

THE INTERACTION OF FORMAL AND RELATIONAL CONTRACTING

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- The first portion of this talk is based on an early draft of the same name, available at: http://www-2.rotman.utoronto.ca/kenneth.corts/working_papers2.htm

Overview

- Research in organizational and institutional economics places great emphasis on the study of the determinants and implications of the contracts chosen to govern economic transaction between parties.
- This applies both to formal contracts (those that are written down and, at least to some extent, enforceable in court) and to relational contracts (those that are sustained through the trust established and supported through repeated contracting).
- In particular, the literature has explored whether relational contracting serves as a substitute or a complement to formal contracting—that is, whether this sort of “trust” obviates the need for explicit contracts or instead makes them more useful and desirable.

Overview

- Clarification of terms and research question
- Theoretical literature overview
 - the mechanisms of interaction
 - extended toy model
 - papers
- Empirical literature overview
 - papers
 - the methodological challenge
 - an example

Clarification of terms

- Formal contract
 - written down
 - conditioned on *verifiable* information
 - enforceable in court
 - may be costly to write and enforce
- The alternative (informal or implicit contracting) is generally understood to include anything that is enforced by means other than the legal system.
 - trust, reciprocity, norms, reputation, social pressure, etc, or...
- Relational contract (overwhelmingly predominant in econ)
 - may or may not be written down
 - conditioned on *observable (but not necessarily verifiable)* information
 - self-enforcing by the logic of repeated games

Research Question

- Are formal and relational contracts complements or substitutes?
 - Does a stronger formal contracting environment (formal contracts cheaper to write or enforce, or larger set of verifiabilities) support or undermine relational contracting?
 - Does stronger relational contracting (more patient players, more frequent interaction, or larger set of observables) displace or encourage formal contracting?
 - In this case “encourage formal contracting” could mean use of more complete and fully-specified formal contracts, formal contracts with steeper incentives, longer-term formal contracts, etc.

Research Question

- In theoretical literature, this analysis builds from two prior literatures
 - formal contracting literature (eg, principal-agent models)
 - incentive pay can induce high effort, eg
 - relational contracting literature
 - principal can induce high effort with credible informal promise of discretionary bonus, eg
- to explore the **choice** between alternative contracts (including hybrid contracts) as characteristics of the contracting environment change.

Research Question

- In empirical literature, the emphasis also tends to be not on **choice of contract** (rather than effect of contract).
 - maintain assumption that agents are optimizing
 - theory gains support if observed choice moves as expected with changes in contracting environment
- Focus on contract choice is widespread in these literatures for an important reason.
 - alternative approach would be to test effect of contract choice
 - but contract choice is presumed to be optimal
 - where do you find exogenous drivers of contract choice?
 - generally presumed to be easier to find exogenous drivers of change in contracting environment, then observe how optimally chosen contracts vary with these changes

Research Question Recap

- Are formal and relational contracts complements or substitutes?
 - If doing a lot of repeated business together builds “trust” between contracting parties, are they able to
 - just do business without formal contracts anymore?
 - be more confident in the appropriate execution and adaptation of stronger formal contracts?
- The simplest hypothesis is that these are alternative modes of contracting and the choice is an either/or choice between them.
 - When relational contracts are feasible they are likely lower-cost to write, implement, and enforce; the relational contract therefore replaces and **substitutes** for the formal contract in those circumstances. (“Theory 0”)

Theory Literature

- A (surprisingly large) literature explores reasons that formal and relational contracting choices may interact in more complex ways, but (in my opinion) they mostly fall into one of four mechanisms
 - (1) formal contracts define the outside option in the relational contracting repeated game
 - (2) formal contracts can limit the profits available in a deviation from the relational contract
 - (3) formal contracts can provide partial incentives when performance measures are imperfect, reducing demands on the relational contract
 - (4) relational contracting may affect how renegotiation and adaptation of an incomplete formal contract plays out as noncontracted contingencies arise
- **Understanding these mechanisms (0)-(4) is the main goal of this talk!**

Theory: Relational Contracting

- Essentials:
 - Principal and agent play a fixed contracting game repeatedly
 - Game repeats indefinitely, with discounting of payoffs
 - Efficient ex ante contract choice (maximizing joint surplus)
 - May condition formal contract on verifiable information
 - always adhered to (severe penalties implicit)
 - May condition relationally enforced components on other observable information (nonverifiable)
 - Generally, agent effort observable but unverifiable, principal's payment verifiable
 - Relational contract of the form “adhere to agreed contract until observe the other party deviate, then abandon relational contracting forever” suffices for the analysis
 - can't do better with more sophisticated contracts
 - can be made renegotiation-proof
- For more detail on the canonical model, see Malcomson's chapter (especially section 5) in the *Handbook of Organizational Economics*, section 10.4 in Bolton and Dewatripont's *Contract Theory* text, or Levin's (2003) *AER* paper.

