Inefficient Ownership and Resale Opportunities

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In a property rights model where there are opportunities to continuously re-sell assets, it is demonstrated that equilibrium ownership may reside with inefficient outside parties and that efficient owners will have strong incentives to relinquish ownership to extract rents from other productive agents. Contractual restrictions on re-sale can prevent such inefficiencies. *Journal of Economic Literature* Classification Numbers: D23, L22

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Using a simple, once-off, auction model to determine asset allocation, Gans (2005) demonstrated that ownership by outside parties may be the unique equilibrium outcome in a property rights model of the firm (as specified by Grossman and Hart, 1986, and Hart and Moore, 1990; hereafter GHM). That result is of interest because outside ownership is not only an inefficient ownership structure it is often the least efficient structure.

At the heart of this is the fact that productive agents, when bidding for assets, do not internalise their impact on others. This paper demonstrates that when re-sale is possible, these externalities provide a potential source of additional rent extraction for owners during the asset trading process. A productive agent can threaten to re-sell to an outside party and impose a negative externality on another productive agent. This threat can be used to extract rents. However, the interaction here is subtle, as continual opportunities for re-sale means that the expropriator can become the expropriated in later rounds.

To explore this, this paper develops a model where re-sale opportunities in the form of auctions may arise sporadically but are not otherwise restricted. This stands in contrast to Jehiel and Moldovanu (1999) who consider bilateral transactions (including auctions) with a finite number of re-sale rounds[1] and Gomes and Jehiel (2005) who consider multilateral bargaining with a similar re-sale structure to that considered here. The auction assumption here captures the bilateral nature of transactions in a natural way; the necessity of which is discussed in more detail in Gans (2005).

[1] This structure is useful for analysing the role of re-sale and its relationship between different types of trading mechanisms and their relative efficiency – indeed, Gans (2004) utilises their model for this purpose. However, it is not as useful a structure to analyse the role of re-sale opportunities per se (as is done in this paper).

This paper demonstrates that the once-off auction result of Gans (2005) is robust to the introduction of re-sale. In Section 2, it is demonstrated that outside owners will choose to produce rather than re-sell assets so long as resale is not frictionless (i.e., that resale opportunities do not arrive too frequently). Section 3 then demonstrates that the efficient owner (i.e., a productive agent) will always choose to re-sell. Given this, Section 4 permits the current owner of an asset to limit the future re-sale opportunities of any buyer.

1. Model Set-Up

There are two productive agents (*A* and *B*), a continuum of outside parties (of type *O*) and a single alienable asset that is owned by another agent for whom the value of the asset is normalised to zero. While *A* and *B* contribute to surplus generated, an *O*'s association with the asset has no influence on the value created by any coalition controlling the asset. Thus, *O* is a *dispensable, outside party*.

The timing of the model is as follows:

DATE 0: Asset trading game determines the asset owner.

DATE 1: *A* and *B* choose any non-contractible actions.

DATE 2: All agents negotiate over the division of the surplus where the precise division is based on the Shapley value. Production takes place and payments are made.

Working backwards, let π_i^j be the expected payoff to agent *i*, at Date 1, under ownership by agent *j*. In a GHM model with (i) a single asset; (ii) where outside parties do not contribute to surplus generation; and (iii) at least one productive agent takes a non-contractible, surplus enhancing action, the total surplus under outside ownership,

$\pi_A^O + \pi_B^O + \pi_O^O$, is less than the total surplus generated under ownership by either productive agent *i*, $\pi_i^i + \pi_j^i + \pi_O^i = \pi_i^i + \pi_j^i$. For simplicity, it will be assumed that *A* is the efficient owner; that is, $\pi_A^A + \pi_B^A \geq \pi_A^B + \pi_B^B \geq \pi_A^O + \pi_B^O + \pi_O^O$ and by implication that $\pi_A^A \geq \pi_A^B \geq \pi_A^O$ and $\pi_B^B \geq \pi_A^B \geq \pi_B^O$.

The key feature of the model is the asset trading game that occurs prior to date 1. Any owner of an asset can potentially sell the asset at any time before date 1, when the productive agents take their non-contractible actions. Between dates 0 and 1, the time allowed for re-selling is infinite and there is no discounting. It is assumed that an asset-owner has an opportunity to sell the asset with probability, *p*. Otherwise, with probability 1-*p*, the asset-owner is forced to produce – moving to dates 1 and 2. Thus, re-sale opportunities are limited but symmetric across agents.

When an opportunity to re-sell arises, each non-asset-owner makes a simultaneous take-it-or-leave-it offer to the current owner. That owner then decides if and to whom they sell the asset. If they do not sell, they produce and all agents receive their payoffs. If they sell, a payment is made and the game begins again with the new owner being able to re-sell with probability *p*. Thus, the exchange mechanism considered here gives all the bargaining power to the buyer and also has an inbuilt delay. As in Gomes and Jehiel (2005), I will focus here on stationary Markov perfect equilibria of the dynamic game.

