

Relational Contracts in Agriculture: Theory and Evidence

Jeffrey D. Michler¹, and Steven Y. Wu²

¹Department of Agricultural and Resource Economics, University of Arizona,
Tucson, Arizona, U.S.A., 85721-0078, email: jdmichler@email.arizona.edu

²(Corresponding Author) Department of Agricultural Economics, Purdue
University, West Lafayette, Indiana, U.S.A., 47907, email: sywu@purdue.edu;

Xxxx. Xxx. Xxx. Xxx. Yyyy. Aa:1–16

[https://doi.org/10.1146/\(\(please add article doi\)\)](https://doi.org/10.1146/((please add article doi)))

Copyright © Yyyy by Annual Reviews.
All rights reserved

Keywords

relational contracts, agricultural contracts, incentives, trust, repeated games

Abstract

We provide an appraisal of the current status of relational contract theory, along with associated empirical studies, with the goal of providing an orientation to the field to economists who may not have expertise in contract theory. We begin with a theoretical discussion focusing mainly on intuition and the usefulness of the theory for conceptualizing applied agricultural contracting problems. We also discuss current theoretical challenges and the current state of empirical work on relational contracts. We conclude the article by discussing potentially fruitful areas for future research.

Contents

1. INTRODUCTION	2
2. AN OVERVIEW AND THEORETICAL DEVELOPMENTS	3
3. EMPIRICAL RESEARCH ON RELATIONAL CONTRACTS	6
4. TESTS OF RELATIONAL CONTRACT THEORY	7
4.1. THE VALUE OF THE RELATIONSHIP	7
4.2. THE INTERACTION BETWEEN RELATIONAL AND FORMAL CONTRACTS	8
4.3. LIMITS OF RELATIONAL-BASED GOVERNANCE	9
4.4. UNTESTED HYPOTHESES	10
5. CASE STUDIES OF RELATIONAL CONTRACTS	10
6. CONCLUSION	12

1. INTRODUCTION

Contract agriculture has become increasingly important over the last several decades (MacDonald and Burns 2019; Vassalos 2015). For instance, contracts govern close to 90 percent of the value of production in tobacco and poultry. Moreover, according to the Agricultural Marketing Resource Center (AgMRC), 99 percent of all processed tomatoes are sold under contract. Contracts are also important mechanisms for facilitating the production and/or marketing of livestock, speciality field crops, and fruits and vegetables (MacDonald 2015).¹ Outside the U.S., contract farming has been increasingly seen as a means by which the welfare of poor rural farmers can be improved (Bellemare and Bloem 2018). The rationale is that contract farming can connect farmers with buyers, reduce uncertainty in prices and demand, provide risk sharing against natural disasters and climate related shocks, and in some cases, provide access to inputs and financing (FAO 2017).

While contracts are playing an increasingly important role in both domestic and international agriculture, the academic study of applied contracting problems tends to be fragmented where researchers sometimes do not distinguish between formal, legalistic contracts and informal agreements that are not codified in a written contract. Much of the core theory that is taught in graduate programs in agricultural economics tends to provide only cursory coverage of the textbook principal-agent model, which is based on the implicit assumption that the buyer (principal) and the seller (agent) trade once and rely on a perfect legal system to enforce a formal contract. However, the situation can be much more complex in practice, where formal contracts are incomplete in the sense that not all important obligations or performance metrics are documented in a written agreement.² Instead, contracting parties may buttress the incomplete formal contracts with informal agreements to fill any gaps in obligations or performance. Informal agreements provide the parties with flexibility, save on transactions costs of drafting detailed contracts, are not limited to performance evaluation based only on objectively measurable outcomes, and can be effective even in environments where the institutions for verifying and enforcing agreements are corrupt or incomplete. As such, informal agreements are prevalent in both developed and developing countries. Within the academic literature, informal agreements are often called *relational contracts*.

The purpose of this paper is to provide an appraisal of the current status of relational contract theory, along with empirical evidence that may or may not support the theory. We try to focus on the most important advancements rather than provide a comprehensive coverage of the entire field. Our hope is that

¹MacDonald points out that the USDA ARMS survey questionnaires define contracts as agreements reached before harvest, or before the end of a production cycle for livestock. These agreements also specify a commodity, a compensation scheme and a buyer. Agreements reached after harvest are treated instead as cash sales.

²In email communication with Jim MacDonald, it was pointed out that USDA surveys try to capture informal contracts. Quoting directly, “We train our enumerators to probe as to whether there is a penalty for failing to fulfill the terms of an agreement. The penalty can be loss of future business, or a rejection of the delivered commodity, or a deduction from the payment. If the producer perceives a potential penalty for failure to fulfill an agreement, then we would regard that agreement as a contract, even if it is informal. Similarly, the “before harvest” criterion is there to give a clean guidance to our enumerators (and to our own reporting).”

our coverage is sufficient to provide an orientation to the field for economists who do not necessarily have expertise in contract theory.

In the next section, we provide an overview of theoretical concepts and discuss some recent theoretical developments. Following this section, we provide an overview of empirical research in contract theory. We discuss empirical research that specifically tests the predictions of relational contract theory. Subsequently, we survey some case studies of relational contracts. We conclude the paper in the final section.

2. AN OVERVIEW AND THEORETICAL DEVELOPMENTS

Broadly speaking, relational contracts are informal agreements that are self-enforcing via repeat trading.³ Repeat trading allows for the possibility of inter-temporal incentives; i.e. short-term opportunistic behavior can be disciplined by the expectation of future rewards or punishments. When future rewards and punishments are credible, in the sense that it is a game-theoretic equilibrium to reward or punish, then an informal agreement is self-enforcing.

Relational contracts need not be completely informal – the agreement can consist of some formal, legally enforceable obligations combined with informal elements or tacit understandings that are layered on top of the formal contract. For example, some transactions between processors and farmers may involve a written contract that specifies payments per unit, quality or quantity obligations, and reject standards. However, it is often the case that the written contract acts only as a “floor” where the parties have the discretion to make payments that exceed the written payments in order to reward unusually high performers or respond to changing market conditions. The buyer may also accept delivery of some shipments even if they fall below written reject standards in order to reward unusually high performing producers or as remediation for excellent past performance. Another advantage of informal agreements is that they enable the trading parties to be flexible. For example, the timing of deliveries may change due to seasonal factors or market conditions.

In terms of modeling, relational contract theory relies heavily on contract theory and the theory of repeated games. With regard to contract theory, the standard textbook principal-agent model of contracting is based on the implicit assumption that there exists a third-party that can perfectly verify performance. Verifiability makes it possible for a court to enforce the contract. For example, in the standard principal agent model of moral hazard, the principal contracts for an output, q , which affects the principal’s revenue.⁴ The variable, q , is stochastically related to the agent’s effort, e , via the probability function $f(q|e)$. Although effort is unobservable to anyone but the agent, it is assumed that q is publicly observable so that any contract that conditions payments on q can be legally enforced. However, in the world of relational contracts, q is no longer assumed to be third-party verifiable, although the principal and the agent can still observe q . Thus, q is assumed to be “insider” information – i.e., highly specialized information that is only known to the buyer and producer but not to outsiders.

