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## Contract Use and Contract Terms in Organic Markets

Jason R.V. Franken, Michael E. Sykuta, and Peter G. Klein

This paper investigates the use of procurement methods and contracting terms in markets for organic products, where contracting is more prevalent than in the conventional commodity sector. Findings largely support transaction cost arguments for chosen procurement methods and contracting terms. Further, contracting is decreasing in general, while the use of longer-duration contracts and cost-plus pricing is increasing, which may reflect learning, development of relationships, and reputation.

**Key words:** contract, contract duration, organic, pricing mechanisms

Agricultural economics has a rich tradition of contracting research dating back at least to Adam Smith's (1776) criticism of sharecropping contracts' lack of incentives. The U.S. agro-food sector continues to experience growth in use of contract transactions between production, processing, and distribution stages. Vertical contracts governed 39% of the value of U.S. agricultural production in 2008, up from 28% in 1991 and 11% in 1969 (Ahearn, Korb, and Banker, 2005; MacDonald and Korb, 2006; MacDonald and Korb, 2011; James, Klein, and Sykuta, 2011).

While increases in contracting coincide with consolidation (Harl, 2000; Key, 2004) and are associated with scale (Paul, Nehring, and Banker, 2005), contracting also serves niche markets such as the organic sector and may be contributing to their growth in mainstream retail outlets (Dimitri and Oberholtzer, 2009). Initially marketed primarily through direct sales (e.g., farmers' markets) and natural foods stores, organic products are now sold primarily through conventional supermarkets (Dimitri and Greene, 2002), and evidence suggests these markets use contracts to procure their organic offerings (Dimitri and Oberholtzer, 2009).

Although it is difficult to make direct comparisons, contracting seems more common in organic than in conventional sectors. About 65% of the volume of organic products bought by organic handlers in 2007 were obtained through written or verbal contracts (Dimitri and Oberholtzer, 2009) compared to 39% of the total value of agricultural production in 2008 (MacDonald and Korb, 2011). According to Dimitri and Oberholtzer

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(2009, p. 9), about 29% of the volume of organic products were procured through spot (cash) markets in 2007 compared to about 60% of purchases of conventional agricultural products. One contributing factor is that the organic sector predominantly consists of commodities, such as fresh produce, for which contract use is also generally more prevalent in the conventional sector. Fresh produce (e.g., fruits and vegetables) historically accounts for over 30% of U.S. retail organic sales (Dimitri and Oberholtzer, 2009). Still, there is evidence that higher contract use in this sector reflects smaller producers, and hence smaller quantities traded, and higher production costs and prices associated with value-added processes, including segregation or identity preservation activities (Dimitri and Oberholtzer, 2008; 2009). With growing demand and lagging supply growth, handlers use contracts to secure consistent quality organic products at stable prices and to encourage or assist producers' transition to organic production (Dimitri and Oberholtzer, 2008).<sup>1</sup> Such assistance, whether financial or training, involves handlers making dedicated investments in capabilities of specific producers, and as discussed in the literature review and hypotheses development section, contracts help ensure a return on such investments.

This study investigates factors influencing contract use and contract terms in organic markets using USDA Economic Research Service data summarizing the results of 2004 and 2007 nationwide surveys of organic manufacturers, processors, and distributors. We use tobit and truncated least squares regressions to examine the factors influencing the use of contracts and contracting terms, and factor analysis to limit measurement error for key variables that can be observed only indirectly (Hair et al., 1995).

### **Literature Review and Hypothesized Relationships**

Within the rich agricultural contracting literature, various types of risk or uncertainty and the costs of organizing exchange through alternative methods are cited as primary motives for contracting. While various pricing terms (e.g., flat price and cost plus) may reflect differential risk preferences by trade partners, the USDA survey data analyzed in this study provide no direct measure of risk attitudes with which to examine such relationships. Hence, we focus this discussion on the transaction cost minimizing motives that are associated with contracting.

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<sup>1</sup> The 2002 USDA National Organic Standards regulation requires farmland to be dedicated to organic production for three years before its products can be labeled organic, thereby creating a lag between increases in retail demand and farm supply. According to Dimitri and Oberholtzer (2008), the resulting shortage of and competition for organic ingredients have led handlers in recent years to rely on contracts to secure needed inputs.



Transaction cost economics (Williamson, 1975), agency theory (Alchian and Demsetz, 1972), and property rights theory (Grossman and Hart, 1986) grew from Coase's (1937) insight that transaction costs render the adopted organizational form and the initial assignment of property rights relevant for efficient outcomes. There has been substantial progress towards joining these positive transaction costs theories (e.g., Mahoney, 1992; Kim and Mahoney, 2005; Klein and Sykuta, 2010) with the central notion that adopted organizational forms minimize transaction costs. Transaction cost economics prescribes that higher levels of most types of uncertainty and higher degrees of asset specialization lead to more sophisticated trade mechanisms (Williamson, 1975).<sup>2</sup>

Uncertainty may be environmental (reflecting variation in supply and demand and resulting prices or revenues, for instance) or behavioral when performance evaluation or outcome or quality measurement is difficult (called performance ambiguity in agency theory). In our research context, organic handlers may contract to secure adequate supply in a market environment where supply lags demand increases due to the mandated three-year farmland transition to organic status and weather impacts on yield, or to provide oversight when quality measurement is difficult.

