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The exclusion of firm-specific considerations in the standard (economizing calculus) approach to buyer–supplier ties makes the large variations in the types of contracts used within the same industry unexplainable. This article tests Ghosh and John's (1999) strategizing calculus model that purports to close this gap. The core organizing principle of this model is a three-way fit among firm resources, investments, and governance that yields the highest net receipts. From this principle, the authors derive predictions and test them using data from 193 original equipment manufacturers that engage independent component suppliers. The data show that investments must be aligned with more complete contract terms (e.g., fixed prices, "hard" designs) to yield cost reduction outcomes for all firms. However, investments must be aligned with more incomplete contracts (e.g., cost-plus prices, "soft" designs) to yield end-product enhancement outcomes, but only for firms with relatively small downstream market margins. Firms with larger downstream market margins find that the previous alignment reduces end-product enhancements. These results are robust to checks for common method bias and alternative estimation procedures. The authors discuss practical guidelines for the desired tightness of supplier contract terms from the three-way fit principle.

Strategic Fit in Industrial Alliances: An Empirical Test of Governance Value Analysis

Recent years have witnessed significant shifts by original equipment manufacturers (OEMs) toward deintegrating their supply chains. The Delphi and Visteon spin-offs from General Motors and Ford, respectively, are prominent examples of these governance changes, as is the rise in outsourcing contracts signed by vendors such as IBM for data center operations.[1] These changes are viewed as facilitating both cost reduction (CR) and end-product/service improvements.

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[1]Governance defines the explicit and implicit rules of exchange between economic parties. Vertical integration, formal and informal contracts, complete and incomplete contracts, and relational norms are all examples of governance mechanisms.

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An important consequence of deintegration is that the contracts used to manage interfirm ties take on much greater significance, and their terms must be properly devised to facilitate the outcomes. It is important to understand how particular contract terms might facilitate or hinder particular outcomes. Notably, casual observation suggests that similarly situated competitors often organize their upstream and downstream ties in radically different ways. To illustrate, Coca-Cola uses its own sales force to sell to its fountain beverage accounts, but Pepsi uses its independent bottlers' salespeople in the same business. Likewise, unlike U.S. automobile OEMs, Japanese automobile OEMs are heavily integrated backward into the hardware and software (e.g., CAM/CAD) used in their assembly processes.

Unfortunately, the dominant research streams that speak to governance issues are silent on this matter. The economizing calculus featured in the transaction cost analysis work and the closely related incomplete contracting/property rights literature offers considerable insights into contract design, but it avers that similarly situated firms within an industry should employ similar contract terms. The subsequent inability to explain firms' heterogeneous governance choices has led strategy and marketing scholars (e.g.,

Hunt and Morgan 1995; Zajac and Olsen 1993) to question the relevance of the economizing calculus for understanding strategic marketing decisions.

Ghosh and John's (1999) governance value analysis (GVA) model proposes to close this gap. It combines the economizing calculus of transaction cost analysis with the resource-based view contention that firm-specific resource endowments drive realized positioning to develop a strategizing calculus that posits a discriminating three-way fit among (1) resources, (2) specific investments, and (3) governance that yields the highest net receipts. Nickerson, Hamilton, and Wada (2001) provide the first general test of the GVA model. However, they do not test the specific three-way fit implicated in the GVA model. This is the central purpose of this article.

In the current study, we use outcome types as a discovery mechanism to derive refutable predictions from the three-way fit notion. As such, we posit that identical investment–governance alignments adopted by firms with different resource levels lead to differential outcomes. We use data from key informants in 193 manufacturing firms in three Standard Industrial Classification (SIC) industry groups and corresponding data from 81 of their counterpart suppliers to address this question. We find support for our core proposition that OEMs possessing more resources in the end-product market generated diminished levels of end-product enhancement (EPE) when they aligned their investments with more flexible (incomplete) contract terms than did OEMs possessing fewer resources. Turning to CR outcomes, we find that aligning investments with less flexible (complete) contract terms improved these outcomes regardless of the resources the firm possessed. Together, these results expose a previously unrecognized weakness of strong firms that attempt to engage their suppliers through close ties. It also sheds light on the practice of "governance value engineering" (Gilson 1984) in designing supplier contracts.

CONTRACT DESIGN

The Economizing Calculus

Profit-motivated parties attempt to devise joint-value maximizing exchanges regardless of power and resource differentials (Williamson 1996) because this also maximizes their own profit. In this Coasian view, exchange processes consist of a value-creating phase and a value-claiming phase (Jap 1999, 2001), and the economizing calculus of contract design arises from the interaction between these two phases. Self-interested firms undertake value-creating investments (to lower costs and/or enhance quality) only to the extent that their expected share of the joint profits exceeds their expected profit under spot markets. Contracts and other forms of governance enable each party to stake a credible claim to their expected share of the value generated. Accordingly, stronger governance mechanisms should be aligned with larger specific investments to minimize unrealized opportunities (i.e., to maximize efficiency). This assumes that all firms have equal access to identical resources in competitive markets; thus, the same alignment between investments and governance is equally available and desirable to all firms. This renders the differences across firms' choices unexplainable. Unpacking these heterogeneous choices is at the heart of the strategizing calculus.

The Strategizing Calculus

This argues for a simultaneous, three-way choice of resources, investments, and governance that yields the highest expected outcomes (Ghosh and John 1999; Nickerson, Hamilton, and Wada 2001). The first element is the resources that each firm possesses; they are defined as the sticky, imperfectly mobile assets and capabilities of a firm (Ghemawat 1991). Examples include brand equity, market strength, and technical capabilities. These resources create value, but they must also be safeguarded in the value-claiming phase. Indeed, the desire to safeguard one's own exposed resources renders certain alignments preferable to other alignments, thus giving rise to heterogeneous alignments across firms. The second element of the calculus is the specific investments made by the parties that create value but also require costly safeguards in the value-claiming phase. The third element of the calculus is the governance form devised to manage the tie. Appropriate governance forms enable parties to claim the value and thus facilitate value-creating activities.

To make the general GVA model empirically tractable, we use Nickerson, Hamilton, and Wada's (2001) approach and restrict certain elements of the model to be exogenous in our selected context. Specifically, we build a middle-range version of the model by examining OEM–supplier ties for engineered components. Although resources are endogenous in the long run, we treat them as an exogenous factor that influences the supplier contract because it is much easier and quicker to change the nature of the tie than to change the level of a firm's resources. However, both investments and governance forms are endogenously determined.

