



Contractual arrangements between farmer cooperatives and buyers in China

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ABSTRACT

The agrofood market in China is dominated by spot market exchanges of small farmers and various small traders, with only minor penetration of the modern supply chain at the farmgate. The emerging Farmer Professional Cooperatives (FPCs) are expected to facilitate vertical coordination. The overall goal of this study is to investigate the contractual arrangements between the FPCs and the buyers. Based on a national representative survey of 157 FPCs in China, this study shows that 32% of FPCs introduced written contracts in the primary marketing channel. Contracts are more likely to be adopted in the livestock sector and are positively related to the scale of production. While branding promotes contracts between FPCs and buyers, public certification of quality and food safety often substitutes for contracts. Furthermore, the membership heterogeneity of FPCs affects an FPC's decision to use contractual arrangements with the buyer.

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Introduction

Smallholder farmers in developing countries face substantial difficulties accessing information and working together in low-cost and low-risk agrofood systems. The use of contracts in the agrofood chain arises when: (a) Firms attempt to reduce the transaction costs of marketing; (b) a small volume of transactions in both production and marketing limits the economies of scale; (c) limited opportunities exist for processors and retailers to source farm produce in a traditional marketing approach; and (d) smallholder farmers have a limited capacity to obtain inputs, and lack the knowledge to use these inputs (Dorward et al., 1998; Little and Watts, 1994; Poulton et al., 2005). The transaction cost approach was introduced to elicit vertical coordination via contracts in the agrofood market (Frank and Henderson, 1992; Martinez, 2002; Masten, 2000). These parallel studies, while approaching the issue from somewhat different angles, found that production attributes that affect transaction costs determine the vertical contracts in the agrofood system.

Internationally, agricultural products produced under contracts have increased rapidly in both developing as well as developed countries, and the growing number of complex contractual arrangements replacing spot markets is a defining characteristic of the “agro-industrialization phenomenon” (Cook and Chaddad, 2000, p. 213). For example, in the USA, the poultry, egg, and pork industries have taken significant steps to improve the control of

production through vertical contracts (and/or vertical integration) (Martinez, 2002). According to Key and MacDonald (2006), the share of farms contracting in the USA accounted for 39% of the total. In Brazil, 75% of poultry production is coordinated via contracts. In Vietnam, approximately 90% of cotton and milk, 50% of tea, and 40% of rice are being purchased through contracts (da Silva, 2005).

In China, the agrofood market is dominated by a large number of small farmers, traders and wholesalers. For example, Huang et al. (2007) surveyed the horticultural market in North China and found that 18.4% of farmers sold their products to small brokers, and 80% of farmers sold products to wholesalers in 2005. Only 0.3% of small farmers reported marketing via a modern supply chain (e.g., supermarkets). None of the surveyed farmers contracted with the buyers and none of them received any service (viz. technology, inputs or credit) from the midstream or downstream segments. This lack of vertical coordination poses tremendous challenges to compliance with food safety standards (Huang et al., 2008). While there has been rapid growth of the supermarket sector in China (Hu et al., 2004), there are few implications for the reorganization of the agrofood supply chain as it affects the “transformation” of agrofood systems in other developing countries.¹

While being specific to the horticultural sector in a limited region in China, the Huang et al. (2007, 2008) studies do not reflect

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¹ The rise of supermarkets beginning in the mid-1990s has transformed the agrofood system in some other developing countries (Reardon et al., 2003; Weatherspoon and Reardon, 2003). The incipient shift to supermarkets in China occurred in the second half of the 1990s and into the 2000s. Hu et al. (2004) found that, by 2003, supermarket sales in China were growing by 30–40% per year, 2–3 times faster than in other developing countries.

the variation across different industries or regions. Nor did the research of Huang et al. (2007, 2008) consider the interventionist policies – termed as agro-industrialization (*nongye chanyehua* in Chinese) – that have been directed at China's high-value sectors and their participants. Niu and Xia (2000) reviewed China's agro-industrialization as a whole and concluded that the agrofood system in China faced challenges of insufficient coordination between production and marketing. By focusing on the livestock supply chains that contain the modern processing industry in China, Waldron et al. (2010) posited that the high-value agrofood chain driven by interventionist policies in China led to perverse outcomes for rural development, food safety and trade.

Given the various challenges within the agrofood supply chain, it becomes crucial to embark on institutional innovations. A collective organization that sets and enforces formal rules has been shown to be one option to overcome the coordination problems in the agrofood system (Markelova et al., 2009; Poulton et al., 2004). Hendrikse and Veerman (2001) predicted that a farmer cooperative is an efficient governance structure when the level of asset specificity of upstream producers increases and becomes important. Since the early 21st century, the Chinese government has also made substantial efforts to promote the development of farmer's cooperatives.² By 2008, 21% of China's villages had at least one Farmer Professional Economic Cooperative (FPC) (Deng et al., in press). Farmer organizations emerged as a mixture of economic rationale and political will.³

Understanding the marketing arrangements of the emerging FPCs in China is important given their rapid growth and the size of China's agriculture. The question therefore arises; have FPCs used contracts to sell their products? If yes, what kinds of contractual arrangements have been used between FPCs and their buyers? Are there any differences in contractual arrangements among agricultural products? To our knowledge, there is no study in the literature that has examined these questions empirically. The overall goal of this study is to investigate the contractual arrangements between the FPCs and the buyers. Based on large-scale survey data collected in 2008 in five provinces in China, this study provides the most updated information on FPC's contractual arrangements with buyers, and the major factors that are associated with these contracts. The findings in this study also have policy implications for promoting vertical coordination via contracts to meet the emerging food safety concerns in China's agrofood system.

This paper is structured as follows. Section "Conceptual framework" presents a conceptual framework and draws research hypotheses. Section "Survey data and descriptive analysis" introduces the mode of data collection and describes the contractual arrangements of FPCs (with their mid- and downstream buyers). In Section "Econometric analysis", we empirically estimate the determinism of the contractual arrangement of FPCs with their buyers. Conclusions are presented in Section "Conclusion".