Investments in specific assets may be physical (specialized tools or equipment), human (firm-specific knowledge), or site (co-location of a coal-fired electric plant and a coal mine) (Williamson, 1985). Such investments have lower (salvage) value outside of the trade relationship, and the difference in value (i.e., a quasi-rent) must be safeguarded by a contract, for instance, to prevent its loss in the event of costly negotiations in the presence of environmental (e.g., supply, demand) uncertainties (Klein, Crawford, and Alchian, 1978). For instance, fruit and nut production entails substantial sunk costs of establishing groves and vineyards and waiting for plants to mature to a harvestable production stage before returns may be realized (Carter, House, and Little, 1998). Organic handlers' provision of advice and financing to (aspiring) organic producers also constitute such dedicated investments. Temporal specificity, which is akin to site specificity when transportation takes substantial time, is also an issue for perishable fruits and vegetables that may require closer coordination of trade (Williamson, 1985; Masten, Meehan, and Snyder, 1991; Ménard and Klein, 2004). Furthermore, behavioral

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<sup>2</sup> In addition to uncertainty and asset specificity, greater frequency of transactions may enhance the likelihood of vertical integration (Williamson, 1979). Researchers typically test for the predicted alignment of transactional forms with these transaction attributes, as the associated transaction costs are not easily measured (Klein, Frazier, and Roth, 1990). Ex-ante (ex-post) transaction costs are incurred prior to (following) contract signing or initiation of the exchange relationship (Williamson, 1985). Ex-ante costs are search and information costs; drafting, bargaining, and decision costs; and costs of safeguarding an agreement, and ex-post costs are monitoring and enforcement costs; adaptation and haggling costs; bonding costs; and maladaptation costs.



uncertainties permit appropriation of unearned rents through shirking effort or reneging on promised quality. Hence, the commonly tested hypotheses are:

- H1 Greater asset specificity leads to greater use of contracts instead of spot markets.
- H2 Greater uncertainty leads to greater use of contracts instead of spot markets.

The literature identifies tradeoffs of contracting for a longer duration to safeguard specific or durable investments and for a shorter duration to maintain flexibility under notable market (i.e., environmental) uncertainty (Crocker and Masten, 1991; Crocker and Masten, 1996). In organic markets, longer duration contracts would be preferable for protecting handlers' investments in suppliers' capabilities in organic production, while shorter duration contracts should be more desirable for commodities with uncertain availability and less established demand. However, when effort, quality, or product claims cannot be easily or immediately verified, contracts of longer duration may mitigate behavioral uncertainty if performance can be more easily inferred over longer periods of time, and compensation can be tied accordingly to average historical performance. Such measurement/verification issues are more pertinent for livestock and poultry, which are graded after slaughter, than for instance easily sampled deliveries of grains, and are compounded for any commodity when additional value claims (e.g., all-natural, grass-fed, organic) are made. Duration is up to five years for tournament contracts where broiler producers' performance is compared across peers to screen out the effects of systemic production uncertainty (Knoeber, 1989; Knoeber and Thurman, 1995). Notably, Knoeber (1989) recognizes rapid technological change as a deterrent to vertically integrated company farms, the exception to the general rule that uncertainty leads to more sophisticated governance. Thus, we hypothesize:

- H3 Greater asset specificity leads to longer contract duration.
- H4 Greater environmental uncertainty leads to shorter contract duration.
- H5 Greater behavioral uncertainty leads to longer contract duration.

However, the costs of writing contracts may not need to be incurred if reputation effects are sufficient to safeguard quasi-rents (Williamson, 1991: 291):



Parties to a transaction to which reputation effects apply can consult not only their own experience but can benefit from the experience of others. ... Improved reputation effects attenuate incentives to behave opportunistically ... since the immediate gains from opportunism in a regime where reputation counts must be traded off against future costs.

Ménard (2004) notes that trust, due to reputation, recurrent transactions, or social networks and social similarities among traders (see Ouchi [1980] on clans), alleviates opportunism. Allen and Lueck (1992) find reputation increases use of oral, as opposed to written, land rental contracts.

Since such reputation effects can limit appropriation of quasi-rents, we hypothesize:

H6 Reputation for quality allows use of less formal marketing arrangements.

The next section discusses the data and methods used here to test these hypotheses for organic food markets.