Finally, we focus on the terms of the formal contract because of the rational choice explanation that underlies our hypotheses. Although the conscious choice of formal contract terms is quite natural, it is difficult to imagine that implicit governance modes, such as relational contracting, can be consciously designed. These modes are valuable, but they are not amenable to rational choice explanations.

HYPOTHESIZED EFFECTS

There are several refutable predictions that emanate from the model in Figure 1. We present them in the following sequence for ease of exposition. We begin with the simpler (one-way) effects, followed by the two-way interaction effect, and, finally, the crucial three-way interaction effect. We close with the nonfocal effects that we do not explicitly hypothesize but include for completeness.

Investments–Governance Alignment Hypotheses

Figure 1 shows reciprocal causal effects of investments and governance and a set of exogenous drivers. Although robust empirical associations have been found between specific assets and governance safeguards, in general, these studies have not disclosed the structural causal processes that underlie the reduced form association. Thus, we specify the causal process (i.e., whether governance structures safeguard investments or facilitate adaptations to those investments).

Governance effects on investments. We focus on the aspects of supplier ties that have been shown to be critical in previous work (e.g., Bajari, McMillan, and Tadelis 2002;

Figure 1
CONCEPTUAL FRAMEWORK
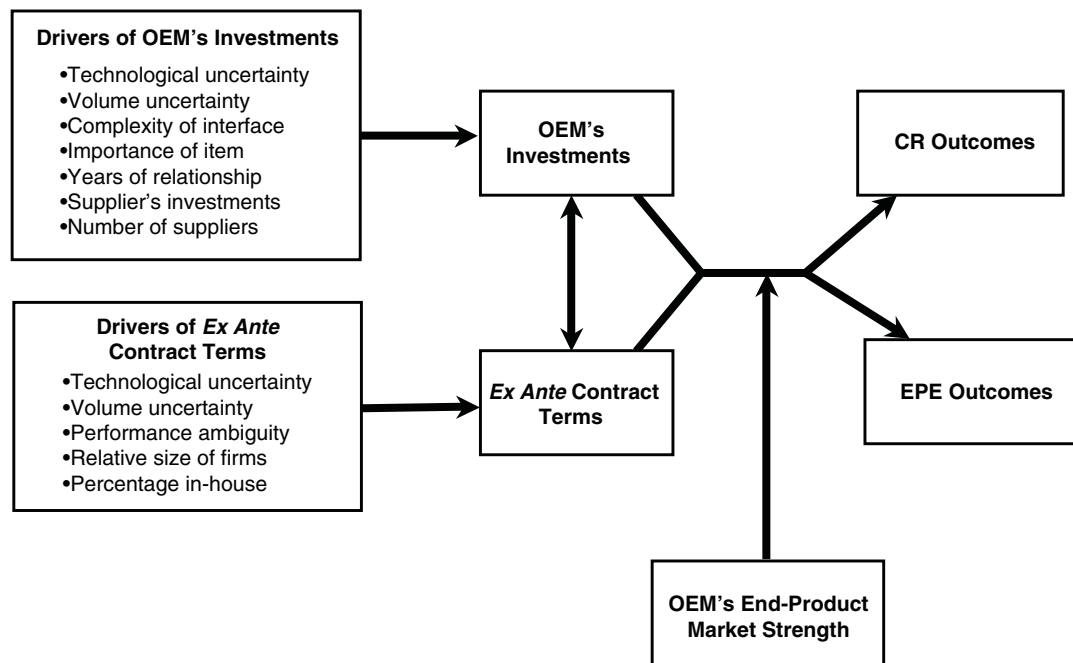
Banerjee and Duflo 2000; Crocker and Reynolds 1993), namely, the incompleteness of the price and design terms of the contract. We operationally define this incompleteness as the extent to which the explicit, formal terms are left open for possible modification through subsequent negotiations. This incompleteness affects *ex ante* incentives and *ex post* adaptation (Williamson 1996). Furthermore, they have different effects in these two phases (e.g., Murry and Heide 1998). Thus, we develop these effects separately.

Incomplete contracts lower incentives to make investments (e.g., Grossman and Hart 1986; Williamson 1996) because they are less enforceable and permit greater opportunities for *ex post* appropriation. Parties with more exposed (partner-specific) assets are relatively disadvantaged in bargaining, so farsighted investors operating under more incomplete terms will reduce their specific investment levels, albeit by sacrificing value creation. Thus:

H_{1a}: All else being equal, the more incomplete the *ex ante* contract terms, the lower are the levels of the OEM's investments in supplier-specific assets.

Viewing contracts as devices to manage *ex post* adaptation leads to the opposite prediction. Consider an OEM that identifies cost-reducing or performance-enhancing improvements in a component's original design. Greater investments increase the probability of identifying worthwhile improvements, but these gains will materialize only if the necessary changes in design, materials, and so forth, are actually agreed on and implemented. More complete contracts are more difficult to renegotiate because status quo positions are stated more clearly and therefore can be enforced more readily (Bajari and Tadelis 2001). This diminishes the probability of any identified improvement

being implemented, thus reducing the OEM's expected return on such investments. As such, rational actors will reduce their investment levels. Thus:

H_{1b}: All being else equal, the more incomplete the *ex ante* contract terms, the higher are the levels of the OEM's investments in supplier-specific assets.

Investment effects on governance. An OEM's specific investment creates value that could be subject to appropriation through renegotiation. Farsighted OEMs undertaking such investments will negotiate more complete contract terms even though their direct ink costs are greater (Crocker and Reynolds 1993) because they are more difficult to renegotiate. Thus:

H_{2a}: All else being equal, the higher the levels of the OEM's investments in specific assets, the less incomplete are the *ex ante* contract terms.

In contrast, the potential gains from specific investments are more realizable when contract terms are sufficiently incomplete to accommodate the redirection of effort for complex objectives and for uncertain environments. Farsighted OEMs will negotiate more incomplete terms to facilitate such revisions. Thus:

H_{2b}: All being else equal, the higher the levels of the OEM's investments in specific assets, the more incomplete are the *ex ante* contract terms.