² The supporting policies have been implemented through county bureaus of the Ministry of Agriculture and eventually at village sites. The preferential policies include fiscal subsidies, credit support, tax exemptions, official document directives, extension meetings and technical training (Deng et al., in press).

³ Since the late 1980s, Farmer Specialized Associations (FSAs) and Farmer Specialized Cooperatives (FSCs) have been established in rural China to disseminate agricultural technology among farmers. With a business registration, the latter could have their own assets and carry out their own product marketing activities. In contrast, the former were not economic organizations, and thereby did not directly carry out marketing activities (Hu et al., 2007). The systematic promotion of farmer cooperatives began in 2004 and the "Law of Farmers Professional Economic Cooperatives" was eventually promulgated on July 1st, 2007. A thorough review on the evolution of farmer cooperatives in China is available in Jia et al. (in press).

Conceptual framework

Vertical contracts in the agrofood market: a transaction cost perspective

The transaction cost approach has been used to explain transactions on the global commodity chains (Gereffi et al., 2005; Humphrey and Schmitz, 2001; Peterson et al., 2001). These studies acknowledge that, in addition to market-based relationships and hierarchies (vertically-integrated firms), there exist a set of hybrid forms encompassing the spectrum of explicit coordination. Vertical coordination via contracts is one of these hybrid forms. The rationale applies to agrofood market as well (Frank and Henderson, 1992).

Neo-institutional economists seek to understand market and non-market exchange under positive transaction costs. The emergence and structure of contracts are explained in terms of information incompleteness, moral hazard, and missing markets (Ménard, 2000). In other words, when the characteristics that the buyer is concerned about are difficult to obtain through market exchange, vertical contracts and/or vertical integration will emerge. From the viewpoint of a specific agricultural sector, Martinez (2002) found that the emergence of new, specialized large-scale production technology affected the transaction complexity of marketing exchange in the poultry, egg, and pork industries. Vertical contracts provided an efficient means of organizing markets by reducing the transaction costs. Non-standard products that originate from food safety and environmental concerns lead to the substitution of vertical contracts for arm's-length market exchange (Humphrey and Memedovic, 2006). The new institutional economists conclude that the transformation of the agrofood market increases the transaction costs associated with market exchange (holdup, coordination, and volatility), but can reduce some of these costs by entering into a contractual arrangement, although contracting will encounter other types of costs, namely *ex ante* contracting costs (when drafting, negotiating, and safeguarding agreements), and *ex post* costs (when enforcing the contracts).

To investigate the information incompleteness present in agrarian institutions, in their pioneering work, Binswanger and Rosenzweig (1986) view the production relations (including contractual arrangements) in agriculture as an endogenous response to material conditions such as spatial dispersion, seasonality, and risks.⁴ The authors conclude that family farming is the most efficient institutional arrangement in the agrarian economy. Although they did not use the new institutional economics approach, the transactional attributes that determine the agrarian forms in their study fall perfectly in the transaction cost economics (TCE) framework. More than a decade later, Allen and Lueck (1998) formalized a set of variables that affect the transaction costs of farm organization in the agrarian economy, including vertical contracts in the agrofood market.

Predictions

We follow the framework of Allen and Lueck (1998), and specify the empirical model of contractual arrangements between FPCs and the buyers as a collection of parameters,

$$V = \{L, T, \phi, \delta, \eta_1, \eta_2; Z\},$$

where V is the vertical contract of the agrofood chain between farmer cooperatives and their transaction partners.

⁴ Some endogenous determinants, such as specific consumption goals and legal codes, are excluded from the analysis of Binswanger and Rosenzweig (1986).

In the equation above, L is the length of production stage (of one harvest), T is the total number of tasks in a given stage, ϕ is the frequency of harvest, and δ is the optimal date under which the quality of harvest would not decrease significantly. Besides the material characteristics, the model specifies additional factors that affect transaction costs: whether the product of FPCs has a brand (η_1); and whether the product has been certified to a certain quality (η_2). Z denotes other controlling variables.

As in Allen and Lueck (1998), the parameters L and T explain the seasonal forces that may affect production complexity and uncertainty. The longer a production stage lasts and the more tasks one stage has, the more complicated the transaction is and the higher are the moral hazard costs that incur, thereby limiting market exchange between FPCs and their buyers. When a production stage is short and the number of tasks is minor, the transaction costs decrease and generic products tend to be marketed through market exchanges (viz. spot transactions). For example, when livestock production is subject to random forces of disease and growth (e.g., poultry and hogs), production contracts are widely used to reduce the transaction costs (Martinez, 2002). As such:

Prediction 1. Where production stage L and the number of tasks T are large, contracting is likely to be used between FPCs and their mid- and downstream partners.

The parameter ϕ explains the frequency of harvesting and marketing.⁵ Some agricultural products have only one life cycle, and marketing occurs only one time (or limited times) per harvest. Wheat, maize, cottons, and some orchard fruits fall into this category.⁶ Horticultural crops such as greenhouse vegetables, however, have several harvests per cycle. When similar transactions occur frequently over a long period of time involving some of the same parties, the one who interacts repeatedly may find it valuable to design and introduce low-cost routines to manage the transactions (Bijman, 2002). Parties involved in a long and close relationship with frequent interactions may be subject to less opportunism and thus substitute informal rules for written contracts. As contracts are rarely complete due to bounded rationality, uncertainty and opportunism, market exchange is expected to be chosen over contracts when frequent transactions introduce repeated games (Ménard, 2000). As such:

Prediction 2. Where the frequency of marketing (ϕ) is high, market exchange may be adopted over contracting.

The parameter δ measures the perishability of FPCs' products. When the optimal dates within which the quality will not change significantly decrease (viz. the smaller δ), timely marketing is crucial and contracts will be used. Timeliness is an important asset specificity, and the notion was expanded to "temporal specificity" by Masten et al. (1991). Where timely performance is critical, an opportunistic delay becomes a potentially effective strategy to seek a larger share of the gains. Contracting via FPCs offers a likely solution to reduce the losses associated with untimely shipment. As such:

Prediction 3. Where the products of FPCs are perishable, contractual arrangements of marketing will be used.