### Data and Methods

The USDA-ERS organic handler surveys cover topics related to procurement and contracting of organic products and ingredients, including procurement methods (i.e., written contracts, informal contracts, spot transactions) and contract terms (i.e., contract duration, pricing mechanism, quality measurement, and other clauses). Organic procurement data include information on 1,038 facilities in 2004 and 1,013 facilities in 2007, and organic contract data include information from 686 facilities in 2004 and 620 facilities in 2007 that use contracts. While all survey respondents are certified organic handlers, some of these firms procure organic products without contracts and may also handle conventional products. The 2004 survey list was accumulated by acquiring contact information on relevant firms from 56 domestic accredited organic certifying agents, while the 2007 survey list was identified using the USDA National Organic Program's list of certified entities. Procurement data are summarized across respondent type (i.e., all handlers, manufacturers/processors, and all others) and by nine commodity groups and 45 underlying commodities, and are available at national and regional levels as well as for some states. Contract data are available only at the national level but are otherwise similar to the procurement data. Table 1 describes the survey items used in this study.

We use factor analysis (Hair et al. 1995) to limit measurement error for key variables which can be inferred only indirectly from correlation or covariance of observable indicator variables. Relationships between relevant survey items are summarized as a



smaller set of more parsimonious variables (eigenvectors called factors) that conserve degrees of freedom and improve power against Type II error in subsequent analyses (Thompson, 2004). Following conventional practice, notable factors possessing characteristic roots (eigenvalues) greater than one are identified in the exploratory phase (Thompson, 2004). Such factors consist of survey items with high factor loadings and explain the majority of common variance. "Furthermore, ... the unreliable variance in the original variables tends to be discarded once the original scores are reexpressed in a smaller set of factor scores" (Thompson, 2004, p. 5). Details regarding the reliability of measures derived from confirmatory factor analysis are provided in the results section.

Since contract and contract terms data are reported by commodity as the percentage of respondents in a geographic area using certain procurement methods (e.g., contract or spot) and contract terms, Tobit and truncated least squares regressions are employed to examine the factors influencing their use. Several studies investigating determinants of the proportion of agricultural production contracted have employed Tobit procedures (e.g., Shapiro and Brorsen, 1988; Goodwin and Schroeder, 1994; Musser, Patrick and Eckman, 1996; Hobbs, 1997). The log-likelihood for the Tobit model contains probabilities of nonuse of contracts from a Probit regression in the first term and a classical regression for positive amounts contracted in the second term:

$$(1) \quad \ln L = \sum_{\alpha_i=0} \ln \Phi\left(-\frac{\beta'_\alpha x_i}{\sigma}\right) + \sum_{\alpha_i>0} \ln \left[ \frac{1}{\sigma} \phi\left(\frac{\alpha_i - \beta'_\alpha x_i}{\sigma}\right) \right]$$

where  $\Phi(\cdot)$  is the standard normal probability density function,  $x_i$  and  $\beta_\alpha$  are vectors of independent variables and coefficients,  $\sigma$  is the standard deviation, and  $\alpha_i$  denotes the proportion contracted.<sup>3</sup>

Relevant independent variables considered here include characteristics of handlers and the commodity markets in which they operate. For instance, the factor analytic measures of handlers' specific or dedicated investments (e.g., provision of advice and financing to growers) are hypothesized to increase contract use and duration (i.e., hypotheses H1 and H3), and variables regarding use of uniform product standards and testing of product claims relate to hypotheses regarding uncertainty (e.g., hypothesis H5). Reputation and continuing relationships may engender trust allowing for less formal marketing arrangements (i.e., hypothesis H6). Furthermore, dummy variables control for commodity

<sup>3</sup> The proportion contracted  $\alpha_i$  equals the latent variable  $\alpha_i^*$  for  $\alpha_i^* = \beta'_\alpha X_i + \varepsilon_{\alpha i} > 0$  and equals zero otherwise, where  $\varepsilon_{\alpha i}$  are independently and normally distributed residuals with mean zero and variance  $\sigma^2$ .



**Table 1. Selected Items from Organic Contracting and Procurement Survey<sup>a</sup>**

Variable Names	Description (% of Respondents Replying "Yes" to Item)
<b>Geography of purchasing:</b>	
Buys local	Buys locally (within one hour drive), any amount
Buys >1/2 local	Buys locally, more than half
<b>Type of sales arrangement:</b>	
Formal	Formal contract (i.e., written)
Informal	Informal contract (e.g., handshake or verbal)
Spot	Spot market
<b>Assistance offered to suppliers:</b>	
Advise if <1 yr	Works with organic suppliers in business for less than one year
Advise standard	Provides technical advice on organic standards or production
Advise prod.	Works with suppliers to increase production
Finances	Provides financial assistance with transition to organic
<b>Supplier requirements:</b>	
Certificates	Organic certificates
Package specs.	Product specifications for packaging and merchandising
Test claims	Testing to verify product claims (e.g., free of genetically modified organisms)
3 <sup>rd</sup> party cert.	Third party food safety certification
Standards	Uniform product standards (e.g., size standards)
<b>Ranking of supplier attributes:</b>	
Local priority	Local (near my facility) ranked as high priority
Relationship	Length of relationship with my facility ranked as high priority
Reputation	Reputation for quality ranked as high priority
<b>Contract Terms:</b>	
Multiyear	Multiyear contract duration
Flat price	Flat price
Cost +	Production costs plus a mark up
Organic premium	Conventional price plus a mark up
Fixed price +	Fixed price plus quality premium