Theory: Bird's-Eye View

- Relational contract is self-enforcing if deviation profits are less than future value of the relationship
 - define v_i^* to be the one-period profit under the relational contract
 - define $v_i^{\text{DEV/FORMAL}}$ to be the best deviation profit in current period
 - define v_i^{OO} to be the outside-option payoff, ie the best you can do if you have to resort to using only formal contracts in the future
- Relational contract is self-enforcing if:
 - $v_i^{\text{DEV/FORMAL}} + \delta/(1-\delta) v_i^{\text{OO}} < v_i^* + \delta/(1-\delta) v_i^*$
 - ...or...
 - $v_i^{\text{DEV/FORMAL}} - v_i^* < \delta/(1-\delta) [v_i^* - v_i^{\text{OO}}]$
- Formal contracts can tighten or loosen this constraint through changes in $v_i^{\text{DEV/FORMAL}}$ and v_i^{OO}

Simple model 1: effect through outside option

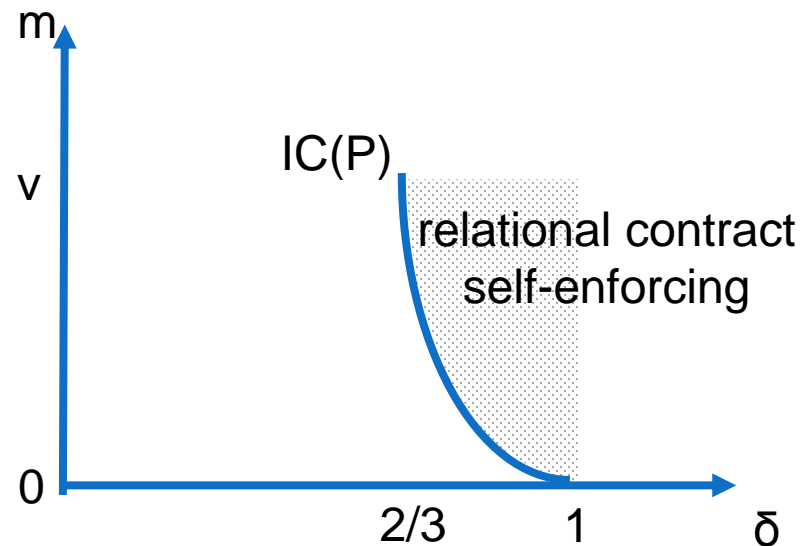
- risk neutral principal and agent
- outside options normalized to zero
- no uncertainty, hidden types, or state dependence
- one task, unverifiable effort = H or L
- effort = H costs agent v
- gross joint value of $3v$ created if effort = H; otherwise, 0
 - surplus net of agent's costs ($3v - v$) equals $2v$
- principal and agent can each invest cost m to make effort observable
- focus on contracts that achieve efficient effort and evenly divide the proceeds (reflecting ex ante symmetric bargaining power)

Simple model 1: effect through outside option

- assume m very large ($m=v$) so that formal contract outside option is worth 0 (ie, not worth setting up formal contracting)
- for discount factor δ large enough, efficient investment can be sustained through the following relational contract
 - principal will pay agent $2v$ (its cost plus half of the surplus) if agent exerts high effort (both parties obtain net surplus v)
- incentive constraint (agent): getting v now and forever better than saving effort cost v this period (but losing the promised payment $2v$ too) and reverting to $v-m=0$ forever
 - obviously holds; no gain even in short run
- incentive constraint (principal): getting v now and forever better than saving payment of $2v$ now and reverting to $v-m=0$ forever
 - holds for δ large enough ($\delta > 2/3$)

Simple model 1: effect through outside option

- BUT, as it becomes cheaper to write and enforce a formal contract (m falls), the principal is more and more tempted to grab the $2v$ (renege on the payment to the agent) and settle for $v-m$ forever (as this becomes more attractive)



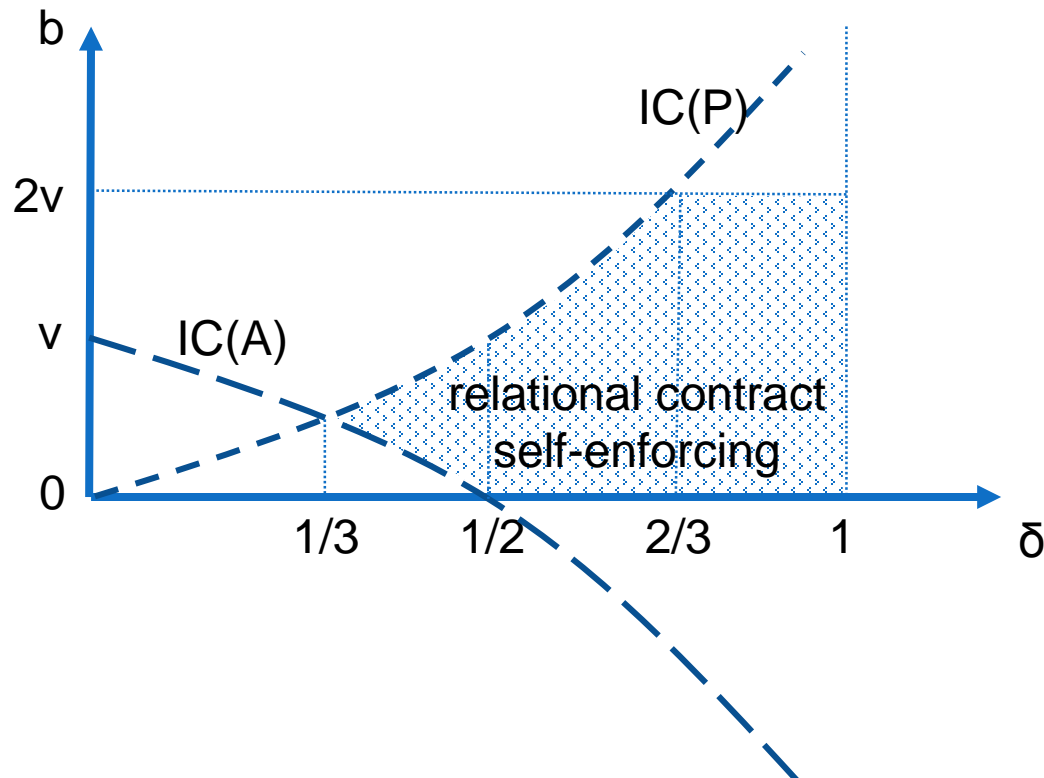
- ie, a strong formal contracting environment can undermine the existence of self-enforcing relational contracts
 - one contracting form **substitutes** for the other

