Grower Heterogeneity and Governance: Authority, Access, and Countervailing Power

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Selected paper presented at the
American Agricultural Economics Association Annual Meetings
Denver, CO-August 1-4, 2004

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Version: Januari 13, 2004

Abstract

The increasing differentiation on the supply side of agricultural and horticultural markets has resulted in many governance structure changes between growers and wholesalers. For example, marketing cooperatives are restructured, heterogeneous associations split up in various one-product associations, growers integrate forward into wholesaling, and so on. These developments are analysed with an incomplete contracting model addressing horizontal as well as vertical relationships in a multilateral setting. The interactions between authority, access, and countervailing power in the choice of governance structure are highlighted.

Keywords: Governance, grower heterogeneity, authority, access, self-selection, countervailing power, incomplete contracts.

JEL Classifications: D23, Q13

Tracking number AAEA: 118458

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'If the world fails to meet its food demands in the next half-century, the failure will be at least as much in the area of institutional innovation as in the area of technical change.'

Ruttan, 2002, p180

1 Introduction

This article is about the relationship between institutional innovation (by way of governance structure changes) and changing food demands. In the agrifood sector there is a trend towards differentiation and innovation. Consumers demand more variety and higher quality; producers respond to intensified competition from globalisation and saturated markets by developing and marketing a broader range of new products. This trend has implications for the organisation of grower – wholesaler relationships. Wholesalers who used to purchase at the auction now contract directly with growers, and growers have established new organisations to bargain with wholesalers or retailers (Bijman, 2002). There are even cases of forward integration into wholesaling.

Important governance structures in the agrifood industry are the producer co-operative[2] and the growers' association. A producer cooperative is an association of many independent growers (horizontal relationship) who jointly own a downstream processor / retailer (vertical relationship). An association is the same as a producer co-operative, except for the vertical relationship. These (collective ownership) governance structures are not listed on stock markets, and have distinguishing features (Commission of the European Communities, 2001, p12) like 'an orientation to provide benefits to members and satisfy their needs, democratic goal setting and decision-making methods, special rules for dealing with capital and profit, and general interest objectives (in some cases)'. A number of these features of collective ownership will be at the centre of the analysis.

Collective ownership among many growers requires a method for collective decision-making. Most commonly a democratic decision-making procedure of some sort is employed. Votes in cooperatives and associations are usually weighted by volume of patronage, although some cooperatives adhere to a one-member-one-vote scheme. A problem with these collective decision-making procedures is that they may yield decisions that are (collectively) inefficient in the sense that they do not maximize aggregate grower surplus (Hart and Moore, 1996). It entails that voting power is to a certain extent allocated independent of quantity and / or quality. A similar observation holds for the feature 'special rules for dealing with capital and profit'. An example of the special rules for dealing with capital and profit is that most cooperatives and associations use a 'pooling arrangement in which members share equitably on a per-unit basis in the revenue stream that has been created' (Cook and Iliopoulos, 1999, p526). This article will refer to such a pooling arrangement as the equality principle regarding the distribution of revenues and in the delivery of output. The equality principle regarding the distribution of revenues entails that each member receives the same remuneration for a unit of output that is sold, regardless the quality of the product. If a grower does not produce, then no remuneration is received. The equality principle regarding the delivery of output entails that a certain quantity of customer demand is met by proportionally delivering from the output of each grower, regardless the quality. The observation regarding the equality principle is, like the observation regarding collective decision making procedures, that revenues and costs are to a certain extent allocated independent of quantity and / or quality.

The trend towards differentiation and innovation in agricultural and horticultural markets entails an increasing heterogeneity of growers. This poses a challenge for the traditional grower organizations like cooperatives and associations because various aspects of these governance structures are tailored towards homogeneous members (Hansmann, 1996). Collective decision making procedures and pooling arrangements are less likely to be

[2] The labels marketing cooperative and agricultural cooperative are also used.

inefficient in a situation with homogeneous rather than heterogeneous membership. However, highly innovative growers demand, or require, a different treatment than the less innovative growers. Increasing heterogeneity seems therefore to undermine the efficiency, and therefore the stability, of cooperatives and associations because it creates tensions between innovative and less innovative growers. The organizational response may be twofold. First, they may restructure internally in order to address the increasing heterogeneity (Cook, 1995). Examples are the introduction of transferable equity shares, appreciable equity shares, and minimum up-front equity investment in order to deal with the free rider problem, the portfolio problem, the horizon problem, the control problem, and the influence problem. Second, different governance structures may have to be adopted in order to deal effectively and efficiently with the increasing heterogeneity (Hendrikse and Bijman, 2002). Examples are the emergence of grower associations, moving decision power closer to the final product markets, and forward integration. This article focuses on the second response, but it is not entirely silent on the first. The reason is that both responses are aspects of a governance structure.

