Incentives, Transaction Costs and Social Capital Considerations in Determination of Contract Duration in the Kenyan Smallholder Horticultural Sub-Sector

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Abstract

A multinomial regression is used on data from a survey of French bean smallholders to analyse duration of business to farm business relations in horticulture farming conditional on incentives, transaction cost minimization and social capital. Average marginal effects return a higher probability of short duration given a higher number of farmer neighbours and farms located further from the village indicating dependence on social networks and avoidance of competition for farm supplies. The probability of long duration is higher if farmers have access to credit and prior information on prices, large farm area under beans and contractual experience, if selected to farm beans and if a farmer knows a higher number of farmers selling to the same buyer, if a farmer uses a supply contract and the farm is further from the source of irrigation water. This suggests that long duration exchanges are based on high powered incentives, transaction cost reduction, social capital and control of quality supplies. It is concluded that the success of production and market intervention programs in the smallholder sector will require buyers to exploit social networks, use production and output incentives and build on existing farmer expertise.

Keywords: contract duration; incentives; transaction costs; social capital; smallholders; Kenya

1. Introduction

Buyers of vegetable and fruits destined for Western European markets are faced by the daunting demand for consistency, reliability, product quality and safety standards from retailers and government import regulations. One coping strategy for buyers and sellers is to use business to farm business (B2B) or supplier-buyer exchange relations that mitigate possible failure in the distribution system. The success of an exchange relationship requires both parties to make concessions and undertake obligations for mutual dependability. This is more profound especially because trading in horticultural produce is subject to strict production and handling standards due to changing consumption lifestyle, nutritional considerations and public regulations in continental Europe and USA (European Commission, 2000; Kilmer et al. 2001). Globally, the growing demand for pesticide-free products, mandatory process standards, traceability and labeling of products, and adoption of private standards (e.g., GlobalGAP) is changing quality and procurement environment in export markets thus posing enormous financial outlay and expertise constraints on smallholdings in Third World countries (Eom, 1992; Lee and Hathaway, 1999; Food and Agriculture Organization, 1999; GlobalGAP, 2009; Asfwa et al. 2010). Smallholder farming systems raise higher concern for control due to potential health risk through pesticide residues and microbial contamination hazards (World Health Organization, 1998; European Commission, 2000; Vorley and Fox, 2004).

For over 20 years, Kenyan smallholders have traded in horticultural exports either individually or as outgrowers through B2B relations under 'arms-length' contractual arrangements with export firms (Natural Resources Institute, 2002; Jaffee, 2003; Humphrey, 2005). The arms-length arrangements involve provision of inputs and technical assistance to smallholders in return for delivery of supplies (Dijkstra et al. 2001). However, export firms prefer supplies from large farms that can implement traceability though supplies from smallholders constitute part of the firms orders destined for the less discerning market segment of overseas customers (Jaffee, 2003). With the entry of GlobalGAP standard and the framework for incorporation of smallholders, B2B relations could increase and become critical governance mechanisms in the horticultural subsector in Kenya.

Though successful partnership in B2B relations require mutual dependence (Vorley and Fox, 2004), this phenomenon has however received little empirical attention. To bridge this gap, this paper answers three critical questions on B2B relations between smallholders and exporters; 1) what incentives do Kenyan smallholders enjoy under 'arms-length' arrangements and what transaction cost reducing factors do buyers consider? 2) Is social capital relevant in farm level B2B relations and 3) is there a trade-off between incentives and transaction costs? Our aim is to evaluate the determinants underlying contract duration when balancing the need to incentivize farmers and reduce transaction costs. The paper contributes to theoretical literature by showing that the initial stages of contracting involve exploiting social capital and avoidance of farm level competition for supplies. In the latter stages of contracting when B2B relations are stabilized, exchanges are shaped by strong

incentives, transaction cost reduction and social capital.

The rest of the paper is structured as follows. In section 2, the theoretical model is specified and the empirical model and data set presented in section 3. The results and discussions are contained in section 4 and section 5 summarizes and concludes.

2. Theoretical model

Contract theorists (agency and transaction cost) generally associate contracting decisions with risk transfer (Stiglitz, 1974), transaction cost economization (Williamson, 1979) and incentive alignment (Hart and Holmstrom, 1987). Empirical literature on contracting establishes the relationship between specificity of investments and the decision to contract or the duration of contracting (Joskow, 1987). The literature also offers broad support for the proposition that transacting parties choose contract terms to promote efficient adaptation and mitigate transaction costs (Crocker and Masten, 1988). There is also the notion that incentive considerations influence sharing arrangements (Lafontaine, 1992). Hart and Holmström (1987) argue that to generate testable implications for contract duration from the deductive agency theory there is need to step outside the theory's propositions and invoke transaction costs. Lyons, (1996) contends that agency theory follows an inclusive use of the term contract to encompass any transaction. According to Masten and Saussier, (2002), variables of interest in the agency and transaction cost theories overlap. In our model, we acknowledge these insights and model duration from a transaction cost perspective (Bercovitz, 1999).

Primarily, a buyer seeks an economical source of consistent, reliable, quality and safe supplies by engaging a producer in an exchange relationship. On one hand, the buyer benefits from access to land[1] for cultivation, all season export supplies and reduced costs of search for potential producers and repeated bargaining. However, the buyer is exposed to costs of transacting with numerous sparsely located farmers (e.g., transport, assembly, organization, monitoring and incentives etc). On the other hand, smallholders seek to bridge their productive resource-poverty through credit and training, access export markets and enhance certainty of farm incomes. Conversely, smallholders face the opportunity cost of not selling to the spot market even when prices are higher than contract prices, requirement to invest (e.g., water pump, knapsacks and grading shed etc) and limited production decisions i.e., farming what the buyer prefers.

