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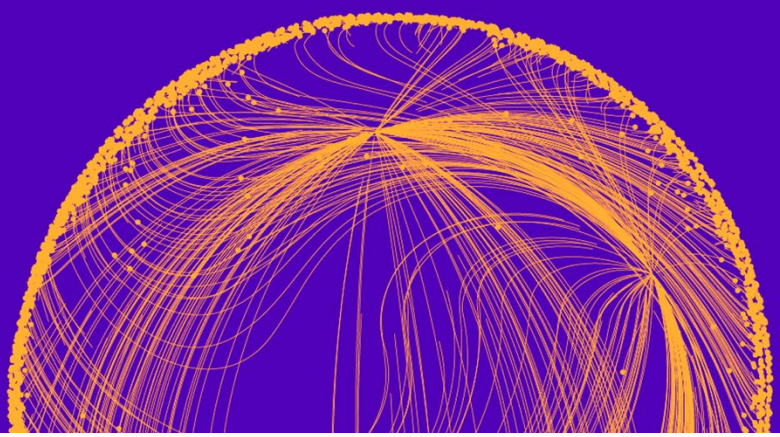

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Markets, Contracts, or Firms?
A Simple Model of Governance*

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April 1, 2025

Abstract

We build a simple formal model of governance. Investments and control rights over assets and labor are fully contractible, but final production decisions are ex ante uncontractible, and ex post negotiations are inefficient. If sunk costs are low, suppliers own assets and trade takes the form of competitive spot market transactions. If sunk costs are large, at most one supplier is active, and governance depends on the asset's relationship-specificity. If the specificity is low, the buyer offers a "master supply agreement" to an independent supplier. If the specificity is high, the buyer owns the asset and employs the supplier.

JEL Codes: D23, D86, L22

Keywords: transaction cost, property right, relationship specificity, organization, bargaining, vertical integration, governance, inefficiency, master supply agreement, managed market

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1 Introduction

In an exceptionally influential body of work, Oliver Williamson informally argues that markets and hierarchies should be seen as alternative governance mechanisms which differ with respect to how they resolve conflicts of interest in the presence of incomplete contracts.[1] Our goal has been to develop a simple model that captures Williamson's central arguments. As it turns out, the model also conveys some new insights that we did not anticipate.

According to Williamson, markets tend to work well when there is room for adequate competition. However, when entry costs are large relative to the size of the market, negotiations between a small number of legally independent actors invite costly haggling and disagreement. Within hierarchically organized firms, these problems are smaller because conflicts can be resolved through the use of authority. But hierarchy comes with its own drawback: Authority can be used for both unproductive and productive purposes.

Specifically, Williamson hypothesizes that hierarchies tend to arise when (i) complexity is high enough to impede contracting, (ii) assets are expensive enough to impede competition, and (iii) assets are sufficiently relationship-specific for disagreements to be costly (as outside options are inferior).[2] Williamson's perspective has been particularly influential in the study of backward vertical integration, the so-called make-or-buy decision. The hypotheses are also empirically successful; see, e.g., Masten (2002) and Lafontaine and Slade (2007) (especially Section 2.2. and the references therein).

Williamson's analysis is verbal. Although his verbal analysis is often believed to be precise—indeed it is the only verbal theory to receive an extensive discussion in the advanced microeconomics textbook by Kreps (1990)—it has not yet been formalized.[3] The informality stands in sharp contrast to the complementary hypothesis by Grossman and Hart (1986) and Hart and Moore (1990) (henceforth GHM). GHM define ownership as residual control rights over assets. These control rights convey bargaining power, which in turn affects non-contractible investments. However, GHM's theory deviates from Williamson's perspective in three major ways. It abstracts from uncertainty and ex post contracting frictions, and it does not consider competition as an alternative solution to the problem of opportunistic behavior that arises in bilateral monopolies.

[1] See, e.g., Williamson (1971, 1975, 1979, 1985).

[2] Williamson (1985, Chapter 2) contains a comparatively compact statement of his main arguments, and we therefore refer repeatedly to this source here.

[3] Or, as Williamson (2010) (p. 686) puts it: "full formalization is a work in progress."

Here, we retain the key assumption of GHM that control rights over assets convey bargaining power. We then formalize Williamson's arguments by emphasizing the three features that GHM play down. We argue that competition is costly as it entails duplication of assets, but it reduces ex post contracting frictions by eroding bargaining power. In the absence of competition, it is instead the allocation of decision rights (over people and assets) between two opposing parties that determines the magnitude of ex post contracting frictions. Generally, we find that control rights should be bundled and owned by the party that is likely to make the best use of them in the future. Vertical integration arises only when the sunk costs associated with asset acquisition are sufficiently large and when assets are sufficiently relationship-specific.

The analysis offers a particularly simple explanation for bundling of the two types of control rights. Decision rights over the supplier's action is only effective in protecting a buyer from supplier opportunism if it goes together with asset ownership. Conversely, the protection against buyer interference that a supplier's asset ownership brings is only effective if the buyer cannot threaten to misuse the supplier's time instead.

We also illustrate the potential usefulness of governance that is intermediate between plain spot contracts and full vertical integration. For example, we demonstrate that long-term supply contracts can have value even if they are highly incomplete. Merely by stating the intention to purchase from a supplier, a buyer can help to coordinate entry decisions and encourage investment. This feature of the model is closely in line with recent empirical work on outsourcing, notably Bernstein (2015). We also demonstrate that it can be profitable for a buyer to subsidize the entry of multiple suppliers, an argument that relates our work to earlier theoretical analysis of multi-sourcing, such as Anton and Yao (1987), Shepard (1987), Farrell and Gallini (1988), and Riordan and Sappington (1989).

