Losing Under Contract: Transaction-Cost Externalities and Spot Market Disintegration*

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Abstract

Standard economic intuition of revealed preference implies that when two parties freely enter into a contract then neither should be worse off. In this study, we develop a simple model showing that introducing the opportunity to contract can lower welfare for some, and perhaps all, contracting parties. We consider a situation where processors can obtain inputs from suppliers (farmers) using either a spot market or contractual arrangements, and where spot market transaction costs depends on the volume of trade in the spot market. We show that contracting parties may lose when more contracting results in higher transaction costs for spot market participants. At the margin, firms and input suppliers gain from signing contracts. However, contracting raises spot-market transaction costs for those who do not sign contracts, which provides a greater incentive for others to sign contracts, ultimately inducing more contracting than optimal. The model demonstrates why structural or organizational change may be rapid and why the private minimization of transaction costs may not lead to optimal institutional arrangements.

KEYWORDS: contracting, transaction costs, externalities, vertical integration

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1. Introduction

In the trade of some agricultural commodities, grower-processor contracts are replacing traditional spot markets. This structural transformation has already occurred in the poultry industry and in many fruit and vegetable markets, and is currently taking place in hog and tobacco markets (MacDonald, et al., 2004). For some commodities the transformation has been quite rapid. For example, meatpacker surveys reveal that the share of market hogs sold in cash markets fell from 87% in 1993, to 43% in 1997, to 26% by 2000. An even more rapid transformation occurred in tobacco: the USDA reports that the share of flue-cured tobacco leaf sold under contract rose from 9% in the 2000 marketing season to 81% by 2001. The transformation to contracting began after one company, Philip Morris, stated in 1999 its intention to begin contracting. By 2003, nearly all cigarette companies and leaf dealers contracted for tobacco (Dimitri, 2003). The shift to contracting has caused many tobacco auction houses to close. In North Carolina, 69 of the 129 auction houses closed before the 2001 season (Capehart, 2002).

While contracting offers numerous potential advantages for both farmers and processors that help explain its growth, at least in some cases, the shift into contracting may have been precipitated by transaction cost externalities—situations where organizational decisions (such as choosing spot markets or contracts) made by some individuals or firms affect the transaction costs, and hence organizational decisions, of others. For the tobacco industry, structural transformation occurred at a time when governmental authorities were repurchasing tobacco quotas from growers and many growers were exiting the business. For processors, this change generated new uncertainty about the supply of raw product that would be available in auction markets. In the Washington Post (Pressley, 2001), a representative from Philip Morris was quoted:

Until the recent past, we felt confident in getting the product we needed. But recently, with quotas falling and people out of business, we suddenly found ourselves in the position where we couldn't get all the grades and styles we needed at auction. Some years, we could get plenty of this. Other years, plenty of that.

The article explains how a thin spot market was the driving force behind the company’s decision to begin purchasing tobacco via direct contracts with producers. The initial movement to contracting by Philip Morris further “thinned” auction markets, which likely encouraged other firms to contract.

In the absence of spot market externalities, it is not clear why the removal of quotas would have caused a permanent change in the tobacco sector’s
organizational structure. We normally view organizational structures as stemming from the nature of transaction costs or agency costs, and removal of quotas should not have changed these in a fundamental way. However, a temporary increase in supply uncertainty, perhaps brought about by the removal of quotas, may have pushed some processors toward contracting. The initial movement to contracting by Philip Morris could have further “thinned” auction markets and thereby increased transaction costs for those still using spot markets, which provided a greater inducement for others to turn to contracting. A key feature of this phenomenon is that growers’ and processors’ private decisions to contract affected the transaction costs of others, and this externality created a feedback effect that has virtually eliminated spot markets for tobacco.