Simple model 2: effect through limiting deviations

- now forget about possibility of making effort verifiable
- instead, focus on a verifiable payment to agent
 - principal can formally contract to make unconditional payment of w
 - principal can relationally contract to make conditional payment of b
- both types of contracts can live side by side
 - recall problem is principal's incentive constraint $IC(P)$; principal tempted to renege on payment
 - recall agent incentive constraint $IC(A)$ had slack (conditional payment of $2v$ offered to cover v in incremental costs)
 - by shifting some payment from bonus (relational contract) to wage (formal contract), can relax $IC(P)$ without violating $IC(A)$

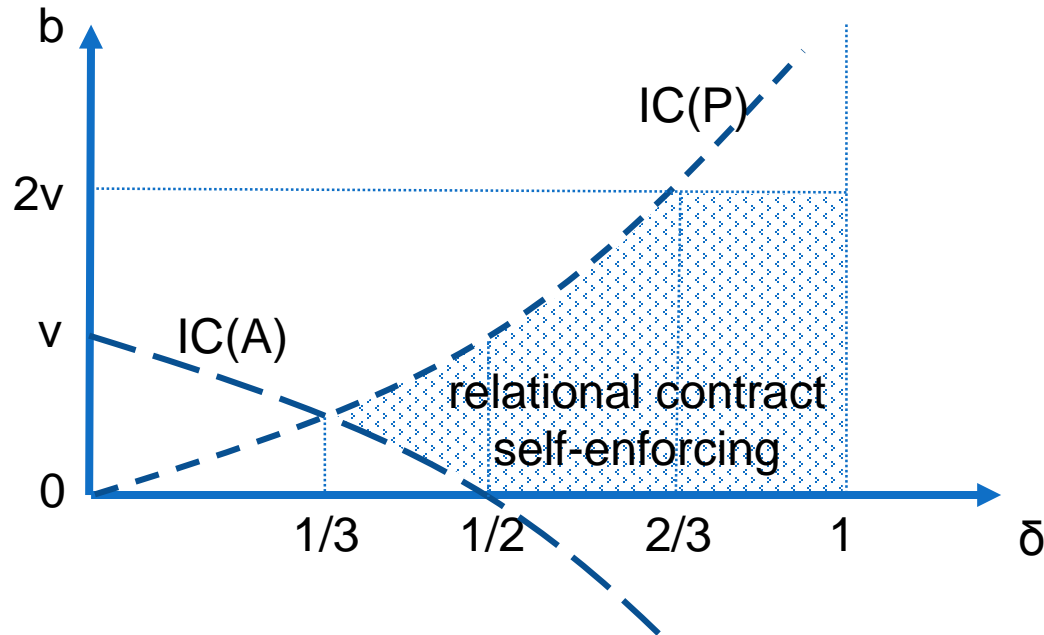
Simple model 2: effect through limiting deviations

- the trick is
 - to keep **bonus high enough** to induce high effort from agent
 - while keeping **bonus low enough** to keep principal from renegeing
 - while keeping $w+b$ constant to achieve desired surplus division



Simple model 2: effect through limiting deviations

- all-bonus (pure relational) contract works for $\delta > 2/3$ (as before)
- all-wage (pure formal) contract works for $\delta > 1/2$
- but, **MUST** have hybrid contract for $\delta > 1/3$ but $< 1/2$
- formal and relational contracts **complement** each other
 - together they can accomplish what neither can do alone