We limit ourselves to studying the roles of sunk costs and asset specificity, taking complexity and the associated contractual incompleteness for granted.[4]

A second benefit of formal modeling is that the implications of the arguments are clarified. For example, once we model the costs of haggling we also begin to think more systematically about how these costs may vary. Our analysis immediately suggests that a reduction of haggling costs will lead to more hierarchies as well as more bilateral monopolies, at the expense of organized multi-sourcing.

[4]Thus, our model is a complement to Bajari and Tadelis (2001), who address the role of complexity in more detail; see also Tadelis (2007) for many additional real-world examples of how complexity generates contractual incompleteness.

A third benefit of formal modeling is that it reveals the limitations of the arguments, making it easier to reconcile different lines of thought. For example, in the final section we indicate how our simple model can straightforwardly be extended to admit alienable cash-flow rights, thereby bridging some of the gap between Williamson's view of vertical integration and related models in corporate finance.[5]

Among other formal models that articulate some of Williamson's central arguments, Raith (2023) is probably most closely related. Like Williamson, Raith focuses on how non-market governance, by reducing bargaining frictions, facilitates adaptation to circumstances that are ex ante uncertain.[6] However, Raith's model has infinite horizon, asymmetric information, and financial constraints—and accordingly focuses on a different range of issues than we do.

Hart and Holmstrom (2010) is also related. Their model focuses on how the boundaries of firms can be shaped by bargaining frictions when contracts are incomplete. Our bargaining model is different from theirs, but we believe that most of our insights would survive if we had adopted their approach instead.[7] The more important difference is that Hart and Holmstrom (2010) abstract from uncertainty, sunk costs, and the possibility of competition, all of which play an essential role in our analysis. On the other hand, they allow for the possibility that some of the cash-flow rights are tradable, which creates a role for organizational integration through outside managers. Accommodating tradable cash-flow rights is a natural next step for us as well.

We should also mention Milgrom and Roberts (1990). Like us, they emphasize the role of short-run bargaining frictions in transaction cost analysis, but their purpose is to criticize and move beyond Williamson's arguments rather than to formalize them (see, e.g., page 65).

[5] Another connection, emphasized by Williamson (1988) but neglected here, is that financial contracts are themselves not merely claims to cash-flows but also entail decision rights.

[6] A related contribution is Wernerfelt (2015). Both Wernerfelt (2015) and Raith (2023) contain more detailed and comparative literature reviews, as do Whinston (2003), Gibbons (2005), and Segal and Whinston (2013, 2016).

[7] Their central friction is that parties have self-serving notions of fairness and will shirk (shade) when they do not obtain what they consider to be a fair share of the surplus.

2 The Model

We consider the case of a buyer who may potentially trade with one or more suppliers. The following three model ingredients are essential.

First, since Williamson's argument involves relationship-specific assets, trade must depend on at least one asset which is not cheaply replicated and which tends to have a higher value when used inside a relationship than outside of it.

A second key feature of Williamson's argument is the shift in competitive conditions that takes place when specialized investments are made. There is often more intense competition before such investments are made than afterward, especially when only one of the suppliers has invested; this is the so-called "fundamental transformation". As Williamson (p.62) explains, the fundamental transformation is linked to the fact that—even when the investment is primarily in physical capital—it takes time to build the human capital that is required to make use of the investment:

> [...] there is more to idiosyncratic exchange than specialized physical capital. Human capital investments that are transaction-specific also occur. These evolve during contract execution. Specialized training and learning-by-doing economics in production operations are illustrations. Except when such investments are transferable to alternative suppliers at low cost, which is rare, the benefits can be realized only as long as the relationship between the buyer and seller is maintained.

To capture the fundamental transformation, there must thus initially be several potential suppliers, but unless all of them invest or otherwise are provided training opportunities, there are fewer potential suppliers post investment.

Third, there must be a drawback to integration. Here, we focus on the problem that decision rights can be abused (Williamson, 1985, Ch 6.4.1), which is essentially the same assumption as in Grossman and Hart (1986) (who might have originated it). Therefore, there must be at least two activities that an integrated supplier could engage in, with the buyer and the supplier disagreeing over which activity is more desirable—at least some of the time.

We now develop a minimal model that captures these considerations. There are three agents. One agent is a buyer, B. The other two agents are ex-ante identical suppliers

S_1, S_2.[8] All agents are risk neutral.

There is a single type of productive asset. We will think of the asset as a physical asset (say, a machine). Suppliers can purchase it in a competitive market at unit cost f. This cost is entirely sunk upon purchase; except for the two types of projects that we describe in the next paragraph, the asset has no redeployment value. Each supplier can operate at most one asset. For simplicity, we assume that B is unable both to directly purchase and to operate assets.

An asset can be used either for a Regular project or for a Tailored project. The Regular project generates a benefit v_R directly to the supplier, whereas the Tailored project generates a benefit v_T directly to B.[9] Whereas v_R is deterministic, v_T is initially random. Eventually, it takes the value v_T^H with probability h and the value v_T^L with probability $(1-h)$.

We assume that $v_T^H > v_R > v_T^L$. In other words, the Tailored project is sometimes superior to the Regular project, but not always.

Timing

The timing of the events is as follows.