<sup>a</sup> Source: USDA Organic Procurement and Contracting Dataset:  
<http://www.ers.usda.gov/Data/OrganicHandlers/>.





group effects and may capture greater uncertainty regarding availability of imported organic products like coffee, tea, and cocoa and the temporal specificity of perishable fruits and vegetables (Williamson, 1985; Masten, Meehan, and Snyder, 1991; Ménard and Klein, 2004), as well as the substantial sunk costs of and delayed returns from establishing groves and vineyards (Carter, House, and Little, 1998). This approach is consistent with Mondelli (2011) and Mondelli and Klein (2010), who surveyed credit officers familiar with agricultural assets to rate the level of asset specificity associated with various sectors of production agriculture due to difficulty of identifying appropriate measures in secondary data. While Mondelli and Klein (2010) construct continuous measures of asset specificity by linking credit officers' ratings to companies' four digit Standard Industry Classifications, the studies indicate that these conditions are usually more prevalent for poultry, hog, floriculture, fruit, and tree nut production than for other commodities.

Under the Tobit formulation, the independent variables and associated coefficients are constrained to be the same for the contract adoption and proportion contracted decisions. If numerous observations of nonadoption for a particular contract or contract terms exist, then truncated least squares regressions should be employed to avoid confounding explanatory variables' effects on adoption and proportional use (Katchova and Miranda, 2004). For instance, in the context of our aggregated organic contract and procurement data, just over 2% of the observations are zeros, indicating nonadoption of procurement methods (e.g., formal and informal contracts and spot markets) for which Tobit estimation is appropriate. However, between 7% and 54% of observations indicate nonuse of the various pricing mechanisms analyzed, as each organic contract uses only one of several available pricing mechanisms. Hence, truncated OLS regression is appropriate for pricing mechanisms.

### **Empirical Results**

Table 2 contains correlations among selected survey items used in this study. Notable correlation, in excess of 0.50, suggests that three items regarding buyers' advice to new suppliers (i.e., in business for less than a year), and more generally, advice regarding organic standards and increasing organic production may be indicators of a latent (indirectly observable) variable characterizing buyers' specific investments in suppliers' human capital. Buyers' financial investments in suppliers' transitions to organic, though correlated, may conceptually be more closely related to specialized investments in physical assets. Similarly, correlation among three items pertaining to the local proximity of suppliers may be reflective of a latent site specificity variable. Interestingly, several of these items exhibit stronger, positive correlation with contract than with spot variables, which is consistent with transaction cost theory.



Table 2. Correlations of Survey Responses

	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24
(1) Formal contract	1.00																							
(2) Informal contract	-0.15	1.00																						
(3) Spot market	-0.07	0.16	1.00																					
(4) Multiyear	0.06	-0.18	-0.21	1.00																				
(5) Flat price	-0.15	0.26	0.09	-0.10	1.00																			
(6) Cost +	0.13	-0.10	-0.16	0.31	-0.08	1.00																		
(7) Organic Premium	0.09	-0.03	-0.20	0.04	-0.14	0.04	1.00																	
(8) Fixed price +	0.07	-0.18	-0.03	0.14	-0.34	0.25	0.11	1.00																
(9) Manufacturer <sup>a</sup>	-0.02	-0.07	-0.09	-0.05	0.01	-0.08	0.02	-0.13	1.00															
(10) Yr-round avail.	-0.19	-0.26	0.00	0.33	-0.09	0.25	-0.17	0.10	0.27	1.00														
(11) Advise standard	0.15	0.20	0.14	0.08	0.16	0.22	-0.10	0.10	-0.32	-0.12	1.00													
(12) Advise prod.	0.34	0.19	0.12	0.22	0.22	0.22	-0.05	-0.03	-0.51	-0.07	0.72	1.00												
(13) Advise if <1 yr	0.19	0.24	0.14	0.20	0.09	0.31	-0.04	0.04	-0.31	-0.05	0.53	0.51	1.00											
(14) Finances	0.27	-0.25	0.20	0.45	-0.20	0.34	-0.09	0.30	-0.02	0.20	0.22	0.12	0.36	1.00										
(15) Buys local	-0.07	0.14	0.42	-0.07	-0.15	0.09	0.10	0.21	-0.27	0.00	0.23	0.15	0.33	0.24	1.00									
(16) Buys >1/2 local	-0.17	0.01	0.38	-0.10	0.00	0.11	-0.06	0.13	-0.33	0.09	0.10	0.03	0.14	0.19	0.76	1.00								
(17) Local priority	0.17	0.35	0.03	0.05	0.18	0.16	0.13	0.09	0.13	-0.29	0.26	0.21	0.27	0.09	0.16	0.06	1.00							
(18) Certificates	0.31	-0.04	-0.24	0.16	-0.16	0.15	-0.07	0.14	-0.25	-0.25	0.08	0.25	0.01	0.00	-0.25	-0.28	0.09	1.00						
(19) Package specs.	-0.19	-0.11	0.11	-0.06	-0.06	-0.26	-0.13	-0.09	0.45	0.30	-0.32	-0.44	-0.23	-0.03	-0.24	-0.23	-0.40	-0.26	1.00					
(20) Test claims	0.37	0.00	0.14	-0.11	-0.05	-0.01	-0.18	0.08	0.04	-0.10	0.31	0.16	0.23	0.19	-0.01	-0.11	0.10	0.21	0.13	1.00				
(21) 3 <sup>rd</sup> party cert.	0.14	0.18	0.21	-0.13	0.17	0.01	0.03	0.01	-0.04	-0.24	0.26	0.24	-0.02	-0.16	-0.16	-0.18	0.07	0.32	0.12	0.50	1.00			
(22) Standards	-0.18	-0.08	-0.16	0.10	-0.17	-0.02	-0.18	-0.02	0.37	0.34	-0.11	-0.16	-0.14	-0.05	-0.42	-0.43	-0.09	0.06	0.41	0.29	0.05	1.00		
(23) Relationship	0.29	-0.15	0.29	0.24	-0.25	0.06	-0.16	0.35	-0.35	0.01	0.28	0.26	0.18	0.44	0.31	0.41	0.06	0.28	-0.10	0.24	0.12	-0.29	1.00	
(24) Reputation	-0.27	-0.08	0.36	-0.08	0.00	-0.11	-0.28	0.12	-0.16	0.14	-0.12	-0.14	-0.09	0.03	0.28	0.42	-0.06	0.11	0.20	0.20	0.15	0.10	0.36	1.00