Assuming risk-neutrality, the buyer chooses exchange duration based on incentives and arising transaction costs in order to maximize utility i.e. quality supplies. Here, we consider a buyer's concessions to include provision of credit, extension services, and prior information on prices while obligations involve all season procurement and arrangement for produce collection and assembly. The buyer is assumed to operate a portfolio of incentives in a way that balances the extreme necessity to insure smallholders and the objective to access quality supplies. For instance, at the initial stages of an exchange relationship, sellers could be strictly chosen and provided with credit. In latter stages, because of repeated transactions and built-in trust, prior information on prices might be introduced. Thus, the buyer systematically combines incentives and transaction costs minimization depending on the stage of exchange relationship.

Consequently, the contract duration decision is modeled as a series of discrete choices. For each future period, a buyer decides whether or not to govern exchange by contract. Following Masten and Saussier (2002), this is represented as a continuous analog to the discrete choice decision. The absence of a contract under this formulation corresponds to the limiting case of contract duration equal to zero. Mathematically (see Masten et al. 1991 for details), the optimal contract duration, τ^*, is represented as:

$$\tau^* = \gamma_0 + \gamma_1 X + \varepsilon \tag{1}$$

where $\gamma_0 = \frac{(\beta_0 - \alpha_0)}{\alpha_1 - \beta_1}$ and $\gamma_1 = \frac{(\beta_2 - \alpha_2)}{\alpha_1 - \beta_1}$ and $\gamma_0 = \frac{(\varepsilon_c - \varepsilon_s)}{\alpha_1 - \beta_1}$

For values of contract duration τ strictly between 0 and the potential duration of the relationship

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[1] Land is under National Irrigation Board (NIB), which allocates farmers 1.62 ha for rice production under Irrigation Settlement Schemes' tenancy and 0.41 ha for food crop production. A tenant loses right to land if they cannot fulfil rice production obligations including delivering rice to the board (Nguyo et al. 2002).

between a smallholder and exporter, T, elements of X that increase the value of contracting for another period

more than the forgone benefits of transacting without a contract in that period $(\beta_2 - \alpha_2 > 0)$, results in contracts

of longer predicted duration. We assume full information and one-time fixed-term supply contracts[1].

Since the gist of contract duration model is basically identifying the attributes likely to affect the efficiency of contracting and its alternatives and in predicting the direction of their net effects (Masten and Saussier (2002), equation [1] could be analyzed using the standard regression model save for several limitations. First, most contract durations have a natural lower bound of zero that tends to affect how the distribution of the error term is parameterized. Secondly, there is a likelihood of the unobserved and observed variables being correlated which renders OLS estimates biased (Maddala, 1999). However, econometrically the problem of data censoring is accounted for through maximum likelihood techniques (Crocker and Masten, 1988).

3. Specification of the empirical model

Following Monteverde and Teece (1982), we econometrically fit various attributes likely to affect the efficiency of the duration of B2B relations into equation (1) using OLS and Logistic estimation techniques and then estimate predictions of the direction of their net effects. As suggested in Crocker and Masten (1988), the duration of contract is modeled in multinomial form to capture breaks in contract periods because farmers have varying

number of seasons with the same buyer. Assuming there are j unordered multiple choices $(j = 0, ..., j)$ and the j

disturbances are independent and identically distributed with Weibull distribution, $F(\varepsilon_j) = \exp(-e^{-\varepsilon_j})$, the

econometric specification of the multinomial model would follow as in Greene (2000):

$$\Pr(Y_i = 1) = \frac{\exp(x_i\beta_j)}{1+\sum_{j=1}^{j}\exp(x_i\beta_j)} \text{ and } \Pr(Y_i = 0) = \frac{1}{1+\sum_{j=1}^{j}\exp(x_i\beta_j)} \qquad (2)$$

where for the ith individual, Y_i is the observed outcome, X_i is a vector of explanatory variables and β_j are the

unknown parameters to be estimated by maximum likelihood approach. The specific model for empirical estimation is thus:

$$duration_i = \alpha_0 + \beta_1 Incentives + \beta_2 Cost\,reducing\,factors + \beta_3 Social\,capital + \varepsilon_i \qquad (3)$$

where i indexes duration, and ε is an error term., $Duration$ is the number of seasons with the same

buyer in the OLS model but is a dummy in the multinomial logit defined as 0 for farmers with up to 4 seasons, 1 for those with between 5 and 9 seasons and 2 for those with between 10 and 20 seasons. The variables capturing incentives, transaction cost reducing factors and social capital are defined in table 1. The choice of the multinomial approach is due to the multimodal distribution of the duration variable (median= 5, mean= 4.6 and skewness= 1.05) and the presence of 78 farmers with zero contract duration with the buyer. To measure and obtain consistent and certain estimates about the relationship between contract duration and explanatory variables in the logistic model observed information matrix procedure is used.

To make the model operational, we propose several assumptions. It is assumed that farmers (buyers) have not switched buyers (farmers) during their exchange relations over the seasons before the survey date. On their part, buyers provide credit, extension services, prior information on prices and consistent buying of farm produce during the season as incentives. This proposition allows buyers to control duration by varying the incentive structure. Conversely, sellers create mutual dependability by exploiting their transaction cost reducing abilities such as farm sizes, investment in irrigation technology, experience in vegetable farming and in other contractual relationships to produce beans. Buyers also contribute toward cost minimization through selection of farmers and linking smallholders directly to the markets. Further, social and economic networks consisting of

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[1] We assume that export firms prefer the relay production system to meet the all-year round export requirements. Under relay production, one year may have 2-3 seasons for most vegetables especially French beans (Minot and Ngigi, 2004).

number of farmer neighbors, farmers selling to the same buyer, producer groups and French beans buyers in the village enhance cooperative enforcement of exchange relations. To control for infrastructural and institutional differences, distances from the farm to the produce collection centre, village and source of irrigation water, use of supply contracts and membership to producer groups and locality of farms are used. The interaction of incentives, transaction cost reducing factors and social/economic networks is hypothesized to yield durations of varying degrees i.e. short (up to 4 seasons), medium (5 to 9 seasons) and long (10-20 seasons). For instance, because of moral hazard and adverse selection problems, short durations may entail selection of new entrants and use of farmer neighbors. In the medium duration, extension could be emphasized to impart production knowledge and a supply contract offered to control farm outputs. Long durations might demand organizational capabilities such as organized marketing around farmers that sell to same buyer for supply consistency and reliability.