The parameters η_1 and η_2 explain the brand and certification of FPCs' products. In Williamson's transaction cost theory, reputation is one of the dimensions of asset specificity.⁷ Branding and certification are both a type of reputation specificity, thus FPCs have to invest something to make this commitment credible. Private brand names are actually the commitment to ex ante-specified high quality standards by a FPC. The commitment created by brand names is credible because the reputational capital of FPCs is at stake under a private brand. Public certification is another option for assuring quality. However, under public certification, the credibility of a quality label relies on government enforcement (Raynaud et al., 2005). Hu and Hendrikse (2009) investigated China's agricultural networks and found that many decision rights are shifted to downstream buyers with high quality products. We thus expect such a causal link between FPCs' contractual arrangements and reputation specificity (includes both brand names and certification). As such:

Prediction 4. Reputation entails positive incentive to honor a contract. When a FPCs' product has a brand or is certified, contracts will emerge.

Survey data and descriptive analysis

Survey, sampling and terms

The data used in this study are from a nationwide survey undertaken in five Chinese provinces.⁸ The first survey was conducted in late 2003, collecting primarily 2003 data in six provinces. Within each province, all counties were sorted in descending order of gross value of industrial output per capita, and two counties from each tercile of listed counties were selected from each stratum.⁹ Finally, six counties were selected in each province. The same strategy applies to the selection of township in each county; six towns were selected and, in each town, we asked all villages to send two representatives (typically the village leader and accountant) for a questionnaire-based survey at the village level. In total, 2459 villages were surveyed.

In each village survey, the two village cadres were asked whether any farmer in their village participated in any FPC, including those not based in their village or outside the boundaries of their village. If the answer was "yes", a set of questions (for example, the legal status, initiation, major functions) were continued.

The second round survey was conducted in early 2009 to investigate the development of FPCs in 2008. Considering the increased survey costs related to the FPC survey, in the second round survey we drew a sub-sample from the first. We surveyed five provinces and, in each province, the six sampled counties (from the 2003 survey) were grouped into three terciles, from which we selected one in each tercile.¹⁰ In each county, the six sampled townships surveyed (from 2003) were sorted into two groups (viz. poor and non-poor); we then drew one from each group. Finally, the second round of the survey in 2009 covered five provinces, fifteen counties, thirty townships and 380 villages.

⁷ In Williamsonism, asset specificity takes basically five forms: physical, human, site, dedicated assets that refer to transaction-relationship, and brand name (Williamson, 1989, p. 143). Masten et al. (1991) expand the notion of asset specificity to include 'temporal asset' as the sixth form one refers to when speaking of timely performance.

⁸ More details on the first round survey are available in Deng et al. (2010) and Shen et al. (2005).

⁹ Gross value of industrial output per capita (GVIO/capita) was found to be one of the best predictors of living standards and development potential (Rozelle, 1996).

¹⁰ For the five surveyed provinces, Jiangsu represents the eastern coastal area; Sichuan represents the southwestern area; Shaanxi represents the provinces on the Loess Plateau and some provinces in the northwest; Hebei represents the north and central area; and Jilin represents the northeastern area.

⁵ The frequency of harvest and market will not necessarily be the same. For example, farmers may harvest maize and sell it several times; the greenhouse farmers in Shandong Province, China, harvest tomatoes eight times for the Fall–Winter cycle, and for each harvest, they may sell for several times. Nevertheless, the two types of frequency are correlated. In the case of the greenhouse farmers, they cannot keep the tomatoes for a long time and most products have to be sold before the next harvest.

⁶ Harvesting and marketing of some orchard fruits (e.g., apples) may not be a one-time affair; it may take several rounds. Nevertheless, the ripe season is a physical limit of nature, and the optimal harvesting should be finished over a fixed amount of days, for example, 14 days in the Shandong Province in North China.

In the second round survey, we asked the village cadres, “Is there any farmer in your village currently participating (or historically participated) in any registered or non-registered farmer professional cooperatives that may not necessarily be in the residential villages?” If the answer was “Yes”, rather than surveying the village cadres about the FPCs at the village level (as done in the first round), we traced the FPCs and surveyed the FPC heads after identifying them in the village survey. A separate questionnaire was used to investigate initiation, products, internal governance structure, provision of inputs and other technical services, provision of marketing and other services, and the personal data of FPC heads. In total, we surveyed 189 FPCs and found 157 of them had specific products. *In this study, the term FPCs refers to farmer professional economic cooperatives that organize production and marketing of specific agricultural products.*¹¹

Descriptive analysis

The emergence of FPCs in China: when, who, and what

When. There were only four farmer cooperatives before 1998 in the entire sample, and there was an accelerated increase during 1998 and 2003 (Table 1). However, a systematic promotion of farmer cooperatives occurred in 2004. We find that 31% of FPCs were established during 2004 and 2006 (Table 2). Various government departments such as the Ministry of Agriculture (MOA), Ministry of Civil Administration (MCA), the State Administration for Industry and Commerce (SAIC), and the Science and Technology Association (STA) were involved in the administration of farmer organizations. On July 1st of 2007, the “Law of Farmer Professional Cooperatives” was promulgated and the Industrial and Commercial Bureau (ICB) was clearly stated as the authorized institution for registration.