<sup>a</sup> Manufacturer is a binary dummy for average responses by manufacturers (1 = manufacturer; 0 = no). Other variable descriptions are supplied in Table 1.

Figure 1 illustrates the results of confirmatory factor analysis (Hair et al., 1995) to determine whether the correlations discussed above do in fact represent latent variables. Exploratory analysis (not shown here, but available from authors upon request) suggests that buyers' financial investments in suppliers' transition to organic are separate from their investments in suppliers' knowledge of organic production (i.e., human capital). The three items relating to human capital investments load highly on the latent factor subsequently named Human Capital Investment. Similarly, the three items pertaining to sourcing organic products locally load highly on the latent factor named Locally Sourced. These variables are very reliable measures as indicated by Cronbach's (1951) alphas between 0.70 and 0.90 (Streiner and Norman, 1995). Including these measures in regression analysis conserves degrees of freedom and avoids multi-collinearity issues that may arise from including each of the underlying variables individually (Thompson, 2004). Additionally, sensitivity analysis (available from authors upon request) reveals that including one of each of the underlying variables in subsequent regression analysis tends to underestimate the magnitude and, in some cases, the statistical significance of effects. Regression results using reliable factors are discussed below.

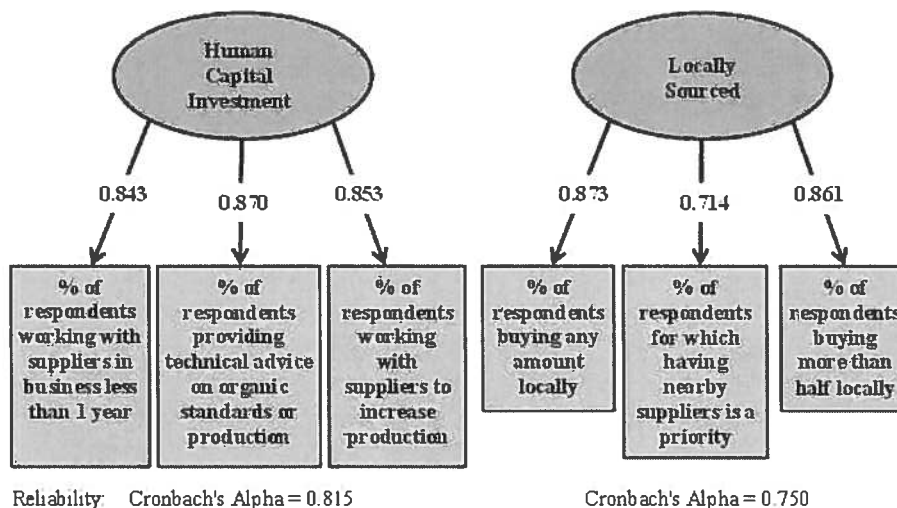


Table 3 presents the results of various Tobit and truncated OLS regressions where the transaction method (i.e., spot market and formal and informal contracts) and contract terms are the dependent variables, and binary dummy variables are included for

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commodity groups.<sup>4</sup> As surveys were conducted in 2004 and 2007, a binary dummy variable equaling one for 2007 and zero for 2004 allows detection of changes in procurement methods and contract terms over time. The low explanatory power of regressions, as indicated by low  $R^2$ , is not surprising given that the data are reported as the average percentage of respondents across commodities.<sup>5</sup>

Consistent with transaction cost theory and hypothesis H1, buyers' investments in suppliers' human capital increase use of formal contracts 6%, as contracts may help to ensure a return on such investments (Table 3). While such investments are also related to spot market use here, significant reputation effects appear to safeguard such investments, which is consistent with hypothesis H6. Notably, high regard for reputation is inversely related to use of formal contracts. Buyers' financial assistance of suppliers' transition to organic production is not significantly associated with any procurement method or contract term, however. The statistically significant inverse relationship between formal contract use and the latent variable reflecting local sourcing of organic products is not consistent with hypothesis H1 either. It may be that formal contracts are used less by buyers sourcing locally, as tabs can be kept on nearby suppliers under more informal arrangements.

