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Contract theory and agricultural policy analysis: a discussion and survey of recent developments*

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This paper surveys some recent developments in contract theory and illustrates how this theory might be useful for conceptualising policy issues related to vertical coordination and contracting in the agro-food industry. The article begins by surveying contract theory to identify key economic distortions that can potentially justify government involvement. Next, the general ingredients of agricultural contracts that are most likely to create inefficiencies are discussed. Finally, controversial aspects of real-world agricultural contracts are highlighted and lessons from the theory are used to determine whether government intervention is justified. Actual legislation that has been proposed in the USA is analysed where appropriate and topics that await further research are also discussed.

Key words: agricultural policy, industrial organisation, information, institutional economics.

1. Introduction

Over the past several years, policy-makers and farmers have become increasingly concerned about the fairness of agricultural contracts. Policy-makers have responded with new legislation in the name of protecting growers from 'oppressive' contracting practices by large processors. Yet, there is a paucity of economic analyses to guide policy-makers, and many new laws are proposed without the benefit of careful economic research. The few studies that do exist tend to focus on the possible effects of banning tournament contracts (Tsoulouhas and Vukina 2001; Wu and Roe 2005a; Wu and Roe 2006), but other important policy issues have been largely ignored by researchers.

The purpose of this paper is to provide a discussion of recent developments in contract theory that might be relevant for conceptualising the role of the government in contract agriculture. From an economics perspective, policy interventions are potentially justified when there are economic distortions. My discussion therefore focuses on what the theory says about the distortionary effects of various contracting imperfections, and how policy interventions might correct these distortions. I subsequently discuss the general ingredients

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of agricultural contracts that are most likely to create inefficiencies. Finally, I highlight some characteristics of agricultural contracts that have created tension between farmers and processors. I discuss whether these characteristics qualify as contracting imperfections that might give rise to the types of distortions discussed in the theoretical section. I also motivate my discussion by referring to actual legislation that has been proposed in the USA.

Although most of my examples are from the USA, the economic logic used should be applicable to other settings beyond the USA. In addition, complex issues that demand further research by agricultural economists are highlighted where appropriate. In some cases, simple mathematical illustrations are used to add clarity, but these models are kept at a low level of formality and made as simple as possible to ensure that this article can reach a wide audience.

2. Contract theory and contract regulation

2.1 Potential pitfalls of regulation

Contracts are private trading arrangements customised to fit specific economic circumstances. As an illustration, a food processor marketing a new food product may be interested in a very specific quality attribute in its raw inputs. As unique quality attributes are rarely available on open markets, which tend to deliver generic commodities, a contract with a grower may be necessary to coordinate production. To induce proper coordination, the processor might design a contract so that it provides adequate incentives for quality production. Given that the optimal structure of a contract depends on important information that may be known only to the contracting parties, contract regulation is particularly susceptible to what Joskow (2002) calls 'Type II' errors where a policy restriction on contractual arrangements ends up sanctioning an efficient trading mechanism. Nevertheless, just as market failures create potential justifications for government intervention, there are certain contracting distortions that may require regulatory intervention.

In the next few subsections, I will discuss relevant aspects of contract theory that are useful for identifying major trading distortions. Highlighting the conditions under which these distortions might occur can provide some clarity as to when government intervention might be potentially justified.

2.2 Contracting imperfections and economic distortions[1]

Gibbons (2005) provides a systematic overview of current thinking in three strands of contract theory: transactions cost economics, property rights

[1] In developing this section, I owe a debt of gratitude to an anonymous reviewer who provided a number of helpful comments.

theory, and incentive systems theory. Although Gibbons discusses these theories within the context of the boundaries of firms, these theories are also useful for identifying various inefficiencies created by contracting imperfections. I will now provide a brief description of each strand of the theory in order to highlight specific types of contracting distortions. My purpose is not to provide a comprehensive description of each theory, as these theories have been discussed at length by other authors, but to highlight the specific types of distortions identified by each theory.

The transactions cost approach (e.g., Klein *et al*. 1978; Williamson 1979) assumes that the combination of incomplete contracts and relationship-specific investments can create a distortion known as rent seeking (i.e., post-contractual opportunism). Incomplete contracts are contracts that are silent on a number of important contingencies and/or have components that are not enforceable by a third party. For example, the timing of delivery of a crop from a grower to a processor may be important to both parties, but many agricultural contracts do not include detailed descriptions of how on-time deliveries are to be rewarded or how delays are to be punished. Relationship-specific investments refer to assets that increase earnings under a specific relationship, but have less value outside the relationship. When assets generate lower returns outside the relationship, there exists a quasi-rent, which is the difference between the profit from the relationship and the profit that can be earned from using the assets in the next best opportunity. The existence of quasi-rents can lead to what Gibbons calls 'individually optimal (but socially destructive)' rent seeking or haggling over appropriable quasi-rents.

With incomplete contracts, not all important events, contingencies, and/or decisions are contractible prior to the resolution of uncertainty so that these details will have to be dealt with after the fact. In other words, *ex ante* (prior to the resolution of uncertainty), the parties cannot write a contract that precisely specifies all important contractual parameters so that the parties will have to negotiate over some actions or decisions *ex post* (after uncertainty is resolved). In addition, there are decisions that are not contractible even *ex post* that create opportunities for rent seeking. To better understand the intuition of the transactions cost theory, consider the following timeline:

1. *Ex ante*: Prior to the resolution of uncertainty, parties agree to a contract to trade some good and make relationship-specific investments.
2. *Ex post*: After the resolution of uncertainty, each party must make decisions on how to deal with scenarios that were not specified in the contract. Because some decision rights are not contractible even *ex post*, they can be used for rent seeking.