The legal framework in China creates an environment conducive to the development of FPCs. As shown in Table 2 and 68% of the surveyed FPCs were established after the introduction of the legal framework. The 2007 law clearly names the Industrial and Commercial Bureau (ICB) as the authorized institution for registration, and the agricultural bureaus at the county level (or higher) are responsible for coordinating the FPCs’ operation. As shown in Table 1 and 60% of the surveyed FPCs (94 out of 157) registered themselves to ICB, and 82% of them were initiated after 2007. The legal framework facilitates the development of FPCs in rural China.¹²

Who. The role of government in initiating FPCs is evident. As shown in Table 2 and 64% of the FPCs had initiating sources related to government funds – 28 from the government exclusively, and 36% from both government and farmers. The presence of the government in initiating FPCs in China was regarded as “too much enthusiasm”, however, and some commentators posit that local government officials in rural China view the performance of promoting FPCs as being the quantitative targets for evaluating their work (World Bank, 2006). Nevertheless, in this study, we find that

¹¹ Agricultural products in this study cover crops, livestock, and fisheries; it is a broader definition of the agricultural sector. The dropped 32 FPCs either provided mechanization and technical services or they were “empty shell” organizations providing no service to farmers. Additionally, we dropped some samples that manage non-food products, for example silk or cotton. To sum up, this study investigates FPCs that produce and market certain agricultural products in the agrofood system in China.

¹² It is not rare that the registration of FPCs to an agency (or more than one agency) qualifies for support from various sources. The national campaign on “Farmers Cooperative Organizations” and increased financial support from various governmental agencies amplify and distort the incentives of initiating cooperatives and associations. In the survey, we found a few “empty-shell” cooperatives that provide no service to members, but still receive preferential support from the government.

Table 1

At which agency were the FPCs registered? *Source:* Author’s own survey.

	Initiation year (%)				Total obs.
	≤1998	(1998, 2003)	(2004, 2007)	≥2007	
Civil Affairs Bureau	0	7	53	40	15
Industrial and Commercial Bureau	1	3	14	82	94
Rural or Agricultural Affairs Office	0	0	0	100	8
Science & Technical Association	14	29	43	14	7
Others	0	33	0	67	3
Non-registration	7	10	43	40	30
Total observations	4	10	37	106	157

Note: The figures in the table are in presented in percentage form.

Table 2

FPCs and marketing with contractual arrangements.

	Total		Percentage of marketing through		
	Obs.	Mean pct.	Written contract	Oral contract	No contract
For whole sample			29	20	51
<i>Initiation time</i>					
1994–2003	14	9	38	19	43
2004–2006	37	24	38	8	54
2007–present	106	68	25	24	51
<i>Initiated by</i>					
Government	44	28	25	20	55
Government + farmers	57	36	27	17	56
Farmers	33	21	35	18	47
Agro-industrial firms	23	15	34	28	38
<i>Spatial coverage</i>					
Within village	74	47	21	22	57
Other villages within township	43	27	28	17	55
Outside township	40	25	45	18	37
<i>Products or sectors</i>					
Dairy and egg	20	13	52	9	39
Meat livestock	48	30	16	19	65
Aquatic	12	8	10	6	84
Grain	12	8	20	31	49
Cash crops	46	29	32	19	49
Orchard fruits	19	12	49	35	16
<i>Brand</i>					
Has own brand	27	17	45	25	30
Has no brand	130	83	26	19	55
<i>Quality certification</i>					
Has own certification	28	18	28	17	55
Has no certification	129	82	29	20	51

the potent promotion of government has been responded to on a grass-roots basis; 21% of the surveyed FPCs reported initiating sources from farmers, some of which were the emerging group of specialized farmers. In addition, 15% of the FPCs had initiating sources from agricultural industries. FPCs are becoming a new mode of agribusiness.

What. Although they possess a wide range of products, FPCs in China are primarily found for cash crops and livestock products. Approximately 43% of the surveyed FPCs engaged in livestock production (including meat, dairy and egg) and 41% of the sample engaged in horticulture, including greenhouse vegetables and orchard fruits (Table 2). When compared with the findings in the first round survey, we find that the percentage of FPCs related to grain products increases: 5.7% of the surveyed FPCs in this study

Table 3
Contractual arrangements and marketing channel of FPCs in China.

	Primary channel (%)				Secondary channel (%)			
	Total obs.	Traditional	Wholesale	Modern downstream	Total obs.	Traditional	Wholesale	Modern downstream
Total observations percent	157 100	31 20	69 44	57 36	86 100	42 49	13 15	31 36
<i>Contractual arrangement</i>								
Written contracts	50	6 (10)	24 (17)	70 (61)	7	0 (0)	14 (7)	86 (19)
Oral contracts	35	11 (12)	71 (36)	17 (10)	14	43 (15)	7 (7)	50 (23)
No contracts	72	33 (78)	44 (47)	22 (29)	65	55 (85)	17 (86)	28 (58)
<i>Contract duration (days)</i>								
≤100	13	0	62	38	2	50	0	50
(100, 365]	37	5	38	57	6	17	0	83
>365	7	14	0	86	1	0	0	100
<i>Contractual pricing</i>								
Market price	68	9	47	44	20	25	15	60
Floor price	9	11	11	78	3	33	0	67
Quality premium	8	0	50	50	1	0	0	100
Contract quantity	50	6	44	50	12	17	17	67
Contract safety and quality	27	7	26	67	7	29	14	57

Note: Numbers in table body are incidence ratio in row. And numbers in parentheses are incidence ratio in column.

report the marketing of grain products, and the figure was merely 2.4% in a previous study (Shen et al., 2005). The percentage of FPCs with orchards and timbers, however, decreases from 20.8% to 12%.

Contracts and marketing channels of FPCs

To survey the marketing of FPCs, we asked the FPC presidents to provide all their marketing channels (for primary products) and the corresponding percentages. For the major two channels, we asked for details of the contractual arrangements. As shown in Table 3, for the primary channel, 36% of the FPC presidents reported marketing via modern supply chains (namely, midstream processors and downstream retailers) and 44% marketed via the wholesale market. For the secondary channel, nearly half marketed to traditional buyers (namely, small brokers and consumers).

We define contracts as formal, written, legally-binding contracts (viz. written contracts) and informal, person-based oral agreements (viz. oral contract). By using logit regression estimates of the choice between oral and written contracts in agriculture, (Allen and Lueck, 1992, 2002) found that contracts in agriculture are often oral agreements, which tend to be enforced through the market via reputation and through the common law via its default rules that simplify the structure of contracts.