Gans (2005) shows that if there are no opportunities for re-sale, i.e., $p = 0$, then if:

$$\pi_A^A - \pi_A^O < \pi_O^O \qquad (\alpha)$$

$$\pi_B^B - \pi_B^O < \pi_O^O \qquad (\beta)$$

hold then winner of a simple auction for the sale of the asset will be an outside party. This is because the LHS of each inequality represents the willingness to pay of each respective productive agent in that auction while the RHS represents the willingness to pay of an outside party.

2. When Will the Outside Party Choose to Produce rather than Re-sell?

Given the model of resale specified here, will *O* sell the asset to either *A* or *B*? If *O* does not sell, then an allocation of ownership to them will 'stick.'

Note that if either *A* or *B* expect to produce with the asset rather than re-sell themselves, by (α) and (β), their willingness-to-pay for ownership will be less than *O*'s payoff from production. Similarly, if only one productive agent expects to produce (while the other re-sells), *O* will be unable to earn more than their production payoff by selling.

O can potentially earn more, however, if both *A* and *B* are interested in re-selling the asset. If *B* has the asset, then it can earn more rents by re-selling to *A*. Competitive bidding from *O* will push that sale price to $\pi_A^A - \pi_A^O$ (the price that leaves *A* indifferent between its own production and *O*-ownership) while *B* potentially earns $\pi_A^A + \pi_B^A - \pi_A^O$ if *A* holds on to the asset; appropriating all of the rents from *A*-ownership. Moreover, by purchasing the asset, *B* avoids being re-sold to by *A* (where *A* would appropriate more rents). The negative externality arising from potential re-sales to each other is something *O* can use to appropriate a greater bid price.

The following proposition demonstrates that *O*-ownership will 'stick' whenever the rents *O* can appropriate from bidding competition between *A* and *B* are low.

Proposition 1. *Suppose* $\pi_O^O > \min\{\pi_A^A - \pi_A^B, \pi_B^B - \pi_B^A\}$. *Then there exists* $\underline{p} \in (0,1)$ *such that, for* $p \in [0, \underline{p}]$, *it is a Markov perfect equilibrium for O not to sell.*

PROOF: If *O* does not sell, it receives π_O^O. Similarly, if *A* and *B* expect to produce, they will not purchase from *O*. If *B* is expected to produce but *A* will re-sell if it has the opportunity, if it sells to *O*, *A* will receive $\pi_O^O + \pi_A^O$ which is greater than its payoff from producing. If *A* re-sells to *B*, it will receive $\pi_O^O + \pi_A^O$ as *B* will place a bid that is just sufficient to leave *A* indifferent between selling to *B* and *O*. Thus, in either case, *A*'s value from ownership is $(1-p)\pi_A^A + p\left(\pi_O^O + \pi_A^O\right)$. Therefore, *A* will not purchase from *O* if $(1-p)\pi_A^A + p\left(\pi_O^O + \pi_A^O\right) \leq \pi_O^O + \pi_A^O$ which always holds by the condition in the proposition as $\pi_A^O < \pi_A^B$.

If *B* is expected to re-sell, if *B* purchases from *A*, *A* will still receive $\pi_O^O + \pi_A^O$ as *B* will take into account any potential external effect from its re-selling on its bid price to *A*. Thus, *A*'s willingness to pay is the same as the previous case.

Finally, suppose that both *A* and *B* expect to re-sell (to each other) if given the opportunity. Let v_i^j be the expected payoff to agent *i* when the asset is owned by agent *j*. Then, say, *A*'s willingness to pay for ownership becomes:

$$v_A^A - v_A^B = \underbrace{(1-p)\pi_A^A + p(\pi_O^O + \pi_A^O)}_{=v_A^A} - \underbrace{\left((1-p)\pi_A^B + p(v_A^A - (\pi_O^O + \pi_B^O - v_B^A))\right)}_{=v_A^B}$$

where a analogous expression for $v_B^B - v_B^A$. Solving for these four expected payoffs (v_i^j), we have:

$$v_A^A - v_A^B = \pi_A^A + p(\pi_A^O - \pi_B^O) - \tfrac{1}{1+p}\left(\pi_A^B - p\pi_B^A + p^2(\pi_A^A - \pi_B^B)\right)$$

Note that so long as $\min\{v_A^A - v_A^B, v_B^B - v_B^A\} < \pi_O^O$, *O* will not sell. Thus, taking limits as *p* approaches 0, obtains the conditions of the proposition. Note that as *p* approaches 1, $v_A^A - v_A^B \to v_B^B - v_B^A$ and *O* will not sell if $\pi_O^O + \pi_A^O + \pi_B^O < \tfrac{1}{2}\left(\pi_A^A + \pi_B^A + \pi_B^B + \pi_A^B\right)$ which can never hold.