Practical examples of insider information include specialized knowledge, or knowledge that can only be gained by closely working with someone such as innovativeness, flexibility, diligence, care, teamwork, etc. This type of information is very difficult to measure or describe with enough precision to include in a legalistic contract, though insiders often know it when they see it. As such, relational contracts have far greater practical applicability than the textbook model that assumes that q must be third-party verifiable. The set of q that can be measured and described with precision is a relatively small set when considering the universe of performance factors that traders care about.

While relational contracts expand the set of modeling possibilities, they can be more difficult to model conceptually as they rely on the theory of repeated games. A repeated game is a game where some basic game (i.e., the stage-game) is repeated a number of times and the structure of the game does not change from

³Formal contracts are legally or third-party enforced.

⁴Think of q as something that the agent produces that is of value to the principal. The most obvious example would be the number of units of a product, but it can encapsulate a number of factors that affects the principal’s revenue.

period-to-period. The study of repeated games, particularly the interplay between theory and actual behavior, has been one of the most active areas of research in general economics in recent years. A canonical repeated game is one where the stage-game is the simple 2x2 Prisoner’s Dilemma and the game is repeated an indefinite number of times. A standard prediction is that, if the discount factor is sufficiently high (i.e., players place a large value on future payoffs), then an equilibrium exists in the repeated game where the players cooperate rather than defect. This contrasts the one-shot Prisoner’s Dilemma game where defect is the unique equilibrium. A number of researchers have conducted laboratory experiments to test predictions from repeated game theory, including but not limited to work by [Fudenberg et al. \(2012\)](#), [Breitmoser \(2015\)](#), [Dal Bó and Fréchette \(2011\)](#), and [Dal Bó and Fréchette \(2018\)](#). The main lessons from these experiments are that (1) punishments for non-cooperation in repeated games are complicated and often deviate from theory; and (2) strategic uncertainty is important in that, even if the discount factor is theoretically high enough to sustain cooperation, people may not cooperate if a cooperative equilibrium is also not risk dominant.⁵

The primary difference between relational contracts and standard repeated game theory is that, because contract structure is endogenous to the principal, the stage-game of a repeated contracting problem resembles a mechanism design problem where the game structure need not be exogenous. This then expands the set of equilibrium possibilities which increases complexity. Given that the study of repeated games is still evolving and relational contract theory expands the set of equilibrium paths even further, there is considerable scope for future theoretical and applied work.

[Telser \(1980\)](#) and [Klein and Leffler \(1981\)](#) were the first formal papers on relational contracts. Both papers show that intertemporal incentives can discipline behavior even in the absence of third-party enforcement. The next wave of theoretical advancements focused on the optimal structure of relational contracts and the interaction between formal and informal contracts ([MacLeod and Malcomson 1989](#); [Baker et al. 1994](#); [Schmitz and Schnitzer 1995](#); [Bernheim and Whinston 1998](#)). For example, the paper by [MacLeod and Malcomson \(1989\)](#) suggests that the optimal relational contract can take a variety of forms, ranging from high fixed price contracts to discretionary bonus contracts. The next major development involved incorporating asymmetric information considerations such as moral hazard and adverse selection. [Levin \(2003\)](#) examines optimal relational contracts under moral hazard, adverse selection, and subjective performance evaluation where the principal and agent can disagree about the value of q . One important point Levin makes is that relationship termination is usually not the most efficient punishment unless there is subjective performance evaluation.

There are also several survey articles that discuss relational contracts in detail. The paper by [MacLeod \(2007\)](#) discusses how relational contract theory rationalizes observed trading mechanisms. The overview paper by [Gil and Zangarone \(2018\)](#) reviews mostly empirical work. [Aghion and Holden \(2011\)](#) provide an overview of incomplete contracts and refer to relational contracts as part of “second generation” models of incomplete contracts.

We now introduce a parsimonious model that dispenses with unnecessary details to illustrate the basics of how to formalize a relational contract. Our presentation draws heavily on the work of [Levin \(2003\)](#). Notationally, we retain the use of q , which we generically refer to as “output.” Output is stochastically related to the agent’s effort, e , via the conditional density $f(q|e)$ for $q \in [q_1, \dots, q_n] = Q$ where $q_1 < \dots < q_n$ and $e \in E \subset \mathbb{R}$. The associated cumulative distribution function is $F(q|e)$. We assume that the distribution function satisfies the well known monotone likelihood ratio property (MLRP) and convexity of the distribution function condition (CDFC) to ensure that the agent’s first order condition can be used as an incentive compatibility constraint for moral hazard problems ([Rogerson 1985](#)). Roughly speaking, MLRP suggests that the difference in conditional probability of q under high effort versus low effort should be increasing in q . In other words, the likelihood of observing higher q should be increasing in effort. CDFC roughly suggests that increasing effort has a positive but decreasing marginal impact on the probability of

⁵A non-cooperative equilibrium can be risk dominant if it is the “safe” equilibrium. For example, in a 2x2 coordination game, it may be very risky for a player to try to cooperate on the Pareto dominant equilibrium because if the other player does not cooperate, the player might suffer large losses. In this case, the players might settle on the non-Pareto dominant equilibrium where potential losses from non-coordination are minimized. The non-Pareto dominant equilibrium is then the risk dominant equilibrium.

high q . The agent's cost function is $c(e)$ that is increasing and convex in effort. For simplicity, we assume that output, q is also the principal's revenue.

The principal and agent can trade in each period $t = 0, 1, 2, \dots$. Within any given period (a stage-game), the principal offers a compensation package that includes a fixed price, w_t , along with a contingent payment, $b_t(q_t)$, that is a function of output, q_t . Of course, in a relational contract, the principal and agent potentially interact an indefinite number of periods and hence the discounted payoff stream expressed in per-period averages, at any given date, t , given the discount factor, δ , are, respectively:⁶

$$\Pi_t = (1 - \delta) \sum_{\tau=t}^{\infty} \delta^{\tau-t} E(q_t - w_t - b_t(q_t)) \quad 1.$$

$$U_t = (1 - \delta) \sum_{\tau=t}^{\infty} \delta^{\tau-t} E(w_t + b_t(q_t) - c(e)) \quad 2.$$

Essentially, the principal would like to maximize 1 and the agent would like to maximize 2 in the contractual relationship. However, in the course of a relational contract, there are several potential concerns. First, there might be standard moral hazard problems where the principal cannot observe agent's effort and low effort reduces the likelihood of high output. Second, even if the agent produces high output, no third-party can verify q , which is where a relational contracting departs from standard contracting. The key implication here is that there is no way to formalize the contingent payment $b_t(q_t)$ in a legalistic contract because the principal can always claim that withholding payment was justified due to poor performance. This might erode the agent's incentive to exert high effort. Thus, there must be a way to self-enforce $b_t(q_t)$.