Contingent Alignment Hypotheses

Recall that a given investment–governance alignment may have differential effects across firms. To uncover these effects, we need to identify dependent variables that are

affected differently by a given investment–governance pairing. To this end, we use Hart, Shleifer, and Vishny's (1997) stylized categorization of benefits from specialized investments into CR and EPE outcomes.[2]

Cost reduction outcomes are *joint* net gains from lower production and administrative costs of a purchased item that result from using customized production techniques/processes, cheaper materials, simplified designs, and so forth. As with any other specific investment, cost-reducing investments must be safeguarded, but the preferred safeguard is more complete contract terms. This is because CR targets can be readily specified, and their realization can be measured quite easily. Most important, their observability enables courts to attribute realized CRs to the efforts of specific parties. Therefore, we can devise relatively complete contracts with "hard" targets, explicit gain-sharing formulae, and so forth, to protect and motivate such investments.[3] Thus:

> H$_3$: All else being equal, the higher the levels of the OEM's investments in specific assets, the greater is the realized CR outcome when the *ex ante* contract terms are less incomplete.

End-product enhancement outcomes are the *joint* net gains from increased customer utility delivered by the end product. Investments that result in better component performance and/or that customize existing components to an end product can increase the end product's desirability. However, it is difficult to attribute increased end-product sales and margins directly to these investments. First, multiple attributes of an end product contribute to sales and margins, and the partworth of a particular attribute is difficult to measure. Second, exogenous changes in industry and competitive conditions also affect end-product sales and margins, which makes the first exercise even more difficult. Finally, EPE initiatives often involve more complex, cutting-edge components. Thus, unanticipated changes in component design and specification are more likely, and identifying all the contingencies *ex ante* becomes costly, if not impossible (i.e., \$Y in additional downstream margins are difficult to disaggregate into separate upstream margins).[4] These performance ambiguity problems with EPE outcomes call for better adaptation rather than stronger incentives, which requires aligning investments with more incomplete contracts. Thus:

> H$_4$: All else being equal, the higher the levels of the OEM's investments in specific assets, the greater are the EPE outcomes when the *ex ante* contract terms are more incomplete.

Heterogeneous Resource Hypotheses

Helper and Levine (1992) analytically demonstrate the ramifications of an OEM's downstream market strength, which they define as margins above competitive levels, on the organization of its upstream supplier ties. Specifically, an OEM must balance its expected additional benefits from cooperative supplier ties (with incomplete contract terms) with its expected costs of opportunistic appropriation of its downstream rents. This argument is central to the strategizing calculus.

To illustrate, consider the real case of a doll manufacturer. This firm enjoys a strong brand preference for its high-end dolls. It currently purchases parts from a plastics supplier and is contemplating a shift toward custom colors for these parts to take advantage of customer preferences for unique color shades that vary by selling season. Adapting to these new colors would be easier if its supplier contract terms were more incomplete. However, this buyer faces an awkward trade-off. More incomplete terms would enable the supplier to bargain over a much larger margin stream with this doll manufacturer. In contrast, if the same supplier has the same contract with another doll manufacturer that has significantly lower margins (e.g., a private-label doll maker), it can bargain opportunistically only over a smaller margin stream. Note that a certain fraction of the downstream margin is derived from the OEM's specific investments, whereas another fraction is derived from its brand strength among consumers. These two fractions are not readily separable, but bargaining occurs over the entire expected revenue stream. In summary, the OEM's specific investment magnifies the vulnerability of its own resources. Therefore, farsighted OEMs that possess greater resources will devise more complete contracts to protect their resources even though this diminishes the EPE outcomes. Thus:

> H$_5$: All else being equal, the stronger the OEM's end-product market strength, the lower are the realized EPE outcomes when higher levels of the OEM's investments in specific assets are aligned with more incomplete *ex ante* contract terms.

The situation is different for supplier ties that yield CR outcomes. For example, suppose that the doll manufacturer wants to invest in supplier-specific computer-aided design software to reduce the cost of doll model switchovers. As we discussed previously, CR outcomes are much easier to track and attribute to particular investments and are better aligned with more complete contracts. Fortuitously, not only do more complete contract terms better protect the investment, but they also reduce bargaining losses derived from the OEM's brand strength on the consumer side. Thus, compared with its private-label competitor, the OEM's brand strength does not handicap the firm from devising the desired contract to yield CR benefits.

We now briefly describe the exogenous drivers of investments and governance shown in Figure 1. They are not central to our article but are vital to our econometric specification. We used prior studies to guide our choice of these exogenous drivers. Replicating them grounds our novel results on firmer terrain.

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[2]These outcomes are similar to Porter's CR and differentiation outcomes. However, we do not view these categories as collectively exhaustive strategies. We do not require these outcomes to be mutually exclusive. Certain investments may generate both types of outcomes simultaneously. Consider just-in-time initiatives in which the primary purpose is to reduce inventory holding and manufacturing costs. To accomplish this, the firms must make their manufacturing processes more precise and their quality control techniques more stringent. This results in better quality parts, which enhances the end product.

[3]For example, Toyota is reputed to use contracts of the following form to motivate CR by its suppliers: payment = target cost + (target cost − realized cost).

[4]Such difficulties are also found in downstream ties. A manufacturer-financed advertising campaign and a retailer's point-of-sales effort both contribute to increased sales and profits. Nevertheless, separating and establishing the influence of each party's effort is difficult.

Exogenous Drivers of Specific Investment

We use nine variables as exogenous drivers of the OEM's specific investments. They are volume uncertainty, which is defined as the inaccuracy in forecasting requirements from the supplier (Saussier 2000); technological uncertainty, which is defined as the uncertainty arising from technological changes in the development and manufacture of the component (Bensaou and Anderson 1999); complexity of interface, which is defined as the intricacy of the engineering links between the focal component and other parts, or subsystems, within the end product (Bensaou and Anderson 1999); importance of the component, which is defined as the relative contribution of a component to the overall performance of an end product; history of the relationship, which is defined as the elapsed time of relationship with the specific vendor; supplier's specific investments, which are defined as supplier's investments that are specific to the OEM relationship (Anderson and Weitz 1992); number of suppliers (Bakos and Brynjolfsson 1997); and two industry dummy variables.

Exogenous Drivers of Incomplete Contracts

We use seven variables as exogenous drivers of incomplete contract terms. They are volume uncertainty; technological uncertainty; performance ambiguity, which is defined as the difficulty of assessing compliance with contractual obligations by output inspection or audit trails; asymmetry of partners, which is defined as the difference in size of the exchange partners (Heide 1994); plural governance, which is defined as the simultaneous use of both in-house production and supplier contracts for the same component (Bradach and Eccles 1989); and two industry dummy variables.