For example, suppose that a buyer and a seller agree to trade a commodity with specific traits that only the buyer cares about and can verify. Assume that in order to produce the traits, the seller has to invest in special housing facilities and that these housing facilities lose considerable value outside the

relationship. Once the product is delivered, the buyer can decide whether to honour the original agreement or attempt to renegotiate a lower price and extract some quasi-rents. The buyer has a number of non-contractible (even *ex post*) decision rights that can be used to extract quasi-rents. For instance, the buyer can use biased methods of measuring quality, claim that the seller failed to meet implicit understandings, and/or use other influence activities derived from superior information or ability to negotiate to justify a lower price. Because the seller has few outside opportunities for the asset, the seller will likely accept a lower price so long as her profits do not fall below the scrap value of the asset. Thus, the main source of inefficiency in transactions cost theory has to do with *ex post* decision governance when some important variables are not contractible even *ex post*.

Like the transactions cost theory, the property rights theory (Grossman and Hart 1986; Hart and Moore 1990) also focuses on incomplete contracts and relationship-specific investments. The idea is that a buyer and/or a seller can make observable but non-contractible *ex ante* investments that potentially increase the value of trade. However, it is assumed that the parties cannot describe all relevant contingencies and can therefore write only very simple *ex ante* contracts that allocate ownership of assets used in production and/or ownership of goods to be exchanged. The parties will then bargain or renegotiate the terms of trade *ex post.* A concise summary of the timeline under the property rights theory is:

1. *Ex ante*: Prior to the resolution of uncertainty, only simple contracts allocating asset ownership titles can be written. Then non-contractible relationship-specific investments are made.
2. *Ex post*: After the resolution of uncertainty, important contingencies that were not describable *ex ante* become contractible *ex post*. This ensures that trade will be *ex post* efficient and the sellers conduct Nash bargaining over the gains from trade.

Ownership is important in that it confers a 'bundle of decision rights' to the owner (Hart 1989), and these decision rights provide more leverage during bargaining or renegotiation of terms of trade *ex post.* However, unlike the transactions cost theory, property rights theory assumes that all decision rights are contractible *ex post.* For example, a decision right that is contractible *ex post* is the right to produce the good for sale on the spot market. Only the asset owner has this right as the other party has no means of production. Unlike the transactions cost theory, non-contractible decision rights are not considered.

Another important component of the property rights theory is that once the state of nature is realised (i.e., *ex post*), then important variables (e.g., quality of the good, value of trade to the buyer, cost of production to the seller) become observable and common knowledge to both parties. This ensures that trade will be *ex post* efficient (i.e., trade occurs whenever buyer valuation exceeds seller's cost) and each party receives a share of the gains

from trade through Nash bargaining.[2] The party with more decision rights has more leverage during bargaining. For instance, if bargaining breaks down, the owner of the asset still has the right to use the asset to produce the good for spot market sales. The ability to sell on the spot market enhances the owner's threat point in the Nash bargain. Because asset ownership affects a party's threat point and therefore each party's payoffs, it also provides indirect incentives for *ex ante* non-contractible investments. However, parties may have suboptimal incentives to make these investments because the Nash bargaining process typically splits the gains from trade (usually assumed to be a 50–50 split), resulting in a hold-up problem. In other words, the investing party may not realise full marginal benefits from investment and may therefore underinvest.

The key difference between the property rights theory and the transactions cost theory is that, whereas transactions cost theory focuses on *ex post* rent seeking as the main source of inefficiency, property rights theory emphasises suboptimal *ex ante* investments/effort as the main source of inefficiency. Of course, in a hybrid theory, underinvestment might be intertwined with rent seeking because suboptimal investments are more likely to occur when the seller anticipates hold-ups and *ex post* rent seeking by the buyer.

The incentive systems (Holmstrom and Milgrom 1991, 1994, Holmstrom 1999) strand of contract theory is similar to the property rights theory in that it focuses on *ex ante* investments/effort incentives, but it considers a greater range of feasible incentive instruments for motivating investment/effort. Although in the property rights theory the good to be traded at date 2 (*ex post*) cannot be described at date 1 (*ex ante*), thereby restricting the method of incentive delivery, the incentive systems approach assumes that additional 'signals' (performance measures or other relevant information about effort/investments) that are verifiable by a third party are available *ex ante* for writing incentive contracts. Incentive contracts can therefore supplement *ex post* asset ownership in motivating *ex ante* investments. The challenge here is to optimise over both contract parameters and asset ownership at the *ex ante* stage. The incentive systems timeline 'reverses' the property rights timeline in that contractibility of important decisions and actions is available *ex ante* rather than *ex post*. That is:

1. Prior to the resolution of uncertainty (*ex ante*), the characteristics of a good (e.g., quality) or other measures of 'performance' are observable and contractible.
2. Non-contractible effort/investments that affect total surplus are taken. Then uncertainty is resolved (*ex post* stage) and contractually specified obligations are triggered.