3.1 Data requirements

The data come from a survey of French beans smallholders of Mwea Tebere of Kirinyaga in Central Kenya. The study site is an irrigated rice scheme set up on around 36 villages where farmers produce rice under tenancy from National Irrigation Board. Export horticulture is produced on farms set aside for other agricultural activities through market reciprocity agreements between farmers and exporters. There is a network of handling facilities owned privately or by the Horticultural Crop Development Authority and farms are served by all-weather gravel compacted roads. Irrigation water is pumped from NIB water canals for a fee charged by a water users association or from the main rivers-Nyamindi, Murubara and Thiba on farms ranging from 0.25-3 acres. There are local collection centres spread all over the producing villages where buyers and sellers assemble farm produce for sorting and grading. During the 2006 crop season, a random sample of 249 farmers was selected from among 24 of 36 farm villages in the region conditional on a French beans crop and a short structured questionnaire administered on a face to face interview. The main research questions were on the number of seasons a farmer sold beans to the current buyer before the survey, access to credit and extension from the buyer, the farm production structure, marketing characteristics, social capital and infrastructural factors. Table 1 presents the whole sample data on the variables included in the model.

Table 1: Descriptive statistics for variables used in the OLS and Multinomial Logit estimations (N=249)

Variable	Defined as	Mean	Std. Dev	Min	Max
Dur	Contract duration (seasons)	4.64	4.42	0	20
Incentives					
Credit	Credit access (1, 0)	.81	.39	0	1
Exten	Number of extension visits (days)	4.84	4.99	0	15
Ptim	Prior information on price (1, 0)	.32	.47	0	1
Bysn	Buys beans all season (1, 0)	.69	.46	0	1
Transaction cost reducing factors					
Land	Farm area under beans(acre)	1.01	.70	.25	3
Exprc	Vegetable farming experience (yrs)	13.05	7.17	1	31
Pump	Invested in water pump (1, 0)	.90	.31	0	1
Rice	Rice grower (1, 0)	.68	.47	0	1
Bloct	Farmer selected (1, 0)	.29	.45	0	1
Firm	Directly linked by exporter (1, 0)	.51	.50	0	1
Social capital/networks in the village					
Fneib	Number of farmer neighbours	4.69	2.45	0	20
Fmbuy	Number selling to the same buyer	3.48	1.58	0	6
Group	Group membership (1,0)	.40	.49	0	1
Grup	Number of producer groups	2.64	.1.99	0	5
Buys	Number of buyers	8.94	2.60	2	12
Control variables					
Ofdis	Distance (farm to collection centre (m))	868.94	881.61	0	3000
Fvdis	Distance (farm to village (m))	872.09	542.65	100	3000
Fwdis	Distance (farm to irrigation water (m))	283.13	208.11	100	1000
Contr	Uses supply contract (1, 0)	.32	.47	0	1
Loct	Located in Upper Mwea (1, 0)	.34	.48	0	1

Source: French beans survey, Mwea Tebere April-June 2006

On average a farmer had 4.6 seasons with the same buyer. This is approximately one and a quarter year when production planning is on a relay system as argued in Minot and Ngigi (2004). Eighty one per cent of the

farmers received credit during the season. Credit is costly and not available to all resource poor producers and traders in Kenya but where available, most farmers do not risk indebtedness for fear of bankruptcy. Fafchamps (2000) argues that access to credit by producers in rural economies is constrained by high interest rates for instance. Obare and Kariuki (2003) found that the form of credit provided for Mwea horticultural producers is mainly an advance to offset harvesting costs and hence non-productive capital. This is replicated in many Micro-Finance Institutions (MFIs), Non-Governmental Organisations (NGOs) and Rotating Savings and Credit Associations (ROSCAs) trying to reach the marginalised credit seekers (see Pederson and Kiiru, 1996). The average distances between the farm and the collection centre, village and source of irrigation water were around 869, 872 and 283 metres respectively. This shows close proximity to collection centres, villages and encroachment of waterways in order to reduce either post-harvest losses, assembly and irrigation costs.

The area under French beans was 1.01 acres. The average farm size compares with the national averages of 1.0 acre for small horticultural farms (International Centre for Insect Physiology and Entomology (ICIPE), 2003; Minot and Ngigi, 2004). Ninety per cent of the farmers had a water pump and pipes for irrigation purposes. Imperatively, some farmers did not own any irrigation equipment. Hiring of equipment (e.g., water pump, water pipes and a knapsack sprayer ect) in exchange for labour is a common practice in the study area especially for part-time farmers and those fully engaged in rice farming (Obare and Kariuki, 2003). Some farms are also located on medium slopes relative to water canals which suits flood irrigation (Muiruri and Nyoro, 1999).