METHOD

Empirical Research Context

We study the organization of OEM–supplier ties for engineered components within the nonelectrical machinery (SIC 35), electrical and electronic machinery (SIC 36), and transportation equipment (SIC 37) sectors. We chose these SIC codes for three reasons. First, our middle-range model of durable ties between OEMs and independent suppliers requires us to rule out spot markets and vertical integration. Thus, we chose sectors in which OEMs routinely engage independent suppliers in long-term relationships. In our selected SIC codes, the end products consist of engineered systems that incorporate components and subassemblies based on a broad range of technologies. The OEMs must maintain sufficient expertise in all these technologies, and thus vertical integration is not practical in these SIC codes (in contrast to chemical and pharmaceutical settings). Second, our focus on engineered components ensures that substantial investments are required in research, design, and engineering. This eliminates spot markets as a feasible alternative. Third, each of these two-digit SIC sectors consists of dozens of four-digit SIC industries, which ensures a sufficient variety of purchasing relationships to test our hypotheses.

Pilot Study and Questionnaire Development

We first conducted on-site interviews with purchasing managers from each of the three SIC codes to establish that our theoretical concepts were material in these settings. We developed a draft questionnaire based on these interviews and published studies and administered it to purchasing managers from 18 firms to verify appropriate wording, response formats, and clarity of instructions. We then made appropriate changes based on their feedback.

Measures

Contractual incompleteness (INCOMPLETE). We used grounded measures of price and design incompleteness similar to those that Crocker and Reynolds (1993), Banerjee and Duflo (2000), and Gopal et al. (2003) use. We asked respondents to describe their price and design terms in one of the four categories (for descriptions, see Table 1). These categories represent increasing levels of incompleteness. For example, Category 1 (fixed-price terms) is the most complete because no allowance is made for adjusting the initial prices. Category 2 uses formulas to adjust initial prices, which introduces some incompleteness because the invoice price is not known until the time of shipment. Nevertheless, the adjustment process itself is fixed and not subject to negotiations. Category 3 incorporates even more incompleteness because neither the adjustment formula nor the invoice price is known until the time of shipment. Only an anchor point is provided in the form of the initial price. Category 4 is the most incomplete because neither the price nor the adjustment formula is fixed and there is no anchor point. Note that the last category accommodates the case in which price is not explicitly included in the contract. Rather, each transaction price is negotiated and determined at the time of shipment. Table 2 provides the distribution of the responses.

The incompleteness of the contract terms regarding the design of the component follows Bajari, McMillan, and Tadelis's (2002) approach. The first category locks the parties into a specific design, whereas the second category permits mutually agreeable changes. The third category signifies a higher level of expected adjustment because of the absence of a veto power. The last category contemplates large design adjustments in which contracts spell out the "functional specs" (i.e., output metrics), whereas the requisite method to accomplish the performance (i.e., inputs and processes) is left to the supplier's discretion.

We treat these price and design measures as formative indicators of the incompleteness construct because they exhaust the relevant domain of the construct. As such, we construct our overall INCOMPLETE scale by standardizing the price and design measures and then summing the two standardized scores.

OEM's specific investments (OEMINV). Our six-item scale based on the work of Anderson (1985) and Heide and John (1990) measures the OEM's investments in physical, process, and human assets that are specialized to a particular supplier.

CR outcomes (CROUTCOME). The seven items of this new scale measure the extent to which the interfirm relationship has generated joint benefits through efficient manufacturing practices, reduced production wastage, fewer defects, and so forth. We asked our informants to report the level of CRs relative to the costs of procuring the component using an arm's-length relationship.

EPE outcomes (EPEOUTCOME). The five items of this new scale measure the extent to which the interfirm relationship has generated joint benefits through tighter integra-

Table 1

MEASURES OF CONSTRUCTS

Scale and Model Statistics	Item Description
INCOMPLETE	1: How would you describe the pricing arrangement for the item(s) under this contract? (Choose one) •Fixed prices over the length of the contract. •Specified prices but with adjustment formulas (e.g., inflation, producer price index). •Specified prices but with negotiated adjustments. •Prices not specified ahead of time of shipment. 2: Purchasing contracts may specify the design features of the item(s), such as the type of materials to be used. How would you describe the arrangement for design specifications for the item(s) under this contract? (Choose one) •No changes in design specs permitted. •Mutually approved changes in design specs permitted. •Unilateral changes in design specs are possible. •Contract does not specify the design features of this item(s).
OEMINV (6 items) $\chi^2(9) = 17.75$; CFI = .99 NFI = .97; reliability = .90	We have made significant investment in tools and equipment dedicated to the relationship with this supplier.
CROUTCOME (7 items) $\chi^2(14) = 7.3$; CFI = 1.00 NFI = .98; reliability = .79	Our business processes and procedures have become more efficient due to this relationship.
EPEOUTCOME (5 items) $\chi^2(5) = 5.85$; CFI = 1.00 NFI = .99; reliability = .84	This relationship has allowed us to better capture design and engineering synergies between their item(s) and our end product.
TECHUNCT[a] (3 items) Reliability = .83	Industry standards for this item's performance specifications are very predictable/unpredictable.
VOLUNCT (2 items)	Our firm's requirements for the item are predictable.
OEMMKTSTR[a] (6 items) $\chi^2(9) = 16.35$; CFI = .98 NFI = .95; reliability = .84	Customers are not willing/very willing to pay a premium for our end product.
SUPPINV (6 items) $\chi^2(9) = 24.13$; CFI = .98 NFI = .97; reliability = .91	We have made significant investment in tools and equipment dedicated to the relationship with this OEM.
PERFAMB (6 items) $\chi^2(5) = 21.37$; CFI = .96 NFI = .95; reliability = .86	It is difficult to verify whether this supplier is performing all of its contractual obligations under this agreement.
RELSIZE	With respect to last year's sales volume, how large is your firm to this supplier?
CMPLXINTF	Item has a simple/complex interface with other components in the end product.
YEARS	How long has your business unit had a business relationship with this supplier?
IMPTCMPT[a]	Item is a very unimportant/very important element of our end product.
Annual volume of purchase	During the last fiscal year, what was your total purchase of the item from this supplier? (MARK ONE): (1) Less than $1M; (2) $1M to $2M; (3) $2M to $3M; (4) $3M to $4M; (5) $4M to $5M; (6) $5M to $6M; (7) more than $6M

[a]We measured these items on a seven-point semantic differential scale.