[2] In Nash bargaining, each party's payoff consists of her threat point plus a fraction of the surplus from trade. Thus, an increase in the threat point increases returns from the bargain. The reader should be aware that in extensions to the basic model, researchers have introduced alternatives to Nash bargaining. For example, Aghion *et al*. (1994) assume Rubenstein's alternating-offers bargaining game.

Incentive systems theory is useful for identifying indirect sources of inefficiencies that can arise from constraints to optimal incentive design. Thus, it is useful for examining the unintended consequences of policy interventions. For example, a government regulation that bans certain types of incentive contracts can constrain the ability of the principal to deliver optimal incentives, thereby creating additional distortions in *ex ante* investments/effort.

Gibbons provides an integrative framework that can nest the three theories described above. In particular, consider the following timeline for a typical buyer–seller interaction: (i) the governance structure and contracts are negotiated; (ii) *ex ante* actions (investments/effort) are chosen; (iii) interim signals (performance measures) and contingencies are revealed; (iv) *ex post* decisions are taken; and (v) payoffs are realised.

Stages 1 and 2 are the *ex ante* stages as important contingencies are not revealed until stage 3. Stages 4 and 5 represent *ex post* stages. The types of actions available in stage 2, the nature of the signals available in stage 3, and the nature of the decisions in stage 4 are particularly important for distinguishing among the three strands. Let stage 2 actions be denoted by a_0 (observable but not contractible), a_N (not observable), and a_C (contractible). Let stage 3 signals be denoted by σ_0 (observable but not contractible) and σ_C (contractible). Finally, let stage 4 decisions be denoted by d_P (contractible *ex post* but not *ex ante*), d_N (not contractible even *ex post*), and d_A (contractible *ex ante*). The ingredients for each of the theories are:

- Property rights (a_0, σ_0, d_P)
- Transactions costs (a_C, σ_0, d_N)
- Incentives (a_N, σ_C, d_A)

Under property rights theory, inefficient *ex ante* action distortions come from the fact that there is no contractible signal at stage 3 and no decision variable that is contractible *ex ante*, thereby limiting the types of incentives that can be structured. Incentives theory partially rectifies this by incorporating the *ex ante* contractible variables σ_C and d_A, which widens the set of incentive instruments available. In transactions cost theory, the fact that there exists certain decision rights that are not contractible even *ex post* implies inefficient bargaining or haggling over quasi-rents at the *ex post* stage.

2.3 Relational contracts

Before moving to a policy discussion, it is important to discuss the theory of relational contracts as this theory assumes that contracting parties are able to self-police their relationship, possibly mitigating some of the distortions discussed earlier. The theory of relational contracts is also tangentially related to a particular strand of transactions cost theory that assumes that, in the course of a contractual relationship, parties will receive new information that will enable them to adapt to changes in the economic environment (Williamson 1985).

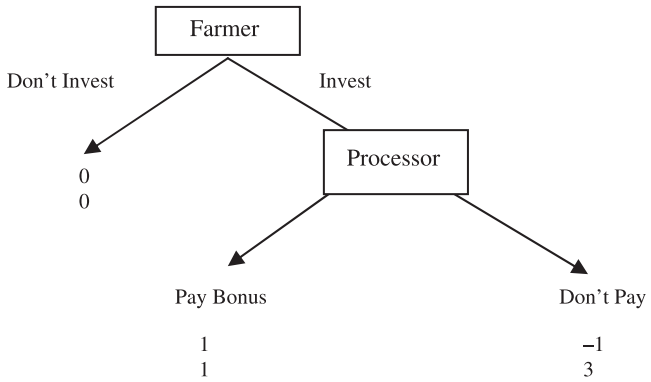

Figure 1 The top number is the farmer's payoff and the bottom number is the processor's payoff.

The power of relational contracts comes from the fact that they allow for the emergence of informal enforcement mechanisms that can support powerful incentives even when the explicit contract is incomplete. As such, they are frequently called self-enforcing contracts and are based on the notion that, in repeated relationships, the promise of future payoffs can sustain performance today; that is, the threat of termination can partially substitute for explicit incentives in disciplining, rent seeking, hold-ups, and underinvestment problems.

To introduce relational contracts, consider a simple example. A processor and a farmer have signed a contract to trade one unit of some commodity. During the production stage, the farmer either 'invests' or 'does not invest' in some costly action that can affect the quality of the commodity and therefore the processor's payoff. Subsequently, the processor can choose to pay a bonus or not. Assume that investment and bonus decisions are observable by the parties but not contractible. In a one-shot relationship, this interaction can be expressed in the following game tree with hypothetical payoffs noted at the end of each node. The top number is the farmer's payoff and the bottom number is the processor's payoff (Figure 1).

It is easy to verify from backward induction that neither party cooperates so that we get (don't invest, don't pay) as the equilibrium outcome. Thus, without a complete and enforceable contract, opportunistic behaviour undermines the gains from trade.