The average number of extension visits during the season was approximately 5 days. Considering the French beans production cycle of 65 days, this characterizes minimal extension services in rural Kenya. The provision of extension services is mainly from the private sector (e.g.,Non-Governmental Organizations) research bodies (e.g., International Centre for Insect Physiology and Ecology) and the public sector (e.g. Kenya Plant Health Inspectorate Services (KEPHIS), Horticultural Crops Development Authority (HCDA) and Ministry of Agriculture (MoA) etc). A buyer may engage own field crop officers to monitor crop production on particular farms that are contracted or targeted as potential supply points. In addition, government or NGO controlled extension officers may visit growing regions to offer advice on pests, chemicals and other agronomic practices. Garforth (2005) notes that duplication of extension services between private and public providers frequently results to uncoordinated human, physical and financial resources. Further, the extension service framework is not demand-driven, and lacks an influential farmer voice in decisions on provision, management and monitoring of services (*ibid*). This dilutes the potential impact of extension services. Provision of extension services to smallholders has elsewhere been termed costly by horticultural exporters (see Jaffee, 2003 and McCulloch and Ota, 2002).

The data reveals that the average experience in vegetable production was 13 years. This shows that most farmers were involved in horticulture farming since the early 1990s when maximum residue levels, farm audits and influence of supermarkets started exerting pressure on exporters to observe produce quality and safety (see Barrett et al. 1999 and Asfaw et al. 2010). The data also show that 68% of the farmers were rice growers, 32% had a supply contract, 29% were selected by the buyer, 40% were members of a producer group, 32% received information on prices at the beginning of the season, 69% sold to the same buyer during the season, and 34% farmed in Upper Mwea. Rice production is the principal occupation in the study area especially in the lower region (Nguyo et al. 2002). Due to the increasing strict food quality and safety standards, it is common for buyers to select sellers based on how well they can observe the set requirements and to use market reciprocity contracts (Jaffee, 2003; Kariuki and Obare, 2004). It is also likely to find new farm organisation at the smallholder level with producer groups slowly replacing individual farm production (Natural Resources Institute, 2002). Incentives in form of farm inputs dominate smallholders' buyer-supplier exchange relationships (Dijkstra et al. 2001), but prior information on prices could motivate future production in smallholdings. Further, competition for supplies and strategies to overcome opportunism in French beans marketing generate varied procurement models with some sellers opting to sell to various buyers and others sticking to the same buyers all season (Ouma, 2010). There were on average 2.6 producer groups, 4.7 farmer neighbours, 3.5 farmers selling to the same buyer and 8.9 buyers known to the farmer in the village. The number of people one can depend on and traders known within the village has a bearing on contract duration. The more the number, the wider the social networks for sharing market and quality information and stronger the ties to enforce contractual requirements.

Table 2 presents the disaggregated data based on contract duration. The table shows that 100, 108 and 41 farmers had short, medium and long duration respectively. The data shows that farmers with short duration farmed significantly further from the village, and also more grew rice and got selected to farm beans than those with medium duration. They also knew more farmer neighbours. There is a high likelihood that initial stages of contracting focus on farmers with prior contractual experience, social networks and positive farming attributes. There were significantly more farmers that accessed credit, got directly linked to the market by an exporter, owned a water pump and used a supply contract, belonged to a producer group, had prior information on prices and whose produce was bought all the season in the medium than in the short duration. The farms in the medium

duration were also significantly further from the collection centre, farmers had more extension visits and they knew more buyers in the village and farmers selling to the same buyer than in the short duration. In the transition stage, there seems to be emphasis on use of incentives, organization capability, networks and reputation to solidify relationships than in the initial stages of contracting. In the medium duration, there were significantly more farmers linked to the markets by exporters and had significantly invested in water pumps, had significantly more extension visits, knew more buyers in the village and farmer neighbours than those in the long duration. This shows that it is more likely to use incentives, demand investment in irrigation technology and rely on social capital in the transitory than in the latter stages of contracting. In the long duration, farmers had significantly more land under beans, and their farms were further from the village and source of irrigation water, significantly more farmers grew rice, used supply contracts, got selected to farm beans, belonged to producer groups and received prior information on prices than in the medium duration. This suggests that it is more likely to factor on scale economies, supply control and organizational capability in the long duration.

Table 2: Descriptive statistics conditional on duration of contract

Variable	Variable description Defined as	Short duration=0 (0-4 seasons) (N=100)				Medium duration=1 (5-9 seasons) (N=108)				Long duration=2 (10-20 seasons) (N=41)			
		Mean	S.D	Min	Max	Mean	S. D	Min	Max	Mean	S. D	Min	Max
Incentives													
Credit	Credit access (1, 0)	.62	.49	0	1	.93***	.26	0	1	.98	.16	0	1
Exten	Number of extension visits (days)	.54	1.81	0	10	8.3***	4.27**	0	15	6.24	4.15	0	15
Ptim	Prior information on price (1, 0)	.03	.17	0	1	.39***	.49	0	1	.85	.36***	0	1
Bysn	Buys beans all season (1, 0)	.24	.43	0	1	1***	0	1	1	1	0	1	1
Transaction costs reducing factors													
Land	Farm area under beans(acre)	.83	.65	.25	3	.94	.59	.25	3	1.6	.77***	.5	3
Exprc	Vegetable farming experience (yrs)	13.22	6.88	2	31	13.2	8.07	1	28	12.22	5.19	1	27
Pump	Invested in water pump (1, 0)	.83	.38	0	1	.96**	.19*	0	1	.88	.33	0	1
Rice	Rice grower (1, 0)	.78***	.42	0	1	.52	.5	0	1	.85	.36***	0	1
Bloct	Farmer selected (1, 0)	.42***	.50	0	1	.07	.26	0	1	.51	.51***	0	1
Firm	Directly linked by exporter (1, 0)	.12	.33	0	1	.86***	.35***	0	1	.56	.5	0	1
Social capital\networks in the village													
Fneib	Number of farmer neighbours	5.23***	3.29	0	20	4.47	1.68*	1	10	3.98	1.19	2	6
Fmbuy	Number selling to the same buyer	2.99	1.94	0	6	3.85***	1.18	0	6	3.71	1.17	2	6
Group	Group membership (1,0)	.04	.20	0	1	.56***	.50	0	1	.85	.36***	0	1
Grup	Number of producer groups	2.83	2.09	0	5	2.51	1.7	0	5	2.51	2.43	0	5
Buys	Number of buyers	8.09	3.08	2	12	9.77***	1.86**	4	12	8.83	2.32	2	12
Control variables													
Ofdis	Distance (farm to collection centre (m))	577.45	464.06	0	2000	996.48***	1144.25	0	3000	1243.9	618.89	100	3000
Fvdis	Distance (farm to village (m))	969**	477.94	100	3000	733.8	577.9	100	3000	1000	524.52**	100	3000
Fwdis	Distance (farm to irrigation water (m))	276.1	186.44	100	1000	255.46	205.16	100	1000	373.17	243.70**	100	1000
Contr	Uses supply contract (1, 0)	.05	.22	0	1	.35***	.48	0	1	.88	.33***	0	1
Loct	Located in Upper Mwea (1, 0)	.17	.38	0	1	.61***	.49***	0	1	.05	.22	0	1