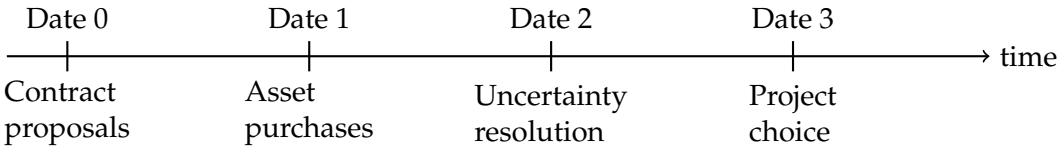

Figure 1: Timing

At Date 0, B makes contract proposals to each of the two suppliers.[10] A contract proposal to supplier i comprises a transfer that is contingent on S_i purchasing an asset and

[8] It is straightforward to extend the model to have more than two suppliers, but it adds more complications than insights.

[9] This assumption is stark, as we do not incorporate contractible costs and benefits from the projects at all, but the presence of inalienable costs and benefits is at the heart of the literature on incomplete contracts.

[10] The assumption that B holds all the bargaining power at Date 0 is justified by the substitutability of the suppliers at this time. Note also that we only consider bilateral contracts. As will become clear, multilateral contracts cannot achieve anything more than is achieved by bilateral contracts in our setting.

that also depends on whether, at Date 0, S_i agrees to give B ownership of the asset and/or authority over S_i.

If B has ownership over the asset, B has veto power regarding how the asset is used at Date 3. If S has ownership, S has the same veto power, and can also unilaterally decide to use the asset for the Outside project.

If B has authority over S_i, B can choose what project S_i works on. Note that authority over S_i's effort does not extend to the use of S_i's asset; ownership of person and asset are separate.[11]

Formally, B announces a contract proposal $(t, o, a) \in \mathbb{R} \times \{b, s\}^2 \cup \emptyset$ to each supplier i, where $o = b$ indicates that B owns, $o = s$ indicates that S_i owns, $a = b$ indicates that B has authority (there is an employment relationship), $a = s$ indicates that S_i has authority (there is no employment relationship), and $\emptyset$ indicates that B is not offering any contract to S_i. Let $t^i > 0$ indicate that the transfer runs from B to S_i and $t^i < 0$ indicate that it runs in the opposite direction.

At Date 1, any supplier who has received a contract proposal either accepts or rejects. A supplier accepting a positive transfer receives the transfer and acquires the asset. A supplier rejecting the contract proposal subsequently decides freely whether to acquire an asset or not. If S_i has accepted a contract that gives B both asset ownership and authority, we call this mode of governance *full integration*; if B has only one of the two, we call it *partial integration,* and if B has neither, we call it *market*.

At Date 2, v_T is revealed to be either v_T^H or v_T^L.

At Date 3, project choices are made. Agents with direct or indirect authority over assets now choose to implement their preferred project (R for suppliers and T for B) or to attempt negotiations with the purpose of obtaining compensation for implementing the other project instead. The remainder of the model describes the outcome of such negotiations.

It may seem superfluous to include the possibility of not offering a contract, as it is payoff equivalent with the admissible contract $(0, s, s)$. But, as we shall see, there will be circumstances in which it is natural to offer no contract, $\emptyset$, to one supplier and the zero-payment contract $(0, s, s)$ to the other (to encourage the second supplier to enter when

[11] As Wernerfelt (2002) notes, there are many practical examples in which asset ownership is separated from decision rights. However, authority over a person sometimes implicitly carry over to the asset. For example, employed building workers sometimes own their tools, and when they are assigned to a project it is implied that they are responsible for bringing tools as well.

only one supplier can profitably do so).

Importantly, it is impossible at Date 0 to contract directly on the Date 3 project choice.[12] Indeed, whenever Date 0 contracting entails S ownership, the contract is akin to the Master Supply Agreements (MSAs) described by Bernstein (2015). For the most part, MSAs are not intended to be legally binding documents that tie the parties to specific terms of trade. Rather, in the words of one of Bernstein's interviewees (p.566):

> the contract is just a formalized handshake that says that your intention is to put business in here

The only legal obligation of the buyer imposed by a typical MSA is to reimburse the supplier for "reliance expenses" (p.567), i.e., for costs that the supplier would not have taken except because of the MSA.

Bargaining

Our assumptions about negotiations stick closely to Williamson's (1985, p. 61) view:

> Monopolistic terms will obtain if there is only a single qualified supplier, while competitive terms will result if there are many.

Let us deal with the two cases in reverse order, starting with the competitive case. From Williamson (1985, Chapter 2) we infer that his statement about competition applies to external suppliers rather than internal ones.

Assumption 1. *If B negotiates with two independent suppliers, the outcome is efficient and B obtains all the gains from trade.*

As we shall explain below, and formally derive in Lemma A1 in the Appendix, Assumption 1 may also be justified as the unique equilibrium of a non-cooperative bargaining game along the lines of the Bertrand duopoly model. We shall also explain why we think that this assumption should not be extended to the case of two internal suppliers.