Simple model 3: effect through multi-task incentives

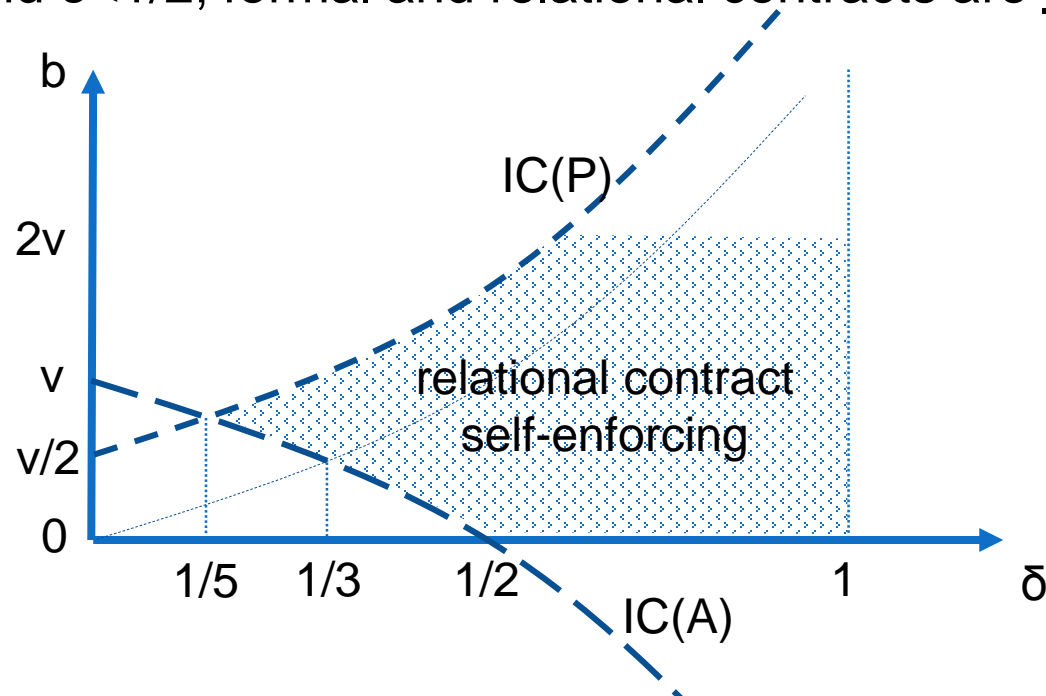
- much of the literature (beginning with the classic 1994 Baker-Gibbons-Murphy *QJE* paper) talk about needing to complement formal contracting on imperfect but verifiable performance measures (think multi-task problems) with relational contracting on more perfect but unverifiable performance measures
- as this model makes clear, this is in effect another case of using formal contracts to take the pressure off the relational contract incentive constraint
 - the formal contract induces some (possibly misguided) effort
 - this relaxes the incentive constraint in the residual agency problem to be solved by the relational contract

Simple model 3: effect through multi-task incentives

- continue with simple model 2, modified as follows:
 - agent has two tasks, H effort on both required to generate surplus
 - one is observable AND verifiable; the other is only observable
 - aggregate effort costs and gross value remain the same
- formal contracting cannot induce efficient effort on the unverifiable task
 - classic multi-task problem
- pure relational contracting on both tasks works as before
 - self-enforcing for δ large enough ($\delta > 2/3$)
- consider a hybrid contract:
 - formally commit to pay some wage AND some bonus conditional on verifiable effort
 - relationally commit to pay an additional bonus conditional on observable but nonverifiable task

Simple model 3: effect through multi-task incentives

- can do better with this hybrid contract
 - formal contract on verifiable task takes care of that task
 - relational contract must induce effort only on the other task
 - a smaller bonus is required, relaxing IC(P)
 - can now support efficient effort for $\delta > 1/5$
 - for $\delta > 1/5$ and $\delta < 1/2$, formal and relational contracts are **complements**



Simple model 4: effect through adaptation/renegotiation

- this theme runs throughout a wide and varied literature
 - formal contracts are necessarily incomplete due to unverifiability or cost of writing complete contracts, so uncontracted contingencies arise *on the equilibrium path*
 - so, formal contracts have
 - pros (provide strong incentives; ensure investment; etc)
 - cons (when uncontracted contingencies arise, these contracts can be inefficiently rigid, lead to costly renegotiation, and be costly to enforce)
 - in a hybrid contracting arrangement, formal contracts can set the ground rules of the interaction, relying on the relational contract to govern outcomes in noncontractible contingencies
 - adaptation to new information
 - renegotiation in light of changes to outside options
 - out-of-court settlement to breach of formal contract

Simple model 4: effect through adaptation/renegotiation

- suppose there are many tasks
 - principal and agent learn which one of them is productive
- agent must incur cost v to exert high effort on some task
 - and an additional tiny cost ε to adapt the effort to the productive task
- aggregate effort across all tasks verifiable
- task-level effort observable, but not verifiable
- formal contract only
 - cannot condition payment on productive task effort
 - therefore cannot induce agent to incur cost ε
- relational contract only
 - agent promises to adapt effort
 - principal promises to pay full bonus conditional on productive effort
 - induces efficient effort for $\delta > 2/3$, as in earlier model

Simple model 4: effect through adaptation/renegotiation

- consider hybrid formal-relational contract
 - agent promises to adapt effort
 - principal formally commits to payment conditional on aggregate effort
- implements efficient effort for all $\delta > 0$; **complements**
 - principal has no incentive to renege (indeed, no opportunity)
 - agent needs promise of future contracting sufficient to induce only the incremental effort cost ε , not the full effort cost v
- formal contract takes pressure off the relational contract
 - relational contracting power therefore sufficient to ensure efficient adaptation of formal contract