NB: *, ** and *** mean significant at 10%, 5% and 1% level (asterisk on the mean compares 0 and 1 and on SD compares 1 and 2).
Source: Mwea Tebere French beans survey, April-June 2006

Interestingly, buyers procured supplies from the same seller all the season in the medium and long durations which indicates a high likelihood of loyalty in the supply and procurement of farm produce. Uniquely, there were significantly more farmers that were directly linked to the markets by exporters, owned a water pump and, had farms in Upper Mwea in the medium than in the short and long durations. Additionally, they knew more buyers in the village and had more number of extension visits than farmers in the short and long durations. The findings indicate a high likelihood of transaction cost reduction, social capital and incentives use in the

transitory stage. The data also shows that farmers were significantly further from the village and more produced rice and were selected to produce beans in the short and long than in the medium duration. This suggests avoidance of competition for supplies and control of supplies in the initial and latter stages of contracting. Another finding is that there were significantly more farmers that used supply contracts, belonged to producer groups and had prior information on prices in the medium and long than in the short duration. This finding might indicate that supply control, organizational capability and incentives are stronger in the transitory and latter stages of contracting. Further, farmers knew significantly more farmer neighbours in the short and medium than in the long duration which shows that social networks could favour initial and transitory stages of contracting.

4. Results and discussions

The OLS estimates have been computed using a robust estimator and reported in table 3.

Table 3: OLS and multinomial Logit estimates

	OLS Estimates			Multinomial Logit Esimates							
	Dependent variable, seasons			Short duration=0, (0-4 seasons) N=100				Long duration=2 (10-20 seasons) N=41			
Independent variables	Coef.	S. E.	t	Coef.	S.E.	AME	S. E.	Coef.	S.E.	AME	S. E.
Incentives											
Credit_1	1.086	.633	1.72*	-.223	.735	-.060	.053	5.700	3.860	.097*	.059
Exten	-.105	.064	-1.64	-.232*	.121	-.016**	.008	.138	.353	.004	.006
Ptim_1	2.873	.573	5.01***	-.014	1.180	-.141*	.086	17.491**	7.612	.293***	.100
Transaction costs reducing factors											
Land	1.322	.316	4.19***	.637	.464	.008	.033	4.169*	2.185	.065**	.031
Exprc	-.392	.296	-1.32	-.086	.412	-.005	.029	-.026	1.607	.000	.027
Pump_1	-1.233	.756	-1.63	-.769	.926	.018	.058	-8.544**	3.543	-.137***	.046
Rice_1	.150	.422	0.35	.897	.633	-.009	.049	8.369**	3.698	.133***	.050
Bloct_1	.231	.656	0.35	1.556**	.666	.014	.054	10.873**	4.516	.170***	.061
Firm_1	1.060	.723	1.47	-.911	1.005	-.001	.065	-7.322**	3.294	-.116**	.045
Social capital\networks in the village											
Fneib	-.113	.064	-1.77*	.282*	.171	.042***	.013	-2.920**	1.149	-.051***	.013
Fmbuy	.610	.155	3.93***	-.597***	.197	-.068***	.014	3.620**	1.492	.065***	.018
Grup	-.099	.174	-0.57	.327*	.183	.015	.012	.814*	.484	.011	.007
Buys	.967	.789	1.23	-2.026**	.897	-.114**	.055	-2.182	1.622	-.020	.025
Control variables											
Ofdis	.001	.000	5.27***	-.001**	.001	-.000***	.000	.004*	.002	.000**	.000
Fvdis	-.098	.248	-0.39	.471	.346	.059**	.025	-3.596**	1.783	-.064***	.024
Fwdis	.342	.324	1.05	.083	.430	-.031	.032	4.533**	2.057	.075**	.030
Contr_1	3.10	.673	4.61***	-2.107**	1.013	-.163***	.061	3.245	2.152	.071**	.031
Loct_1	-1.134	.467	-2.43**	-.200	.773	.012	.051	-3.141	2.217	-.051	.035
Constant	-1.220	3.342	-0.37	3.378	3.947			-22.619	15.710		

NB: Base cases (medium duration=2: all binary variables=0): F (18,   230)=24.62 (p-value = 0.0000), R^2 = 0.6197: The ML LR chi2(36)=384.34 (p-value = 0.0000).

The R^2 show that approximately 62% of the total variation in the duration of contract is attributable to the explanatory variables at between 1 and 10% levels. The model's F statistic, F (18, 230) = 24.62, is also significant at 1% level. The variation and the F-test indicate that the OLS model is relatively strong and shows good fit. Maddala, (1983) and Menard, (2002) argue that OLS estimates may be biased due to the interval nature of contract duration and zero periods. Hence the results may only be mentioned but not prominently discussed. For instance, the duration of contract increases by 1.322 seasons for an additional acre of land area under beans and farmers with a supply contract have 3.1 more seasons than those without a supply contract.

