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Investment spillovers and the allocation of property rights

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HIGHLIGHTS

- Revisits the property rights theory of the firm.
- Examines how investment spillovers shape the ranking of ownership regimes.
- Distinguishes *asset-embodied* and *footloose* spillovers in a model with two assets.
- Under the former, joint control is never optimal.
- Under the latter, joint-control may indeed be optimal.

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ABSTRACT

In the context of the property rights theory of the firm, we study the role of investment spillovers in shaping the efficiency ranking of ownership regimes. In our model, spillovers arise from asset-embodied investment and footloose investment. Under the former, the benefits of investment can be appropriated only through asset control; under the latter, the benefits of investment can be appropriated independently of asset control. Our model predicts that asset-embodied investment favors the adoption of non-integration, while joint ownership may prevail in the presence of footloose investment.

1. Introduction

The seminal contribution of Grossman and Hart (1986) [GH] established that asset ownership matters when contracts are incomplete because it affects the incentives of trading parties to undertake relationship-specific investments. A party's investment responds to its share in the trade surplus, which depends on the party's outside option. Asset control improves the outside option and strengthens the incentive to invest. An efficiency ranking of ownership regimes is obtained. Control rights should be assigned to the party whose investment is more important in the generation of trade surplus, while non-integration is optimal when both parties' investments are important. It is never optimal to assign both parties veto power over the usage of assets. Joint-control cannot do better than integration because it reduces the incentive to invest for the previously controlling party without increasing that of the non-controlling party.

However, investment by one party may benefit the other even if they fail to trade, i.e., investments may have spillovers.

In this paper, we examine the role of spillovers in shaping the regime ranking. Spillovers arise from *asset-embodied* investments and *footloose* investments. Under the former, a party benefits from the partner's investment only if it controls the asset. Under the latter, it benefits independently from the assets it controls.[1]

Investment in physical capital is an instance of asset-embodied investment; its benefits are fully appropriated by any controlling party. Thus, there are investment spillovers only under integration

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[1] Our taxonomy of investments cuts across the distinction between tangible and intangible investments developed in the literature on the dissipation of proprietary advantages (Markusen, 1995). In our framework, R&D and advertising expenditures are examples of asset-embodied investments.

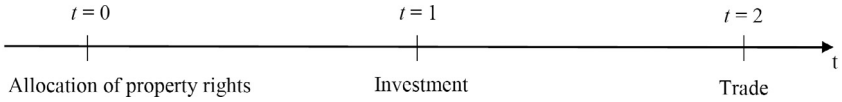

Fig. 1. Time line.

(De Meza and Lockwood, 2004). With more than one asset, we show that non-integration is preferred to joint-control. Like joint-control, non-integration neutralizes spillovers but preserves the incentive to invest that stems from one's outside option. Because it neutralizes spillovers, non-integration is preferred to integration even if one party is significantly more productive than the other. Our result appears to be in contrast with the literature on investment in physical capital (Hart, 1995; Guriev, 2003).[2] However, in this literature, non-integration is ruled out by design, as a standard assumption is that there is just one asset or that assets are strict complements.[3]

Spillovers are not confined to asset-embodied investments. Consider a multinational enterprise (MNE) cooperating with a local supplier. Investments by the MNE that improve the quality of the final product raise the supplier's reputation for input reliability. Workforce training by the supplier improves the quality of the local labor pool and the MNE's prospects if it internalizes outsourced operations. These are instances of footloose investments. We show that footloose spillovers affect non-integration and integration alike. Only joint-control neutralizes them, and it is optimal when investment cross-effects exceed own-effects.[4]

In summary, our model predicts that asset-embodied investments favor the adoption of non-integration, while joint-control may prevail in presence of footloose investments. The exact nature of spillovers is crucial in establishing the optimality of joint-control when non-integration is viable.

2. The model

Consider two parties. M_1 produces a good by means of an input and asset a_1. M_2 produces the input by means of asset a_2. M_1 and M_2 expect to trade and can increase the trade surplus by relationship-specific investments. Because of contract incompleteness, they cannot commit to any investment or trade price. However, they can sign a contract assigning control rights over a_1 and a_2. There are four ownership regimes $A = \{NI; T_1; T_2; JC\}$:

Non-integration (NI): M_1 owns a_1 and M_2 owns a_2

Type 1 integration (T_1): M_1 owns a_1 and a_2

Type 2 integration (T_2): M_2 owns a_1 and a_2

Joint-control (JC): both M_1 and M_2 have veto power over the use of a_1 and a_2.

At $t = 0$, M_1 and M_2 select the ownership regime. At $t = 1$, they non-cooperatively select investments e_1 and e_2, at cost $C(e_1) = \frac{1}{2}e_1^2$ and $C(e_2) = \frac{1}{2}e_2^2$. At $t = 2$, they negotiate over the exchange of the input (see Fig. 1).