Cattle farmers have voiced concerns about the potentially negative consequences of contracting for efficiently functioning spot markets. In Senate testimony on January 26, 1999, Keith Collins, the Chief Economist of the U.S. Department of Agriculture, related these concerns:

A producer concern about captive supplies is that as more animals are procured through captive supply arrangements [contracts], the thinner cash or spot markets may make it more difficult for a producer to find a spot buyer, an issue of access to competitive markets. Some small, independent producers worry that they may not have access to contracts and be left with a thin, potentially less competitive and more volatile spot market. Some cattle producers have alleged that the spot price may be influenced by the supply of cattle being delivered under contract, which may be under the control of the packer.1

Reflecting these concerns, farmer interest groups such as the American Farm Bureau, National Farmers Union, and the Organization for Competitive Markets have called for legislation banning certain types of contracting by meatpacking companies.2

In this paper, we present a simple model of the interplay between spot-markets and contracting in agriculture when spot markets display external economies in transaction costs. When farmer-processor contracts replace spot market transactions, travel and search costs for spot market participants may rise and spot prices may be more variable and subject to manipulation. Thinner spot markets may impose timing and coordination costs on suppliers and processors, especially when products are perishable. The model shows that as spot-market


2 See, for example, http://www.newfarm.org/action/captive%20supply/background.html.
transaction costs for non-contracting suppliers rise, the “supply” of product available for contract shifts out, and the premium suppliers must be paid to accept a contract falls. Suppliers and purchasers who do not contract are worse off because they face higher transaction costs in the spot market. Some suppliers or purchasers who contract may also be worse off than before contracting was offered: a higher spot-market transaction costs means a lower reservation price, so some accept contracts that they would not have accepted previously. In an extreme case, contracts may cause all suppliers and purchasers—both contracting and independent—to be worse off.

Recent work has sought to identify spot market transaction costs that influence producers’ marketing decisions (Hobbs, 1997; Bailey and Hunnicutt, 2002). Some transaction costs found to be significant in explaining marketing channels could be expected to increase as spot markets thin. For example, transportation costs (which are correlated with animal weight loss and risk of injury), the risk of no sale (not being able to obtain a fair market price due to an insufficient number of buyers), and commission costs are all likely to increase as the volume traded declines.

As spot markets thin, farmers may face higher transaction costs associated with price discovery. Researchers have maintained that as the number of spot market transactions declines spot market prices increasingly fail to reflect “true market conditions”, become “susceptible to manipulation”, and “may not efficiently allocate resources” (Tomek and Robinson, 1990; Kohls and Uhl, 1990; Rhodus, Baldwin and Henderson, 1989). However, empirical and experimental efforts to test the relationship between thin markets and price variability and bias in agricultural markets have yielded conflicting results (Tomek, 1980; Nelson and Turner, 1995).³

There is some evidence in the literature that thin spot markets are associated with a greater use of contracts. For example, Hubbard (2001) found a positive relationship between thinner markets and the use of contracts in a study of the trucking industry. Similarly, Pirrong (1993) found, in a study of the bulk shipping industry, evidence that long-term contract arrangements replace spot transactions when markets are thin.

We are not aware of any research that has modeled the effect of external economies in spot markets on farmers’ and processors’ decisions to contract. However, there are several examples in the literature where contracting is associated with both positive and negative externalities (e.g., Rasmusen, ³Outside of agriculture there appears to be greater support for a link between market thinness and efficiency. For example, Campbell, et al (1991) used an experimental market to show that increased off-floor trading led to a “disintegration” of the stock exchange market that reduced market efficiency by inducing wider bid-ask spreads and greater price volatility.
Segal generalizes a class of contracting problems in which one party (a principal) contracts with many agents in the presence of externalities. Unlike standard principal-agent analyses, in the contracting with externalities literature, an agent’s utility depends on the actions of the other agents. In other words, agents’ actions create positive or negative externalities on other agents. The focus of this literature is on optimal incentive schemes and outcomes in light of these externalities, not on how externalities alter tensions between competing organizational structures, which is the focus of this paper.

Economides and Siow (1988) modeled the formation of spot markets when there are positive externalities associated with a high volume of trade, or liquidity, in a market. They show that since liquidity is a positive externality, there may be too many markets (and hence too little liquidity in each market) for a social optimum. On the other hand, they also show that new markets may fail to open because nobody wants to use a new market with low liquidity. Hence, there may be fewer markets than is necessary for efficiency. Like Economides and Siow, we consider positive externalities to liquidity, but focus on how the availability of an alternative organizational arrangement (contracting) affects the welfare of spot market participants and contracting parties.

A recent paper by Dixit (2003) is probably most similar to this one, although it makes no reference to agriculture. Dixit presents a simple game theoretic model to argue that adoption of new technologies or formation of new institutions may bring both costs and benefits, some of which may have “network effects or positive externalities.” As a result, he argues that organizational change may bring about a negative net benefit to many who willingly participate in the new organization. The positive externalities Dixit describes are much like the ones we describe here for agricultural spot markets.