A few key theory papers

- pure relational contracting
 - Bull (QJE 1987)
 - Macleod and Malcomson (Econometrica 1989; AER 1998)
- formal and relational contracts
 - Schmidt and Schnitzer (Econ Letters 1995)
 - Pearce and Stachetti (J Law Econ 1998)
 - Levin (AER 2003)
 - Sobel (J Labor Econ 2006)
 - Iossa and Spagnolo (wp 2011)
 - Itoh and Morita (AEJ: Micro 2015)
- formal and relational contracts in multi-task setting
 - Baker, Gibbons, and Murphy (QJE 1994)
 - Daido (Intl Rev Law Econ 2006)
 - Schottner (J Law Econ 2007)
- endogenous formal contract completeness, in light of relational contracting
 - Bernheim and Whinston (Rand 1998)
 - Battigalli and Maggi (Rand 2008)
 - Kvaloy and Olsen (AER 2009)
- formal and relational contracts interact through adaptation/renegotiation
 - Corts (JLEO 2012)
 - Gil (JLEO 2013)

Empirical work

- Empirical work seeking to ask the question, “Are formal and relational contracts complements or substitutes?” faces a number of difficulties.
 - How do you observe/measure the strength of a formal contract?
 - How do you observe/measure the strength/existence of a relational contract?
 - What exogenous variation do you use to drive the “experiment” governing contract choice?
 - ideally, for example, would like to say “transaction A could have been governed by strong formal and/or strong relational contracts, while transaction B had available the same formal contracts but only weak relational contracts; how did choice vary?”
 - ie, **exogenous** variation in **available** contracts
 - we observe only **endogenous** variation in **chosen** contracts
- Nonetheless, such work exists!
 - Gil and Zanarone (JEMS, forthcoming) provides a nice survey of empirical challenges and approaches

A few empirical papers

- Management literature

- tends to focus on complexity and level of detail as characteristics of formal contract
- tends to find complementary relationship (positive correlation)
 - Poppo and Zenger (SMJ 2002): among IT services contractors, more complex formal contracts are associated with greater relational contracting (here, repeated interaction, information sharing, and perceived mutual dependence and trust)
 - Mayer and Argyres (Org Sci 2004): in a single relationship between firms in the personal computer industry, formal contracts become more detailed and complex over time in a way that cannot be explained by characteristics of the transaction
 - Argyres, Bercovitz, and Mayer (Org Sci 2007): at a large IT services provider, repeated contracting is associated with more detailed and complex formal contracts, controlling for other features of the job
 - Zhou, Poppo, Yang (JIBS 2008): among Chinese manufacturing firms, an increase in contracting hazards leads to both more reliance on relational contracting (here, working with partners where survey evidence indicates a sense that the partners share cooperative norms, etc) and more complex formal contracts
 - Ryall and Sampson (Mgt Sci 2009): in joint technology development contracts between telecom companies, repeated prior contracting is associated with more complex formal contracts, though intensity of contemporaneous contracting is associated with less complex formal contracts (comps/subs?)
 - Vanneste and Puranam (Org Sci 2010): in IT services and procurement, contracts more technically complex in presence of repeated contracting (comps)

A few empirical papers

- Economics literature

- considers a variety of characteristics of the formal contract, including contract length, steepness of incentives, level of detail, etc
- results go both ways
 - Banerjee and Duflo (QJE 2000): for Indian software firms, parties engaged in repeated bilateral contracting show no difference in choice of contract type, but more established firms are more likely to have lower powered, more flexible time-and-materials contracts (subs, with hint at importance of *market* reputation)
 - Corts and Singh (JLEO 2003): in offshore drilling industry, parties engaged in repeated contracting opt for lower powered, more flexible cost-plus contracts (subs)
 - Kalnins and Mayer (JLEO 2003): for IT services companies, when parties engage in repeated contracting (intriguingly, only at the local level) they opt for lower powered, more flexible cost-plus contracts (subs)
 - Gil (JLEO 2013): Spanish movie distributors complement informal contracts with formal contracts in addition when contracting hazards higher (comps)
 - Corts and Martinez (wp 2018): in the Costa Rican coffee market, parties engaged in repeated contracting opt for longer-term formal contracts (comps)

A few empirical papers

- Economics literature
 - and a related literature not exactly on contract **choice** per se, but rather on effect of relational contracting on formal contracting **outcomes**:
 - Machiavello and Miquel-Florenza (wp 2017): in Costa Rican coffee market, parties engaged in repeated contracting default less on formal contracts (hints at comps)
 - Johnson, Woodruff, and McMillan (JLEO 1999): in formerly communist economies, better court enforceability implies higher repayment rates on credit for newly formed contracting partnerships, but not in established relationships (hints at subs)

LONG TERM CONTRACTS AND REPEATED INTERACTION: EVIDENCE FROM THE COSTA RICAN COFFEE MARKET

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Octavio Martinez (INCAE)

- This working paper is available at:

http://www-2.rotman.utoronto.ca/kenneth.corts/working_papers2.htm

Research Question

- How does the use of long-term contracts interact with relationships established through repeated contracting?
 - Are formal and relational contracting complements or substitutes?
 - When I contract with someone a lot, do I forgo sophisticated formal contracts or am I empowered to use them more effectively?
- We have in mind a hypothesis that falls under “mechanism 4”
 - poor enforceability undermines the effectiveness of long-term formal contracting because the outcomes in the event of uncontracted/unanticipated events are costly and unappealing
 - resolving those situations fairly through repeated contracting restores the appeal of long-term formal contracts