It turns out that extending the generic contract design framework to relational contracts is straightforward – only the addition of a *self-enforcement constraint* is required. The self-enforcement constraint should capture the idea that the principal will not shirk on the promised contingent payment even in the absence of third-party enforcement so long as the future relationship-specific gains are sufficiently high.

To simplify the specification of this constraint, we can focus attention on *stationary contracts*. Levin (2003) shows that when optimal relational contracts exist, then there exists stationary contracts that are optimal so there is no loss of generality from focusing on these contracts. A stationary contract simplifies matters because the principal offers the same w and $b(q)$ in every period and the agent always obeys the same rule in exerting effort. Under a stationary contract and using dynamic programming, the self-enforcement constraint can be characterized in a straightforward manner. Suppose that π^* is the principal's value function under a stationary contract and $\bar{\pi}$ be the principal's reservation payoff, then the self-enforcement constraint for the principal to honor the contingent payment is

$$\frac{\delta}{1 - \delta} [\pi^* - \bar{\pi}] \geq b(q) \quad 3.$$

In words, the future discounted profit from the relational contract must exceed the short term gain from not paying $b(q)$. The cost of imposing this constraint is that it puts a cap on the size of the contingent payment that can be used to motivate the agent. In other words, the smaller the future relationship-specific gains, the smaller the credible bonus. Hence, relatively non-productive relationships (in terms of relationship-specific gains) are harder to sustain because there is greater temptation to renege on the promised contingent pay.

The self-enforcement constraint also has the flexibility of incorporating a warranty or money-back guarantee by the seller. This occurs if $b(q)$ is negative in which case it must be self-enforcing for the agent to return some of the principal's money in the event of subpar performance. Self-enforcement requires that

$$\frac{\delta}{1 - \delta} [u^* - \bar{u}] \geq -b(q) \quad 4.$$

⁶In the game theory literature, it is common to convert a stream of discounted payoffs to per-period averages by multiplying the discounted payoff stream by $(1 - \delta)$. This allows one to conveniently compare payoffs from the repeated game to the stage-game payoffs. See (Gibbons 1992) (page 97) for a detailed discussion.

where u^* is the value function of the agent and \bar{u} the reservation payoff. Bonus contracts tend to be used when most of the surplus goes to the principal, whereas warranty contracts are used when the agent captures most of the surplus. Intuitively, the party with the most to gain from the relationship tends to have the most slack self-enforcement constraint.

With the self-enforcement constraint in hand, the contract design problem can proceed in the usual textbook manner where the principal designs a contract by optimizing her objective function (in this case, her Bellman equation) with respect to w , $b(q)$, and e subject to the participation and moral hazard incentive compatibility constraint. The only difference is that a relational contract also requires the self-enforcement constraints 3 and 4. We refer the reader to [Levin \(2003\)](#) or [Bolton and Dewatripont \(2005\)](#) for mathematical details of how to set up a relational contract design problem.

One of the most important implications of relational contract theory is that it can formalize the idea that increasing trust can make relationships more productive. To understand this, note that one of the roles of the contingent payment $b(q)$ is to provide performance incentives to the agent to exert high effort. However, $b(q)$ is only credible if it satisfies the self-enforcement constraints 3 and 4. Notice that the slack in these constraints is largely determined by the amount of relationship-specific profits/surplus that the parties can earn from continuing with the relationship. That is, the higher the value that the parties place on contracting with the specific trading partner, the more relaxed these constraints become making it possible for the parties to credibly promise large contingent payments. This in turn, makes it possible to incentivize higher effort. Thus, the cultivation of trust or other relationship enhancing activities makes it possible for the contracting partners to implement more productive contracting activities. If relationship-specific gains from trade are insufficiently high, then only small contingent payments can be credibly promised making it difficult to induce high effort from the agent.

In contrast, a one-shot legalistic contract is not bound by self-enforcement constraints so trust and relationship do not affect the productivity of a contractual relationship. Thus, relational contracts can capture many stylized features of real world contracts that often involve informal elements, repeat trading, and cultivation of trust and social ties.

3. EMPIRICAL RESEARCH ON RELATIONAL CONTRACTS

There is a voluminous empirical literature on agricultural contracts, though rigorous studies that test theory are relatively few. Recent years have seen several reviews of the empirical literature ([Bellemare and Bloem 2018](#); [Gil and Zanarone 2018](#); [Otsuka et al. 2016](#); [Ton et al. 2018](#); [Wang et al. 2014](#)) and the message from all of these studies is that we still lack a consistent body of quality evidence regarding the role of relational contracts in agriculture.

To date there have only been a handful of randomized control trials (RCTs) that induce exogenous variation in the terms of farm contracts. [Ashraf et al. \(2009\)](#) randomize access to marketing contracts among French bean farmers in Kenya in order to evaluate the effectiveness of an NGO's services. [Saenger et al. \(2014\)](#) randomize access to third-party verification of product quality among diary farmers in Vietnam to determine the effects of asymmetric information on investment. [Casaburi and Willis \(2018\)](#) randomize the timing of insurance premium payments made by sugarcane farmers in Kenya in order to explore the effects of making transfers across time versus state. [Burchardi et al. \(2019\)](#) randomize the percentage of output farmers in Uganda retain in their sharecropping contracts in order to explore the role of moral hazard in low productivity outcomes. Finally, [Arouna et al. \(2019\)](#) randomize the terms of production contracts for rice farmers in Benin in order to discover the proximate causes of low agricultural productivity. It is important to note that all of these studies involve written, formal contracts. In fact, to our knowledge, there is only one RCT that studies relational contracts: [Bubb et al. \(2018\)](#), which we discuss in detail below.

The empirical literature that exists on relational contracts in agriculture tends to be interested in either the reasons for participation in farm contracts or the welfare impacts of contract participation. Rarely does this literature explore the differential effects of variation in the terms of the contracts. In fact, most empirical work on relational contracts seems to be ignorant of or uninterested in the relational aspects of the contracts. The studies tend to take place in developing countries where contracts are verbal and third-party

enforcement rare or non-existent. Yet very few of these studies acknowledge that the contracts in question are relational, relying on self-enforcement through repeat trading, and instead treat the contracts as if they were formal and enforceable by third-parties. The empirical literature that explicitly tests relational contract theory in an agriculture setting is sparse.

4. TESTS OF RELATIONAL CONTRACT THEORY

The relatively few studies that seek to empirically test relational contract theory have focused on three major theoretical predictions. The first is that the value of the contracting relationship in the future determines the terms of the present contract (MacLeod and Malcolmson (1989) or Halac (2012)). The second is that relational and formal contracts can co-exist and when they do they often interact in interesting ways (Baker et al. 1994, 2002). Finally, there are some papers that examine the limits of relational contracting and how institutional or enforcement limits affect relational contracting. We discuss each of these insights in turn and conclude this section with an outline of theoretical insights for which empirical evidence is still missing.

