and M2 jointly own asset $a_i$, then write $\beta_i = \alpha_i$ and $\gamma_i = 1 - \alpha_i$, where $\alpha_i \in [0, 1]$ denotes M1’s share of the asset sale revenue. Let $A_1 = (\beta_1, \beta_2, ..., \beta_n)$ and $A_2 = (\gamma_1, \gamma_2, ..., \gamma_n)$ be the sets of assets owned by M1 and M2 respectively. Denote an asset ownership structure by $A = \{A_1, A_2\}$.

At date 1, both parties makes non-verifiable investments. Let $I_1$ be M1’s investment and $I_2$ be M2’s investment, where $I_i$ can be multi-dimensional. The investment cost to M1 is given by $C_1(I_1)$, to M2 by $C_2(I_2)$. The joint surplus is $S = R(I_1, I_2)$ if M1 and M2 choose to trade with each other at date 2. The assumption that $S$ is independent of ownership structure captures the notion that information or technology is unaffected by ownership structure. Let $r_1(I_1, I_2; A_1)$ and $r_2(I_1, I_2; A_2)$ denote the outside option of M1 and M2, respectively. The outside options depend on asset ownership because the owner of an asset can take the asset with him/her to trade with an alternative partner and thus enhance his/her value. When an asset is jointly owned, then neither M1 nor M2 can take the asset with him/her to trade with another party without renegotiation. By default, without renegotiation, a jointly owned asset is sold to the outside asset market and the sale revenue is divided between M1 and M2. This can be represented by the following: if for some $a_i$, $\beta_i = \alpha_i$, then $r_1(I_1, I_2; A_1) = r_1(I_1, I_2; A_1^{-i}) + \alpha_i V_i$ and $r_2(I_1, I_2; A_2) = r_2(I_1, I_2; A_2^{-i}) + (1 - \alpha_i) V_i$, where $A_1^{-i} = (\beta_1, ..., \beta_i = \phi, ..., \beta_n)$ and $A_2^{-i} = (\gamma_1, ..., \gamma_i = \phi, ..., \gamma_n)$. 

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The above specification of the investment technology is very general, including as special cases most of the existing models in the literature. For example, in the standard GHM model (Hart, 1995), both players make one-dimensional investment ($I_i$ is scalar), $R(I_1, I_2)$ is additive in $I_1$ and $I_2$, and there are no cross-effects of investments on outside options ($r_i$ is independent of $I_j$). For another example, Che and Hausch (1999) consider “cooperative investments” that increase the outside value of one’s opponent, that is, $r_i$ is increasing in $I_j$. In addition, several models in the existing literature studied multi-dimensional investments $I_i = (I_i^S, I_i^G)$, where specific investments $I_i^S$, $i = 1, 2$, increase the surplus within the relationship $R(I_1^S, I_2^S)$ and general investment $I_i^G$ increases $i$’s outside option $r_i(I_i^G; A_i)$ (see, e.g., Cai, 2003). Such a generalization allows analysis of how complementarity and substitution between specific and general investments (through cost functions $C_i(I_i^S, I_i^G)$) affects ownership structure and other organizational designs.

2.2 Equilibrium

The analysis of the model is to solve for Subgame Perfect Equilibria of the game. If the game proceeds to date 3 where M1 and M2 have to break up their business relationship, they will bargain over how to dispense the assets. Given investments $(I_1, I_2)$, the joint surplus without asset ownership renegotiation is $s(I_1, I_2; A) = r_1(I_1, I_2; A_1) + r_2(I_1, I_2; A_2)$. Let $A^*$ be an ownership structure that maximizes $r_1(I_1, I_2; A_1) + r_2(I_1, I_2; A_2)$, and let $s^*(I_1, I_2) = s(I_1, I_2; A^*) = r_1(I_1, I_2; A_1^*) + r_2(I_1, I_2; A_2^*)$. Then $s^*(I_1, I_2)$ is the highest joint surplus M1 and M2 can possibly achieve at date 3 given investments $(I_1, I_2)$.