The Costa Rican Coffee Market

- Growers -> Mills -> Exporters -> Roasters
- Mills
 - convert coffee cherries into coffee beans
 - small, local, may be coops
- Exporters
 - buy beans from mills
 - undertake blending/aggregating/branding
 - sell to international roasters and coffee traders
- Data
 - 2007-08 crop year to 2011-12 crop year
 - 12769 contracts; 114 buyers; 197 sellers
 - excluding all contracts involving any firm ever involved in a vertically integrated transaction
 - 8083 contracts; 70 buyers; 179 sellers

Distribution of firm characteristics

- Mills (sellers)
 - 114 to 136 active in a given year
 - on average, a seller signs 18 contracts
 - totaling 519k kg and \$1.4m (average scale of seller, not contract)
 - at the median, a seller signs 7 contracts
 - w/ total values of 92k kg and \$241k (median seller total, not contract)
- Exporters (buyers)
 - 36 to 44 active in a given year
 - on average, a buyer signs 42 contracts
 - totaling 1.2m kg and \$4.6m (average scale of buyer, not contract)
 - at the median, a buyer signs 5 contracts
 - w/ total values of 94k kg and \$387k (median buyer total, not contract)

ICAFFE and the Costa Rican Coffee Market

- ICAFFE is the regulatory body in Costa Rica
 - maintains a common classification scheme
 - 3 “quality” grades (hardness)
 - 8 “types” (geography and climate conditions)
 - 11 “preparations” (defect tolerances)
 - “differentiated” (certification, specific origin, etc)
 - records and reviews *every* transaction in a standard contract form
 - price
 - quantity
 - bean characteristics
 - buyer and seller
 - dates of signing and final delivery
 - contract enforcement is far from perfect
 - breach penalties are weak
 - litigation is costly

Distribution of contract characteristics

- Exporters tend to buy from a varied set of mills under a varied set of contract lengths
 - a seller deals with ___ buyers
 - range = [1, 11]; mean = 3.3; median = 3
 - a buyer deals with ___ sellers
 - range = [1, 57]; mean = 24.9; median = 17
 - a pair contracts with each other ___ times per year
 - excluding pairs that never contract
 - range = [1, 123]; mean = 6.1; median = 2
 - 35% are one-off contracts
 - from signing to final delivery, a contract lasts ___ days
 - range = [0, 1341]; mean = 115; median = 65
 - 25% are essentially spot contracts (a week or shorter)
 - 95% are a year or shorter

Contracting Considerations

- **Exporter**
 - sells to international roasters under a variety of contract lengths
 - processes and delivers beans to fulfill these contracts
 - manages purchases and inventories of beans
 - develops specific blends (of differentiated beans) that support branding investments of international roasters
- **Key contracting concerns**
 - ensure ample ongoing supply to avoid stock-out risk
 - avoid accumulating costly excess inventory
 - hedge or arbitrage future prices
 - protect against holdup in presence of specific investments, especially with respect to differentiated blends

Contracting Considerations

- Long-term contracting may be valuable
 - especially in differentiated beans
- However, it is imperfect
 - incompleteness and inflexibility lead to costly and inefficient renegotiation
 - enforceability is imperfect and costly
- When contract repeatedly,
 - solve the contracting problem with relational contracting directly (ie, in lieu of formal contracts), or
 - use formal long-term contracting, where enforceability is supported by the relational contract?
 - Machiavello and Miquel-Florensa (wp 2017) show that partners who contract repeatedly default less often on formal contracts
 - $\frac{1}{4}$ as often; takes 10x the price shock to induce default

Empirical Questions

- Focus is on contract choice with repeated contracting.
 - Martinez focuses on static contract choice (buyer and commodity characteristics).
 - firms with more differentiated positions use longer-term contracts
 - Machiavello and Miguel-Florensa focus on effect of contract choice.
 - firms in repeated contracting relationships abide more fully with terms of long-term contracts
- Do repeated relationships lead to longer contracts?
 - first, do they correlate?
 - second, does this persist when identified by exogenous variation?
- If yes, is this especially true for high-hazard contracts?
 - is coefficient on relationship higher for differentiated bean contracts?

Identification Issues: Endogenous Matching

- Endogenous matching
 - well-known in literature: particularly high-risk transactions may be governed by *strongest contracts* and conducted with *most reliable* (eg, frequent) trading partner
 - spurious correlation of partner and contract characteristics
 - want drivers of contracting frequency not related to unobservable transaction/bean characteristics
 - addressed by looking at cross effects between bean types
 - frequency of contracting in, eg, standard beans should not affect LTC use in differentiated beans due to unobservable characteristics of differentiated bean transactions
 - addressed by instrumenting for intensity of relationship
 - characteristics of potential matches in close proximity in product space
 - intensity of the relationship with the *chosen* trading partner can be IV'd with the average intensity of relationship with *potential* trading partners active in this product space

Identification Issues: Endogenous Matching

- eg, a specialized bean is especially subject to hold up, so I choose *both* to use LTC *and* to buy it only (and frequently) from the most reputable seller

$$\begin{aligned}
 L_{ijk} = & \quad (\text{contract length}) \\
 & X_k + \quad (\text{transaction characteristics}) \\
 & B_i + \quad (\text{buyer characteristics}) \\
 & S_j + \quad (\text{seller characteristics}) \\
 & R_{ijk} + \quad (\text{pair characteristics; eg, relationship}) \\
 & u_{ijk} \quad (\text{error}) \\
 R_{ijk} = & X_k + B_i + L_{ijk} + v_{ijk}
 \end{aligned}$$