Multinomial logistic estimates have been estimated using the observed information matrix and are reported in table 3. The variables representing membership to a producer group and buying all the season have been dropped due to perfect prediction of medium and long durations. The model's LR chi2(36) of 384.34 is significant and the estimates show that a considerable number of the incentives, transaction cost reduction and social capital variables are significant at between 1% and10% levels. The interpretation of the results is based on the average marginal effects (AME) which allow use of actual probabilities in the discussions (see Wooldridge, 2010). On incentives, the results show that the probability of a short duration is on average about 1.6% and 14.1% lower for those with a higher number of extension visits and those with prior information on prices during the season respectively, *ceteris paribus*. And on social capital, the probability of a short duration is on average 4.2% higher for farmers who know more farmer neighbours but is on average 6.8% lower for farmers who know more farmers that sell to the same buyer and 11.4% lower the more the number of buyers in the village. The control variables show that the probability of a short duration is 16.3% lower for farmers with a supply contract compared with those without a supply contract but higher by 5.9% for farmers with farms further from the village. The results suggest that in the initial stages farmer neighbours are the prime movers of short duration contracts. This is more important especially if a farm is located further from the village. Rationally, a higher number of farmer neighbours generates the critical mass for contracting as well as a cost-effective foundation for shared information and knowledge. There is less emphasis on incentives perhaps due to lack of trust given that crop delivery may not be guaranteed at harvest because of competition between farmers to supply produce and between buyers for crop deliveries. This could be more succinct if there are a higher number of farmers selling to the same buyer and the number of buyers in the village and if farmers use supply contracts since there is also lower probability of short duration contracts. The result suggests that contracting smallholders is beset with pre-

contractual enforcement problems of intra and extra-competition that make it difficult to use incentives. These difficulties in turn favour dependence on social networks to initiate contracts. Generally, the results show that compared with medium duration, short durations are heavily dependent on social capital which is strengthened by locality of farms away from the village. This result seems plausible because buyers need to know farmers before engaging them in business to farm business relationships. Additionally, supplies from farms near villages would most likely attract intense competition which would in turn disadvantage new entrants in fresh produce contracting. Consequently, there seems to be a balance between avoidance of competition and exposure to transportation costs in the short duration.

The probability of long duration is on average 9.7% higher for farmers with access to credit and 29.3% higher if farmers have prior information on prices during the season. This result indicates that after contracting has stabilized, incentives become the pillar of tying farmers in repeated exchanges. However, the probability of a long duration is on average 13.7% lower for farmers who own a water pump and 11.6% for those directly linked to the markets by exporters but is on average 6.5% higher for farmers with large farm sizes, 13.3% higher for those who grow rice and 17% higher for those selected by the buyer to grow beans. This result further shows that minimization of transaction costs through economies of scale, contractual experience and farmers' ability to meet quality requirements are a key element in latter stages of contracting. Additionally, the probability of a long duration is 5.1% lower for farmers who know more farmer neighbours but 6.5% higher for farmers who know more farmers that sell beans to the same buyer. It might be imputed that the value of economic networks is stronger in latter stages of contracting because of possibilities of shared market information. The control variables reveal that the probability of a long duration is 6.4% lower for farmers who are further from the village but 7.5% and 7.1% higher for farmers who are further from the source of irrigation water and those who use a supply contract respectively. While a supply contract holds partners into a mutually dependent relationship, distances further from irrigation water protect waterways from pollution and environmental degradation from farm wastes. Conversely, the low probability of long duration due to ownership of a pump, direct linkage to the markets by an exporter and knowledge of a higher number of farmer neighbours suggests that investments in irrigation technology, linking farmers to markets and developed village market hubs empowers farmers to make flexible choices devoid of longevity. The overall results show that incentives are mainly monetary and minimization of transaction costs relies on scale economies, accumulated expertise in contracting and reduction of information asymmetry costs in the latter stages of contracting. This is compounded by irrigation and contractual enforcement costs. Therefore, in the long duration contracts buyers seek to balance the extreme need to incentivize farmers and the reduction of the main transaction costs.

The results of this study reveal the role of strong incentives in contracting (see Lafontaine and Slade, 2014 for instance). Incentives are essential in the later stages of an exchange relationship especially when transacting with resource poor producers. Thus credit and extension services are critical if the relationship involves capital investments and technically demanding export vegetables that are subject to import quality and safety requirements. According to Zeller (2000), credit assists the poor to weather economic and climatic shocks in the short run and enables them to finance investments in new agricultural and non-agricultural assets. Credit would usually be used in the purchase of irrigation equipment e.g. knapsacks and water pumps, among others, and construction of grading sheds. Credit could also be used by buyers to 'lock' smallholders into repeated relations through the highly preferred relay production for year round exports (Jaffee, 2003). Extension services provide producers with knowledge on new methods of farming such as traceability, certification schemes and the process of certification, market changes on quality and agronomic practices e.g. use and application of pesticides. Therefore, provision of credit and extension services corroborate theoretical basis for contracting as a way of motivating a producer to exert more effort and perform as the buyer postulates (Bogetoft and Olesen, 2003) and as a commitment and insurance to continued trading (Lafontaine, 1992).

Our results are also consistent with the transaction cost considerations in exchange relations and contract duration (Williamson, 1996). Selection of producers, prior contractual experience and a supply arrangement captures the uncertainty embedded in futures markets especially in the fresh quality produce markets. Reducing the transaction costs due to information asymmetry may unlock producers' potential through production planning and secure supplies from competitors if the market depends on dynamics of supply and demand. Thus, long duration exchange relationships in fresh export crops demand reliability and consistency while at the same time keeping financial support and monitoring costs down. This theme runs through the works of McCulloch and Ota (2002), Jaffee (2003), Reardon and Farina, (2002) and Graffham et al. (2007).