4.1. THE VALUE OF THE RELATIONSHIP

As discussed in the theory section, for relational contracts to be self-enforcing it must be the case that the future discounted relationship-specific surplus from the contract must exceed the short term gain from breach. Thus, the more valuable the relationship, the less likely it is for one party to defect or default on the terms of the contract.

Several papers have tested these ideas. The earliest is Beckmann and Boger (2004), who investigate the role of courts in enforcing contracts in Poland during the post-communist transition. The authors develop a simple theoretical model in which the costs of third-party enforcement of formal contracts are variable, matching the setting of political transition in the 1990s. They then test their model using data on hog production contracts. The authors find that the enforceability of relational contracts is positively correlated with the value of the relationship. The more valuable the business relationship, the more willing each party is to accept losses in the short term.

While Beckmann and Boger (2004) provide early evidence on the value of the relationship, their analysis is based on cross-sectional data and lacks exogenous variation in its variables of interest. Two recent studies have used plausibly exogenous shocks to causally identify the role of relationship value in contracts. Macchiavello and Morjaria (2015) study relational contracts in the cut flower industry in Kenya. An intense episode of ethnic violence, relating to national elections, occurred during their period of study. This violence provides an exogenous supply shock, allowing the authors to examine how relationships respond to the crisis. Macchiavello and Morjaria (2015) find that 1) the value of the relationship increases with the age of the relationship and 2) during the supply shock deliveries are an inverted-U shaped function of the age of the relationship. For suppliers with a newly formed relationship at the time of the violence, the continuation value of the contract was low. Therefore, these suppliers stopped delivering flowers, defaulting on their contracts. Conversely, suppliers with long, well established relationships had extremely high continuation values for their contracts. Yet these firms also stopped delivering flowers. As Macchiavello and Morjaria (2015) show, this is because in the long-term relationships, the suppliers have already established a reputation for reliability, allowing them to forgo deliveries during the period of violence without threatening their relationship. In between these two extremes are suppliers still engaged in the process of establishing their relationship with buyers. These suppliers exerted costly effort to bolster their reputation for reliability, thereby protecting their existing relationships. The authors conclude that, for those who have built a reputation, relational contracts allow for flexibility when a negative shock occurs.

Similar to Macchiavello and Morjaria (2015), Antras and Foley (2015) use an unexpected shock (the Great Recession) to induce variation in their data on trade contracts for an international poultry processor. The processor primarily uses two types of financing for their transactions: cash in advance or open account. The authors show that the processor is more likely to use cash in advance terms to finance transactions with customers in countries with weak contract enforcement. However, as the length of the relationship between the processor and customer increases, the processor is more likely to accept transactions on an open

account. The implication is that in countries where contract enforcement is weak, trade contracts must be self-enforcing. In the early stages of the relationship, the temptation for the customer to default is high, resulting in the processor requiring payment up-front. But as the relationship ages, the continuation value of the contract is greater than the one time gain from default. In these cases the processor is willing to finance transactions on an open account. [Antras and Foley \(2015\)](#) test these ideas by examining changes in contract terms during the Great Recession, in which trade financing was scarce. They find that the longer the relationship, the more flexible the financing terms. This allowed for the maintenance of long-term relationships during the financial crisis.

One additional paper constructs an empirical test that indirectly sheds light on the value of the relationship in informal contracts. [Casaburi and Macchiavello \(2019\)](#) are primarily interested in the role of infrequent payments as a commitment device for Kenyan dairy farmers. They observe that dairy farmers are willing to accept lower prices if the buyer combines many small payments into one lump sum. The authors conduct lab-in-the-field demand and supply experiments that show that infrequent payments are used as a commitment device to save for lumpy expenses. They also show that many buyers lack the reputation necessary to make these infrequent payments to dairy farmers. The implication is that as the value of the relationship grows, dairy farmers trust buyers not to default on the contracts, allowing the farmers to use the infrequent payments as a commitment device.

4.2. THE INTERACTION BETWEEN RELATIONAL AND FORMAL CONTRACTS

A second key insight of the theoretical literature is that relational and formal contracts can co-exist. Typically, even if a relational contract has been established, the formal contract can serve as the implicit default option in the event that the relational contract breaks down. However, whether formal contracts crowd out or complement relational contracts is not clear-cut theoretically. [Baker et al. \(1994\)](#) show that whether formal contracts act as complements or substitutes to relational contracts depends on a number of institutional variables.

Several early empirical papers study relational contracts in settings where formal contracts also exist. [Beckmann and Boger \(2004\)](#) capture the boundary between “enforceable” and “not-enforceable” in Poland. The authors provide econometric evidence to show that actors are more likely to consider court enforcement when 1) the costs of using the legal system are low and 2) when the value of the ongoing relationship is low. As we saw above, when the value of the relationship is large, contracting parties have an incentive to mediate their own dispute in order to preserve that value. What [Beckmann and Boger \(2004\)](#) show is that when the value of the relationship is sufficiently low, parties will fallback on existing formal contracts and seek court mediated resolution, even if this means terminating the relationship. Supporting, but less direct, evidence can be found in [Goodhue \(2000\)](#), which studies broiler production in the United States. In this setting, the long-term relational contract provides the grower with a mechanism to reveal her ability to the processor. At the same time, the short-term explicit contract acts as the default or fallback option in case the implicit contract breaks down. Similarly, [Leegomonchai and Vukina \(2005\)](#) provide descriptive evidence from a setting where explicit contracts act as a floor for implicit contracts. Neither paper provides a test regarding how the two types of contracts interact. Rather, they study incentive effects in the relational contract given that a formal contract exists as a fallback option.

More recently, [Macchiavello and Morjaria \(2019\)](#) examine how competition affects market outcomes when formal contracts are difficult to enforce, and parties resort to relational contracts. Studying contracts between upstream farmers and downstream mills in Rwanda’s coffee industry, [Macchiavello and Morjaria \(2019\)](#) find that relational and formal contracts act as substitutes. In regions of the country with few coffee mills, competition between mills is low, allowing for firms to earn an economic profit. Because of this, the value of a mill’s upstream and downstream relationships is large, allowing for self-enforcement of relational contracts. Conversely, in regions of the country with many coffee mills, competition is more fierce and profits are lower. The authors find that in these regions, mills are less likely to rely on relational contracts. The relational surplus is not sufficient to allow for self-enforcement.