3. A Simple Model

3.1 Supply of Contracts

Consider a continuum of input suppliers (growers) indexed by \( i \in [0, N] \), producing at the rate of one unit of raw agricultural product. Growers may sell product on the spot market or via contract to a processing firm. A grower’s decision to sign a contract or participate in the spot market (denoted CONTRACT or SPOT, respectively) is a function of compensation under contract, \( c \), compensation under spot-market participation, \( s \), the transaction costs associated with CONTRACT, \( t^C \), and transaction costs associated with SPOT, \( t^S(i, n) \), which is assumed to be continuous and differentiable. Growers take \( s \) and \( c \) as exogenous. The first argument in the function \( t^S(i, n) \) embodies grower
heterogeneity. Some growers may be located further from a spot market or be especially risk averse and therefore face higher spot market transaction costs. Growers are ordered such that $t^S(i, n)$ is strictly decreasing in $i$. The second argument, $n \in [0, N]$, is the volume of growers choosing CONTRACT. This argument embodies external economies in transaction costs described in the introduction. Due to increasing returns in spot market liquidity, $t^S(i, n)$ is strictly increasing in $n$—that is, each grower’s SPOT transaction costs decline as the number of growers choosing SPOT ($N-n$) increases. For simplicity, we assume contracting transaction costs are fixed costs that do not depend on the degree of spot market participation.\(^4\)

A grower’s payoff is:

\[
C_g = c - t^C \quad \text{if } i \text{ chooses CONTRACT} \\
S_g(i,n) = s - t^S(i,n) \quad \text{if } i \text{ chooses SPOT.}
\]  

(1) \hspace{1cm} (2)

Nash equilibrium occurs when all growers choose optimally given choices of other growers: a grower chooses CONTRACT if $C_g \geq S_g$ and chooses SPOT if $C_g < S_g$. Equilibrium is defined by the grower, $n^*$, such that:

\[
c - t^C \geq s - t^S(i, n^*) \quad \text{for all } i \leq n^*
\]  

(3)

and

\[
c - t^C < s - t^S(i, n^*) \quad \text{for all } i > n^*.
\]  

(4)

Corner solutions occur if all growers choose CONTRACT and $c - t^C > s - t^S(N, N)$ or all growers choose SPOT and $c - t^C < s - t^S(0, 0)$.

In general, there may be multiple equilibria. Because growers are a continuum, no single grower has a positive measure, so $n$ is unaffected by any grower’s decision to choose SPOT or CONTRACT, and they all take $t^S(i, n)$ as exogenous. This implies that any $n^*$ that solves $C_g = S_g(n^*, n^*)$ is a Nash equilibrium. To see this, consider that for all $i > n^*$, $t^S(i, n^*) < t^S(n^*, n^*)$, since $t^S(i, n)$ is decreasing in $i$, which implies $C_g < S_g$ and these growers optimally choose

\[^4\] Because we assume positive externalities in spot markets and none in contracting, we conclude that, from the vantage of welfare, excess contracting occurs in equilibrium. If external economies also exist in contracting, it is unclear whether or not the incidence of contracting would be excessive. In general, however, if there were external economies in contracting as well as spot markets, this would exacerbate the collective action problem and make the equilibrium organizational structure even more sensitive to exogenous shocks.
SPOT and do not deviate. Similarly, \( C_g \geq S_g \) for all \( i \leq n \), so these growers optimally choose CONTRACT and do not deviate. Totally differentiating the line \( C_g = S_g(i, n) \) with respect to \( i \) and \( n \), it is straightforward to show the line is monotonically increasing in \((i, n)\) space. The line may, however, cross the line \( i = n \) multiple times, so there could be multiple interior equilibria in addition to the possible corner equilibria, all CONTRACT and all SPOT.

It is important to note that interior equilibria may be unstable. By this we mean that an arbitrarily small positive measure of growers can optimally deviate. In other words, unstable equilibria are an artifact of our decision to model growers as a continuum. Unstable equilibria occur when the slope of the slope of the \( C = S \) line, \(- \left( \frac{\partial S}{\partial i} \right)/\left( \frac{\partial S}{\partial n} \right) \), is greater than 1 at \((n^*, n^*)\). This implies \( r^s(n^* + \varepsilon, n^*) > r^s(n^*, n^*) \) and \( r^s(n^* - \varepsilon, n^* - \varepsilon) < r^s(n^*, n^*) \) for some arbitrarily small positive \( \varepsilon \).