Notes: Unless otherwise indicated, the anchors for the scale points are 1 = "strongly disagree" and 7 = "strongly agree." We provide an illustrative item for all multi-item scales. Remaining items for each scale are provided in an appendix that is available on request. CFI = comparative fit index, and NFI = normed fit index.

Table 2

DISTRIBUTION OF PRICE AND DESIGN TERMS

Variable	Category 1	Category 2	Category 3	Category 4
Price incompleteness	45	73	62	9
Design incompleteness	59	65	57	11

Notes: Because of missing data, we have 189 observations for price and 192 observations for design terms of the contract.

tion of the component into the end product, greater differentiation, improved product performance, and so forth. Again, the reference point was the baseline level of end-product performance that was attainable from purchasing the component in the open market at arm's length.

OEM's end-product market strength (OEMMKTSTR). The six items of this new scale measure the OEM's competitive strength in its downstream customer market for the most

important end-product line using the component. The items refer to end customers' preferences for this product line, its margins compared with competing products, and so forth.

Volume uncertainty (VOLUNCT). This two-item scale, which we adapted from the work of Walker and Weber (1984) and Anderson (1985), measures the unpredictability in demand forecasts for the component.

Technological uncertainty (TECHUNCT). This three-item scale, which we adapted from the work of Bensaou and Anderson (1999), measures the upstream uncertainties arising from technological changes.

Performance ambiguity (PERFAMB). This five-item scale, which we adapted from the work of Anderson (1985), measures the OEM's inability to assess the supplier's performance satisfactorily through processes such as inspection and tests of delivered samples.

Supplier's specific investments (SUPPINV). This six item scale, which we adapted from the work of Anderson and Weitz (1992) and Heide and John (1990), is parallel to the OEM's specific investment measure.

We used single-item scales to measure the following variables:

Complexity of interface (CMPLXINTF). This item measures the intricacy and proprietary nature of the interface between the end product and the component (Bensaou and Anderson 1999).

Importance (IMPTCMPT). This item measures the component's impact on the performance of the end product.

Relative size (RELSIZE). We measure the ability of a larger firm to extract certain concessions from a smaller exchange partner by rating the two parties on their total sales volume in the previous financial year, which is in line with Heide and John's (1990) method.

Years (YEARS). We measure the elapsed time of the history of purchases from this supplier (not necessarily for the component in question) in years to date, which is also in line with Heide and John's (1990) method.

In-house production (PCTINHSE). We measure this construct as the fraction of in-house production of the component during the previous year, excluding prototypes and special models.

Data Collection from OEMs

Unit of analysis. Our unit of analysis is a purchasing agreement between an OEM and an independent supplier (i.e., no cross-equity holdings) for a single component or a set of technologically indivisible components. The item is always physically incorporated into an end product. Thus, joint ventures and other equity partnerships as well as maintenance and repair operations were ineligible for inclusion. This specific relationship became the focus of our subsequent data collection effort.

Contacting key informants. We drew a random sample of 1016 names of purchasing managers or directors in manufacturing firms in SIC codes 35, 36, and 37 from a national mailing list. We used the key informant procedure (Campbell 1955) to contact and qualify these informants. Multiple telephone calls using a snowball technique were necessary to qualify an informant at each firm. We offered them a customized report that summarized the relationship profiles in our sample and compared their own relationship profile with the average profile. We set up a Web-based discussion forum for participants to comment on the reports and inter-

act with other participants. Our qualification process yielded 521 informants to whom we mailed questionnaires and stamped, addressed envelopes. Using reminder cards and follow-up telephone calls, we received 207 completed questionnaires. Of these, we eliminated 14 responses because of excessive missing data, giving us a final sample of 193 responses. Our 37% response rate compares favorably with previous studies in similar settings (e.g., Heide and John 1990).

Assessing key informant quality and nonresponse bias. We used two items to measure informant knowledge and involvement: "How knowledgeable are you about your business unit's dealings with this supplier?" and "How involved are you personally in your business unit's dealings with this supplier?" We measured responses on a seven-point Likert scale (1 = "very low," and 7 = "very high"). Average response were 6.40 (standard deviation [s.d.] = .68) and 6.37 (s.d. = .68) for knowledge and involvement, respectively. To assess nonresponse bias (Armstrong and Overton 1977), we classified all responses within the first five weeks as early responses and the rest as late respondents. We based the five-week cutoff on the observed pattern of responses received. Table 3 displays data on four characteristics. We did not detect statistical differences between these samples (Wilks's lambda [$\Lambda*$] = .97; $F(4, 188) = 1.46$). The observed but nonsignificant differences (potentially due to a weak test) are consistent with the expected nature of a bias.

Data Collection from Suppliers

We asked each of the 193 OEM informants to specify a contact at the named supplier. Using the same process and incentives we described previously, we were able to contact informants at 142 supplier firms. Using the same mailing and reminder procedure, we obtained 81 questionnaires for a 57% response rate. We eliminated one response for excessive missing data, yielding 80 usable responses. The average supplier knowledge and involvement scores were 6.34 (s.d. = .59) and 6.60 (s.d. = .56), respectively. Table 4 describes the rich variety of end products and components that are represented in this sample of long-term ties (on average, more than eight years of history).