The surplus from asset ownership renegotiation between M1 and M2 is $s^*(I_1, I_2) - s(I_1, I_2; A)$. Although $s^*(I_1, I_2)$ is not directly affected by the initial ownership $A$, the division of the total value between the two parties crucially depends on $A$, because it affects the disagreement point in the bargaining process. As is standard in the literature, we suppose that bargaining outcomes are given by the Nash Bargaining Solution throughout the paper. We assume that the relative bargaining power of M1 versus M2 is $\tau : (1 - \tau)$, where $\tau \in [0, 1]$. After renegotiation of asset ownership, M1’s payoff is
\[
\begin{align*}
    u_1(I_1, I_2; A) &= r_1(I_1, I_2; A_1) + \tau [s^*(I_1, I_2) - s(I_1, I_2; A)] \\
    &= \tau s^*(I_1, I_2) + (1 - \tau) r_1(I_1, I_2; A_1) - \tau r_2(I_1, I_2; A_2)
\end{align*}
\]

and M2’s payoff is

\[
\begin{align*}
    u_2(I_1, I_2; A) &= r_2(I_1, I_2; A_2) + (1 - \tau) [s^*(I_1, I_2) - s(I_1, I_2; A)] \\
    &= (1 - \tau) s^*(I_1, I_2) + \tau r_2(I_1, I_2; A_2) - (1 - \tau) r_1(I_1, I_2; A_1)
\end{align*}
\]

At date 2, after investments have been made and observed by both parties, M1 and M2 bargain over whether and how to trade with each other. Since there is no information problem, we assume that bilateral bargaining will lead to efficient outcomes given by the Nash Bargaining Solution. Given initial asset ownership \(A\) and investment choices \((I_1, I_2)\), we have

(i) If \(S - s^* = R(I_1, I_2) - s^*(I_1, I_2) \geq 0\), then M1 and M2 will trade with each other and M1 will get a surplus of \(u_1(I_1, I_2; A) + \tau (S - s^*)\) and M2 will get a surplus of \(u_2(I_1, I_2; A) + (1 - \tau)(S - s^*)\). The payoff functions for the whole game are

\[
\begin{align*}
    U_1 &= u_1(I_1, I_2; A) + \tau (S - s^*) - C_1(I_1) \quad (1) \\
    U_2 &= u_2(I_1, I_2; A) + (1 - \tau)(S - s^*) - C_2(I_2) \quad (2)
\end{align*}
\]

(ii) When \(S - s^* = R(I_1, I_2) - s^*(I_1, I_2) < 0\), then M1 and M2 will not trade with each other and M1 will get a payoff of \(u_1(I_1, I_2; A) - C_1(I_1)\) and M2 will get a payoff of \(u_2(I_1, I_2; A) - C_2(I_2)\).

Equilibria of case (i) are termed “trade” equilibria, those of case (ii) “no trade” equilibria.

Note that in deriving the payoff functions above we have assumed that the relative bargaining power of the two parties is the same as in the dissolution stage at date 3. This is an
important assumption. As the bargaining literature shows, the relative bargaining power is determined by either the bargainers’ discount factors or the probabilities of bargaining breakdown following their rejections of offers. There does not seem to be a good reason why those factors would change from the trade negotiation stage (date 2) to the asset ownership renegotiation stage (date 3). If the relative bargaining power differs somewhat but not dramatically in these two stages of bargaining, then the qualitative result of the paper, that allowing asset ownership renegotiation does not affect much the optimal ownership structure, should still hold. The reason is that the ownership structure choice is discrete and hence is robust to small payoff changes. If the relative bargaining power differs dramatically from the trade negotiation stage to the asset ownership renegotiation stage, then the main result of the paper would not hold and allowing renegotiation of asset ownership would change the implications for optimal asset ownership structure.

Going back to date 1, the analysis of the game is to find the equilibrium investment choices with the payoff functions derived above for any fixed initial asset ownership structure. At date 0, the optimal asset ownership can be found to maximize the total surplus of the whole game.

In the property right theory of the firm, one crucial assumption is that the more assets a party owns the greater his outside option value is, because control over more assets enables him to be more productive outside his current business relationship. Formally, for any $i$, we say that $a_i \geq \alpha \geq \alpha' \geq \phi$ for $\alpha \geq \alpha'$, namely, the descending ranking is sole ownership of $a_i$, joint ownership with $\alpha$ share, joint ownership with smaller $\alpha'$ share, and no ownership. Then we can define a partial ordering on the set of assets $M_1$ owns: for $A_1 = (\beta_1, ..., \beta_i, ..., \beta_n)$ and $A_1' = (\hat{\beta}_1, ..., \hat{\beta}_i, ..., \hat{\beta}_n)$, we say $A_1 \geq A_1'$ if $\beta_i \geq \hat{\beta}_i$ for all $i$. Similarly, we can define a partial ordering on the set of assets $M_2$ owns. Then the assumption can be stated that $r_1(I_1, I_2; A_1)$ and $r_2(I_1, I_2; A_2)$ are non-decreasing in their last elements. That is, holding investments and ownership of other assets fixed, a party’s outside option is highest if he is the sole owner of asset $a_i$, medium if he is a co-owner of asset $a_i$, and lowest if he does not own asset $a_i$. A joint ownership with $\alpha_i$ share for $M_1$ gives $M_1$ an outside option of $\alpha_i V_i + r_1(I_1, I_2; A_{1}^{-i})$, where $A_{1}^{-i} = (\beta_1, ..., \beta_i' = \phi, ..., \beta_n)$. The assumption requires that $r_1(I_1, I_2; A_1) \geq V_i + r_1(I_1, I_2; A_{1}^{-i})$. 