Turning to the monopolistic case, let us first consider under what circumstances bilateral negotiations over positive quasi-rents arise in our context. If exactly one of the suppliers invested, and this supplier is not vertically integrated, B bilaterally negotiates

[12] By now, there is a rich theory on the foundations of incomplete contracts; see, for example, Tirole (2009) and the references therein. However, to the best of our knowledge, there are no simple off-the-shelf deep assumptions that justify this exact short-cut.

with this supplier in state H. Analogously, if exactly one of the suppliers invested, and this supplier *is* vertically integrated, there are negotiations in state L. Define the ex-post quasi-rent r as the (state-contingent) difference between the best attainable total payoff and the total payoff that is attained if bargaining fails. When B negotiates with an external supplier, there is a positive quasi-rent $r^H = v_T^H - v_R$ in state H. When B bargains with an integrated supplier, there is a positive quasi-rent $r^L = v_R - v_T^L$ in state L. To characterize the outcome of these negotiations, we again seek to comply with Williamson's (1985, p. 63) view:[13]

> Although both have a long-term interest in effecting adaptations of a joint profit-maximizing kind, each also has an interest in appropriating as much of the gain as he can on each occasion to adapt. Efficient adaptations that would otherwise be made thus result in costly haggling or even go unmentioned, lest the gains be dissipated by costly subgoal pursuit.

Accordingly, we make the following assumption about bilateral bargaining over the quasi-rents.

Assumption 2. *(i) When bilateral negotiations are required to implement the efficient project, a fraction* $1 - \varphi > 0$ *of the quasi-rent* r *is lost. (ii) Conditional on an agreement, each side receives (in addition to their ex post outside option)* $\varphi r/2$.

That is, φ is the fraction of the quasi-rent that is not lost.[14] Lemma A2 in the Appendix offers a bargaining foundation for Assumption 2 based on aggressive commitments.

3 Analysis

As usual, we derive the model's solution recursively. We first describe the set of possible organizational forms. We also rank these organizational forms according to their overall

[13] In Chapter 2 of Williamson (1985), like in his earlier writings of inefficient ex post adaptation, Williamson focuses on the problem of bargaining with external suppliers. It is only in Chapter 6 of Williamson (1985) that he recognizes that a similar problem of inefficient negotiations can arise internally as well; see especially Chapter 6.4.1). We find the symmetry to be analytically appealing

[14] Inefficient bargaining outcomes in our setting of complete information can be theoretically justified by appealing to the line of work on inefficiencies of bilateral negotiations due to aggressive commitment tactics by Schelling (1956), Crawford (1982), Ellingsen and Miettinen (2008, 2014), and Basak and Deb (2020). An alternative approach, most fully explored by Wolitzky (2023), is that commitments are difficult to observe. A different explanation for ex post inefficiencies is developed in Hart and Moore (2008). There, inefficiency arises in the form of suboptimal effort (shading) following perceived injustices when authority is used to fill in gaps in a contract.

welfare (sum of expected net payoffs), clarifying the pros and cons of the different modes of governance.

Having thus described the various final outcomes, we describe the strategic actions. We first derive the suppliers' response (accept or reject) to each contract proposal, which is typically an easy choice in our symmetric information environment. Finally, we study which contract proposal(s) maximize B's expected payoff for various parameter configurations. This completes our characterization of the model's subgame perfect equilibria.

Date 3 outcomes

Each end node is associated with a vector that describes the state of nature (H or L), the identity of the suppliers who have trained with an asset, which of the trained suppliers is also employed (if any), and who owns which asset. Altogether, there are eight types of governance outcomes. We now compute the payoffs associated with each of them. For each case, we also report the ex ante expected payoffs, including the cost of assets. We refer to this measure as *welfare*.

Recall that Assumption 1 applies to the case of two independent suppliers and Assumption 2 to all cases with only one supplier (integrated or not).

- *No assets:* In this trivial case, all payoffs are 0.
- *One asset. Full integration (F1):* B owns the asset and has employed S_i, who is the only supplier to have trained with the asset. State L then entails negotiation between B and S_i. B's payoff is $v_T^L + \varphi(v_R - v_T^L)/2$ and S_i's payoff is $\varphi(v_R - v_T^L)/2$. In state H, B orders the tailored project and receives v_T^H. The other supplier earns 0. Welfare is
$$W^{F1} = hv_T^H + (1-h)\left[\varphi(v_R - v_T^L) + v_T^L\right] - f. \tag{1}$$
- *One asset. Bilateral monopoly (BM):* S_i owns the asset, is not employed, and is the only supplier to have trained with the asset. State H then entails negotiation between B and S_i. B's payoff is $\varphi(v_T^H - v_R)/2$ and S_i's payoff is $\varphi(v_T^H - v_R)/2 + v_R$. In state L, S_i chooses project R and receives v_R. The other supplier has no assets and earns 0. Welfare is
$$W^{BM} = h\left[\varphi(v_T^H - v_R) + v_R\right] + (1-h)v_R - f. \tag{2}$$

- *One asset. Labor integration (L1):* S_i owns the asset, but is employed, and is the only supplier to have trained with the asset. There is then negotiation in both states. In state H, B can command S_i's labor, but not use of S_i's asset. In state L, S_i needs B's permission to work on the regular project. Welfare is

$$W^{A1} = h\left[\varphi(v_T^H - v_R) + v_R\right] + (1-h)\left[\varphi(v_R - v_T^L) + v_T^L\right] - f. \tag{3}$$

- *One asset. Asset integration (A1):* B owns the asset, but has not employed any supplier. S_i is the only supplier to have trained with the asset. There is then negotiation in both states. In state H, B needs to negotiate S_i's labor participation. In state L, S_i needs B's asset work on the regular project. Welfare is

$$W^{L1} = h\left[\varphi(v_T^H - v_R) + v_R\right] + (1-h)\left[\varphi(v_R - v_T^L) + v_T^L\right] - f. \tag{4}$$

- *Two assets. Competitive market (CM)*: Suppose both suppliers own assets. By Assumption 1, the suppliers earn their outside option v_R each in both states. (In state L there is no gain from trade. In state H this outcome would arise as the unique Nash equilibrium of the non-cooperative game in which the suppliers compete through simultaneous price offers to serve B.) B thus earns $v_T^H - v_R$ in state H and 0 in state L. Welfare is

$$W^{CM} = h\left[v_T^H + v_R\right] + 2(1-h)v_R - 2f. \tag{5}$$

  For comparison with the last two cases, we might alternatively refer to this case as dual sourcing with full separation.