[Michler and Wu \(2019\)](#) study the use of relational and formal contracts to purchase groundwater irriga-

tion in Bangladesh. In this setting, villages vary in the degree to which they provide third-party enforcement of contracts. Some villages provide no enforcement while others provide enforcement with varying degrees of severity in punishment for contract violation. This variation in village-level governance allows [Michler and Wu \(2019\)](#) to examine the conditions under which formal contracts act as substitutes or complements. They find that an increase in the quality of third-party verifiable performance measures decreases the use of relational contracts when enforcement of formal contracts is strong and has the opposite effect when enforcement is weak. The intuition is that, when verifiable performance measures provide quality information on agent action, and contract violations are severe, there is little to be gained by using a relational contract. In this environment, formal contracts substitute for relational contracts. However, in environments with weak enforcement, the high quality performance measure can be used to write formal contracts that act as a complement by establishing a fallback position to relational contracts. Because enforcement is weak, parties prefer to use relational contracts but the floor provided by the formal contract relaxes the self-enforcement constraint. To our knowledge, this is the only empirical evidence of relational and formal contracts acting as both substitutes and complements in the same market.

4.3. LIMITS OF RELATIONAL-BASED GOVERNANCE

The earliest empirical research on relational contracts focused on the value of the informal agreements in settings where information was imperfect and enforcement was costly. But relational contracts are only second best outcomes compared to what formal contracts can achieve in a world of perfect information and costless enforcement. The last couple of years has seen a small flurry of research that measures the costs of relying on relational contracts when compared to the first best outcomes of complete contracts.

We can generally divide the costs of relational contracting into two types. First is the cost of building a relationship of value. These costs are transitory and dissipate with time. In the [Antras and Foley \(2015\)](#) study, the international poultry processor typically requires new importers located in countries with weak enforcement of contracts to finance transactions through cash in advance payments. Only after numerous transactions will the processor view the relationship as valuable enough to allow for trade on an open account. This period of relationship building limits the amount and size of transactions that the two parties can make. Similarly, [Macchiavello and Miquel-Florensa \(2018\)](#) find that trade volume is lower earlier in a contracting relationship. Studying forward sales contracts in Costa Rican coffee, they find that the size of forward sales supported by long-term relationships is limited because of the temptation to default.

Second is the cost to parties because enforcement is imperfect. As [Michler and Wu \(2019\)](#) show, the types of contracts used in a market are, to a large extent, determined by the governance institutions that exist to enforce contracts. This cost of imperfect enforcement is not transitory but persistent. Several studies have recently documented how varied these costs can be. [Casaburi and Macchiavello \(2019\)](#) show that in their study of diary farmers, the farmers would like to use infrequent payments from milk buyers as a commitment device for savings. However, because of poor contract enforcement, the possibility of strategic default severely limits a buyer's ability to offer infrequent payments. This removes that commitment device from the diary farmer's portfolio of financial management tools. [Blouin and Macchiavello \(2019\)](#) show a similar result in their study of the international coffee market. The authors find that imperfect contract enforcement reduces both the supply and demand for hedging tools, leaving firms in a position where strategic default is their best option. These defaults negatively impact output and efficiency both up stream and down stream in the coffee market.

The costs of imperfect enforcement also warp how markets work and alter how trade is conducted. [Macchiavello and Morjaria \(2019\)](#) find that increased competition can lead to inefficient market outcomes. Relational contracts rely on the continuation value of the contract to ensure self-enforcement, and competition erodes this value, leading to worse outcomes for coffee farmers and mills in Rwanda. An improvement in contract enforcement would allow for competition to effect its disciplining role, increasing efficiency and output, relative to the second-best world. [Giné and Jacoby \(2019\)](#) study groundwater contracts in India where there is a fair degree of uncertainty regarding the supply and demand for irrigation. Because of imperfect enforcement, well owners must trade-off between the ex-post inefficiency of long-term relational contracts

and the ex-ante inefficiency of spot contracts. While long-term contracts are more protective of relationship-specific investment, they are less flexible than spot contracts. Because of the long-term contracts, well owners are not able to efficiently adjust to changes in water level or demand.

A final example of the limits of relation-based governance is [Bubb et al. \(2018\)](#), the first RCT on relational contracts. The authors study relational contracts for groundwater irrigation in villages in India. Using buyer-seller pairs, they randomly offer subsidies of varying sizes to either the buyer or the seller. Crucially, the subsidies are delivered at the end of the growing season, creating a potential recovery issue in the buyer-subsidy treatment. [Bubb et al. \(2018\)](#) find that the cost of future funds recovery undermines mutually beneficial trade. Relative to the seller-subsidy, the buyer-subsidy results in less irrigation and lower crop output. Because parties were unable to perfectly enforce contracts, a substantial amount of surplus was left on the table.

4.4. UNTESTED HYPOTHESES

In several review articles, [Gil and Zanarone \(2017, 2016, 2018\)](#) define the frontiers of empirical research on relational contracting. Along similar lines, [Macchiavello \(2018\)](#) reviews the empirical challenges to studying relational contracts. Each of these studies concludes that, while the empirical literature is growing, there are still numerous untested hypotheses.

Relational contract theory has demonstrated that there are numerous benefits to informal contracting. Many of these have been subject to empirical testing. As this review has demonstrated, there is a small but consistent body of evidence that increasing trust can make relationships more productive and that particularly valuable relationships enable flexibility in accommodating unexpected events. While there is also consistent evidence that formal contracts can act as a floor for relational contracts, there is less evidence on the specific ways relational and formal contracts work as substitutes or complements. There has also been only one test in an agricultural setting of the idea that relational contracts allow for the use of “insider” or high-quality information, thereby increasing surplus and efficiency compared to formal contracts.

Only in the last two years has empirical research turned its focus on the limits and challenges to relational contracts. Most of these recent papers have examined situations in which trade breaks down because the value of relational contracts are too small to remain self-enforcing. While evidence on the breakdown of relational contracts is useful, we still lack evidence from settings in which contracts are self-enforcing but punishments are complicated or cooperation difficult. There is also little concrete evidence regarding the role risk and intertemporal incentives play in disciplining behavior.

The above examples are concerned with testing the implications of standard relational contracting models. [Gil and Zanarone \(2017\)](#) argue that there is even less empirical evidence regarding non-standard models. It would be useful to build a body of evidence regarding relational contracts in situations where liability is limited, information about the value of the relationship is asymmetric, or where principal and agent have different bargaining power. To date, almost all empirical research has investigated contracting relationships between firms. This has left the study of relational contracts within firms unexplored. Given agriculture’s long history of interest in labor and monitoring costs for on-farm production, the use of relational contracts within organizations is a potentially fruitful area of study.

5. CASE STUDIES OF RELATIONAL CONTRACTS

Beyond the dozen or so studies that seek to test implications from models of relational contracts, there are scores of case studies of relational contracts in a variety of settings. Most of these case studies are located in developing countries where legal enforcement is weak. Many of the studies do not even acknowledge that the contracts under investigation are relational and must rely on self-enforcement. We focus on a subset of these that either have strong identification strategies or interesting results. For a more complete review of the case study literature, see [Bellemare and Bloem \(2018\)](#), [Otsuka et al. \(2016\)](#), [Ton et al. \(2018\)](#), and [Wang et al. \(2014\)](#).