The emerging use of contracts is being facilitated through FPCs in China's agrofood market. We find that 32% of FPCs (50 out of 157) had written contracts and 22% of FPCs (35 out of 157) orally contracted marketing in the primary marketing channel (Table 3). Contracts were rarely used in the FPCs' secondary marketing channel. For the 86 FPCs that marketed through more than one channel, 65 selected spot market exchange in the secondary channel – most of them went with small traders (Channel II, Table 3). In both channels, written contracts occurred mostly when FPCs marketed products through the modern agrofood chain. Taking the primary channel as an example, for the 50 FPCs that had written contracts, 70% of them occurred through the modern supply chain. In other words, the modern suppliers tend to contract with FPCs. For the 57 FPCs that marketed with modern suppliers in the primary channel, 61% of them adopted written contracts.

The contractual arrangements between FPCs and their buyers in China are quite simple. Very few FPCs "customized" farming practices and quality through vertical contracts. None of them im-

posed internal governance (e.g., membership) on FPCs. The buyers contracted with the FPCs only for committed and timely marketing. Nevertheless, rarely were duration, price, quantity and quality specified. For the primary channel, only 57 FPCs specified a contract duration, and most of these were short-term (namely, less than 1 year). Nearly all FPCs placed price contingent on market price, only 9 FPCs set a floor price, and 8 FPCs set their price for a quality premium. While 30% of FPCs contracted quantity, very few contracted quality and safety standards (Table 3).

Allen and Lueck (1998, Chapter 3) explained the simplicity of agricultural contracts by using institutional economics. The transaction costs of contracting in agriculture are high, as both contracting and enforcement are affected by farming and its related uncertainty. For example, it is difficult to detect a bad harvest due to insufficient effort from a bad harvest due to unfortunate weather. In the meantime, the costs of market exchange are lower than contractual enforcement, as farmers in a small community may be quickly aware of cheating and a good reputation acts as a bond.

Contracts, initiation and product attributes

In Table 2, we decompose marketing through written and oral contracts by initiating year, sources, spatial coverage and product attributes. The longer an FPC was operating, the higher was its ratio of marketing with written contracts. In addition, FPCs having an initiating source from the government does not lead to contracting farming through FPCs; the grassroots FPCs and agro-industrial FPCs (initiated by agro-enterprises) market more by contracting.

The emergence of vertical contracts along the agrofood chain via FPCs in China varies by products. While dairy, egg, and horticultural products (including orchard fruits) are most likely marketed via contracts, the contracted marketing of meat livestock, aquatic products and grains is not common. Dairy and egg products are highly perishable, and the frequency of production and marketing is higher than meat livestock. Hobbs and Young (2000) found that 70% of poultry and 36.1% of the hogs in USA were under contract, but the figures for grains (namely, wheat, barley and soybeans) were lower than 10%. However, the authors did not separate dairy and egg from meat livestock.

Table 4

Vertical contracts and FPC membership.

	Total sample	Formal members during initiating year (median)	Client member during initiating year (median)	Percentage of formal member to total (median)
For entire sample	157	23	35	87
Has written contract	54	31	35	100
Has oral contract	38	20	80	63
Has no contract	69	20	33	71

Table 5

Percentage of FPC's contracted marketing and market environment.

	Total		Percentage of marketing through		
	Obs.	Mean pct.	Written contract	Oral contract	No contract
Mean			29	20	51
<i>Provinces</i>					
Jiangsu	75	47.8	23	16	61
Sichuan	17	10.8	48	13	39
Shaanxi	20	12.7	48	23	29
Jilin	30	19.1	23	24	53
Hebei and Henan	15	9.6	23	33	44
Ratio of village production to township (same product)	147	0.42	29	20	51
1st quartile	37	0.03	18	17	65
2nd quartile	37	0.13	31	22	47
3rd quartile	73	0.78	34	21	45
Number of FPCs in local township (same product)	147	3	29	20	51
1st quartile	83	1	36	21	43
2nd quartile	33	2	18	21	61
3rd quartile	31	7	23	18	59

Contracts emerge when there are benefits to contracting. Contract benefits are due to positive vertical externalities. Examples are eliminating coordination problems (like timely delivery), reduced volatility, and eliminating double marginalization to a certain extent. Hendrikse (2007) shows that increasing contractual benefits result in a higher incidence of contracts. This provides one explanation of contract variability in different agricultural markets.

Contracts and membership of FPCs

FPC membership by and large occurs within township boundaries. As shown in Table 2 and 47% of the surveyed FPCs were within their own villages, and 27% were in other villages in the same townships. Market exchange (between FPCs and their buyers) is used when the membership of FPCs is confined to the local community, where information asymmetry is less problematic and the transaction costs of market exchange are low. When FPCs are scaled up and the membership stretches outside the local township, contracting will be chosen over market exchange.

FPC membership in China is not exclusive. Nearly half of the surveyed FPCs provided services to “client members”, who in some cases differentiate themselves from “formal members” only through registration status and related voting rights. As shown in Table 4, the median size of client membership is larger than that of the formal (or registered) membership. To avoid the large variation of membership size, we generate the percentage of formal FPC members from the total number of service farmers. Notably, the FPCs that contracted marketing had almost no client members; the governance structure is quite tight.

Vertical contract and competition

When examining regional competition at the provincial level, we find that where local markets are less commercialized (for

example, the Loess Plateau area of the western provinces, say, Sichuan and Shaanxi), market exchange in the agrofood chain is likely to be replaced by contracting via FPCs (Table 5). Market exchange and contracting via FPCs seem to substitute for each other in terms of regional market development.

When examining local competition at the community level, we use two variables: (1) the ratio of village production in an FPC's residential village to township production; (2) the number of FPCs producing the same types of production in the local township. The smaller the former is, the more competition the FPC may face within the township.¹³ As shown in Table 5, when the ratio of village production to town production increases from 0.03 in the first quartile to 0.78 in the third quartile, the percentage of contracted marketing (in written form) increases from 18% to 34%. Competition at the community level undermines FPCs' contracting with buyers.