Now consider how things might change in an indefinitely repeated trading situation where the common discount factor is r and the farmer plays the following strategy: the farmer invests so long as the processor paid the bonus in all past trading rounds, but does not invest if there is any past round in which the processor did not pay the bonus. Given this 'trigger strategy' by the farmer, for any history in which both parties have cooperated up to the current period, a processor can earn a payoff of '3' from not paying. If, instead, the processor pays, she earns '1' and faces the same choice the next period so that the present value of the infinite sequence of payoffs from paying the bonus is $V = 1 + rV$ or $V = 1/(1 - r)$. So long as $1/(1 - r) \geq 3$, the processor

will pay the bonus. The condition $1/(1 - r) \geq 3$ is also called a self-enforcement constraint and it is satisfied whenever $r \geq 2/3$ in this example. Thus, when the discount factor is sufficiently high, the self-enforcement constraint for the processor is satisfied, and the grower has an incentive to invest as the processor can credibly promise bonus payments. This illustrates an important point, which is that some contracting distortions that exist in one-shot situations can be mitigated if the parties can successfully establish a relational contract.

Another important aspect of relational contracts is that it can be desirable for one or both parties to make relationship-specific investments. Recall that in the property rights and transactions cost theories, asset specificity is a necessary condition for rent seeking and underinvestment to exist. In relational contracts, however, relationship-specific rents can promote self-enforcement. To see this, return to the previous example and assume that the processor can make a relationship-specific investment, which enhances her own payoffs from '1' to '2' in the node where the farmer 'invests' and the processor 'pays'. This is a relationship-specific investment because it affects the processor's payoffs only when it cooperates with the current farmer. It is straightforward to see that self-enforcement would be enhanced because the self-enforcement constraint changes to $2/(1 - r) \geq 3$, which implies that $r \geq 1/3$. Thus, self-enforcement is now possible under a wider range of values for the discount factor.

Although relational contracts can mitigate some distortions, the parties to a relational contract are not entirely immune to opportunism. This is particularly true when important parameters change (e.g., interest rates) that can affect expected profits or outside opportunities. When self-enforcing agreements unravel, then contracting distortions can emerge because parties may engage in costly renegotiation (e.g., withhold promised bonuses or contract continuation), which can in turn lead to underinvestment problems. Additionally, relational contracts are most likely to be effective in environments where firms want to trade with the same partner repeatedly. If efficiency dictates the use of different trading partners – perhaps because demand comes from different places – then relational contracts may inefficiently bind a firm to one trading partner.

3. The nature of agricultural contracts

I will now discuss the specific nature of agricultural contracts to provide some context for applying the theory. Given the numerous commodities (e.g., fruits, vegetables, specialty grains, livestock) that are exchanged via contracts, it would be impossible to provide a detailed characterisation of all contracts used in agriculture. Thus, I will focus on general characteristics that have the potential to create distortions.

It would be useful to frame this discussion within Gibbons' integrative framework presented earlier to highlight the types of distortions that can occur in agricultural contracting. Recall that Gibbons' framework in section 2.2 is a five-stage framework. Stages 2 (where *ex ante* actions are chosen), 3

(where contingencies are revealed), and 4 (where *ex post* decisions are taken) are particularly relevant for this discussion.

With regard to stage 2 actions, it is common for processors to ask growers to make *ex ante* contractible investments (a_C) and undertake *ex ante* unobservable actions (a_N). The contractible actions (a_C) are typically large, verifiable investments that are long-term and last through multiple flocks/harvests/seasons, and are most commonly observed in hog and broiler production contracts. For example, a contract may require growers to build new chicken houses that meet the exact specification of the processor. These types of investments are easy to observe and verify. *Ex ante* unobservable actions (a_N) are also present in most contracting relationships and represent short-term actions/effort such as the amount of care taken in packing fruit, or the amount of effort taken to sort good tomatoes from bad tomatoes after harvest. Because these actions are unobservable, they can create moral hazard problems.

In stage 3, both σ_0 (observable but not contractible signals) and σ_C (contractible signals) are typically available to processors in determining grower performance. Incentive systems theory suggests that contractible signals are extremely useful for constructing incentive contracts to motivate *ex ante* actions. Verifiable signals of effort, such as measured quality or other performance factors correlated with effort, allow processors to condition rewards and penalties on these signals. Thus, these signals allow processors to design incentive schemes for mitigating moral hazard. This is consistent with real-world agricultural contracts that typically contain incentive schedules based on verifiable performance measures. Of course, not all performance measures observed by processors are contractible. Some performance signals are non-contractible because they are too subjective or too vague for a third party to verify (e.g., amount of cooperation and flexibility exhibited by growers when working with processor field men), but others are non-contractible because of missing institutions. For example, processors in some livestock sectors often weigh the animals themselves and/or determine mortality rates without a third party present so that there have been allegations that processors engage in opportunistic behaviour by either manipulating quality outcomes and/or falsifying rankings in tournaments (Hamilton 1995).

In stage 4, a large number of *ex post* decision rights typically exist after the resolution of uncertainty. Because it is impossible to discuss every possible decision right available to the contracting parties, I will give only a few examples of relevant decision rights. In processing tomatoes, the State of California has set quality standards for tomatoes. For instance, if more than 8 per cent of tomatoes in a shipment are mouldy (mold is measured and verified by a third party), then the shipment is rejected. After 1997, the state allowed processors and growers to negotiate whether they want to exchange a load of tomatoes even if it fails to meet state quality standards. This is an example of an *ex post* contractible decision right d_P because it is a decision that would be made after quality is revealed and is verifiable by a third party. During the contract negotiation stage, the way this right is allocated might influence the *ex post* terms

of trade and therefore can be used to influence *ex ante* action incentives as in the property rights model. There may also be decision rights that are not contractible even *ex post* (d_N). For example, under production contracts, broiler growers have alleged that processors can engage in influence activities such as manipulating input quality or falsifying grower rankings under tournaments to retaliate against growers who want to organise collectively. These sorts of activities, if they exist, are difficult to prove and therefore are not contractible even *ex post*. However, they can be used for rent seeking, as preventing growers from organising collectively can enhance processors' bargaining power when negotiating terms of trade.