where \( A_1 = (\beta_1, ..., \beta_i = a_i, ..., \beta_n) \), \( r(I_1, I_2; A_1) \) is M1’s outside value with sole ownership of \( a_i \), and \( V_i + r_1(I_1, I_2; A_1^{-i}) \) is M1’s greatest outside value with joint ownership of \( a_i \). This is essentially a free disposition assumption. Suppose M1 owns an asset \( a_i \) and decides to leave M2 to trade with a third party. If he sells the asset in the outside asset market before conducting the trade with a third party, then he can get \( V_i + r_1(I_1, I_2; A_1^{-i}) \). So as long as M1 has this option to dispose the asset, his outside option \( r_1(I_1, I_2; A_1) \) from sole ownership must be greater than that from any joint ownership.

Another crucial assumption in the literature is that investments are relation-specific in the sense that investments (at least in some dimensions of \( I_1 \) and \( I_2 \)) yield higher values and marginal values within the relationship than in the outside markets. This implies that trade within the relationship is more efficient than in the outside market. It is also assumed that assets and some dimensions of investments are complements in the sense that asset ownerships increase the marginal products of investments in those dimensions in the outside option values. The idea is that investments in those dimensions are asset specific, so having access to more assets increases the marginal returns of those investments. This implies that owning more assets gives a player greater incentives to invest in those dimensions, hence giving rise to links between asset ownership structure and investment incentives. These assumptions are critical to the fundamental insights of the property right theory of the firm. However, they are not needed for the equivalence result of this paper.

3 The Equivalence Result

First we consider the case of non-renegotiable asset ownership. Let \( \mathcal{A} = \{A_1, A_2\} \) denote the initial ownership structure M1 and M2 choose at date 0. If they cannot renegotiate the asset ownership in the case they break up, then the total surplus at date 3 is simply \( s(I_1, I_2; \mathcal{A}) = r_1(I_1, I_2; A_1) + r_2(I_1, I_2; A_2) \). Given an initial asset ownership \( \mathcal{A} \) and investment choices \( (I_1, I_2) \), if \( S - s = R(I_1, I_2) - s(I_1, I_2; \mathcal{A}) \geq 0 \), then M1 and M2 will trade with each other and M1 will get a surplus of \( r_1(I_1, I_2; A_1) + \tau(S - s) \) and M2 will get a surplus of
\[ r_2(I_1, I_2; A_2) + (1 - \tau)(S - s). \] So in the case that M1 and M2 trade with each other, their payoff functions for the whole game are

\[
W_1 = r_1(I_1, I_2; A_1) + \tau(S - s) - C_1(I_1)
\]

\[ = \tau S + (1 - \tau)r_1(I_1, I_2; A_1) - \tau r_2(I_1, I_2; A_2) - C_1(I_1) \quad (3) \]

\[
W_2 = r_2(I_1, I_2; A_2) + (1 - \tau)(S - s) - C_2(I_2)
\]

\[ = (1 - \tau)S + \tau r_2(I_1, I_2; A_2) - (1 - \tau)r_1(I_1, I_2; A_2) - C_2(I_2) \quad (4) \]

When \( S - s = R(I_1, I_2) - s(I_1, I_2; A) < 0 \), then M1 and M2 will not trade with each other and M1 will get a payoff of \( r_1(I_1, I_2; A_1) - C_1(I_1) \) and M2 will get a payoff of \( r_2(I_1, I_2; A_2) - C_2(I_2) \).

For the case of renegotiable asset ownership, Equations 1 and 2 give the two players' payoff functions for the whole game when they trade with each other. From Equation 1, we have

\[
U_1 = \tau S + (1 - \tau)u_1(I_1, I_2; A) - \tau u_2(I_1, I_2; A) - C_1(I_1)
\]

\[ = \tau S + (1 - \tau)[r_1(I_1, I_2; A_1) + \tau [s^*(I_1, I_2) - s(I_1, I_2; A)]] - \tau [r_2(I_1, I_2; A_2) + (1 - \tau)[s^*(I_1, I_2) - s(I_1, I_2; A)]] - C_1(I_1) \]

\[ = \tau S + (1 - \tau)r_1(I_1, I_2; A_1) - \tau r_2(I_1, I_2; A_2) - C_1(I_1) \]

\[ = W_1 \quad (5) \]

Similarly, \( U_2 = W_2 \).