When this occurs, the marginal effect of the externality dominates the marginal effect of grower heterogeneity. Thus, a small collective deviation toward SPOT is optimal, and the equilibrium unravels. When \( \frac{\partial S}{\partial i} \leq -\frac{\partial S}{\partial n} \) at \((n^*, n^*)\), it is not optimal for some small positive measure of growers to collectively deviate and the equilibrium is stable.

To make these concepts concrete and derive explicit solutions, we assume \( r^s(i, n) \) is linear. Letting \( t^c = a_0 \) and \( t^s = a_1 - a_2 i - b(N - n) \), grower payoffs are:

\[
C_g = c - a_0 \tag{5}
\]

\[
S_g(i, n) = s - a_1 + a_2 i + b(N - n) \tag{6}
\]

where the parameters \( a_0, a_1, a_2 \) and \( b \) are all positive. Equilibrium is defined by \( n^* \) such that

\[
c - a_0 \geq s - a_1 + a_2 i + b(N - n^*) \text{ for all } i \leq n^* \tag{7}
\]

and

\[
c - a_0 < s - a_1 + a_2 i + b(N - n^*) \text{ for all } i > n^*. \tag{8}
\]

If an interior equilibrium exists, it is defined by

\[
n^*(c, s) = \frac{c - s - a_0 + a_1 - bN}{a_2 - b}. \tag{9}
\]

From the equilibrium conditions it is easy to show that for all \( i > n^* \), \( C_g < S_g \), so SPOT is optimal, and that for all \( i \leq n^* \), \( C_g \geq S_g \) and CONTRACT is optimal, so no grower deviates and \( n^* \) is a Nash equilibrium. The equilibrium is
unstable, however, if \( n^* \) is an interior equilibrium and \( a_2 \leq b \). In this case, when one unit of growers marginally choosing CONTRACT \((i \in [n^*-1, n^*])\) collectively deviates and chooses SPOT, their payoffs change from \( c - a_0 \geq s - a_1 + a_2 i + b(N - n^*) \) to \( s - a_1 + a_2 i + b(N - n^*-1) \), which is an improvement if \( a_2 < b \). It is straightforward to show that the only stable equilibria in this case are all SPOT and all CONTRACT.\(^5\)

If we restrict \( a_2 > b \), and rule out the possibility of mixed equilibria (which are weakly dominated by pure strategy equilibria) there is a unique equilibrium, which may be some interior \( n \), all CONTRACT, or all SPOT. This equilibrium defines the supply of product under contract:

\[ n^*(c, s) = \begin{cases} 0 & \text{if } \frac{c - s - a_0 + a_1 - bN}{a_2 - b} \leq 0, \\ \frac{c - s - a_0 + a_1 - bN}{a_2 - b} & \text{if } 0 < \frac{c - s - a_0 + a_1 - bN}{a_2 - b} < N \\ N & \text{otherwise.} \end{cases} \]  

This equilibrium is illustrated in figure 1. The notes below the figure explain the restriction \( b \geq a_2 \) and how the general case differs from the linear case. The supply curve has the expected upward slope with respect to \( c \) and downward slope with respect to \( s \).

\(^5\) Note that the case where growers are homogeneous \((a_2 = 0)\) is a special case of the situation where \( a_2 \leq b \). A stable interior solution never exists when \( a_2 = 0 \) because all growers behave symmetrically in equilibrium. If there is some interior \( n^* \) for which \( C_y = S_y(n^*, n^*) \), \( n^* \) is unstable. If a small positive measure of growers deviates and chooses SPOT, it improves their welfare by causing \( i^* \) to decline, which makes \( S_y > C_y \), and then all will choose SPOT. Also in this case, both all SPOT and all CONTRACT are always equilibria. All CONTRACT is an equilibrium (albeit one with lower welfare than all SPOT) because \( S \) is strictly decreasing in \( n \), so if \( C_y = S_y \) for some interior \( n \), then \( C_y > S_y \) for \( n=N \), and none have an incentive to deviate from CONTRACT if all others choose CONTRACT. The same result is true in the general model with heterogeneous growers when there exists only a single interior equilibrium and it is unstable.