Commodity group dummy variables also provide some insights regarding procurement method, some of which relate to asset specificity explanations (Table 3). Relative to livestock, contract use is significantly greater for the coffee, tea, and cocoa group, the fruit and nuts group, the oilseed, grains, and legumes group, and the vegetable and melons group, but no significant difference is found for greenhouse and nursery, poultry and eggs, and dairy groups. For commonly imported commodities (i.e., coffee, tea, and cocoa) and especially plant-based products with high yield variation like fruits and vegetables, higher contract use may reflect uncertainty regarding availability of supply, which is consistent with hypothesis H2. Higher contract use for vegetables, fruits, and nuts may also reflect various forms of asset specificity, consistent with hypothesis H1. For instance, the perishable nature of fruits and vegetables implies temporal specificity (Williamson, 1985; Masten, Meehan, and Snyder, 1991; Ménard and Klein, 2004). Higher contract use for fruits and nuts, relative to other organic products,

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<sup>4</sup> The livestock commodity group dummy is excluded, and hence, the coefficients for dummy variables are all relative to the livestock group.

<sup>5</sup> Note that no equivalent  $R^2$  measure is available for truncated least squares regressions.



Table 3. Marginal Effects for Tobit and Truncated Regressions

	Formal Contract	Informal Contract	Spot	Multiyear Contract	Flat Price	Cost- Plus	Organic Premium	Fixed-Price- Plus
Manufacturer	1.4011 (2.6857)	2.4771 (2.8157)	1.2403 (2.6126)	-6.1159 (5.7651)	9.4463** (4.1719)	-7.7614** (3.0839)	-5.228 (3.8480)	-1.3131 (4.4381)
Year-round availability	0.055 (0.0855)	-0.1791** (0.0897)	-0.1520* (0.0832)	0.5148*** (0.1741)	-0.1697 (0.1478)	-0.2283 (0.1488)	-0.0133 (0.1551)	-0.1328 (0.1332)
Human K investment	6.1469*** (1.5850)	-0.9355 (1.6600)	6.6775*** (1.5421)	-1.9506 (5.2750)	3.2514 (3.2521)	-0.6779 (3.8565)	-0.8859 (4.4619)	3.2083 (3.3033)
Finance transition to organic	-0.0918 (0.1055)	0.0885 (0.1107)	-0.1098 (0.1026)	0.3115 (0.2606)	-0.1576 (0.1868)	-0.3297 (0.2250)	-0.039 (0.1973)	0.5022 (0.3377)
Locally sourced	-3.4707** (1.5728)	3.4848** (1.6480)	-0.8993 (1.5286)	3.2871 (3.4769)	-4.8881* (2.6818)	-0.0265 (1.9527)	1.3477 (2.5659)	4.1416 (2.9018)
Requires certificates	0.2209 (0.2811)	0.4258 (0.2947)	-0.5057* (0.2730)	0.5538 (0.6179)	-0.8820* (0.4528)	0.6364 (0.5328)	0.1605 (0.3814)	0.9065*** (0.3539)
Package/merch. specs.	-0.0965 (0.0755)	0.1218 (0.0789)	-0.0453 (0.0734)	0.4084** (0.1988)	0.1474 (0.1414)	0.5812*** (0.2223)	0.1124 (0.1712)	-0.1236 (0.1554)
Test to verify claims	0.1813** (0.0860)	0.12 (0.0902)	0.0005 (0.0837)	-0.4506** (0.1837)	-0.0143 (0.1412)	-0.8819*** (0.1946)	-0.0054 (0.1540)	-0.2195* (0.1244)
3 <sup>rd</sup> party certification	0.006 (0.1051)	0.0743 (0.1102)	0.0637 (0.1025)	-0.0995 (0.3064)	0.0157 (0.1798)	-0.5399** (0.2478)	0.2259 (0.1771)	-0.1973 (0.1208)
Uniform standards	0.0775 (0.1054)	-0.2104* (0.1103)	0.0468 (0.1027)	-0.5924** (0.2705)	-0.3796** (0.1812)	0.7988*** (0.2060)	0.1091 (0.1953)	0.1106 (0.1302)
Length of relationship	-0.0019 (0.0976)	0.1207 (0.1023)	-0.2627*** (0.0948)	0.2612 (0.2180)	-0.1479 (0.1748)	0.3726** (0.1644)	-0.4480** (0.1859)	-0.4098** (0.1756)
Reputation for quality	-0.2057** (0.0980)	0.0598 (0.1027)	0.1594* (0.0951)	-0.0769 (0.2037)	0.2507 (0.1624)	-0.225 (0.2091)	-0.0643 (0.2214)	0.2941 (0.2285)
Coffee, tea, and cocoa	28.7759*** (9.3428)	-23.7471** (9.7918)	44.1036*** (9.1125)	-19.7479 (22.7773)	-34.1227* (17.9961)	-7.7537 (13.1783)	-33.1549* (18.7907)	15.443 (12.6186)
Dairy	-2.9912 (9.3861)	-0.3185 (9.8395)	-2.4772 (9.1086)	12.1932 (21.4209)	-13.2163 (17.4017)	-19.1110* (10.3214)	-53.6037*** (16.7634)	40.7888*** (11.9551)
Fruits and nuts	17.7632** (7.2871)	-2.9664 (7.6368)	12.0809* (7.0761)	4.1911 (19.2066)	-13.6505 (14.4346)	-14.2669*** (8.7649)	-28.9509** (12.6005)	-0.0386 (8.5615)
Greenhouse and nursery	7.7795 (7.7371)	3.4491 (8.1088)	13.0512* (7.5165)	-1.7824 (18.9975)	-10.4733 (14.8907)	-25.3789 (8.5346)	-22.3434* (12.8969)	-6.9042 (6.8193)
Oilseeds, grains, legumes, & feed	12.7870* (7.0642)	0.4723 (7.4030)	16.6704** (6.8594)	-9.9976 (19.0875)	1.7917 (13.4396)	9.1435 (9.2452)	-32.5281*** (11.6106)	-3.8643 (6.5538)
Poultry and eggs	2.8768 (8.0974)	-1.2321 (8.4867)	13.4059* (7.8697)	48.4537** (19.0162)	-1.3708 (14.3986)	4.1553 (11.0521)	-15.7868 (10.9506)	—
Vegetables	20.1012*** (7.4367)	-7.5758 (7.7948)	14.4022** (7.2195)	12.2243 (20.9422)	-0.3999 (14.4941)	-8.2665 (10.5680)	-29.3615** (13.5302)	0.183 (7.1811)
Year 2007	-14.9403*** (5.6530)	0.6668 (5.9253)	-1.829 (5.4933)	44.4465*** (13.0048)	-0.5562 (9.1989)	23.6517** (10.7683)	-10.3753 (12.3792)	—
Sigma	13.9023 (0.7734)	14.5705 (0.8154)	13.4891 (0.7617)	12.6100*** (1.5384)	16.0782*** (1.2193)	5.3505*** (0.7548)	6.3303*** (0.9124)	5.7248*** (0.7617)
R <sup>2</sup>	0.0424	0.033	0.0521	—	—	—	—	—
Observations	164	163	161	66	115	33	35	37
Censored or Truncated	1 at 0%, 1 at 100%	1 at 0%, 2 at 100%	3 at 0%, 2 at 100%	60 at 0%, 1 at 100%	12 at 0%	94 at 0%	92 at 0%	31 at 0%