We have established the following equivalence result.

**Proposition 1** Fix any initial asset ownership \( A \). If M1 and M2 trade with each other in both cases of renegotiable and non-renegotiable asset ownership, then M1 and M2 have identical payoffs in these two cases.

The idea of Proposition 1 is very simple, and can be best seen from Figure 1 below. Without renegotiation of asset ownership, the disagreement point is \( D_0 = (r_1(I_1, I_2; A_1), r_2(I_1, I_2; A_2)) \),
and efficient bargaining leads to $W = (W_1, W_2)$, where the slope of the line connecting $D_0$ and $W$ reflects the relative bargaining power of the two parties. With renegotiation of asset ownership, the disagreement point moves to $D_1 = (u_1, u_2)$. But $D_1$ must be on the line connecting $D_0$ and $W$, because the slope of $D_0D_1$ is also determined by the relative bargaining power of the two parties. Therefore, from the new disagreement point $D_1$, the two parties will again bargain to the same agreement $W$.

Insert Figure 1 here.

In some models, it is assumed that investments are so relation-specific that total surplus is always higher within the relationship than outside the relationship for all investment choices and for all ownership structures. As a result, trade will always occur between M1 and M2 no matter whether asset ownership is renegotiable. For example, in the standard GHM model with single dimensional investments, it is assumed that $R(I_1, I_2) > r_1(I_1, I_2; A_1) + r_2(I_1, I_2; A_2)$ for all $(I_1, I_2)$ and all $A = (A_1, A_2)$.

2 In such cases, the assumption of non-renegotiable asset ownership is completely dispensable in the following sense.

**Corollary 1** Suppose for any ownership structure, the total surplus within the relationship is always greater than that outside the relationship for all investment choices and for all ownership structures. Then the games in the renegotiable and non-renegotiable asset ownership cases are payoff-equivalent.

In models with multi-dimensional investments, it is often the case that there exist both trade equilibria in which M1 and M2 trade with each other and no-trade equilibria in which they trade outside the relationship. Since investments are relation-specific, trade is mutually beneficial. The primary focus of the literature is on trade equilibria because the main interest is on how asset ownerships are chosen to maximize total surplus from trade. Following Proposition 1, as

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2 In Hart (1995), stronger assumptions are made where $R(I_1, I_2)$ is additively separable in $(I_1, I_2)$ and $r_1$ is independent of $I_2$ and $r_2$ is independent of $I_1$. 

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long as we focus on trade equilibria, the assumption of non-renegotiable asset ownership does not have any effect on the implications of the model.

**Corollary 2** Suppose for any ownership structure, in equilibrium M1 and M2 trade with each other in both renegotiable and non-renegotiable asset ownership cases. Then the equilibrium outcomes and the optimal ownership structure are identical across the two cases.

In the no trade equilibrium (if it exists), the payoff functions of M1 and M2 at date 2 in the non-renegotiable asset ownership case (point $D_0$ in Figure 1) are somewhat different than those in the renegotiable asset ownership case (point $D_1$ in Figure 1). However, in the non-renegotiable asset ownership case, if the two parties expect that they will break up their relationship at date 2, at date 0 they will choose the ownership structure that maximizes the total value of dissolution $s(I_1, I_2; A) - C(I_1) - C(I_2)$ given their own equilibrium investment responses to the ownership structure choices. As long as the ownership structure chosen in this way is not subject to time inconsistence, namely, at date 2 when they break up their relationship M1 and M2 could not gain from renegotiating their asset ownership given their equilibrium investment choices, then the optimal asset ownership structure should be the same as that for the case of renegotiable asset ownership. Thus, absent time inconsistence, the assumption of non-renegotiable asset ownership does not affect the implications of optimal asset ownership in the no-trade equilibria either.

**Corollary 3** Suppose no trade is an equilibrium outcome in both renegotiable and non-renegotiable asset ownership cases. The optimal asset ownership is identical in the two cases, as long as there is no time inconsistence problem.

4 Conclusion

In this paper we show that allowing renegotiation of asset ownership does not affect the standard framework of the property right theory of the firm. It is obvious from our analysis that the conclusion holds for more than two parties. Moreover, the logic applies to other models with efficient ex post bargaining: renegotiation of disagreement points does not change the eventual agreement point as long as the relative bargaining power remains unchanged.
References