Gibbons's framework can be used to provide a concise summary of the typical ingredients of many agricultural contracts.

1. Negotiate the governance structure (e.g., allocation of decision rights) and contract
2. Growers take actions a_C and a_N
3. Signals σ_0 and σ_C are realised
4. The parties make decisions d_P and d_N
5. Payoffs are realised

Again, stages 1 and 2 are *ex ante* stages as contingencies are not realised until stage 3. Stages 4 and 5 are the *ex post* stages. The two types of contracting distortions (inefficient *ex ante* actions and *ex post* rent seeking) described earlier can exist due to the fact that contracts are typically incomplete (because σ_0, d_P and d_N are not contractible *ex ante*), there are relationship-specific investments (a_C and/or a_N might be specialised), and the existence of decision rights that are not contractible even *ex post* (d_N).

It is important to clarify exactly what underinvestment means in the context of agricultural contracting. As mentioned earlier, one type of *ex ante* action typically made by growers has to do with investments in 'lumpy' long-term assets such as housing that meet processors' specifications. Long-term investments in fixed assets are easily verifiable by a third party and can therefore be contracted upon *ex ante*. In some cases, growers are required to make these investments before receiving a contract offer. In either case, processors may not have to worry about suboptimal investments as they essentially choose the 'level' of these investments in the contract.

Another type of *ex ante* action mentioned earlier is short-term 'effort' that is not contractible. Because effort exerted tends to be 'smooth' as opposed to 'lumpy' like large production assets, suboptimal effort may resemble the underinvestment problem in the property rights model. Given the presence of incomplete contracts and asset-specific investments, it is likely that some inefficiency in these *ex ante* actions will occur. However, processors also have some verifiable performance measures for structuring an incentive contract to mitigate some of this underinvestment. Moreover, processors have private incentives to deter underinvestment problems because efforts made by growers

to undertake good management practices, careful harvesting, and disease detection can be crucial for the quality of the commodity produced. Thus, government intervention to deter suboptimal investment in effort is a delicate issue. On the one hand, policy interventions that reduce rent seeking and contractual incompleteness will mitigate underinvestment. On the other hand, underinvestment can potentially be exacerbated by government intervention if the intervention restricts the types of incentive contracts available to processors.

4. Controversial features of agricultural contracts

In this section, I will outline five stylised observations of agricultural contracts that have been alleged to create difficulties for growers.[3] The five observations are: (i) contracts are often incomplete and leave too much discretion to processors; (ii) processors hold monopsony/bargaining power; (iii) contracts can be prematurely terminated; (iv) dispute resolution procedures favour processors; and (v) tournament-based performance pay is unfair. In the following subsections, I will discuss whether these observations justify government intervention in light of our earlier theoretical discussion.

4.1 Contractual incompleteness

Casual observation of most agricultural contracts will reveal that they are incomplete. Contracts can be incomplete because some decision rights are not *ex ante* contractible perhaps due to bounded rationality, indescribability and/or transactions costs (e.g., lawyer fees) of drafting contracts. Contracts can also be incomplete because some signals of performance might be impossible to verify by a third party, whereas others are verifiable in principle but may not be contractible due to missing institutions for enforcement. Finally, it is also possible that some contracts are deliberately left incomplete because the trading parties govern their relationship with an underlying self-enforcing agreement.

Growers have expressed concerns regarding incompleteness due to missing institutions. In the US livestock sector, growers often complain about the lack of transparency when it comes to the weighing of animals due to the absence of a third party institution to perform the function. Jon Caspers of the National Council of Pork Producers states that a source of mistrust of packers by producers has to do with reliance on '. . . packers' measurement and weighing systems . . .' and that the best solution might be to have '. . . a third party evaluation method, carried out either by a governmental agency

[3] These observations come from farm advocates, academics, and/or anecdotal evidence from popular press. To my knowledge, there are no comprehensive surveys that give precise numbers on the degree to which each of the observations exist across various agricultural subsectors. Nonetheless, these observations are widespread enough that policy makers in the USA have proposed legislation to address these problems.

or an independent company' (Caspers 2000). In contrast, one rarely hears complaints about quality manipulation in the California processing tomato industry because a third-party institution called the Processing Tomato Advisory Board (PTAB) conducts quality grading of tomatoes (Hueth and Ligon 2004).

Growers and industry watchers are also concerned about incompleteness when it provides processors with certain *ex post* decision rights. For example, according to Hamilton (2001), some broiler contracts contain a provision that allows a contractor to unilaterally change payment methods or pay rates, which provides integrators with the option of making discretionary *ex post* adjustments in pay.