If they agree to trade, the parties realize $e_1 + \chi e_2$, with $\chi > 0$ capturing the relative productivity of each party's investment. If negotiations fail, M_1 and M_2 turn to the market. Their outside options are $s_1^A = \lambda_{11}^A e_1 + \lambda_{12}^A \chi e_2$; $s_2^A = \lambda_{21}^A e_1 + \lambda_{22}^A \chi e_2$. Parameter $\lambda_{ii}^A \geq 0$ captures investment own-effects, i.e., the marginal increase in M_i's outside option due to its own investment. Parameter $\lambda_{ij}^A \geq 0$[5] captures investment spillovers or cross-effects, i.e., the marginal increase in M_i's outside option due to M_j's investment. Investments are relationship-specific: The marginal benefit of investment is larger within the relationship than outside it. Absent spillovers, relationship-specificity entails $\lambda_{ii}^A < 1$. In the presence of spillovers, relationship-specificity entails $\left(\lambda_{ii}^A + \lambda_{ij}^A\right) < 1$.

Information is symmetric. Ex-post negotiations are governed by the Nash Bargaining Solution with equal bargaining power. In the event of agreement, M_i receives its outside option plus half of the surplus from trade with M_j. Because of relationship-specificity, $s_1^A + s_2^A < e_1 + \chi e_2$ and the parties are better off trading. M_1 and M_2 select the investment to maximize payoff:

$$\max_{e_1} \pi_1^A = \lambda_{11}^A e_1 + \lambda_{12}^A \chi e_2 + \frac{1}{2}\left[e_1 + \chi e_2 - \left(\lambda_{11}^A e_1 + \lambda_{12}^A \chi e_2\right) - \left(\lambda_{21}^A e_1 + \lambda_{22}^A \chi e_2\right)\right] - \frac{1}{2}e_1^2$$

$$\max_{e_2} \pi_2^A = \lambda_{21}^A e_1 + \lambda_{22}^A \chi e_2 + \frac{1}{2}\left[e_1 + \chi e_2 - \left(\lambda_{11}^A e_1 + \lambda_{12}^A \chi e_2\right) - \left(\lambda_{21}^A e_1 + \lambda_{22}^A \chi e_2\right)\right] - \frac{1}{2}e_2^2.$$

Substituting the equilibrium investments $\hat{e}_1^A = \frac{1}{2}(1 + \lambda_{11}^A - \lambda_{21}^A)$ and $\hat{e}_2^A = \frac{1}{2}\chi\left(1 + \lambda_{22}^A - \lambda_{12}^A\right)$ into π_1^A and π_2^A, we obtain the equilibrium payoffs, $\hat{\pi}_1^A$ and $\hat{\pi}_2^A$. Absent liquidity constraints, the parties select the ownership regime that maximizes joint surplus:

$$\hat{S}^A = \hat{\pi}_1^A + \hat{\pi}_2^A = \frac{3}{8}\left(1 + \chi^2\right) + \frac{1}{4}\left\{\left(\lambda_{11}^A - \lambda_{21}^A\right)\left[1 - \frac{1}{2}\left(\lambda_{11}^A - \lambda_{21}^A\right)\right] + \chi^2\left(\lambda_{22}^A - \lambda_{12}^A\right)\left[1 - \frac{1}{2}\left(\lambda_{22}^A - \lambda_{12}^A\right)\right]\right\}.$$

If parties selected investments cooperatively, the joint surplus would be $S^* = \frac{1}{2}\left(1 + \chi^2\right)$.

Because $0 \leq \lambda_{ii}^A < 1$ and $0 \leq \lambda_{ij}^A < 1$, $\hat{S}^A < S^*$: No ownership regime achieves the first best. However, regimes are not equally inefficient. Inspection of $\hat{S}^A$ reveals that the ranking of ownership regimes depends on the magnitude of investment own and cross-effects.

The magnitude of own-effects captures asset complementarity. Assets are complements [independent] when the marginal benefit of investment is increasing [constant] in the number of controlled assets, normalizing it to zero in the case of no asset. Because the number of assets a party controls varies across ownership regimes, the magnitude of own-effects also varies: $\lambda_{ii}^{T_i} \geq \lambda_{ii}^{NI} \geq \lambda_{ii}^{T_j} = \lambda_{ii}^{JC} = 0$.

The magnitude of cross-effects depends on the nature of the investment. In GH, the parties invest in human capital. M_i benefits from M_j's investment only if they cooperate ex-post: $\lambda_{ij}^A = 0, \ \forall A$. However, investment can be asset-embodied. The asset-controlling party fully appropriates the return of any investment by the non-controlling one: $\lambda_{ij}^{T_i} > \lambda_{ij}^{NI} = \lambda_{ij}^{T_j} = \lambda_{ij}^{JC} = 0$.[6] If the

[2] With the exception of Schmitz (2013).

[3] For surveys see Segal and Whinston (2012) and Gattai and Natale (2015).

[4] According to Rosenkranz and Schmitz (1999), joint-control of a non-excludable asset is optimal when parties investing in human capital disclose information affecting the trade surplus and the partner's outside option. Our model complements their results as we consider excludable assets and the empirically relevant case of unintended transmission of information.

[5] We rule out negative cross-effects.

[6] Like own-effects, cross-effects are normalized to zero in the case of no asset.