In addition, our results support contractual design and economies of scale literature when dealing with numerous producers. The land under French beans is a proxy for production potential and the number of farmers selling to the same buyer a proxy for organized market hub. Compared to small farm sizes, large ones could produce more output due to economies of scale but small farms could be organized into a common unit with economies of scale in production, reduced monitoring and administrative costs. In Mahoney (1992), output is a measure of a producer's effort. Output also features in quantity and quality specifications of a product in

designing contract terms (Sykuta and Parcell, 2002). In the long duration relationship output and market organization gain value indicating buyers' awareness of the negative marginal benefits from quality as output increases. Smallholders may be unable to adequately observe quality standards when faced with large outputs due to lack of crop handling facilities or sheer knowledge of post-harvest handling practices. Lack of expertise is emphasized in quality standards protocols (e.g. GlobalGAP, 2009) while, Food and Agriculture Organization (FAO) (1999) cites technical quality challenges as a major constraint to smallholders' entry into lucrative export markets. Large outputs may also increase transaction costs in terms of quality control, grading, and assembly facilities, and human capital as observed in Joskow (1987) and Bercovitz (1999).

5. Conclusions and implications

Despite significant growth in Kenya's horticultural exports, farm consolidations, rise of supermarkets, private standards, and public and government concerns for food safety are increasingly reshaping engagement of smallholders. This dynamism lead to particular agency and transactions cost problems in business to farm business procurement relationships between exporters and smallholders. This paper answers the question on duration of farm level exchange relationships conditional on incentives, minimization of transaction costs and social capital.

Multinomial logistic estimates showed that a higher number of farmer neighbours and distance from the village significantly influenced the probability of short duration. It is concluded that short durations are dependent on social capital irrespective of transportation costs. Therefore, entry in business to farm business exchanges in smallholdings should exploit farmer networks while avoiding farms around villages since they are centres of intense competition for supplies. Conversely, access to credit and prior information on prices, farm area under beans, contractual experience and selection of farmers, a higher number of farmers selling to the same buyer, use of a supply contract and distance from the source of irrigation water showed higher probability of long duration. The conclusion is that long duration exchanges are based on high powered incentives, transaction cost reduction, social capital and control of quality supplies. Consequently, stabilizing farm level business to business relationships in smallholdings will require a balance between the need to incentivize future production and to reduce important transaction costs while exploiting social networks. The results imply that for any production and market intervention programs to succeed in the smallholder sector, buyers need to exploit social networks, use production and output incentives and build on existing farmer expertise.

Acknowledgements

References

Asfaw, S., Mithöfer, D., and Waibel, H. (2010) What impact are EU supermarket standards having on developing countries export of high-value horticultural products? Evidence from Kenya, *Journal of International Food and Agribusiness Marketing*, 22(Issue 3-4), 252-276

Barret, H. R., Ilbery, B.W., Brown, A.W., and Binns, T. (1999) Globalization and the changing networks of food supply: The importation of fresh horticultural produce from Kenya into the UK, *Transactions of the Institute of British Geographers*, 24(16), 159-174

Bercovitz, J.E.L. (1999) An analysis of the contractual provisions: Business-format franchise agreements, in J. Stanworth and D. Purdy, eds., Franchising Beyond the Millennium: Learning lessons from the past. Proceedings of the 13th Conference of the Society of Franchising

Bogetoft, P., and Olesen, H.B. (2003) Incentives, information systems and competition, *American Journal of Agricultural Economics*, 85, 234-247

Crocker, K.J., and Masten, S.E. (1988) Mitigating contractual hazards: Unilateral options and contract length, *Rand Journal of Economics*, 19(3), 327

Dijkstra, T., Muelenberg, M., and Van Tilburg, A. (2001) Applying marketing channel theory to food marketing in Developing Countries: Vertical disintegration model for horticultural marketing channels in Kenya, *Agribusiness*, 17(2), 227-241

Eom, Y.S. (1992) Consumers respond to information about pesticide residues, *Food Review*, 15, 6-10

European Commission, (2000) White Paper on Food Safety, Brussels: European Commission. www.europa.eu.int

Fafchamps, M. (2000) Rural poverty, risk and development, in: The State of Food and Agriculture (SOFA), Economic and Social Department, Food and Agriculture Organization of the United Nations, Rome, Italy

Food and Agriculture Organization, (1999) The importance of food quality and safety for developing countries: In Committee on World Food Security, 25th Session, Rome, 31 May-3 June, http://www.fao.org/docrep/meeting/x1845e.htm

Garforth, C. (2005) Critical review of draft Kenya National Agricultural Sector Extension Policy (NASEP) Document, Commissioned under the Programme of Advisory Services and Support, Department for International Development. Renewable Natural Resources and Agriculture Team, University of Reading

GlobalGAP. (2009) GlobalGAP Protocol for Fresh Fruits and Vegetables, www.globalgap.org

Graffham, A., Karehu, E. and MacGregor, J. (2007) Impact of EUREPGAP on access to EU retail markets by small-scale growers of fruits and vegetables in Kenya, *Fresh Insights*, no. 6

Greene, W. (2000). Econometrics Analysis. 4th ed. Upper Saddle River, NJ: Prentice-Hall

Hart, O.D., and Holmstrom, B. (1987) The theory of contracts, in Truman F. Bewley, ed., Advances in Economic Theory: 5th World Congress, New York: Cambridge University Press, 71-155