- *Two assets. Dual sourcing, full integration (F2):* Suppose B owns two assets, each operated by different integrated suppliers. In state H the buyer would like to sell the right to one of the suppliers to undertake project R while commanding T from the other; again, competition would allow B to extract all gains from trade. However, in state L there is no competition, as both suppliers should ideally undertake project R. Suppliers thus haggle individually with the buyer. B obtains the payoff $\varphi(v_R - v_T^L)/2 + v_T^L + \varphi v_R/2$. Welfare is

$$W^{F2} = h\left[v_T^H + v_R\right] + 2(1-h)\left[\varphi(v_R - v_T^L) + v_T^L\right] - 2f. \tag{6}$$

- *Two assets. Dual sourcing, partial integration (P2)*: Suppose both suppliers have trained. B owns one of the assets and a supplier owns the other. In state H, B commands project T from the integrated supplier, who earns nothing. In state L it is better to negotiate project R, so in this state B earns $\varphi(v_R - v_T^L)/2 + v_T^L$ and the integrated supplier earns $\varphi(v_R - v_T^L)/2$. The non-integrated supplier earns v_R in both states. Welfare is

$$W^{P2} = h\left[(v_T^H - v_R) + 2v_R\right] + (1-h)\left[\varphi(v_R - v_T^L) + v_T^L + v_R\right] - 2f. \tag{7}$$

Optimal governance

We are now ready to compare the expected welfare associated with the different governance modes. Results are quite immediate from (1)-(7).

Proposition 1. *If there is only a single asset, both full integration (F1) and bilateral monopoly (BM) dominate partial integration (A1 & L1).*

With a single asset, either form of partial integration entails negotiation in both states of the world, whereas full integration and bilateral monopoly entail negotiation in only one state each.

It is also easily seen that $W^{CM} > W^{P2} > W^{F2}$.

Proposition 2. *Dual sourcing from nonintegrated suppliers welfare dominates other forms of dual sourcing.*

In other words, competition between suppliers works best at arm's length. Dual sourcing from nonintegrated suppliers is better because it reaps all the benefits from competition in state H without creating unnecessary bargaining frictions in state L when there is no competition between the suppliers.

It thus only remains to compare W^{CM}, W^{BM}, and W^{F1}. Simple computations show that the ranking of these three governance modes is determined by the following loss functions (relative to first best, conditional on first-best involving investment), $l(G)$:

$$\begin{aligned} l(CM) &= f - v_R; \\ l(BM) &= h(1-\varphi)(v_T^H - v_R); \\ l(F1) &= (1-h)(1-\varphi)(v_R - v_T^L). \end{aligned} \tag{8}$$

Proposition 3. *The welfare ranking of the three relevant governance modes is the opposite of the ranking of their loss functions $l(G)$.*

The explanation is straightforward. The only loss from the competitive market (CM) is that it requires an extra asset, which is costly if $f > v_R$, but not otherwise. The loss from bilateral monopoly (BM) is that there is a bargaining friction in state H. Conversely, the loss from full integration is that there is a bargaining friction in state L.

For brevity, let's denote an (possibly second-best) optimal governance mode G^*. From the inspection of the loss functions, we have the following result.

Corollary 1. *The optimal governance structure G^* is*

(i) CM if $f \leq v_R$,.

(ii) F1 if $f \geq v_R$, $WF^{F1} \geq 0$ and $h(1-\varphi)(v_T^H - v_R) \geq (1-h)(1-\varphi)(v_R - v_T^L)$,

(iii) BM if $f \geq v_R$, $WF^{BM} \geq 0$ and $h(1-\varphi)(v_T^H - v_R) \leq (1-h)(1-\varphi)(v_R - v_T^L)$.

Otherwise inactivity is optimal.

Remark that WF^{F1} and WF^{BM} are given by Equations (1) and (2), respectively. Figure 1 illustrates.

[Insert Figure 1 around here.]

Thus, the model confirms Williamson's argument that competitive market governance tends to be best if sunk costs (f) are low whereas full integration (hierarchy) tends to be better than the market if sunk costs are higher and if asset specificity (h and v_T/v_R) is high. The model furthermore clarifies that sunk costs and asset specificity are not the same thing, and it demonstrates that multi-sourcing through arm's-length contracts can also constitute an optimal form of governance, usually for "intermediate" parameter values.

From (8), it is also obvious that bargaining frictions $1-\varphi$ have no impact on the internal ranking of BM and $F1$, but make both of these organizational forms less attractive in comparison to CM:

Corollary 2. *Suppose $f > v_R$. When bargaining frictions $1-\varphi$ grow, organized multi-sourcing becomes more likely.*

Equilibrium governance

We are now ready to study whether (second-best) optimal governance is actually implemented in equilibrium. This requires an investigation of the suppliers' optimal responses

at Date 1 and the buyer's optimal proposal at Date 0. Since these steps are conceptually easy, we here state the main result and sketch its logic, leaving the details to the Appendix.