\(^6\) Unique stable equilibria and a well defined supply of product under contract are possible in the general model. One would need to assume that the \( C=S \) line crosses the \( i=n \) line once at most, and that at this point the slope of the \( C=S \) line is less than one.
Figure 1. Growers’ Equilibrium

Notes: Figure 1 depicts the growers’ equilibrium \((n^*)\) in the linear model with \(a_2 > b\). If \(b < a_2\), the slope of \(C_g = S_g\) line is steeper than the \(i=n\) line and any equilibrium defined by the intersection of \(C_g = S_g\) and \(i=n\) is weakly dominated by \(n=N\) and \(n=0\). In the general (non-linear) case, the \(C_g = S_g\) line would be upward sloping but not necessarily linear and may intersect the \(i=n\) line many times, so there may be multiple equilibria.
3.2 Demand for Contracts

Demand for product under contract is derived from processors’ decisions symmetrically to the way supply of product under contract was derived from growers’ decisions. Processors’ payoffs are declining in transaction costs and in spot market and contracting compensation, $s$ and $c$. There are $M$ processors indexed by $j \in [1, M]$ who purchase raw-material from growers and, like growers, are ordered according to their heterogeneous preferences for purchases under contract versus the spot market. For simplicity, we assume all processors purchase the same amount of raw product. As there are likely to be fewer processors than growers, this amount (equal to $N/M$) may be different than the amount each grower produces.

Heterogeneity of preferences across processors may depend on transaction costs associated with the kinds of finished goods they produce. For example, all else the same, baby-cut carrot producers demand a more specialized variety, size, and timing of raw carrots and may therefore have a stronger preference for contracting as compared to a canned soup processor’s demand for raw carrots, which may be less specialized. Processor’s spot market transaction costs, like those of growers, depend on liquidity, which is inversely tied to the volume traded under contract. These preferences and costs can be embodied in processors’ spot market transaction cost functions.

Using a linear representation for processors, like we did for growers, processor $j$’s payoff is

$$C_j = A - c - d_0 \quad \text{if } j \text{ chooses CONTRACT}$$  \hspace{1cm} (13)

$$S_j(j,m) = A - s - d_1 + d_2 j + e(M - m) \quad \text{if } j \text{ chooses SPOT},$$  \hspace{1cm} (14)

where $m$ denotes the number of processors choosing CONTRACT, $A$ is a constant, $d_0$, $d_1$, $d_2$, and $e$ represent transaction cost and external economies parameters for processors (analogous to $a_0$, $a_1$, $a_2$, and $b$ for growers), and we restrict $d_2 > e$ (analogous to the restriction $a_2 > b$).

In equilibrium, the aggregate quantity demanded under contract by processors equals $(N/M) \ m^*(s, c)$ where

$$m^*(c, s) = 0 \quad \text{if } \frac{-c + s - d_0 + d_1 - eM}{d_2 - e} \leq 0$$  \hspace{1cm} (15)

$$m^*(c, s) = \frac{-c + s - d_0 + d_1 - eM}{d_2 - e} \quad \text{if } 0 < \frac{-c + s - d_0 + d_1 - eM}{d_2 - e} < M$$  \hspace{1cm} (16)
\[ m^*(c, s) = M, \text{ otherwise.} \] (17)

As external economies increase (the larger \( e \)), the slope of demand becomes flatter.

### 3.3 Equilibrium of Supply and Demand

Considering supply and demand for contracts simultaneously gives equilibrium levels of \( c, n, \) and \( m \) (we assume \( s \) is exogenous). The linear system results in a unique equilibrium. We illustrate equilibria with and without transaction cost externalities in figure 2 (denoted, respectively, \( E^1 \), where \( b, e > 0 \), and \( E^0 \), where \( b, e = 0 \)). We draw the supply and demand curves so that they have the same vertical intercepts. This fixes spot market transaction costs in the case of no externalities equal to the minimum level possible in the case with externalities. The existence of positive external economies in spot markets and none in contracting clearly leads to more contracting.