Econometric analysis

Modeling specification

Based on the second round survey of FPC presidents, we create cross-section data from 157 FPCs. As nearly half of FPCs marketed their products through more than one channel, and the contract arrangements varied in different channels (viz. the primary and the secondary channel), we estimate the contracts between FPCs and their buyers in each channel by using an Ordinary Least Squares estimator (OLS). The empirical model is specified as:

¹³ If an FPC operates beyond their local township, we mark the ratio as 1. When an FPC operates in several villages (but within the local township), the presidential village will be used, as, from our field work, we find in most cases that the presidential village is the original and core area for production and marketing.

$$Y_i = a + \beta \cdot \text{TCE} + \varphi \cdot \text{FPC} + \gamma \cdot \text{Others} + \varepsilon_i, \quad (1)$$

where dependent variable Y_i is defined as the percentage of product sold in the i th marketing arrangements, including marketing through written contract, oral contract, and no contract. Because three marketing arrangements total 100 for each observation, in the regression we deleted the equation of non-contract marketing. The explanatory variables are grouped into three categories: transaction attributes (TCE), characteristics of FPCs (FPC), and market environment and local contexts (Others). The TCE variables were discussed above. The FPC variables include initiating sources, heterogeneity of membership, and spatial coverage of FPCs. The other controlling variables include local market competition and dummies for provinces.

To investigate transaction attributes, we start with the “product dummy approach” by categorizing products into livestock, aquatic, grains, cash crops, and orchard fruits. Nevertheless, the categorization of industry is crude, as products in the same category are distinct in terms of transaction complexity and uncertainty. For example, while dairy and egg poultry farmers harvest every day, hog and slaughtering poultry have only one harvest for the entire production stage. To compare dairy and egg poultry products, the former is highly perishable and the raw milk may be subject to quality loss overnight, but eggs can retain their quality for more than 1 week in normal situations.

Taken together, categorizing products is crude and may not allow us to uncover how the material attributes of different agricultural products affect the vertical contracts of FPCs along the agrofood chain. In this study, we try to decompose the transaction attributes by developing a set of parameters. We explain production complexity by using the length of production stage and the number of tasks for one stage.¹⁴ To define frequency of transactions, we surveyed the number of harvests and the marketing for the major product of the FPC. Perishability explains temporal specificity by using “How long the quality of harvest can be retained in normal conditions”. To explain reputation specificity, we asked, (a) Does the FPC have a brand for the product, b) Is the FPC product certified to Safe Food (*wu-gong-hai*), or Green Food (*lv-se-shi-ping*) without using pesticide, or Organic food (*you-ji-shi-ping*)? When including reputation and perishability, the reputation specificity and temporal specificity of transactions – the fifth and sixth forms of transaction attributes in Williamson’s TCE theory, respectively – are identified in the regression.

Results

Transaction attributes

Prediction 1 is not verified in the TCE specification. The estimated coefficients for the variables regarding length of production stage and number of tasks are not significant (Model II, Table 6). When moving to the specification with product dummies, we find that FPCs producing livestock and orchard fruits are positively correlated with the usage of written contracts in statistics; the marginal effects for the coefficient of livestock and orchards are 19.2 and 23.1, respectively. Compared with grains and greenhouse vegetables, livestock and orchard crops have longer production stages. The number of tasks for the two types of products, however, cannot be compared due to the heterogeneous production processes. The TCE approach presents no robust consistency with the product dummy approach.

Contrary to Prediction 2, the estimated results show that marketing frequency is positively correlated with the usage of written contracts. As harvesting and marketing frequency increases, FPCs

are inclined to substitute contractual arrangements (with the buyers) for market exchange. Compared to spot market trading, such a market-specification contract reduces coordination costs of gathering and exchanging information about demand, quality, timing and price, thus reducing uncertainty and the concomitant market risks.

The results of the TCE approach are consistent with the product dummy approach when studying Prediction 2. The repeated exchanges – for example, in dairy and egg sectors – become an indication of the need for vertical coordination; contracting becomes a useful tool (Column I, Table 6). Compared to dairy and egg, aquatic products and meat livestock are less frequently harvested. Market exchange tends to be chosen over contracts in the aquaculture and meat sectors.

However, parties involved in a long and close relationship with frequent interactions may be subject to less opportunism and thus substitute informal rules for written contracts (Bijman, 2002). In this study, the parameter of frequency to oral contract is not significant. It seems that when frequent transactions occur in the agrofood market in China, contracts through FPCs tend to be formal.

The contradicted results of Prediction 2 are interesting and deserve further research. As Menard and Shirley state (2005, pp. 12–13), frequency “... can produce ambiguous results, while asset specificity and uncertainty have proved hard to measure, leading many researchers to resort to proxies, with mixed success. Linking transaction costs to contractual design or contractual design to performance is also tough, and success varies.”

Prediction 3 is not robustly verified in the two approaches. The variable of perishability is not significant in the TCE specification (Table 6, Columns 3 and 4). Nevertheless, the sector dummy approach seems to be revealing. As shown in Table 6 (Column 1), written contracts are inclined to be used in the dairy and egg sector as the products are highly perishable. Although most meat and aquatic products are highly perishable as well, farmers in China rarely slaughter animals (or fish) by themselves before they find proper traders or slaughterhouses from which they receive payment on delivery of the animal. In reality, spot markets are also prevalent for livestock, as the slaughterhouses seek to manage perishability risks by buying livestock as long as possible – usually until the day before slaughter – which is necessarily done on open markets and informal procurement arrangements.

Temporal specificities may arise because producers of a perishable product have difficulties finding alternative processors on short notice. However, when the market is “thick” and there are large numbers of buyers and sellers, temporal specificities are less severe (Pirrong, 1993). Buyers may easily find market outlets and sellers may adopt market exchange to safeguard against opportunistic behavior and its related contractual costs. The non-significance of perishability in this study may be due to the market strategy of the producers.