[Hayami and Otsuka \(1993\)](#) provide some of the first case studies of contract farming in agriculture. While almost all the contracts they examine are not third-party enforceable, and are therefore relational

contracts, their focus is not on the relational aspects of the agreement. This set-up, of studying relational contracts without paying attention to the elements that make relational contracts unique, remains common today. Both [Hueth et al. \(1999\)](#) and [Drescher \(2000\)](#) provide descriptive studies of agricultural production contracts in California and Germany, respectively. Each paper describes the use of informal contracts that would be difficult or impossible for a third-party to enforce but focus on the non-relational aspects of the contracts. More recently, econometric research on relational contracts has tended to focus on one of three outcomes: how contracts impact farmer welfare, how contracts impact productivity, and how contracts contribute to the modernization of agricultural value chains.

Studies that look at the welfare effects of contract participation on farmers include [Michelson \(2013\)](#), [Macchiavello and Miquel-Florensa \(2019\)](#), [Cahyadi and Waibel \(2016\)](#), and [Barrett et al. \(2012\)](#). [Michelson \(2013\)](#) investigates the welfare impact on farmers in Nicaragua who supply vegetables to Walmart and other supermarkets. Contracts are almost exclusively verbal, relational contracts though supermarkets will offer formal, written contracts to farmer groups or cooperatives. [Michelson \(2013\)](#) finds that participation in contract farming has a positive effect on farmers' asset portfolio. However, results are heterogeneous, with most of the benefits accruing to farmers with advantageous geographic endowments (proximity to major roads). Similarly, [Macchiavello and Miquel-Florensa \(2019\)](#) find positive welfare effects for contract participants among coffee growers in Columbia. [Cahyadi and Waibel \(2016\)](#) study palm oil production in Indonesia where contracts are written but incomplete, failing to set prices, quantities, or stipulate quality grading. The setting is analogous to those discussed in section 4.2, where formal contracts provide a fallback position for relational contracts, though [Cahyadi and Waibel \(2016\)](#) do not discuss this. Rather, the authors focus on poverty outcomes for participants and non-participants. They find that contract farmers are slightly less poor than farmers not under contract, but that contract farmers remain vulnerable to poverty. Finally, [Barrett et al. \(2012\)](#) provide evidence from five countries (Ghana, India, Madagascar, Mozambique, and Nicaragua). In their study, most contracts are verbal (relational), though some farmers had written contracts. The authors document patterns of participation, the welfare gains associated with participation, and reasons for non-participation, though not how these differ between verbal and written contracts. Overall, they find that participation in contract farming tends to have a positive impact on welfare.

Most studies of the impacts of contract farming on production and efficiency focus on formal contracts in industrial agriculture. Yet there are a number of studies that investigate this aspect of contract farming in developing countries, where contracts tend to be relational. Results from these case studies tend to be mixed. [Rao et al. \(2012\)](#) find that vegetable farmers in Kenya who have contracts to supply supermarkets increase their technical efficiency relative to non-contract farmers. [Singh \(2002\)](#) finds the opposite among farmers in Punjab. Farmers producing under contract over invest in fertilizer, lowering their productivity. [Jacoby et al. \(2004\)](#) study interlinked irrigation and land tenancy contracts in Pakistan. Barriers to entry and spatial fragmentation give well owners monopoly power. The authors find well owners do not price discriminate based on tenancy status. The implication is that the type of contract a farmer has with a well owner (irrigation-only or interlinked) does not affect the efficiency or equity of distribution. They do however find that the well owner's monopoly status generates deadweight loss, as in the standard textbook setting. [Aggarwal \(2007\)](#) and [Banerji et al. \(2012\)](#) also study contracting in groundwater markets, though both of their studies are located in India. [Aggarwal \(2007\)](#) compares the role of risk preferences and transaction costs in contract choice. He finds that transaction costs, in the form of a double-sided incentive problem, drives contract choice. Because of the incentive problem, farmers with relational contracts produce below what they could achieve with an ideal, fully-enforceable contract. This outcome differs from what [Banerji et al. \(2012\)](#) find in their study of sugarcane growers. The authors focus on a single village that uses a social contract to price and distribute groundwater for irrigation. They find that the social contract results in a spatially-efficient allocation of water and that social ties allow for enforcement of the agreement, eliminating the market power of well owners.

The final outcome frequently examined in the case study literature is the role contracts play in modernizing the agricultural value chain. While [Schippmann and Qaim \(2011\)](#), who study sweet peppers in Thailand, find that farmers prefer marketing options that do not involve contracts, most studies find farmers willing to accept contracts. This is because contracts are typically viewed as a mechanism to foster agricultural

modernization by relaxing constraints to liquidity, technology, and market access. This is what [Deb and Suri \(2013\)](#) find among pineapple growers in Ghana. The authors show that a change in the mode of shipping (from air to sea) resulted in an increase of both production contracts and cash loans for consumption. [Deb and Suri \(2013\)](#) demonstrate that because of the inability to enforce contracts, pineapple exporters use cash loans to increase the value of the contracting relationship, relaxing the self-enforcement constraint. In [Macchiavello and Miquel-Florensa \(2019\)](#), the authors find that farmers who participate in contract farming are able to upgrade their plantations and expand their land area. This investment in new technology allows farmers to improve the quality of their product and increase their farm gate prices. [Michelson et al. \(2011\)](#), in their study of vegetable production in Nicaragua, find that farms supplying Walmart receive lower mean prices but also have less variance in the price they receive. Contracting with Walmart, as opposed to supplying the traditional market, provides farmers with insurance against price volatility. [Barrett et al. \(2012\)](#) find similar evidence of agricultural modernization in their five country study. However, they note that just because relational contracting is beneficial to most farmers does not mean that all farmers are able to participate. They note a significant amount of contract noncompliance, and considerable churn in the market as farmers and firms enter and exit frequently. The implication is that, while relational contracts can overcome many of the constraints that limit farmer productivity and wealth, limits to relation-based governance remain.

6. CONCLUSION

This paper provides an appraisal of the current status of relational contract theory and associated empirical work. The key points we would like to emphasize are as follows. First, for applied work, relational contract theory is potentially much more useful than standard textbook theory. This is because, in practice, most contractual relationships involve informal elements even when a formal contract exists. The set of performance outcomes that contracting parties typically care about goes well beyond those that can be objectively measured and verified by third-parties. Additionally, when contracting institutions and laws are incomplete, relational contracts still allow people to engage in contractually based trade. Second, relational contract theory is still an evolving field and there are considerable opportunities for scholars to make both methodological and theoretical contributions. Third, rigorous empirical testing of relational contract theory is still in its infancy. Many empirical studies of agricultural contracts fail to distinguish between formal and informal contracts. Even the studies that acknowledge relational aspects of contracts tend to conduct indirect tests of the implications of relational contract theory as opposed to testing precise comparative statics predictions. Yet, this literature has produced some interesting insights that are not part of the explicit theory, such as how durable relationships often provide more options for parties to deal with unfavorable financial shocks.