Proposition 4. *(i) For all parameters, there exists a subgame perfect equilibrium entailing optimal governance, G^*. (ii) Except for a subset of the parameters that entail $G^* = BM$ (and the measure-zero set of parameters for which G^* is multivalued), subgame perfect equilibrium outcomes are unique.*

In other words, the contracting game always *weakly implements* the second-best optimal governance mode. Implementation is *strong* for all parameter configurations except some of the configurations that entail BM as the preferred governance mode.

The result is trivial when $f < v_R$, as the contract is not needed for optimal investment in this case. Indeed, if $f \leq v_R$, competitive market reaches first-best; all other forms of governance that emerge in equilibrium are contractual second-best solutions and reflect (buyer's) attempts to minimize market imperfections. If $f > v_R$, the buyer is often able to implement the constrained efficient organizational form and extract all the gains from trade by offering just the right transfers either to one of the suppliers (in case $G^* = BM$ or $G^* = FI$ and one transfer is positive) or both of them (in case $G^* = CM$ and both transfers are positive).

However, when $G^* = BM$ and a supplier is willing to invest without any transfer if she believes that the other supplier does not invest, B cannot strongly implement this asymmetric outcome. On the other hand, weak implementation is possible; there are (plausible) subgame perfect equilibria in which BM is attained and in which B extracts all the surplus (see case (iii) in the Appendix). A problem is that there is also an inefficient symmetric equilibrium in mixed strategies, in which each supplier invests with positive probability. Hence, in principle, there can be underinvestment as well as overinvestment in subgame perfect equilibrium. But because both suppliers earn expected profits of 0 in the inefficient equilibrium, they have no material reason to challenge the buyer's coordination attempt. We thus consider this coordination problem more of a theoretical curiosity than a realistic obstacle to efficient governance.

4 Final remarks

Our model produces conclusions that are closely in line with Williamson's theoretical discussion while also beginning to address some of the empirical patterns documented

by Bernstein (2015). However, the model is extremely stylized and therefore mutes many potentially relevant mechanisms. Let us briefly mention three of them.

First, and perhaps most controversially, we assume that agents are not allowed to trade any claims to their returns. If it were possible, without any transaction costs, for an S to sell all future returns from Regular projects to B, full integration would produce an efficient outcome. The reason is that B would voluntarily pick the Regular project in State L; there would no longer be any reason to haggle in this state. Williamson was well aware of this type of objection, and he provided reasons why there are limits to the pledging of future returns, see, e.g., Williamson (1975, Chapter 5, Section 1.5.3). A natural next step is to consider less extreme limits to financial contracts.

Second, we assume that information is symmetric. It might be more realistic to assume that the buyer has some private information about the value of the tailored project, v_T, especially if this involves the use of new technologies. In this case, contract design becomes a signaling problem and equilibrium governance might well be distorted as a result.

Third, apart from allowing bargaining frictions to vary, we ignore the role of trust. Since there is no possibility for building trust over time, the model fails to capture how contracting interacts with relationship-building between and within organizations, as discussed by Bernstein (2015), Hadfield and Bozovic (2016), and Frydlinger and Hart (2024), for example. All of the above three complications are related to the issue of complexity, which our model also fails to represent.

One reason to pursue some of these extensions is that they would enable us to get a better grasp on governance dynamics, which are likely to respond to changes in information and contractibility. Some firms start out within a small niche and gradually integrate with suppliers or customers. Other firms are vertically integrated to begin with but subsequently shed business lines to focus on core activities. Indeed, the type of vertically integrated production that was common for much of the twentieth century and that Chandler (1977) and Chandler (1990) eulogized as late as 1990 was condemned soon thereafter, by Stuckey and White (1993) and Quinn and Hilmer (1994) among others. In the present model, two rationales for such a reversal from vertical integration to vertical separation is a reduction of assets' sunk costs or their relationship-specificity. Our hunch is that changes to contractibility, possibly along the lines suggested by our extensions, might have been at least as important.