As predicted in hypothesis 4, in a form of a private reputation, branding FPCs’ products facilitates the contractual arrangements between FPCs and their buyers. When FPCs have their private brand, the percentage of written contracts increases by 35.8% (in Model 1) and 31.4% (in Model 4). Private standards make production differentiation easier and have been found to be the predominant drivers of the agrofood system in both developed and developing countries (Henson and Hooker, 2001). Private brand names are actually the commitment to ex ante specified high quality standards by a firm. The commitment created by brand names is credible because the reputational capital of FPCs is at stake under a private brand.

Nevertheless, in another form of reputation, certification to public food safety and quality standards by FPCs in China did not lead to contracting transactions between FPCs and their buyers (Table 6). This indicates that if an FPC produces certified products, marketing options and market exchange are more likely adopted.

¹⁴ If a cooperative has more than one product, we survey the most important one.

Table 6
Marketing with contractual arrangements of FPCs in China: OLS estimation.

	I: By sector		II: TCE approach	
	Written contract (1)	Oral contract (2)	Written contract (3)	Oral contract (4)
Dairy and egg (D)	38.513*** [11.125]	-16.347* [9.550]		
Meat product (D)	9.710 [9.878]	-9.200 [8.479]		
Aquaculture (D)	0.482 [11.733]	-15.243 [10.072]		
Cash crops (D)	13.306 [9.589]	-10.603 [8.231]		
Orchard fruits (D)	21.821* [11.388]	0.591 [9.776]		
Brand	33.467*** [7.949]	0.453 [6.823]	31.422*** [7.807]	-0.706 [6.917]
Certification	-25.167*** [6.986]	-6.681 [5.997]	-23.223*** [6.864]	-6.752 [6.081]
Ratio of formal members to total	0.206*** [0.065]	-0.164*** [0.056]	0.126** [0.063]	-0.146*** [0.056]
Initiating year	-1.128 [1.080]	0.795 [0.927]	-0.228 [1.056]	0.562 [0.936]
Initiating source of government and farmers (D)	-5.515 [6.033]	-3.343 [5.179]	-4.267 [5.842]	-3.848 [5.176]
Initiating source of farmers (D)	0.184 [7.419]	-3.746 [6.369]	-6.821 [7.416]	-2.049 [6.571]
Initiating source of agro-industrial firms (D)	-5.253 [8.328]	4.038 [7.149]	-6.817 [8.206]	4.137 [7.270]
Spatial coverage: Within village (D)	-10.721* [6.346]	1.490 [5.447]	-11.919* [6.269]	3.531 [5.554]
Spatial coverage: Other villages within township (D)	-7.943 [6.837]	2.777 [5.869]	-4.404 [6.807]	2.649 [6.031]
Sichuan	18.825** [8.597]	-6.918 [7.380]	24.414*** [8.245]	-6.472 [7.305]
Shaanxi	7.646 [8.226]	1.586 [7.061]	16.348** [7.605]	5.432 [6.738]
Jilin	0.391 [6.451]	5.249 [5.538]	3.577 [6.511]	5.137 [5.769]
Hebei & Henan	-0.311 [9.769]	19.292** [8.386]	2.721 [9.650]	18.038** [8.550]
Ratio of village production to township (same product)	7.911 [7.442]	6.401 [6.389]	5.054 [7.575]	9.731 [6.711]
Number of FPCs in local township (same product)	0.097 [1.074]	-0.331 [0.922]	0.854 [1.028]	-0.229 [0.911]
Length of production stage			0.007 [0.014]	-0.007 [0.013]
Number of tasks for one stage			1.292 [1.143]	-0.090 [1.012]
Number of harvest and marketing			0.039** [0.018]	-0.004 [0.016]
How many days the quality of harvest can be retained in normal conditions			0.017 [0.023]	0.009 [0.021]
N†	227	227	223	223
R ²	0.244	0.132	0.262	0.101

Note: (1) The dependent variable is the percentage of marketing volume under written (or oral) contracts in each channel. (2) We failed to collect production attributes of 4 FPCs, resulting in missing information. (3) Standard errors in brackets * $p < .10$, ** $p < .05$, *** $p < .01$. (4) For product classification, the category of "grains" is set as the base value; for initiating sources, the category of "government" is set as the base value; for scope of FPC membership, the category of "outside township" is set as the base value; for province dummies, "Jiangsu" where the agrofood market has been well developed is set as the base value.

The results are consistent with existing studies. By drawing from a set of 42 case studies in 3 agrofood sectors from 7 European countries, Raynaud et al. (2005) found that agrofood chain governance is closer to hierarchy-like modes of organization in cases where reputational capital is the main quality assurance device, whereas market-like governance is more prevalent in cases with public certification. Henson and Reardon (2005) reviewed group studies about private standards in the agrofood market and concluded that public food safety regulations established in developing countries often do not have either monitoring or enforcement capacities. Private standards make production differentiation easier and have been found to be the predominant drivers of the agrofood system.

The agrofood market has been structured by quality-centered competition (Busch and Bain, 2004). As a relationship-specific asset, the certification of quality and safety standards specifies input usage and certain production methods. Although private standards have been found to be the predominant drivers of the agrofood system in both developed and developing countries, a consistent public certification and labeling system would enable these reputational and competitive advantages, and might even upgrade food safety and quality along the whole supply chain (Henson and Reardon, 2005). However, the public certification of food safety and quality standards in China's agrofood system, be it at the national or local level, is primarily used by Chinese cooperatives and firms as a means to advertize and promote sales without affecting the production stage (Hu et al., 2007). Certification for certain quality and safety standards is not instrumental to vertical contracts through FPCs in China.¹⁵ Recent studies reveal that public certifications play a minor role in signaling quality and food safety standards, as China's consumers do not consider them as a primary concern when purchasing food (Bai and Zhang, 2010; Zhang et al., 2009). When FPCs advertise quality certification as a value-adding strategy, the mid- & downstream buyers may find that the additional payment for FPCs' certified products is not welcome in the downstream segment. Rather, they prefer to purchase on spot markets with lower prices and retain the value-added content for themselves. When FPCs find that their efforts to provide products of good quality are unappreciated and they cannot obtain a value-added premium, their incentive for providing safe food will be lessened.