Basically, the condition of the proposition requires that the benefits to *A* and *B* from their ownership relative to ownership by the other to be small and there are relatively few re-sale opportunities. The left hand side of each inequality represents the 'bargaining position' the other productive agent will have in any subsequent re-sales. If this is high, then an agent will bid more intensively for ownership to avoid being in a relatively weak bargaining position at a later stage. Of course, this is only a concern if re-sale opportunities arise frequently (high *p*) and if productive agents can credibly threaten to re-sell to *O*. Therefore, so long as re-sale opportunities are sufficiently low, bidding between *A* and *B* will not give rise to rents to *O* that outweigh *O*'s expected payoff from production.

Note that, in ex ante bidding for the asset, *O* will be allocated the asset. This is because the most *A* or *B* are willing to pay for the asset are $(1-p)\pi_A^A + p\left(\pi_O^O + \pi_A^O\right) - \pi_A^O$ and $(1-p)\pi_B^B + p\left(\pi_O^O + \pi_B^O\right) - \pi_B^O$, respectively, each of which is less than π_O^O. Thus, in these circumstances, the model has a clear prediction of outside ownership.

3. When Will the Efficient Owner Choose to Re-Sell rather than Produce?

Now consider a situation where the initial owner is efficient; that is, *A*.

Proposition 2. *Suppose that A owns the asset. Given (α) and (β), in any Markov perfect equilibrium, retaining ownership is dominated by re-selling to O.*

The proof is straightforward and is omitted. This proposition also applies to *B*. Hence, neither *A* nor *B*-ownership will 'stick' with both choosing to re-sell. *A* will always be able to guarantee a price for the asset of π_O^O because of competition between *O*-types. On the other hand, if the new owner re-sells, there is a potential negative effect imposed on *A*. However, regardless of this *A* can always guarantee a minimum payoff following re-sale of π_A^O; as if *O*-ownership continues. This is because *A* can always refuse to purchase the asset in subsequent rounds (if they arise) thereby leaving the only equilibrium productive options *O* or *B* ownership resulting π_A^O or π_A^B respectively.

Proposition 2 demonstrates that, even if ownership resides with the GMH-efficient owner, that owner will have an incentive to re-sell the asset if the opportunity arises. This means that there is a positive probability that production will not occur with an efficient agent as the owner.

4. Contractual Limits on Re-Sale

The re-sale model considered here does not permit the asset-seller to impose conditions on the buyer (e.g., from re-selling). As Bolton and Whinston (1993) note, such restrictions on future exchange may be difficult to specify contractually. However, it is useful to consider the implications of what happens when such restrictions can be imposed.

Will parties have an incentive to agree to restrictions on future sales? Such restrictions remove an option, thereby reducing a potential buyer's willingness-to-pay for ownership. On the other hand, a restriction can remove the potential negative externality that might be imposed on an asset-seller in future re-sale transactions. Thus, restrictions on later re-sale may lower or raise the gains from asset trading.

In a situation where asset ownership is expected to stick with a potential buyer, contractual restrictions on re-sale do not bind. This will occur for *O* as a buyer under the condition of Proposition 1. However, consider the roles of *A* or *B* as buyers. If, say, *A* is the seller and *B* can be prevented from re-selling, then the gains from trade with *B* (as opposed to *O*) are $\pi_B^B - \pi_B^O + \pi_A^B - \pi_A^O - \pi_O^O$. On the other hand, in the absence of such a restriction the gains from trade are:

$$p(\pi_B^B + \pi_A^B) + (1-p)(v_A^A + v_B^A) - \pi_A^O - \pi_B^O - \pi_O^O$$

where v_i^j is the expected payoff to agent *i* when the asset is owned by agent *j*. If $v_A^A + v_B^A \leq \pi_B^B + \pi_A^B$, then a restriction on resale by *B* is optimal. Using the calculated values, v_i^j, from the proof of Proposition 1, it is straightforward to show, however, that $v_A^A + v_B^A > \pi_B^B + \pi_A^B$ but that $\pi_A^A + \pi_B^A > v_B^B + v_A^B$ so that *A* and *B* will find it optimal to place a restriction on resale by *A* but not by *B*. Thus, an efficient outcome is possible.

Note, however, that an initial asset owner will not find it optimal to place restrictions in re-sale. Therefore, this means that the willingnesses-to-pay of *A* and *B* for the asset will be

$$(1-p)\pi_A^A + p\left(\pi_O^O + \pi_A^O\right) - \left((1-p)\pi_A^B + p\left(\pi_A^A - \pi_O^O - \pi_B^O\right)\right) \text{ and}$$

$$(1-p)\pi_B^B + p\left(\pi_O^O + \pi_B^O\right) - \left((1-p)\pi_B^A + p\left(\pi_B^B - \pi_O^O - \pi_A^O\right)\right),$$

respectively (assuming that each has a willingness-to-pay in excess of *O*). Essentially, *A* and *B* have less to fear from ownership by the other as future trade between them will have higher gains from trade that in our case accrue to the buyer. Thus, their willingness-to-pay for ownership is *lower* than is the case when re-sale restrictions are not possible; increasing the likelihood the *O* will successfully bid for the object and that *O*-ownership will ‘stick.’

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