Note: Asterisk (\*), double asterisk (\*\*), and triple asterisk (\*\*\*) denote significance at 10%, 5%, and 1%, respectively.

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may also reflect the substantial sunk costs of establishing groves and vineyards and the delay in returns from waiting for plants to mature to a harvestable production stage (Carter, House, and Little, 1998; Mondelli, 2011; Mondelli and Klein, 2010).

Multiyear contracts are used significantly more by buyers requiring year-round availability and those requiring suppliers to meet packaging and merchandising specifications, and are needed significantly less when uniform product standards are used and product claims are tested (Table 3). The use of long-term contracts when suppliers must make specialized investments to meet the packaging and merchandising specifications of particular buyers is consistent with hypothesis H3. However, there is no evidence in support of the hypothesized negative relationship between environmental uncertainty and contract duration (hypothesis H4). For instance, although the negative sign of the coffee, tea, and cocoa dummy variable is consistent with short-term contracting in uncertain import markets, the effect is statistically insignificant. The availability of established uniform product standards and the ability to test to verify product claims helps limit the potential for behavioral uncertainty, and lower use of long-term contracts under conditions with lower potential for behavioral uncertainty supports hypothesis H5. Significantly greater utilization of multiyear contracts for poultry and egg procurement is also consistent with hypothesis H5, considering the use of multiyear broiler production tournament contracts to engender producer effort is common in that sector (Knoeber, 1989; Knoeber and Thurman, 1995).

The last four columns of Table 3 pertain to truncated OLS regression results for alternative pricing provisions included in contracts. Relative to other handlers, manufacturers use significantly more flat-price and less cost-plus contracts with their suppliers. Flat-price contracts are used less when products are sourced locally, when organic certificates are required, or when uniform product standards are in place. Instead, if such standards are in place or organic certificates are required, more sophisticated pricing mechanisms are commonly used to adjust for cost (i.e., cost-plus) or quality (i.e., fixed-price-plus quality premiums), respectively. Cost-plus pricing is also more prevalent when suppliers must meet product specifications for packaging and merchandising, but buyers seem less willing to cover suppliers' costs if these costs include third party certification and testing to verify product claims. Interestingly, organic premiums over conventional prices and quality premiums over fixed prices appear to be less necessary in longer duration relationships, once suppliers become familiar with buyers' needs (see last two columns of Table 3). Various commodity group dummy variables are significantly associated with pricing mechanisms, as well. For example, relative to livestock (i.e., the omitted commodity group), most commodity groups have a lower percentage of contracts offering organic premiums over conventional commodity prices, and fixed-price-plus quality premium pricing is significantly greater for dairy products.