Going forward, we believe there are several promising areas for research. First, from a contract design perspective, it would be important to understand more systematically how formal contracts interact with informal contracts. In U.S. agriculture, written contracts are fairly common but these contracts typically have gaps in them that are filled by informal agreements. Are the written contracts fallback positions in case a relationship breaks down and therefore complement relational contracts by making it safer to engage in relational contracts? Or do the formal contracts crowd out relational contracts? Second, it would be useful to have more precise tests of theoretical predictions in order to stress test the theory. Theories that survive stress tests can be more externally valid and useful for modeling applied problems ([Cason and Wu 2019](#)). However, more precise tests also require better data which are often unavailable. A promising tool for testing theory is experimental economics where the researcher has control over the structure of the economic environment. Laboratory experiments are particularly well suited for testing general theories because a myriad of interventions and treatments can be incrementally introduced at relatively low cost. Third, there is a curious contradiction in the way agricultural contracts are viewed domestically versus internationally. [Wu and MacDonald \(2015\)](#) point out that farm activists in the U.S. often see contracts as "...mechanisms for exploitation" of growers whereas contracts are often seen as instruments for poverty alleviation by international development agencies and economists ([FAO \(2017\)](#)). Perhaps the disconnect

lies in understanding how contracts interact with market power. Relational contracts in particular, are most effective when there are relationship-specific rents which often exist in the absence of competition. Thus, understanding the industrial organization implications of relational contracting may help bridge the disconnect between the way contracts are viewed in domestic agriculture versus international agriculture.

SUMMARY POINTS

1. Summary point 1. For applied work, relational contract theory is potentially more useful than standard contract theory. In practice, most contractual relationships involve informal and formal elements.
2. Summary point 2. When contracting institutions and laws are incomplete, relational contracts still allow people to engage in contractually based trade.
3. Summary point 3. Relational contract theory is still an evolving field and there are considerable opportunities for scholars to make both methodological and theoretical contributions.
4. Summary point 4. Rigorous empirical testing of relational contract theory is still in its infancy. More empirical work is needed to test relational contract theory.

FUTURE ISSUES

1. Future issue 1. It would be important to understand more systematically how formal contracts interact with informal contracts. In U.S. agriculture, written contracts are fairly common but these contracts typically have gaps in them that are filled by informal agreements. Are the written contracts fallback positions in case a relationship breaks down and therefore complement relational contracts by making it safer to engage in relational contracts? Or do the formal contracts crowd out relational contracts?
2. Future issue 2. It would be useful to have more precise tests of theoretical predictions to stress test the theory. Theories that survive stress tests can be more externally valid and useful for modeling applied problems.
3. Future issue 3. It would be useful to understand the contradiction in the way agricultural contracts are viewed domestically versus internationally. In the U.S., policy makers are often skeptical of contracts for enhancing farmer welfare, whereas international development agencies see contracts as an instrument for farm poverty alleviation.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

ACKNOWLEDGMENTS

Wu gratefully acknowledges financial support from USDA-NIFA HATCH project IND010580.

LITERATURE CITED

- Aggarwal, R. M.
2007. Role of risk sharing and transaction costs in contract choice: Theory and evidence from groundwater contracts. *Journal of Economic Behavior and Organization*, 63(3):475–96.
- Aghion, P. and R. Holden
2011. Incomplete contracts and the theory of the firm: What have we learned over the past 25 years? *The Journal of Economic Perspectives*, 25:181–197.

- Antras, P. and F. Foley
2015. Poultry in motion: a study of international trade finance practices. *Journal of Political Economy* (forthcoming).
- Arouna, A., J. D. Michler, and J. C. Lokossou
2019. Contract farming and rural transformation: Evidence from a field experiment in Benin. NBER Working Paper 25665.
- Ashraf, N., X. Giné, and D. Karlan
2009. Finding missing markets (and a disturbing epilogue): Evidence from an export crop adoption and marketing intervention in Kenya. *American Journal of Agricultural Economics*, 91(4):973–90.
- Baker, G., R. Gibbons, and K. Murphy
1994. Subjective performance measures in optimal incentive contracts. *Quarterly Journal of Economics*, 109:1125–1156.
- Baker, G., R. Gibbons, and K. J. Murphy
2002. Relational contracts and the theory of the firm. *Quarterly Journal of Economics*, 117(1):39–84.
- Banerji, A., J. Meenakshi, and G. Khanna
2012. Social contracts, markets and efficiency: Groundwater irrigation in north India. *Journal of Development Economics*, 98(2):228–237.
- Barrett, C. B., M. E. Bachke, M. F. Bellemare, H. C. Michelson, S. Narayanan, and T. F. Walker
2012. Smallholder participation in contract farming: Comparative evidence from five countries. *World Development*, 40(4):715–30.
- Beckmann, V. and S. Boger
2004. Courts and contract enforcement in transition agriculture: Theory and evidence from Poland. *Agricultural Economics*, 31(2-3):251–63.
- Bellemare, M. F. and J. R. Bloem
2018. Does contract farming improve welfare? a review. *World Development*, 112:259–71.
- Bernheim, B. and M. Whinston
1998. Incomplete contracts and strategic ambiguity. *American Economic Review*, Pp. 902–932.
- Blouin, A. and R. Macchiavello
2019. Strategic default in the international coffee market. *Quarterly Journal of Economics*, 134(2):895–951.
- Bolton, P. and M. Dewatripont
2005. *Contract theory*. MIT press.
- Breitmoser, Y.
2015. Cooperation, but no reciprocity: individual strategies in the repeated prisoner’s dilemma. *American Economic Review*, 105(9):2882–2910.
- Bubb, R., S. Kaur, and S. Mullainathan
2018. The limits of neighborly exchange. Working Paper, UC Berkeley.
- Burchardi, K. B., S. Gulesci, B. Lerva, and M. Sulaiman
2019. Moral hazard: Experimental evidence from tenancy contracts. *Quarterly Journal of Economics*, 134(1):281–347.
- Cahyadi, E. R. and H. Waibel
2016. Contract farming and vulnerability to poverty among oil palm smallholders in indonesia. *Journal of Development Studies*, 52(5):681–95.
- Casaburi, L. and R. Macchiavello
2019. Demand and supply of infrequent payments as a commitment device: Evidence from Kenya. *American Economic Review*, 109(2):523–55.
- Casaburi, L. and J. Willis
2018. Time versus state in insurance: Experimental evidence from contract farming in Kenya. *American Economic Review*, 108(12):3778–813.
- Cason, T. and S. Wu
2019. Subject pools and deception in agricultural and resource economics experiments. *Environmental and Resource Economics*, 73(3):743–758.
- Dal Bó, P. and G. R. Fréchet
2011. The evolution of cooperation in infinitely repeated games: Experimental evidence. *American Economic Review*, 101(1):411–29.
- Dal Bó, P. and G. R. Fréchet
2018. On the determinants of cooperation in infinitely repeated games: A survey. *Journal of Economic Literature*,