Reliability, Measure Validity, and Discriminant Validity

For each multi-item set, we excluded items with item-to-total correlations below .30. We then estimated congeneric models for each set of items to assess unidimensionality. Table 1 shows that our scale reliability estimates (based on

Table 3
NONRESPONSE BIAS

| | Mean | |
| | Early Respondents (N = 126) | Late Respondents (N = 67) |
Variable		
Annual volume of purchase (scale)	4.65	4.33
Ratio of annual sales volume of the buyer to that of the supplier	1.19	1.31
Number of suppliers of the focal component	2.82	3.09
Proportion of purchase of the focal component from this supplier	63.8	60.5

Table 4
PROFILE OF SAMPLES (%)

OEM Key Informant Job Title (n = 193)	
Purchasing manager/director/agent	49
Materials manager/director	20
Operations/production manager/director	10
Director: vendor/supplier management	8
Others	13
Supplier Key Informant Job Title (n = 80)	
Sales manager/director/agent	35
Marketing manager/director	16
Accounts manager	10
Sales representative	24
Others (e.g., general manager)	15
Types of OEM End Products (n = 193)	
Machines (e.g., agricultural/automotive/construction/ drilling, manufacturing)	31
Dies and tools (e.g., subassembly/casts/molds)	23
Finished components (e.g., motors/pumps/valves/ compressors/turbines)	12
Instruments (e.g., navigational systems/medical devices/ process control equipment/)	16
Electronic equipment (e.g., computers/ion vaporizers)	8
Others	10
Types of Supplier Components (n = 193)	
Fabricated metal parts (e.g., molds/dies/castings)	29
Finished components (e.g., motors/engines)	35
Electronic subassemblies (microprocessors)	17
Instruments (e.g., gauges, sensors)	12
Others (e.g., optical lenses)	7
Average Number of Years in Business Relationship	8.1

Werts et al. 1978) and fit indexes indicate a satisfactory level of internal consistency and unidimensionality.

To establish the convergent validity of the dyadic constructs, we examined data from our OEM and supplier samples and found significant correlations among the reports for each construct. Well-known theoretical differences in perspectives and viewpoints of dyadic partners (Pondy and Boje 1980) typically attenuate these zero-order correlations. As a stronger test, we attempted to estimate multitrait, multimethod models that incorporated party-specific factors and trait and method factors, but these models failed to converge. This is a common problem with organizational data. To assess discriminant validity, we conducted confirmatory factor analysis for different subsets of our eight multi-item scales. All the own trait loadings and the fit indexes for each confirmatory factor analysis exceeded the benchmarks used in the literature. We also obtained significant fit differences between an unconstrained model and a series of constrained models in which one intertrait factor correlation is constrained to be 1.0. The χ^2 tests provided strong support for discriminant validity of the constructs.[5]

Structural Model Estimation

We estimated the following system of four equations to test our hypotheses:

$$(1) \quad \text{OEMINV} = \beta_{01} + \beta_{11} \text{ INCOMPLETE} + \text{(additional terms)} + \varepsilon_1;$$

[5]Details of the test appear in an appendix that is available from the authors on request.

$$(2) \quad \text{INCOMPLETE} = \beta_{02} + \beta_{12} \text{ OEMINV} + \text{(additional terms)} + \varepsilon_2;$$

$$(3) \quad \text{CROUTCOME} = \beta_{03} + \beta_{13} \text{ OEMINV} \times \text{INCOMPLETE} + \text{(additional terms)} + \varepsilon_3; \text{ and}$$

$$(4) \quad \text{EPEOUTCOME} = \beta_{04} + \beta_{14} \text{ OEMINV} \times \text{INCOMPLETE} + \beta_{24} \text{ OEMINV} \times \text{INCOMPLETE} \times \text{OEMMKTSTR} + \text{(additional terms)} + \varepsilon_4.$$

The additional terms in Equation 1 (for OEMINV) and Equation 2 (for INCOMPLETE) are the exogenous drivers of specific investments and incomplete contracts that we discussed previously. The additional terms in Equation 3 (for CROUTCOME) and Equation 4 (for EPEOUTCOME) are the various lower-order terms that are included in accordance with the convention of obtaining support for hypothesized higher-order effects after controlling for lower-order effects.[6] We also added three variables, TECHUNCT, YEARS, and PERFAMB, to Equations 3 and 4.[7] To reduce clutter and focus attention on the hypothesized effects, we avoid detailing the additional terms. The complete set of variables appears in Table 5, which provides the results of our three-stage least squares estimation.[8] For the CROUTCOME and EPEOUTCOME equations, we used fitted values of OEM's specific investments and contractual incompleteness to create the interaction terms involving these variables.[9] We denote these variables as OEMINVHAT and INCOMPLETEHAT, respectively, in Table 5. We now discuss of our results.

Investment–governance alignment hypotheses. In support of H_{1b} over H_{1a}, we find that more incomplete contracts increase the OEM's specific investments ($\hat{\beta} = .34$, $t = 2.79$). In support of H_{2b} over H_{2a}, we find that the OEM's specific investments lead to more incomplete contract terms ($\hat{\beta} = .17$, $t = 1.80$). These results reveal that in our context, for-

[6]Note that the GVA model's theoretical structure does not enable us to generate refutable predictions on the other estimated two-way interaction coefficients (e.g., the two-way interactions between OEMMKTSTR and OEMINV and between OEMMKTSTR and INCOMPLETE).

[7]One of the reviewers had requested that these variables be added.

[8]To address issues about the metric properties of the INCOMPLETE scale, we undertook two additional sets of estimations to test the robustness of our results. First, we replaced the INCOMPLETE scale with the raw scores for price and design incompleteness and estimated the entire system of equations for each of the two measures. Second, we replaced the INCOMPLETE scale with a dichotomized price and design measure. Specifically, we combined the first two categories in the price (design) measure into the "low-price- (design-) flexibility" category and the third and fourth categories into the "high-price- (design-) flexibility" category. We then estimated the entire system of equations, consisting of a mix of qualitative and interval-scaled endogenous variables for each of the binary measures, using the procedures described in Maddala's (1983) study. Our core results were invariant to the four different estimations, providing us with confidence in our results. (Details of the results are available on request.) In addition, our system of equations satisfies both the rank and order conditions for identification, indicating uniqueness of our solution. We used the procedure described in Wooldridge's (2001) work. These results are also available from the authors on request.

[9]We also estimated the structural model using observed values rather than fitted values to generate the interaction terms. The results are consistent with those we report in Table 5.