Two issues warrant further discussion. First, we have assumed transaction cost externalities exist in spot markets but not in contracting. As we described in footnote 4, it is possible transaction cost externalities also affect contracting arrangements. For example, due to learning by doing, lawyers may become ever more experienced and efficient in developing contracting arrangements over time, so that early contract adopters might reduce contracting transaction costs for subsequent contracting parties. If external economies also exist in contracting, it is unclear whether or not the incidence of contracting would be excessive. We have focused on positive externalities in spot markets because they seem more plausible and more in line with what has been observed in practice. A spot market simply cannot function without many participants, whereas a contract might easily be written between a single buyer and seller. Tobacco growers and processors also noted spot market thinness as a motive to contract, not a reduction in contracting costs. In general, if there were external economies in contracting as well as spot markets, this would exacerbate the collective action problem and make the equilibrium organizational structure even more sensitive to exogenous shocks.

Second, our model is a static, simultaneous-move game while a more appropriate model may be dynamic. A dynamic model would lead to the same general conclusions with regard to greater contracting and the sensitivity of contracting incidence to exogenous shocks. Dixit describes how equilibria in a similar dynamic model results in equilibria that are similar to the simultaneous-move game.
Notes: Figure 2 depicts equilibrium incidence of contracting with and without transaction cost externalities in the spot market. To enable comparison, transaction costs are equal between the two regimes if all parties choose SPOT. Externalities clearly lead to greater contracting. The optimal incidence of contracting—the level that maximizes aggregate grower plus producer surplus—is greater than the level under $E^0$ and less than the level under $E^1$.

4. Welfare

A socially efficient organizational structure is given by the share of product under contract that minimizes aggregate transaction costs. The efficient share is greater than the equilibrium share because, in making SPOT versus CONTRACT decisions, growers and processors do not account for the marginal effect of their decision on others’ spot-market transaction costs. This is shown by defining welfare, $W(n)$ as the integral of all growers and processors payoffs as a function of $n$, where all growers greater than $n$ and all processors greater than $nM/N$ choose SPOT.
In our linear model, the derivative of $W(n)$ is

$$\frac{dW(n)}{dn} = C_g + \frac{M}{N} C_p - S_g(n,n) - \frac{M}{N} S_p(n,n) - (N - n)(b + e).$$

If $n^*$ is an interior equilibrium, $dW(n^*)/dn = -(N - n^*)(b + e) < 0$, which implies excess contracting: a marginal reduction in $n$ from the equilibrium level causes welfare to increase at a rate of $(N - n^*)(b + e)$. In general, the socially efficient $n$ is less than or equal to all $n^*$.7

In figure 3 we show the change in welfare among growers and processors relative to that when contracting is disallowed. In the scenario depicted, only growers face positive external transaction costs. Relative to no contracting, processors unambiguously gain in aggregate. In contrast, after the introduction of contracting, some contract growers gain, some contract growers lose, and all spot market growers lose. The change in aggregate grower welfare is ambiguous. Note consumer welfare does not change in this analysis because total production is fixed.

The figure illustrates that when the transaction-cost externality is borne by one side of the market (growers or processors), the side not bearing the externality actually benefits. This happens because net compensation under contract ($c$) moves out along the supply or demand curve of the parties not affected by externalities, increasing their surplus. Thus, when processors bear all of the transaction-cost externalities, net contract compensation increases; and when growers bear all the transaction-cost externalities, net contract compensation decreases. When both growers and processors bear transaction-cost externalities, the net contract compensation change is ambiguous. In this situation, some processors and growers gain while others lose and it is ambiguous whether the gains exceed losses. In an extreme case, disallowing contracting altogether may improve aggregate welfare relative to equilibrium.

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7 The result from the linear model extends naturally to the general model if there is a unique equilibrium. If there are multiple equilibria, it is straightforward to show that all equilibria result in more contracting that the socially optimum. In the general model, $-b$ and $-e$ in (19) are replaced by the partial derivatives growers’ and processors spot-market transactions cost functions with respect to spot-market volume, which are generally negative.
Figure 3. Equilibrium and Welfare with Grower Externalities

Notes: Figure 3 depicts equilibrium of both processors and growers ($n^E$) in the linear model where growers have external economies in spot market transaction costs and processors do not ($b > 0$ and $e = 0$). Grower utility is constant along the line defined by $n^*(c \mid b=0)$ allowing for graphical welfare analysis. Relative to no contracting, processors’ aggregate surplus equals $A + C$. Contract growers’ who face relatively high spot market transaction costs ($i < i^L$) gain surplus $B$ with the introduction of contracting. However, contract growers with relatively high spot market transaction costs ($i^L < i < n^E$) lose $C + D$. Higher spot market transaction costs cause spot market growers ($i > n^E$) to lose $E + F$. Although processors gain unambiguously from contracting, the change in aggregate grower welfare ($B - C - D - E - F$) is ambiguous.