The challenge for policy-makers or the courts is to determine the root causes of incompleteness. If contracts were not deliberately left incomplete, and the explicit contract plays an important role in the governance of the transaction, then incompleteness may have consequences for rent seeking and underinvestment problems. Courts and legislatures can fill 'gaps' or at least reduce the transaction costs of negotiating contracts in several ways. First, courts or legislatures can supply common vocabulary (Schwartz 2002). The vocabulary can be based on commonly used phrases in an industry or can be based on the way trade associations use phrases. This reduces writing costs because private parties need not spend as much time haggling over precise vocabulary. A second possibility is for courts or legislatures to supply default rules, which 'fill gaps' in contracts (Cooter and Ulen 2000; Schwartz 2002). In other words, if a non-contractually specified contingency arises, then parties will have to allocate the losses and there will be a dispute. If the parties go to trial, the court would have to allocate the losses to the parties; that is, the court would have to 'create' a term that will specify how losses are to be allocated. For example, suppose that a contract between a tomato grower and tomato processor fails to specify how losses would be allocated if the delivery truck is involved in an accident. A court or legislature might create a default rule using the guiding principle that the party who is 'in the best position to bear the risk should bear it'.

When contracts have been deliberately left incomplete, then government intervention in providing 'filler' clauses or verification of performance may be unnecessary and even harmful. Dixit (2004) suggests that if a relational contract produces higher surplus than a formal contract, then the formal contract becomes the fall back position from shirking on a self-enforcing agreement. However, one of the tenets of game theory is that a cooperative agreement might be easier to sustain if the punishment from deviation is harsh. If the formal contract is a fall-back position for the relational agreement, then a marginal improvement in payoffs from the formal contract may actually lead to a net loss in surplus. Wu and Roe (2007) show in a series of economic experiments that self-enforcing relationships are most productive when parties have maximum discretion. Nonetheless, discretion can also be used for rent seeking and opportunism. In Wu and Roe's study, discretion was used for opportunism in approximately 20 per cent of the trades. Miceli

(1997) points out that a key question to ask in evaluating whether a discretionary modification should be enforced by the courts is whether the modification is efficiency enhancing or rent seeking.

Whether contracts are deliberately left incomplete or not, a legal principle that might be effective in deterring rent seeking might be the requirement of good faith. For example, the Producer Protection Act, a model state legislation proposed by Iowa Attorney General Tom Miller and 16 other state attorneys general, requires 'an implied promise of good faith', which 'imposes an obligation of good faith on all parties in an agricultural contract' and 'honesty in fact in the conduct or transaction concerned' (Iowa Attorney General's Office 2000). Good faith laws can provide growers with some leverage in holding processors accountable for rent-seeking activities. According to Miceli (1997), an economic test of good faith is to ask whether a party to a contract has acted in an 'efficient' manner. Rent seeking is clearly an inefficient activity and can create underinvestment problems (e.g., growers unwilling to participate due to fear of rent seeking) and a good-faith rule would increase the probability of a lawsuit when processors engage in rent seeking. In the case of relational contracts, where the ability to make discretionary deviations from the explicit contract is crucial for making efficiency-enhancing adaptations, good faith can protect both parties from the misuse of discretion.

4.2 Monopsony/bargaining power

The second observation is that in some agricultural subsectors, there tends to be an imbalance of bargaining power between processors and growers. In many regions, there are numerous growers vying for contracts with only a few processors so that processors potentially hold market power.

The legal doctrine of necessity is often invoked as a justification for government intervention when there is market power. For example, farm advocates sometimes claim that the presence of monopsony power may make it 'necessary' for growers to accept take-it-or-leave-it, standard form contracts (contracts of adhesion) that leave little room for negotiation. One problem with invoking the necessity doctrine for contracts of adhesion is that such contracts can be an indicator of either market power or perfect competition (Cooter and Ulen 2000). If terms of trade vary little across contractors for commodities with similar quality, then this may be an indication that it is competition, not market power that is driving contracts of adhesion. In this case, contracts of adhesion may be beneficial to society as they would minimise transactions costs by eliminating the need for parties to haggle over terms. Thus, according to Cooter and Ulen, the key question to ask when assessing whether necessity should be invoked is not whether a contract of adhesion exists, but rather, whether market power exists.

De Geest (2002) points out that the real danger of market power is that it can be used to exploit 'signing-without-reading' problems. For example, certain farmers may be unaware of the risks involved in signing a contract as many

contract risks are buried in legal jargon. In such cases, a contract drafter with market power has an incentive to create inefficient clauses to exploit the farmers' lack of understanding. Clauses can either be directly inefficient (e.g., growers' costs exceed the processor's benefits) or indirectly inefficient such as those that only redistribute rents but create no real economic value. The latter clauses are indirectly inefficient because real resources would be devoted toward drafting rent-seeking clauses. De Geest suggests that, without the signing-without-reading problem, even monopsonists would have little incentive to create inefficient clauses. Thus, the policy requiring 'plain language disclosure of risks' and other readability conditions in the Producer Protection Act may be justified to deter rent seeking.

Ex post market power can exist when the grower has made relationship-specific investments so that quasi-rents exist. If a processor uses non-contractible decision rights to renegotiate or modify a contract to exploit sunk relationship-specific investments, then potential issues of duress come into play. The inefficiency of duress comes from the fact that it threatens to destroy the value of the relationship-specific investment in order to force the grower to make decisions that she would otherwise not make. Exchanges made under duress resemble zero-sum games rather than surplus-creating cooperative games. For this reason, Schwartz (2002) suggests that courts should police the contracting process to prevent duress. Moreover, good faith laws might deter rent seeking under duress because these laws can increase expected liability from rent seeking.