Table 5

HYPOTHESES TESTS ON BUYER (OEM) DATA

	Dependent Variable			
Independent Variables	OEMINV	INCOMPLETE	CROUTCOME	EPEOUTCOME
CONSTANT	.52 (3.34)	−.63 (−1.28)	−.27 (−2.52)	.29 (2.83)
OEMINV		.17 (1.80)	.07 (1.12)	.13 (1.88)
		H$_{2a}$ (−), H$_{2b}$ (+)		
INCOMPLETE	.34 (2.79)		−.16 (−1.98)	.22 (2.24)
	H$_{1a}$ (−), H$_{1b}$ (+)			
TECHUNCT	.07 (1.25)	.14 (1.95)	.05 (.75)	.31 (2.88)
VOLUNCT	−.03 (−.31)	−.18 (−2.32)		
CMPLXINTF	−.04 (−.50)			
IMPTCMPT	.11 (1.69)			
YEARS	−.06 (−.76)		.20 (2.76)	−.06 (−1.15)
SUPPINV	.33 (3.29)			
SUPNUM	−.14 (1.96)			
PERFAMB		.26 (2.51)	.01 (.11)	.17 (2.03)
RELSIZE		−.20 (1.99)		
PCTINHSE		−.02 (−.41)		
OEMMKTSTR			.03 (.37)	−.06 (−1.01)
OEMINVHAT × INCOMPLETEHAT			−.19 (−2.03)	.30 (2.78)
			H$_3$ (−)	**H$_4$ (+)**
OEMINVHAT × OEMMKTSTR			.13 (1.68)	−.03 (−.64)
INCOMPLETEHAT × OEMMKTSTR			−.02 (−.26)	.02 (.26)
OEMINVHAT × INCOMPLETEHAT × OEMMKTSTR			.08 (1.26)	−.16 (−1.97)
				H$_5$ (−)
SIC 36	.05 (.41)	−.07 (−.81)	.10 (1.30)	.03 (.50)
SIC 37	.06 (1.20)	−.10 (−1.62)	.07 (1.12)	−.08 (−1.15)

Notes: $n = 189$, system-weighted $R^2 = .66$, t-statistics are in parentheses, and bold numbers represent hypotheses tests. **H$_n$ (−)** = negative coefficient predicted, and **H$_n$ (+)** = positive coefficient predicted.

mal contract terms principally assist adaptation rather than motivate investments. In other contexts, such as those involving partial (equity) or complete (vertical integration) ownership, formal contract terms may motivate investments.

Contingent alignment hypotheses. In support of H$_3$, we find that CR outcomes are lower when OEM investments are aligned with more incomplete contracts ($\hat{\beta} = −.19$, $t = −2.03$). In support of H$_4$, we find that EPE outcomes are higher when OEM investments are aligned with more incomplete contracts ($\hat{\beta} = .30$, $t = 2.78$). Together, these results offer strong support for our strategy contingent alignments. Note that we obtain each of these effects after controlling for the corresponding lower-order terms.

Heterogeneous resource hypotheses. In support of H$_5$, EPE benefits are reduced when OEMs possessing greater end-product market strength align their investments with more incomplete contracts ($\hat{\beta} = −.16$, $t = −1.97$).[10] Figure 2 depicts the three-way interaction effect for high market strength on EPE outcomes. The surface dips sharply in the region of high incompleteness and high investments. The corresponding surface is flat for the low-market-strength condition. In addition, note that EPE outcomes are high for low incompleteness and high investments.

Exogenous drivers of OEM investment. Original equipment manufacturer investments are greater when supplier's specific investments are greater ($\hat{\beta} = .33$, $t = 3.29$), in accordance with the work of Anderson and Weitz (1992); when the number of suppliers are smaller ($\hat{\beta} = −.14$, $t = −1.96$), in

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[10]We also decomposed these two- and three-way interaction effects using the Aiken and West procedures. The decomposed effects are consistent with our hypotheses, but lack of space precludes reporting these in detail. These estimates are available on request.

Figure 2

THREE-WAY EFFECT ON EPE OUTCOMES FOR HIGH MARKET STRENGTH
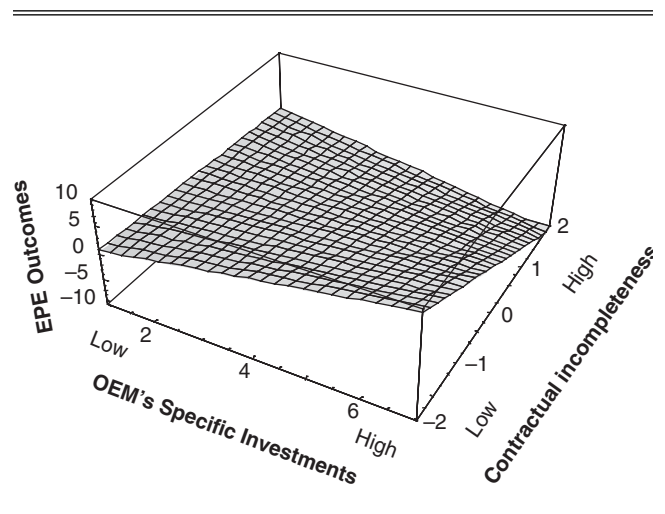
accordance with the work of Bakos and Brynjolfsson (1997); and when the component becomes more important ($\hat{\beta} = .11$, $t = 1.69$).

Exogenous drivers of incomplete contracts. Contracts are more incomplete when the technological uncertainty increases ($\hat{\beta} = .14$, $t = 1.95$), performance ambiguity increases ($\hat{\beta} = .26$, $t = 2.51$), the buyer's size decreases ($\hat{\beta} = −.20$, $t = −1.99$), volume uncertainty increases ($\hat{\beta} = −.18$, $t = −2.32$), and the firms operate in the automotive sector ($\hat{\beta} = −.11$, $t = −1.62$).

Exogenous drivers of CR outcomes. Cost reduction outcomes are lower as contracts become more incomplete ($\hat{\beta} = -.16$, $t = -1.98$) and greater as the relationship age increases ($\hat{\beta} = .20$, $t = 2.76$).

Exogenous drivers of EPE outcomes. End-product enhancement outcomes increase as OEM investments increase ($\hat{\beta} = .13$, $t = 1.88$), contract terms become more incomplete ($\hat{\beta} = .22$, $t = 2.24$), technological uncertainty increases ($\hat{\beta} = .31$, $t = 2.88$), and performance ambiguity is greater ($\hat{\beta} = .17$, $t = 2.03$).

DISCUSSION

Summary of Findings

Our primary purpose was to test the three-way fit implicated in the GVA model. Our empirical test addressed the following three GVA predictions:

- Investments and governance have a reciprocal effect,
- The desired investment–governance alignment is contingent on the desired outcomes, and
- Firm-specific resources differentially affect the outcome from a particular investment–governance alignment.