Humphrey, J. (2005) Shaping value chains for development: global value chains in agribusiness. Research Paper for GTZ, Eschborn, Germany, 2005, pp. 22-25. www.gtz.de/trade

International Centre for Insect Physiology and Entomology, (2003) Preparing smallholder export vegetable producers of French beans and Okra for compliance with EU Regulations on MRLs and Standards Hygiene: Ex-ante assessment of French bean farmers involved in Farmer Group Training. http://www.icipe.org

Jaffee, S. (2003) From challenge to opportunity: Transforming Kenyan fresh vegetable trade in the context of emerging food safety and other standards. Agriculture and Rural Development Working Paper 10; IBRD, Agriculture and Rural Development Department, Washington DC

Joskow, P.L. (1987) Contract duration and relationship-specific investment: Empirical evidence from the coal market, *American Economic Review*, 77(1), 168-185

Kariuki, I. M., and Obare, G. A. (2004) Informal contract choice in Kenyan smallholder horticultural farming: A case of French beans production in Mwea Tebere, *Egerton Journal, Science and Technology Series*, 5(1), 92-105

Kilmer, R. L., Andre A. M., and Stevens., T. J. III. (2001) Pesticide residues and vertical integration in Florida strawberries and tomatoes, *Agribusiness*, 17 (2), 213-226

Lafontaine, F. (1992) Agency theory and Franchising: Some empirical results, *Rand Journal of Economics*, 23, 263-283

Lafontaine, F., and Slade, M. (2014) Incentive and strategic contracting: Implications for the Franchise decision: In Game Theory and Business Applications, Second Edition, K. Chatterjee and W. Samuelson (eds.) Kluwer Academic Press

Lee, J. A., and Hathaway S. C. (1999) Experiences with HACCP as a tool to assure the export of food, *Food Control*, 10, 321-323

Lyons, B. R. (1996) Empirical relevance of efficient contract theory: Inter-firm contracts, *Oxford Review of Economic Policy*, 12 (4), 27-53

Maddala, G. S. (1999) Limited dependent and qualitative variables in econometrics. Econometric Society Monographs No. 3. Cambridge University Press

Mahoney, J. (1992) The choice of organizational form: Vertical financial ownership versus other methods of vertical integration, *Strategic Mananagement Journal*, 13, 559-584

Masten, S.E., Meehan J. W. Jr., and Snyder E. A. (1991) The costs of organization, *Journal of Law, Economics and Organization*, 7(1), 1-26

Masten, S.E., and Saussier, S. (2002) Econometrics of contracts: An assessment of developments in the empirical literature on contracting; In the Economics of contracts, theories and applications, Brousseau, E and Glachant, J.M, 273-292. Cambridge University Press

McCulloch, N., and Ota, M. (2002) Export horticulture and poverty in Kenya, IDS Working Paper 174, Brighton: Institute of Development Studies, http://www.gapresearch.org/production/publications.html

Menard, S. (2002) Applied logistic regression analysis. 2nd Edition, University of Colorado, Boulder

Minot, N., and Ngigi, M. (2004) Are horticultural exports a replicable success story? Evidence from Kenya and Cöte d'Ivoire, IFPRI MTID Discussion Paper No. 73, 2004

Monteverde, K. C., and Teece, D. J. (1982) Suppliers switching costs and vertical integration in Automobile industry, *Bell Journal of Economics*, 13 (1), 206-213

Muiruri, H. K., and Nyoro, J. K. (1999) Sustainable agriculturally based rural livelihoods, Mwea study site. Tegemeo Institute of Agricultural Policy and Development, Egerton University

Natural Resources Institute. (2002) Smallholders in export horticulture: a guide to best practices. Natural Resources Institute, Kent, UK

Nguyo, W., Kaunga, B., and Benuzeh, M. (2002) Alleviating poverty and food insecurity: The case of Mwea Irrigation Settlement Scheme in Kenya: In Broadening access and strengthening input market systems (BASIS), University of Wisconsin-Madison

Obare, G. A., and Kariuki, I. M. (2003) Production and productivity effects of informal contract farming in Kenya's smallholder horticultural sub-sector, *Eastern African Journal of Rural Development*, 19(1), 13-24

Ouma, S. (2010). Global standards, local realities: Private agrifood governance and restructuring of the Kenyan horticulture industry, *Economic Geography*, 86(2), 197-222

Pederson, G. D. and Kiiru, W. K. (1996) Kenya rural enterprise program: Case study of a Micro-Finance Scheme. Micro-Finance Series, AFTE1, Africa Region, Washington, D.C.: World Bank

Reardon, T., and Farina, E. (2002) The rise of private food quality and safety standards: Illustrations from Brazil, *International Food and Agribusiness Management Review*, 4, 413-421

Stiglitz, J. E. (1974) Incentives and risk sharing in sharecropping, *Review of Economic Studies*, 41, 219-255

Sykuta, M., and Parcell J. (2002) Contract structure and design in identity preserved Soybean production. Working Paper No. 2002-01, University of Missouri

Vorley, B., and Fox, T. (2004) Global food chains: Constraints and opportunities for smallholders. Agriculture and pro-poor growth Task Team Report, Helsinki Workshop, Finland. OECD DAC POVNET

Williamson, O.E. (1979) Transaction-cost economics: The governance of contractual relations, *Journal of Law and Economics*, 22(2), 233-261

Williamson, O. E. (1996) The mechanisms of governance. Oxford University Press, Oxford and New York

Wooldridge, J. M. (2010) Econometric analysis of cross section and panel data, Second edition, MIT Press

World Health Organization, (1998) Food safety and globalization of trade in food: A challenge to the public health sector. WHO/FSF/FOS/97.0 Rev 1

Zeller, M. (2000) Rural financial policies for food security of the poor, IFPRI policy brief No. 3 Washington, DC

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