4.3 Contractual duration

The third observation has to do with contract duration. As mentioned earlier, growers are sometimes required to make expensive investments in new production facilities. At the same time, processors have been known to prematurely terminate or fail to renew contracts, leaving growers vulnerable as the relationship may end before all debts are paid. In broilers for example, contracts tend to be short term (flock by flock) but the construction of chicken production facilities required to secure the initial contract may cost growers hundreds of thousands of US dollars. Consequently, the Producer Protection Act allows farmers to be '. . . reimbursed for damages incurred due to termination, cancellation, or failure to renew. Damages shall be based on the value of the remaining useful life of the structures, machinery, or equipment involved'. Damages shall be based on the value of the remaining useful life of the structures, machinery, or equipment involved. Within the context of a non-relational contracting, Edlin and Reichelstein (1996) show that legal remedies such as expectations damages may encourage investment and mitigate hold-up problems. However, it is not clear that their results carry over to the agricultural context where processors choose the level of large, discrete investments that growers must make, and can construct incentive contracts to motivate short-term effort. More research in this area is needed.

Lee and Wu (2005) show that, under relational contracts and asset specificity in an agricultural context, if termination damages were enacted into law, there would be no impact on the optimal effort level implemented by processors' contracts. In other words, termination damages would neither mitigate nor exacerbate moral hazard problems. In addition, rational processors would price the expected liabilities into the *ex ante* contract terms so that growers would earn less under continuation relative to the case where no law exists. Thus, although growers' and processors' profits in different states of nature would be affected, expected profits would remain the same.

The design of breach damages, however, is not trivial as excessively high breach damages can reduce the propensity of processors to offer long-term contracts. Moreover, given that grower performance is not verifiable in some cases, a processor can always disguise a no-fault termination by claiming poor performance. Nonetheless, the appropriate design of breach damages may induce information revelation to solve this problem (see Chapter 4 of Miceli 1997 for examples).

4.4 Dispute resolution clauses

The fourth observation is that some contracts contain explicit dispute-resolution clauses in the form of mandatory arbitration. Some grower advocacy groups allege that these clauses are typically inserted by processors to preclude growers from accessing the courts (e.g., see online fact sheet by RAFI-USA). In response to these concerns, Senator Chuck Grassley proposed S.91 to the 108th Congress, which forbids mandatory arbitration in contracts.

I am not aware of any formal economic analysis of mandatory arbitration clauses so this might be a fruitful area of research for agricultural economists. A possible modelling strategy might be to start with a contracting model that allows for conflict and then introduce a dispute resolution mechanism such as mandatory arbitration. Levin's (2003) model of relational contracting with subjective performance evaluation (SPE) might be particularly well suited for such an endeavour.

Levin points out that relational contracts with SPE must provide two types of incentives. First, effort incentives must be provided to agents (growers). Second, incentives must be provided to principals (processors) to report performance truthfully to avoid rent seeking. To solve this dual incentive problem, Levin proposes a relational contract with the following characteristics. First, if the principal reports that the agent's performance is strong, she pays the agent a bonus. Second, if the principal reports performance as unsatisfactory, then the bonus is withheld, a dispute arises, and the agent walks away. One can see that the principal has an incentive to be honest when the agent is a strong performer. When the principal sees large future benefits from continuing to contract with this agent, the principal will report truthfully rather than rent seek. The key point is that there must be a cost imposed on the principal for false reporting.

One problem with the Levin contract is that, in some livestock sectors, growers have few outside opportunities and processors often possess market power due to an excess supply of growers vying for contracts. Therefore, simply 'walking away' from the relationship becomes extremely costly to growers, not to mention that processors may not lose much when any one grower walks away because there is always another grower waiting to replace a departed grower. In this situation, it is doubtful that the optimal relational contract would emerge without some form of government intervention.

There are two possible ways in which government regulation may facilitate the emergence of optimal relational contracts. First, elimination of binding arbitration clauses in contracts can enable growers to sue processors thereby imposing a much-higher cost on processors than simply walking away. Second, a good faith rule can provide growers with even more leverage for a lawsuit as it would increase the probability of a legal dispute if processors deviate too far from 'truthful' reporting. However, policy-makers and the courts should not be overly vigorous in imposing these costs because social welfare can be reduced by frivolous lawsuits and a possible reduction in number of contracts offered. It is important for agricultural economists to examine these issues formally to find the right balance.

4.5 Tournaments

The final observation is that some contracts, particularly in the broiler industry, use tournament compensation schemes. Under these schemes, a grower's performance pay is based on how he performs relative to other growers so that his total pay depends on his relative ranking. Growers and policy-makers often refer to tournaments as an 'unfair practice' and have sought to make them illegal. However, recent research by Tsoulouhas and Vukina (2001) and Wu and Roe (2005a) suggest that it is unlikely that a ban on tournaments will improve social welfare, especially as processors are more likely to use tournaments only when common shocks are large. When common shocks are large, a ban will not increase social welfare and may not even increase grower welfare.