In our setting, we find that formal contract terms influence efficiency by safeguarding investments and by facilitating adaptation, but the latter effect is more influential. The desired alignments between investments and governance are contingent on the outcome variable. Cost reduction outcomes are improved by aligning OEM investments with more complete contract terms, whereas EPE requires incomplete contracts to support specific investments. Our three-way hypothesis attempted to demonstrate that firms' resources mattered in making the proper governance–investment alignment choice. Original equipment manufacturers that were stronger within their own end-product market lowered EPE outcomes when they chose the supposedly efficient alignment; that is, more investments were aligned with more incomplete contracts. In effect, their advantages in their own downstream markets limit their flexibility and force them to sacrifice potentially efficient alignments. This demonstrates the trade-off between the efficiency and strategic considerations that is at the core of the strategizing calculus.

Limitations and Validity Threats

Common method bias. Conclusions from cross-sectional survey data are vulnerable to common method bias because the dependent and independent variables are both obtained from the same respondent. To assess this threat, we reestimated our model as follows: For each dyad, we replaced the OEM's report on the key variable (INCOMPLETE) with the corresponding report from its supplier counterpart, while maintaining all the other variables from the OEM report. Despite a reduction in the sample size (n = 80), which reduces the power of the test, we obtain results that are consistent with the original results reported in Table 5.[11]

Testing the Coasian assumption. The key underlying logic of GVA, based on the Coase theorem, is that exchange partners always bargain to achieve the joint profit outcome regardless of the initial distribution of

power because neither party can be made worse off if the joint profit outcome is larger. However, this assumption may not hold if firms choose contract forms that sacrifice their profits and deviate from efficient outcomes (for reasons including lack of foresight, desire to maintain long-term dominance, corporate culture, and so forth) Such suboptimal choices would provide a significant, though subtle, validity threat to our logic linking a firm's private outcomes to the joint relational outcomes. To verify this logic, we regress both firms' own profit measure against their reported joint outcome measure (CROUTCOME and EPEOUTCOME) for both the OEM and supplier data. We also included variables to control for the bargaining strength of the party compared with its partner, including the relative size of the OEM compared with its supplier, the OEM's ability to replace its supplier, the supplier's ability to replace its OEM, and the OEM's end-product market strength. In each of the samples, joint outcomes have a positive effect on the own profit outcome, removing this as a validity threat.

Even though we have ruled out two important validity threats, other limitations remain. Principally, there are no direct measures of our respondents' motivations for choosing any particular contract form. We proceed from the position that the observed contract is their preferred choice. Direct measures of firms' motivations would shed more light on the underlying mechanism and help rule out alternative explanations. In addition, although we used dummy variables to capture industry-specific fixed effects, unobserved heterogeneity in these product markets remains a possibility. Finally, our estimations assume continuous dependent variables. Using ordered probit models (Franses and Paap 2001) with endogeneity and interaction terms would have been useful, though it is infeasible with our limited sample.

Further Research

The strategizing calculus of GVA requires revisiting many of the issues studied from the economizing viewpoint. Our analysis examined the completeness of contract terms and their interaction with firm resources and investments. However, this calculus applies beyond just contract terms. We suggest that a high priority for further research would be to study additional governance issues from a strategizing viewpoint. One such extension is vertical integration. Although early empirical efforts disclosed firm differences (e.g., Monteverde and Teece 1982), these differences have neither been incorporated into the theoretical models (for an exception, see Grossman and Hart 1986) nor been studied empirically in a systematic fashion. A natural starting point for further work would be to unpack the differential advantages of vertical integration to different firms. For example, managers often assert that vertically integrated operations favor firms that produce higher-quality output. This can be explored by extending the current model's logic about EPE outcomes to accommodate vertical integration. Another high-priority research area is to understand the importance of governance choices to firm performance (Masten 1993), given the centrality of performance outcomes in GVA. In turn, this necessitates incorporation of appropriate methodological tools, such as selection correction estimation procedures (Shaver 1998).

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[11]Details of the test appear in an appendix that is available from the authors on request.

The Practice of Governance Value Engineering

Contract design does not come naturally to marketing managers or purchasing agents. Borrowing Gilson's (1984) phrase, we contend that managers should view themselves as "governance value engineers" who add value by engineering contracts properly. To this end, we offer some practical advice gleaned from our results.[12]

To begin, the naive notion that contract terms should always be written as tightly as possible must be abandoned. Indeed, properly engineered contracts should possess a degree of tightness (completeness) that balances (1) expected gains with protecting specific investments, (2) expected gains with making adjustments, and (3) expected losses with exposing existing margins to bargaining over adjustments. Striking the right balance requires the contract engineer to consider the nature of the expected outcomes and the firm's own resource profile. In this respect, engineering the pursuit of CR outcomes is quite straightforward. Here, all firms should strive to engineer complete, albeit complex, contracts featuring fixed prices, fixed designs, and gain-sharing formulas. These terms protect necessary specific investments and motivate suppliers to find ways to reduce costs. Note that we advise against the close ties that are often promoted in the popular press.

The picture changes dramatically when suppliers are engaged to pursue EPEs. Here, the balance shifts toward cost-plus prices, changeable designs, and change orders because EPE requires adjustments over time. Initially specified designs may be replaced with better designs, or else they may need to be scaled back as difficulties are uncovered. In either case, allowing for adjustments offers greater expected gains than locking into the initial terms. Thus, contract terms should be engineered to facilitate adjustments. However, the right degree of flexibility depends on the risks to that particular firm that arise from these adjustments. Recall that adjustments expose the firm's overall margins (from brand equity, to customer loyalty, to other market-based assets) to appropriation risks. These adjustment risks are proportional to the firm's margins. Thus, firms with larger margins face smaller gains from expected adjustment. In such cases, more complete contracts with suppliers must be engineered even though this sacrifices some EPE.

We also urge the contract engineer to examine more fully the nature of the goals that can be realistically pursued by their own firms. Although all OEMs can pursue CR initiatives equally vigorously with their supply chain partners, EPE initiatives are paradoxically less attainable for relatively stronger OEMs. However, the latter OEMs are not locked out of such initiatives. They need to move these initiatives in-house rather than attempt to engage independent suppliers. As always, the three-way fit among resources, investment, and governance is the basic organizing principle.

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[12]Parenthetically, law schools have begun to teach specific courses based on these same research ideas (Williamson 2000), so the necessary common ground across functional areas is being developed.

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