Other attributes

The extent of excluding farmers without FPC membership in China affects the percentage of written contracting (for marketing). When FPCs have fewer formal members than client members, the buyers may find it too costly to contract (and to enforce the contract), as they believe the collective action of production and marketing is difficult to maintain due to the divergent preference of members (Cook and Iliopoulos, 2000; Holmstrom, 1999). When internal governance is tight and the organization provides services only to members, the buyers may find the transaction costs of contracting low. When an FPC has a large group of client members, the buyers will adopt market exchange (with the FPC), as they are suspicious of the collective action of such a loose governance structure.

Scale matters for FPCs' contracting with buyers in written forms. When FPCs' membership is expanded outside the local village, the percentage of written contracting increases by 12% (Table 6, Models 1 and 3). The buyers find it is easier to capture scale

economies by contracting with FPCs when the production of FPCs is extensive to a certain degree.¹⁶ In other words, the transaction costs related to the discontinuance of frequent marketing mount when FPCs expand outside local villages. Certainly, an extensive market is a necessary condition for contracting, but it is not sufficient. Commodities such as corn and wheat are large in scale but tend to be traded through market exchange.

The market environment affects FPCs' contracting with their marketing partners. Where the regional agrofood market and agribusiness are developed and highly commercialized – as in the Jiangsu Province on the eastern coast of China – market exchange will be chosen over contracting. In central China (for example, Sichuan and Shaanxi in this study), where regional markets are lagging, contracted marketing (in written form) emerges through market exchange.

Lastly, market competition presents slight effects on the vertical coordination of FPCs in the agrofood chain.¹⁷ As the ratio of village production to township production (of the same products) increases, FPCs will face less competition at the community level. When the buyers notice an FPC is organizing most of the township's production (or even more), they may want to secure their marketing by contracting, particularly when the products have local attributes. When there are a number of FPCs producing the same type of products within the local township, competition undermines the written contract. As shown in Table 5, when the number of FPCs producing the same type of production within a township increases to a median level, the percentage of contracted marketing decreases from 36% to 18%. However, when FPCs cluster together, economies of scale lead to increased written contracting, even at the community level. The effect of competition from other FPCs on contractual arrangements seems to be nonlinear.

Conclusion

This study aims to investigate the vertical contracts of farmer organizations in the transformed agrofood market in China. The empirical analysis is based on a national representative survey on 157 Farmer Professional Cooperatives in China. We determine the vertical contracts between FPCs and their mid- and downstream buyers through a set of parameterized transaction attributes in the framework of neo-institutional economics and several other unique factors that reflect "Chinese characteristics" to capture contextual determinants.

The main research findings are summarized as follows. First, although the agrofood market in China is atomistic and there is little penetration from the downstream segment at the farmgate, vertical coordination is emerging through farmer cooperatives and associations in China. This coordination is maintained by impersonal rules (viz. written contracts) and relational agreements (viz. oral contracts). Second, production complexity does not affect the marketing contracts of FPCs in China. The contractual arrangement of marketing is disconnected from the transactional attributes of production. FPCs' vertical coordination via contracts is market-specific. The control of the contractor is weaker than the resource-providing contract (or production contract) or vertical integration.

Third, as a private reputation, branding becomes an important asset specificity for FPCs in China to achieve vertical coordination

¹⁵ It is possible that the buyers (viz. processors, traders, retailers) require public certification. The branding and certification of buyers are thus important for analyzing FPC behavior. While we intended to collect the buyers' characteristics from FPCs, the answers to these questions were subject to imprecise guesswork because most FPCs did not have that much knowledge of their buyers. This could be an important topic for future research.

¹⁶ As a proxy for economies of scale, the variable "spatial coverage of membership" likely has drawbacks. It is possible that one FPC has several progressive and specialized farmers who live in different villages, while another FPC consists of a large number of equally small-scale farmers who live in the same villages and produce the same product. A thorough household survey is needed to address this issue.

¹⁷ The low significance level in the statistics may arise from the small sample size and the low variation of "the number of FPCs in a local township" due to scaling.

with contracts. Certification for public food safety and quality standards (for FPCs), however, does not lead to contractual arrangements between FPCs and the buyers. Lastly, contracts between FPCs and buyers are related to FPCs' characteristics (for example, scale and excludability of membership) and local contextualities (for example, market environment and local competition).

The emerging use of contracts through FPCs becomes an institutional response (or adaptation) to technological advances, market volatility, and the demand for high quality and safety of food products. Governance of the agrofood chain is able to be coordinated via contracting between individual farmers and buyers through farmer organizations. Nevertheless, contractors do not have better control over production than through open-market coordination, and the control transferred across stages is usually minimal. China faces challenges to coordinate the agrofood chain for offering safe food.

Policy-makers can indirectly influence the incentives of contract farming through FPCs in China by promoting private standards in the agrofood system. Importantly, reputational specificity of FPCs (for example, branding, geographical origin, and other private labeling of quality and food safety) introduces incentive mechanisms for FPCs to seek contractual arrangement with the buyers.

This study has several limitations, leaving the potential for future research. While the findings provide tangential support for the TCE framework, some parameters present low significance and even contradictions. In this study, the investigation into relationship-specific investments of both FPCs and buyers are basic. The marketing channels of FPCs' buyers, their branding and certifications were not further traced. In addition, as important contractors, the decision-making of individual farmers in FPCs and the characteristics of the buyers were not included in the modeling due to a limited survey budget. While there have been a vast number of empirical studies in both TCE theory and the vertical coordination of the agrofood chain in developing countries, a combined work is just emerging from its infancy. Agricultural transactions provide a rich and largely unexplored area for refining TCE.

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