- problems:
 - jointly determined/endogenous
 - in particular, unobservable transaction characteristics are in u_{ijk} and v_{ijk}
- goal:
 - instrument for R_{ij} with exogenous determinants/proxies based on characteristics of potential trading partners

Identification Issues: Endogenous Matching

- Potential-partner IV—details
 - for each particular contract, identify potential sellers
 - any seller who is party to 1 or more contracts in this exact bean category (same type, quality, preparation, differentiation)
 - for buyer in this contract, compute the number of contracts or the volume of contracts that this buyer had with each of these sellers
 - average this relationship measure across those potential sellers to get the instrumental variable reflecting the average relationship characteristics of the potential sellers
 - use this to IV for the relationship characteristics of the chosen seller—ie, of the actual observed match

Empirical model

- All specifications regress $\log(\text{contract duration})$ on:
 - buyer-year FEs
 - quality, preparation, and type FEs
 - contract volume
 - a measure of seller scale (except when seller FEs included)
- The measure of repeated contracting is measured as:
 - count of contracts between a buyer-seller pair (within a year)
 - aggregate volume of all contracts between the pair (within a year)
- When volume is used:
 - seller scale is also measured by volume
 - seller scale and the aggregate pair volume measure both logged

Table 2: Main Effect

Sample: Full

Dependent Variable: Log (contract days +1)

Identification Relationship Measure	OLS		IV lags		IV potential partner	
	Count	Volume	Count	Volume	Count	Volume
Column	i	ii	iii	iv	v	vi
differentiated	0.0062	0.0385	-0.0734	-0.0396	-0.0023	0.0212
	0.0572	0.0572	0.0688	0.0693	0.0592	0.0676
pair's total contracts	0.0079**		0.0131**		0.0079**	
	0.0012		0.0021		0.0028	
pair's total volume (log)		0.2780**		0.2838**		0.2122
		0.0248		0.0605		0.2062

Other controls: seller scale; contract volume; bean characteristic fixed effects; and **buyer-year FEs**

Back-of-Envelope Effect Magnitudes

- Dependent variable is log contract days, so coefficients give % changes.
 - The mean of the dependent variable is around 115 days.
- In the “count” regressions,
 - the mean of the independent variable is around 6 contracts among contracting pairs;
 - around 35% of all pairs have only a “one-off” contract;
 - an intuitive change to consider is going from one-off to the mean—ie, increasing contracting frequency by 5
- In the “volume” regressions,
 - the independent variable is also logged;
 - the coefficient is therefore an elasticity

Table 2: Main Effect

Sample: Full

Dependent Variable: Log (contract days +1)

Identification Relationship Measure	OLS		IV lags		IV potential partner	
	Count	Volume	Count	Volume	Count	Volume
Column	i	ii	iii	iv	v	vi
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pair's total volume (log)		0.2780**		0.2838**		0.2122
		0.0248		0.0605		0.2062

An increase of 5 contracts leads to a $5 * 0.008 = 4\%$ increase in contract length, or about $0.04 * 115 = 5$ days.

An increase of 10% in bilateral contract volume leads to a 2% increase in contract length.

Table 3: Interaction Effect

Sample: Full

Dependent Variable: Log (contract days +1)

Identification Relationship Measure	OLS		IV lags		IV potential partner	
	Count	Volume	Count	Volume	Count	Volume
Column	i	ii	iii	iv	v	vi
differentiated	-0.0317	-0.0905	0.1499	-0.4492**	-0.0423	-0.2034
	0.0578	0.0644	0.1032	0.1070	0.0611	0.1053
diff X pair's total contracts	0.0159**		0.0264**		0.0224**	
	0.0022		0.0035		0.0061	
std X pair's total contracts	0.0063**		0.0115**		0.0066*	
	0.0012		0.0021		0.0029	
diff X pair's total volume (log)		0.4658**		0.7778**		0.6989**
		0.0497		0.1241		0.2155
std X pair's total volume (log)		0.2463**		0.2306**		0.1994
		0.0258		0.0598		0.2074

Other controls: seller scale; contract volume; bean characteristic fixed effects; and **buyer-year FEs**

Table 3: Interaction Effect

Sample: Full

Dependent Variable: Log (contract days +1)

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	0.0578	0.0644	0.1032	0.1070	0.0611	0.1053
diff X pair's total contracts	0.0159**		0.0264**		0.0224**	
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diff X pair's total volume (log)		0.4658**		0.7778**		0.6989**
		0.0497		0.1241		0.2155
std X pair's total volume (log)		0.2463**		0.2306**		0.1994
		0.0258		0.0598		0.2074

F-test rejects equality of coefficients at 5% or better in 5/6 specifications (and at 10% in the other).