- 56(1):60–114.
- Deb, R. and T. Suri
2013. Endogenous emergence of credit markets: Contracting in response to a new technology in Ghana. *Journal of Development Economics*, 101:268–83.
- Drescher, K.
2000. Assessing aspects of agricultural contracts: An application to German agriculture. *Agribusiness*, 16(4):685–98.
- FAO
2017. Contract farming and the law: What do farmers need to know? <http://www.fao.org/3/a-i7581e.pdf>. (Accessed on 09/06/2019).
- Fudenberg, D., D. G. Rand, and A. Dreber
2012. Slow to anger and fast to forgive: Cooperation in an uncertain world. *American Economic Review*, 102(2):720–49.
- Gibbons, R.
1992. *Game theory for applied economists*. Princeton University Press.
- Gil, R. and G. Zanmarone
2016. New frontiers in the empirical research on informal contracting. *Journal of Institutional and Theoretical Economics*, 172(2):390–407.
- Gil, R. and G. Zanmarone
2017. Formal and informal contracting: Theory and evidence. *Annual Review of Law and Social Science*, 13:141–59.
- Gil, R. and G. Zanmarone
2018. On the determinants and consequences of informal contracting. *Journal of Economics and Management Science*, 27(4):726–41.
- Giné, X. and H. Jacoby
2019. Contracting under uncertainty: Groundwater in South India. *Quantitative Economics*, forthcoming.
- Goodhue, R.
2000. Broiler production contracts as a multi-agent problem: Common risk, incentives and heterogeneity. *American Journal of Agricultural Economics*, 82:606–622.
- Halac, M.
2012. Relational contracts and the value of relationships. *American Economic Review*, 102:750–779.
- Hayami, Y. and K. Otsuka
1993. *The Economics of Contract Choice: An Agrarian Perspective*. Oxford: Clarendon Press.
- Hueth, B., E. Ligon, S. Wolf, and S. Wu
1999. Incentive instruments in fruit and vegetable contracts: Input control, monitoring, measuring, and price risk. *Review of Agricultural Economics*, 21:374–389.
- Jacoby, H. G., R. Murgai, and S. U. Rehman
2004. Monopoly power and distribution in fragmented markets: The case of groundwater. *Review of Economic Studies*, 71(3):783–808.
- Klein, B. and K. Leffler
1981. The role of market forces in assuring contractual performance. *The Journal of Political Economy*, Pp. 615–641.
- Leegomonchai, P. and T. Vukina
2005. Dynamic incentives and agent discrimination in broiler production tournaments. *Journal of Economics & Management Strategy*, 14:849–877.
- Levin, J.
2003. Relational incentive contracts. *The American Economic Review*, 93(3):835–857.
- Macchiavello, R.
2018. A mutually beneficial relationship: relational contracts in developing countries. In *A Research Agenda for New Institutional Economics*, C. Ménard and M. M. Shirleyh, eds. Northampton & Cheltenham: Edward Elgar Publishing.
- Macchiavello, R. and P. Miquel-Florensa
2018. Vertical integration and inter-firm relationships: Evidence from the Costa Rica coffee chain. Working Paper, London School of Economics.
- Macchiavello, R. and P. Miquel-Florensa
2019. Buyer-driven upgrading in GVCs: The sustainable quality program in Columbia. Working Paper, London School of Economics.
- Macchiavello, R. and A. Morjaria

2015. The value of relationships: evidence from a supply shock to kenyan rose exports. *American Economic Review*, 105(9):2911–2945.
- Macchiavello, R. and A. Morjaria
2019. Competition and relational contracts in the Rwanda coffee chain. Working Paper, Northwestern University.
- MacDonald, J.
2015. Trends in agricultural contracts. *Choices*, P. 3rd Quarter.
- MacDonald, J. and C. Burns
2019. Marketing and production contracts are widely used in u.s. agriculture, *Amber Waves*, USDA, ERS, Washington, D.C., July 1. <https://www.ers.usda.gov/amber-waves/2019/july/marketing-and-production-contracts-are-widely-used-in-us-agriculture/>.
- MacLeod, W.
2007. Reputations, relationships, and contract enforcement. *Journal of Economic Literature*, Pp. 595–628.
- MacLeod, W. and J. Malcomson
1989. Implicit contracts, incentive compatibility, and involuntary unemployment. *Econometrica*, Pp. 447–480.
- Michelson, H., T. Reardon, and F. Perez
2011. Small farmers and big retail: Trade-offs of supplying supermarkets in Nicaragua. *World Development*, 40(2):342–54.
- Michelson, H. C.
2013. Small farmers, NGOs, and a Walmart world: Welfare effects of supermarkets operating in Nicaragua. *American Journal of Agricultural Economics*, 95(3):628–49.
- Michler, J. D. and S. Y. Wu
2019. The effects of governance on relational and formal contracts: Theory and evidence from groundwater irrigation markets. Working Paper, University of Arizona.
- Otsuka, K., Y. Nakano, and K. Takahashi
2016. Contract farming in developed and developing countries. *Annual Review of Resource Economics*, 8:353–76.
- Rao, E. J., B. Brümmer, and M. Qaim
2012. Farmer participation in supermarket channels, production technology, and efficiency: The case of vegetables in Kenya. *American Journal of Agricultural Economics*, 94(4):891–912.
- Rogerson, W. P.
1985. The first-order approach to principal-agent problems. *Econometrica: Journal of the Econometric Society*, Pp. 1357–1367.
- Saenger, C., M. Torero, and M. Qaim
2014. Impact of third-party contract enforcement in agricultural markets: A field experiment in Vietnam. *American Journal of Agricultural Economics*, 96(4):1220–38.
- Schipmann, C. and M. Qaim
2011. Supply chain differentiation, contract agriculture, and farmers’ marketing preferences: The case of sweet pepper in Thailand. *Food Policy*, 36:667–77.
- Schmitz, K. and M. Schnitzer
1995. The interaction of explicit and implicit contracts. *Economic Letters*, 48:193–199.
- Singh, S.
2002. Contracting out solutions: Political economy of contract farming in the Indian Punjab. *World Development*, 30(9):1621–38.
- Telser, L.
1980. A theory of self-enforcing agreements. *Journal of Business*, 53:27–44.
- Ton, G., W. Vellema, S. Desiere, S. Weituschat, and M. D’Haese
2018. Contract farming for improving smallholder incomes: What can we learn from effectiveness studies? *World Development*, 104:46–64.
- Vassalos, M.
2015. Theme overview: Current issues in agricultural contracts. *Choices*, P. 3rd Quarter.
- Wang, H. H., Y. Wang, and M. S. Delgado
2014. The transition to modern agriculture: Contract farming in developing economics. *American Journal of Agricultural Economics*, 96(5):1257–71.
- Wu, S. and J. MacDonald
2015. Economics of agricultural contract grower protection legislation. *Choices*, P. 3rd Quarter.