A first-best incidence of contracting may be implemented using a contracting tax, akin to the Pigouvian tax for environmental externalities. The first best may also be achieved by subsidizing the spot market transactions by an amount equal to the first-best Pigouvian tax. The subsidy alternative may be the more politically feasible of the two policy alternatives (Just, Rausser, and Zilberman, 1995). Political feasibility would also depend on the welfare distribution. If contracting were optimally reduced using a spot-market subsidy, it...
is possible (and perhaps likely) that some processors and/or some growers will lose as result of the intervention—that is, some actually gain from the externality even though there may be aggregate losses. The welfare implications of the subsidy depend on the slopes of the supply and demand curves and how the transaction-cost externalities are split between processors and growers. Without lump-sum transfers, a Pareto improvement over the transaction costs equilibrium could be difficult or impossible to implement.

5. Conclusion

Standard economic intuition of revealed preference implies that when two parties mutually agree to sign a contract then both should benefit from its terms. At first blush, the noted resistance by many farmers to the trend toward contracting and away from spot markets therefore seems unwarranted. As a recent USDA analysis of the shift from spot markets to contracts in the tobacco industry notes: “the rapid growth in the use of contracts suggests that both producers and manufacturers benefit from the new marketing system” (Dimitri, 2003). This paper shows why this reasoning may not be true in some situations.

The paper develops a simple model that demonstrates how transaction cost externalities can influence the organizational structure of agricultural industries. In the context of this model, we show that even in a competitive market, some, and perhaps many, growers and processors may lose with the introduction of contracting. These losses occur because contracting reduces positive externalities in the spot market. At the margin, some processors and growers gain from signing contracts. However, when some growers contract, spot-market transaction costs increase for those who don’t sign contracts, which provides a further inducement for independents to sign contracts, ultimately inducing more contracting than socially optimal. A Pigouvian-like contracting tax or spot-market subsidy can correct this externality and thereby achieve an optimal contracting incidence. Without lump-sum transfers, however, such a mechanism may not achieve a Pareto improvement over the laissez-faire equilibrium.

In some agricultural markets the move toward contracting has coincided with a marked increase in processor concentration.8 A natural extension of our analysis would be to examine how monopsony power changes both efficiency and welfare outcomes. In this case, a monopsonist processor would be large enough to recognize the influence of the transaction cost externality, allowing it to

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8 In the meatpacking industry, for example, the combined market share of the four largest steer and heifer slaughter operations increased from about 25 to 80 percent between 1972 and 1994 (Ward and Schroeder).
manipulate grower reservation utilities and reduce average prices paid for raw materials. Some have cited market manipulation of this kind in the meatpacking industry (Ward and Schroeder, 1996). If transaction cost externalities were borne entirely by growers, then such an analysis would be a straightforward application of Segal’s general contracting with externalities framework. The monopsonistic case may be an interesting one to explore as the welfare implications are not immediately obvious. Indeed, as compared to the competitive case examined here, a monopsonist regime may improve aggregate welfare by internalizing transaction cost externalities.

Another interesting extension would be to examine how the externality itself might arise in a market with monopsonistically competitive processors. The degree of market power might hinge on transportation costs and depend on the number and locations of spot markets, growers, and processors. As farmers switch from spot markets to contracts, the number of processors in the spot market will decrease, which will make spot market pricing less competitive. Contracting decisions might therefore generate externalities by affecting processors’ market power, not just transaction costs.  

The transaction cost externality framework discussed here may be relevant in other contexts. For example, an analogy can be made to firms’ financing decisions. Firms may choose to finance new investment using internal funds or using external sources such as debt, sales of equity shares, or venture capital. The way a firm chooses to finance investment, like other organizational decisions, has been attributed to the transaction costs associated each source (Gomes, 2001; Jaffee and Russell, 1976; Jensen and Meckling, 1976, among others). The transaction costs associated with some financial institutions likely depend on how extensively the institution is used by other firms. The existence of these externalities would imply that some organizational structures could be inefficient.

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9 We thank an anonymous reviewer for suggesting this extension.
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