Table 3: Interaction Effect

Sample: Full

Dependent Variable: Log (contract days +1)

Identification Relationship Measure	OLS		IV lags		IV potential partner	
	Count	Volume	Count	Volume	Count	Volume
Column	i	ii	iii	iv	v	vi
differentiated	-0.0317	-0.0905	0.1499	-0.4492**	-0.0423	-0.2034
	0.0578	0.0644	0.1032	0.1070	0.0611	0.1053
diff X pair's total contracts	0.0159**		0.0264**		0.0224**	
	0.0022		0.0035		0.0061	
std X pair's total contracts	0.0063**		0.0115**		0.0066*	
	0.0012		0.0021		0.0029	
diff X pair's total volume (log)		0.4658**		0.7778**		0.6989**
		0.0497		0.1241		0.2155
std X pair's total volume (log)		0.2463**		0.2306**		0.1994
		0.0258		0.0598		0.2074

An increase of 5 contracts (from one-off to mean) leads to increases in average contract length of 4 days for standard beans and 13 days for differentiated beans.

Table 4: Interaction Effect with Seller FEs

Sample: Full

Dependent Variable: Log (contract days +1)

Identification Relationship Measure	IV lags		IV potential partner	
	Count	Volume	Count	Volume
Column	i	ii	iii	iv
differentiated	0.0240	-0.1541	-0.0209	0.4542
	0.1151	0.1462	0.0961	0.2584
diff X pair's total contracts	0.0653**		0.0288**	
	0.0123		0.0083	
std X pair's total contracts	0.0630**		0.0205**	
	0.0133		0.0071	
diff X pair's total volume (log)		0.7804**		2.0802**
		0.1969		0.6417
std X pair's total volume (log)		0.5675**		2.6704**
		0.1618		0.9016

Other controls: seller scale; contract volume; bean characteristic fixed effects; **buyer-year FEs;**
and seller FEs

Table 4: Interaction Effect with Seller FEs

Sample: Full

Dependent Variable: Log (contract days +1)

Identification Relationship Measure	IV lags		IV potential partner	
	Count	Volume	Count	Volume
Column	i	ii	iii	iv
differentiated	0.0240	-0.1541	-0.0209	0.4542
	0.1151	0.1462	0.0961	0.2584
diff X pair's total contracts	0.0653**		0.0288**	
	0.0123		0.0083	
std X pair's total contracts	0.0630**		0.0205**	
	0.0133		0.0071	
diff X pair's total volume (log)		0.7804**		2.0802**
		0.1969		0.6417
std X pair's total volume (log)		0.5675**		2.6704**
		0.1618		0.9016

Other controls: seller scale; contract volume; bean characteristic fixed effects; **buyer-year FEs**; **and seller FEs**

Table 4: Interaction Effect with Seller FEs

Sample: Full

Dependent Variable: Log (contract days +1)

Identification Relationship Measure	IV lags		IV potential partner	
	Count	Volume	Count	Volume
Column	i	ii	iii	iv
differentiated	0.0240	-0.1541	-0.0209	0.4542
	0.1151	0.1462	0.0961	0.2584
diff X pair's total contracts	2.5x 0.0653**		1.3x 0.0288**	
	0.0123		0.0083	
std X pair's total contracts	5.5x 0.0630**		3x 0.0205**	
	0.0133		0.0071	

Tentatively, seems that controlling with seller FEs mitigates effect of some very large firms that do a lot of spot market transactions, which had pulled down effect for standard bean contracts. With FEs, evident that for firms in general, effect in standard beans is just as big. (More work to do here!)

Table 5: Cross-Effects by Bean Type

Dependent Variable: Log (contract days +1)

Relationship Measure: Count

Identification	OLS		IV lags		IV potential partner	
	Differentiated	Standard	Differentiated	Standard	Differentiated	Standard
Sample						
Column	i	ii	iii	iv	v	vi
pair's diff contracts	0.0114*	0.0111**	0.0263**	0.0069	-0.0056	0.0271**
	0.0050	0.0039	0.0101	0.0062	0.0209	0.0100
pair's std contracts	0.0438**	0.0054**	0.0655**	0.0127**	0.0182	0.0082*
	0.0060	0.0014	0.0095	0.0022	0.0199	0.0033

Other controls: seller scale; contract volume; bean characteristic fixed effects; and **buyer-year FEs**

Summary of Evidence

- Are longer contracts used for contracting partners with a more intensive trading relationship?
 - yes; robust to various IVs and FEs
- Are differentiated bean contracts more responsive to intensity of relationship?
 - maybe; robust to both IVs but not to inclusion of seller FEs
- Are longer contracts used in one bean type for contracting partners with a more intensive relationship in the other bean type?
 - yes; true in OLS and most of the time in IVs
- Evidence that repeated interaction and long-term contracting are complements
 - formal contract enforceability benefits from implicit contract/repeated relationship

Interaction of Formal and Relational Contracts

- A fascinating and relevant subject
 - no doubt important in the world; every formal contract happens in a social and relational context
- Theory literature is rich
 - but the ideas are not as complex or inaccessible as they first seem
- Empirical work is hard (but isn't it always)
 - there are workable identification strategies available
- I hope this talk gives you confidence to navigate this topic
 - If you are thinking about formal contracts, at least consider the implications of relational contracting that may be going on in the background
 - If you are thinking about relational contracting, at least consider what formal contracts the parties are or could be signing
- because economic relationships are rarely governed entirely by only one or the other of these modes of contracting