Interestingly, use of formal contracts decreased while multiyear and cost-plus contracts increased in 2007 relative to 2004. Mayer and Argyres (2004) found that writing optimal contracts is learned over time by firms in the personal computer industry. Similarly, learning and/or the development of reputations and longer-term relationships may be playing a role in the dynamics of procurement practices for the organic food industry. That is, as trade partners become more familiar with each other's needs and practices over time, they realize more sophisticated combinations of contract terms allowing for longer duration contracts, and trust through established relationships or reputations decreases the overall need for contracts. Such occurrences could contribute to trends of fewer and longer-term contracts.

### **Discussion and Conclusions**

Using data from USDA ERS organic handler surveys, this paper investigates factors influencing use of procurement methods and contracting terms in markets for organic products, where contracting is more prevalent than in the conventional commodity sector (Dimitri and Oberholtzer, 2009). Factor analytic methods (Hair et al., 1995) limit error in the measurement of key conceptual variables, and Tobit and truncate least squares regressions are used to examine hypothesized relationships between these variables and the procurement methods and contracting terms of interest.

Consistent with transaction cost theory, use of formal contracts is significantly related to buyers' investments in suppliers' understanding of organic production (i.e., human capital asset specificity) and low reliance on reputations, whereas reliance on reputations enables spot market governance of transactions entailing similar investments. Findings regarding proximity of trade partners are not consistent with transaction costs theory's hypothesized effects for site specificity. Formal contracts are used significantly less by organic handlers sourcing products locally, as they may keep tabs on nearby suppliers with less formal means. This finding may also reflect that, due to temporal issues (i.e., product perishability), formal contracts may be required between trade partners separated by greater distances. Findings of greater contract procurement of organic fruits, vegetables, and nuts relative to organic livestock may reflect such temporal issues due to perishability, as well as the substantial sunk costs of establishing groves and vineyards and delayed returns from waiting for plants to mature to harvestable stage.

Multiyear contracts are used significantly more by buyers requiring year-round availability and those requiring suppliers to meet product specifications for packaging and merchandising but are needed significantly less when uniform product standards are used and product claims are tested. Use of long-term contracts when suppliers make investments to meet the packaging and merchandising specifications of particular buyers is consistent with transaction cost theory's prescription for safeguarding such



investments. Use of established product standards and testing product claims helps limit the potential for behavioral uncertainty, and less need for long-term contracts under such conditions is also consistent with the theory. Similarly, significantly greater utilization of multiyear contracts for poultry and egg procurement is observed, which is consistent with the use of multiyear broiler production tournament contracts to incentivize producer effort reported in prior research (Knoeber, 1989; Knoeber and Thurman, 1995).

Relative to other organic handlers, manufacturers use more flat-price and less cost-plus contracts with their suppliers. Cost-plus pricing is more prevalent when uniform product standards are in place and if suppliers face product specifications for packaging and merchandising, but is less prevalent if the costs include required third party certification and testing to verify product claims. Relative to livestock, most other organic products have a lower percentage of contracts offering premiums over conventional commodity prices. Commodity group specific effects are significantly associated with other pricing mechanisms, as well. For instance, fixed price plus quality premium pricing is significantly greater for dairy products and also significantly more likely when organic certificates are required.

Finally, use of formal contracts decreased while multiyear and cost-plus contracts increased in 2007 relative to 2004, which may reflect learning with respect to optimal procurement methods and contract terms (Mayer and Argyres, 2004). Development of reputations and growth in length of relationships over time may also be playing a role.

These trends raise the question of whether the proportionally higher contract use reported for organic relative to conventional products (Dimitri and Oberholtzer, 2009) will persist through maturation of this relatively younger niche market. The significant association found here between formal contract use and organic handlers' provision of advice to growers may indicate that contracts provide a mechanism to train suppliers and increase availability of organic products. Then relatively high levels of contract use may be required as organic markets expand. However, if market growth stagnates, contract use may decline in this sector with diminished need for new suppliers and development of reputations, trust, and familiarity (i.e., knowledge of needs) between existing market participants.

Another factor is whether the USDA organic certification standards will adequately serve the industry as it evolves. USDA standards may not provide sufficiently differentiated quality characteristics to allow downstream distributors to capture the most value from their organic products. For instance, Jang and Sykuta (2009) find the growing contract use and carcass-merit pricing in the hog industry is at least partly attributable to inability of USDA grading standards to distinguish quality characteristics of interest to packers. Future research may continue to monitor changes in the use of these procurement methods over time, and make more direct comparisons between





procurement methods for conventional and organic products, as well as other value added products (e.g., free of genetically modified organisms).

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