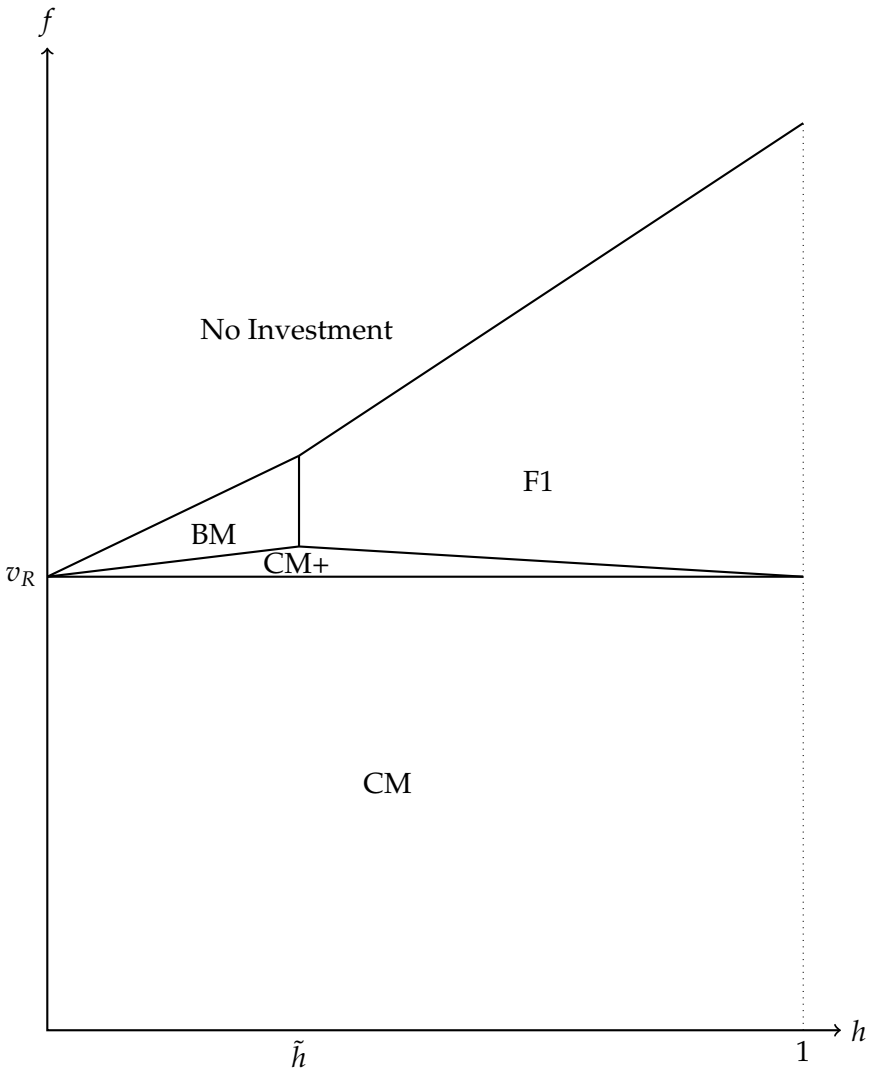

Figure 1: Optimal governance outcomes

The horizontal axis measures the probability h that the Tailored project will be optimal. The vertical axis measures the sunk cost. Parameter regions are labeled by the (uniquely) optimal governance choice G^*. BM denotes bilateral monopoly, $F1$ denotes full integration with a single asset, CM denotes competitive market, and $CM+$ denotes competitive market sustained by positive transfers (dual sourcing). The figure is drawn for the parameter values $v_T^H = 4, v_S = 2, v_T^L = 1, \varphi = 4/5$; for other values, proportions between the optimal governance regions would be different.

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5 Appendix A

Here, we provide a microfoundation for Assumptions 1 and 2. Specifically, we devise a model within which the following two lemmas will be proven.

Lemma 1. *If B negotiates with two independent suppliers, the outcome is efficient and B obtains all the gains from trade.*

Lemma 2. *(i) When bilateral negotiations are required to implement the efficient project, a fraction* $1 - \varphi > 0$ *of the quasi-rent* r *is lost. (ii) Conditional on an agreement, each side receives (in addition to their ex post outside option)* $\varphi r/2$.

Our bargaining game is a one-shot random proposer ultimatum game.[15] Depending on whether there is competition or not, there will be two (competition) or one (bilateral) simultaneous bargaining tables active. When there is competition, participants at Table 1 are B and S_1 and participants at Table 2 are B and S_2. Without loss of generality, we assume that when only one table is active, it is Table 1.

Before arriving at the bargaining table, the two parties have an opportunity to attempt tying their hands to force concessions from the other party. Each player i chooses a commitment attempt $x_i \in [0, 1]$, where x_i denotes the share of the gains from trade that Player i demands and $x_i = 0$ (or indeed any value below a player's outside option) can be interpreted as a choice not to commit. Suppose that the cost of attempting commitment is infinitesimally small but positive (Ellingsen and Miettinen, 2008). Inbetween the two stages, each player's commitment attempt may fail independently with probability $1 - \rho$. Following Schelling (1956), we say that a player whose commitment attempt fails has a loophole. The probability that a commitment attempt is successful is ρ. The realization of the attempt, the commitment status, is denoted by s_i and equals x_i with probabiliy ρ and 0 with probability $1 - \rho$.

At the bargaining stage at each active bargaining table, each player becomes the proposer with probability $1/2$. At Table i, the proposer proposes a deal d_i indicating the share to Supplier i. WLOG, we impose that $d_i + d_B = 1$, where we refer to d_B as the offer made to B. Each player then votes to accept or reject; any Player i with commitment status $s_i > d_i$ automatically rejects the proposal.

[15] The model can be extended to a dynamic framework building on Ellingsen and Miettinen (2014) and Miettinen and Vanberg (2025).

Competition

Suppose now that two tables are active and a deal is struck with one supplier only. With randomly selected proposers, there are four possible constellations: (i) B proposes at both tables, (ii) B proposes at Table 1 and S_2 proposes at Table 2, (iii) B proposes at Table 2 and S_1 proposes at Table 1, and (iv) S_1 proposes at Table 1 and S_2 proposes at Table 2.

It is easy to show that the following constitutes an equilibrium.[16] When (i), B makes offer $min\{x_1, x_2\}$ at one table and an empty offer at the other table. The supplier with lower x wins the deal. When (ii), B proposes $d_1 = x_1$ at Table 1, S_2 proposes $d_2 = x_1$ and Table 2 strikes a deal unless $x_2 > x_1$ in which case S_2 proposes $d_2 = x_2$ and Table 1 strikes a deal. In every case, the outcome is x_1 and the supplier with lower x wins the deal. Case (iii) is the mirror image of (ii). Thus again, the supplier with lower x wins the deal. When (iv), there is essentially Bertrand-competition between suppliers with x_i proxying the marginal cost of S_i. The supplier with lower x wins the deal.