This leads to a puzzle which is, if both growers and processors can benefit from tournaments in the presence of large common shocks, why do growers express such dissatisfaction with tournaments? One possibility is that growers allege that tournaments are often used as a vehicle for opportunism. That is, there are claims that processors discriminate against certain growers by providing them with inferior-quality inputs and/or gaming tournament rankings to retaliate against growers who attempt to organise collectively. In this case, the appropriate government response should be to increase penalties for fraud and rent seeking rather than to ban tournaments. A second possibility is that people may simply perceive relative performance contracts as being less 'fair' particularly if people exhibit social preferences such as inequality aversion (Fehr and Schmidt 1999). Recent studies have shown that people

care about both absolute and relative payoffs (Rabin 1998; Bandiera *et al*. 2005). Wu and Roe (2006) conduct economic experiments and find that people are willing to pay a premium to operate under absolute performance standard contracts rather than tournaments due to inequality aversion. Even if tournaments are 'unfair' when social preferences are taken into account, it is not clear that government intervention is necessary as processors may have to pay fairness premiums to induce participation so that the costs are internalised.

5. Summary, policy lessons and future research

This article surveys and discusses recent developments in contract theory that can be used to rationalise government involvement in agricultural contracting. The discussion can be summarised as follows. Government intervention is potentially justified when economic distortions exist. Contract theory identifies two important distortions that can occur in contracting relationships: *ex ante* investment distortions and rent seeking. These distortions can exist whenever contracts are incomplete and at least one party must make relationship-specific investments. However, parties may also have private incentives and means of mitigating investment distortions through the design of incentive contracts. Therefore, effective policy should correct for inefficient rent-seeking and investments, whereas not constraining the ability of private parties to design effective incentive contracts. The theory of relational contracts also teaches us that, under certain conditions, private parties can construct self-enforcing agreements to mitigate rent seeking and underinvestment even when contracts are highly incomplete. Thus, the government should promote principles or legal rules that facilitate economic relationships.

The above insights were used to analyse some features of agricultural contracts that have been alleged to create problems for growers in the USA. First, most agricultural contracts tend to be incomplete along some dimension of performance. Given that incompleteness is a necessary condition for the existence of distortions, government intervention to 'complete' contracts may potentially improve welfare. Moreover, good-faith rules can potentially deter rent seeking and underinvestment. When contracts are based on self-enforcing relationships that do not require complete contracts, then government interference in contract terms can potentially decrease welfare by limiting the parties' ability to use discretionary adjustments to improve trading outcomes. Second, if processors hold most of the bargaining power, then they may have incentives to draft inefficient clauses in the presence of information problems that prevent farmers from understanding the risks involved in contracting. Policies that reduce signing-without-understanding (reading) problems can mitigate incentives to draft inefficient clauses designed for rent-seeking. Third, growers must often make expensive relationship-specific investments, whereas there is no guarantee that their contracts will not be terminated before all debts are paid. Nonetheless, if growers are reasonably well informed

about the expected duration of contracts, there is no clear justification for termination damages to protect growers. Termination damages can, however, enable policy-makers to meet distributional objectives in a non-distortionary way. The optimal design of termination damages is a potentially ripe area of research for agricultural economists. Fourth, some contracts contain mandatory arbitration clauses that restrict growers from accessing the courts. Policy has been enacted in the USA to ban mandatory arbitration clauses. On the surface, it appears that a ban on these clauses could, in certain cases, facilitate relational contracts. Nonetheless, given the paucity of research and formal analysis, it is difficult to draw definite conclusions. The economic analysis of mandatory arbitration clauses may be another important area of research for agricultural economics. Finally, tournament compensations schemes are often alleged to be unfair to growers. However, there is no current theoretical justification for banning relative performance contracts. Perhaps studying relative performance contracts under the assumption that people have social preferences might provide another view of these contracts and lead to sharper insights.

An important line of research that was not covered in this short article has to do with how learning and renegotiation might affect the nature of contracts. An important theme from the published work is that mechanism design principles combined with *ex post* renegotiation of contracts can be used to devise solutions to problems associated with incomplete contracts. However, the solution mechanisms depend on assumptions about what trading partners observe and learn over time, what third parties can verify *ex ante* and *ex post*, and whether parties can commit not to renegotiate. Under property rights theory assumptions (i.e., some variables are observable but not contractible *ex ante*), first best outcomes can be achieved through the use of revelation mechanisms (Maskin and Tirole 1999). However, Maskin and Tirole's results rely crucially on the assumption that parties can commit not to renegotiate the contract after the state of nature is revealed (Hart and Moore 1999). When renegotiation is possible, optimal complex contracts can sometimes be substituted with simple initial contracts that are renegotiated later on (e.g., Aghion *et al*. 1994; Noldeke and Schmidt 1995). Under transactions cost theory assumptions (i.e., some decision rights not contractible even *ex post*), models of authority (e.g., Aghion and Tirole 1997) become relevant. Contracting models of authority assume that decision rights – the right to choose a decision *ex post* – can be endogenised into the contract design problem. Thus, the initial contract may contain explicit guidelines about who directs production *ex post*. Gibbons refers to this as 'contracting for control' as parties are chiefly concerned about how the contract allocates *ex post* decision rights. This line of research seems particularly relevant for the analysis of agricultural production contracts where processors control the use of inputs and provide strict guidelines about how farming is to proceed. In the future, it would be important for agricultural economists to determine whether the lessons from this line of research can be used to improve the design and formulation of policy for agricultural contracting markets.

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