Commitment stage. Knowing that in every case the S_i with lower x_i wins the deal with probability one, the commitment stage boils down to a Bertrand competition between the two suppliers. B does not commit. Each supplier chooses a commitment weakly below the outside option. Thus, there is always a deal and B receives all the surplus above the outside option of the supplier with lower outside option. This establishes Lemma A1.

Bilateral bargaining

Suppose only one table is active. Since commitments are infinitesimally costly, by Proposition 3 in Ellingsen and Miettinen (2008), each party attempts commitment to the entire surplus and succeeds with an i.i.d. probability ρ. These positions are incompatible. Both simultaneously succeed with probability $1 - \varphi = \rho^2$ in which case the entire surplus is lost. B succeeds but not S and thus B grabs the surplus with probability $\rho(1-\rho)$. S succeeds but not B and thus S grabs the surplus with probability $\rho(1-\rho)$. Neither succeeds with probability $(1-\rho)^2$ in which case each has $1/2$ chance of being the proposer and grabbing the entire surplus. Thus, if surplus equals S under any efficient deal, the expected surplus equals $\psi = (1-\rho^2)S$ which is shared in equal shares between the two parties at an active bargaining table. This establishes Lemma A2.

[16] It turns out this equilibrium is unique. Suppose WLOG $x_1 < x_2$. It cannot be the case that $d_2 > s_2$ as otherwise there is a proposer at one of the tables who would have an incentive deviate.

Appendix B

Here we offer a proof of Proposition 4. Propositions 1 and 2 imply that organizational forms where authority and asset ownership are separated are dominated by other forms and thus never chosen. This allows us to simplify notation: contract offer (t, o) denotes contracts with transfer t from supplier to buyer (as before) where both ownership and authority are assigned to a single party o.

We first describe the nature of a supplier i's choice after having received a contract offer (t^i, o^i). We then solve the buyer's contract design problem for each profile of parameters.

Date 1: Suppliers' Asset Purchase Decisions

At Date 1, each supplier decides whether or not to purchase an asset. Not purchasing an asset yields the net payoff 0. Purchasing an asset after agreeing to a contract (t^i, o^i), expecting governance G (which in turn can depend on the contract accepted by the other supplier) yields a payoff $\pi(G) + t^i - f$, where $\pi(G)$ denotes an active supplier's expected Date 3 payoff from trading. For two organizational forms, $\pi(G)$ is uniquely defined by our analysis above: $\pi(CM) = v_R$, and $\pi(FI) = (1-h)\varphi(v_R - v_T^L)$. However, if $G = BM$, an active supplier's Date 3 payoff is not uniquely defined. Because of this exception, we now analyze the suppliers' asset purchase decisions jointly with the contract offers.

Date 0: Optimal contract offers

It's useful to distinguish the following six cases, which exhaust the relevant set of the parameters of the model.

Case (i): $f \leq v_R$
The optimal governance is CM. Suppliers will purchase assets even if the buyer does not promise transfers. Thus, it is optimal for B not to offer any contract (or to offer the contract $(0, s)$) and earn $W^{CM} - 2(v_R - f)$.

Case (ii) $f > v_R$ and $W^{CM} > \max\{W^{BM}, W^{FI}, 0\}$
The optimal governance is CM, but suppliers must be compensated for acquiring assets. Thus, in the unique subgame perfect equilibrium, B offers each supplier the con-

tract $(t, o) = (f - v_R, s)$, both suppliers buy an asset, and B earns the maximum possible surplus, W^{CM}.

Case (iii): $f \in (v_R, v_R + h\varphi(v_T^H - v_R))$ and $W^{BM} > \max\{W^{CM}, W^{F1}, 0\}$.
The optimal governance outcome is BM. Furthermore, if all transfers are zero, one supplier makes a positive expected profit by purchasing an asset if the other does not. Thus, following such a contract proposal there are two efficient asymmetric equilibria in pure strategies. There is also an inefficient mixed strategy equilibrium in which each supplier purchases an asset with probability $1 - (f - v_R)/(h\varphi(v_T^H - v_R))$. A natural solution to the coordination problem is that B offers the contract $(f - v_R - \varphi(v_T^H - v_R), s)$ to one supplier, S_i, and $\emptyset$ (no contract) to the other, S_j, letting it be understood that if S_i rejects the contract, then S_j is expected to invest. Thus, in harmony with Assumption 1, B exploits the competition between the two suppliers to extract all the gains from trade through the negative transfer t_i. Note that the threat to turn to S_j in case S_i rejects the contract proposal is credible; S_j is more than happy to invest if S_i does not (and S_i will not recoup the investment cost if S_j also invests, as $f > v_R$).

Case (iv): $f > v_R + h\varphi(v_T^H - v_R)$ and $W^{BM} > \max\{W^{CM}, W^{F1}, 0\}$
The optimal governance outcome is BM, but a supplier will only invest if there is a positive transfer. Thus, the two optimal equilibria now entail B offering the contract $(t, o) = (f - v_R - h\varphi(v_T^H - v_R), s)$ to one of the suppliers and no contract to the other. There is no suboptimal equilibrium.

Case (v): $f > v_R$ and $W^{F1} > \max\{W^{BM}, W^{CM}, 0\}$
The optimal governance outcome is $F1$. A supplier only accepts a contract (t, b) if $t \geq f - (1 - h)\phi^{F1} v_R$, so B offers the contract with lowest such transfer to one supplier and no contract to the other.

Case (vi): $\max\{W^{F1}, W^{BM}, W^{CM}\} < 0$.
It is optimal not to invest at all. Thus, B does not offer contracts.