A governance structure has to specify the means of motivating individuals, i.e. delineating incentives, and to specify how decisions are made, i.e. the allocation of authority.[3] The former will be reflected in the allocation of costs and payment schemes. A prominent example in cooperatives and associations is the above equality principle, and nowadays the design of member benefit programs. This is the realm of complete contracting theory in the form of agency relationships. The working hypothesis is that everything that is known, can and will be incorporated in the design of optimal remuneration schemes. The main issues regarding the allocation of authority are (de)centralization of decision rights and ownership in the form of property rights.[4] This is the main topic of the theory of incomplete contracts.[5] The allocation of authority serves the role of completing the incompleteness of contracts. It is complementary to complete contracting theory because the focus is on allocating authority in situations not covered by formal contracts.

The theory of the firm is mostly concerned with the bilateral relationship between one seller and one buyer. However, multilateral relationships are more realistic. A multilateral setting consisting of two sellers and one buyer is presented in this paper. This allows an analysis regarding the effect of differentiation and innovation in horizontal as well as vertical relationships on the choice of governance structure. The interactions between authority, self-selection, countervailing power, and access in the choice of governance structure are highlighted. Authority entails the power to decide / selectively intervene in unforeseen circumstances. Self-selection means that growers with high quality organise themselves in an independent association, leaving the growers with low quality behind. This is attractive for high quality growers because they are now able to appropriate the full benefits of their additional effort. However, a disadvantage of the (small) specialised growers' association is that it has less countervailing power compared to a marketing co-operative combining several different growers. Countervailing power entails that the wholesaler cannot deal with the growers separately. Direct access (Rajan and Zingales, 1998) at the retail stage of production is also an important concern for growers. Forward integration by growers into wholesaling establishes direct access. However, this may undermine the investment incentives for wholesalers.

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[3] Hansmann (1996) uses the terms income and decision rights.

[4] Property rights are fundamental: entrepreneurs will not invest if they expect to be unable to keep the fruits of their investment. The empirical study by Johnson, e.a. (2002, p 1336) concludes '… secure property rights are both necessary and sufficient to induce investment by entrepreneurs.'. Weak property rights discourage firms from investing their profits, even when bank loans are available.

[5] There are various reasons for the incompleteness of contracts, like limited cognitive capacities preventing to foresee all possible contingencies, the costs of writing complete contracts, the impreciseness of language, and the limitations of the judicial system in verifying all observable information.

The interactions between authority, access, and countervailing power in the choice of governance structure are analysed from an incomplete contracting perspective (Grossman and Hart, 1986 and Hart and Moore, 1990). The model consists of two upstream parties, offering produce of different quality in excess supply to one downstream party in a situation with certainty.[6]

This article is organised as follows. Section 2 presents the model. The incentive to invest is determined for each party in each governance structure in section 3. Section 4 addresses the equilibrium choice of governance structure. Comparative statics results are formulated in section 5. Section 6 concludes.

2 Model

The interplay between authority, access, and countervailing power in the choice of governance structure is analysed with a model consisting of three parties: grower 1 producing high quality A, grower 2 producing low quality B (<A), and a wholesaler. Figure 1 presents these three parties. The top-left box of each governance structure is grower 1, while the top-right box is grower 2. The wholesaler is depicted with the box at the bottom.

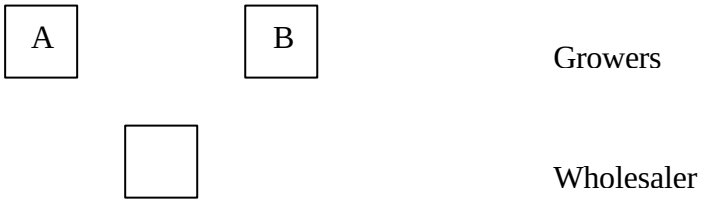


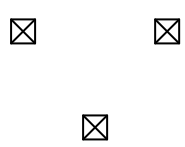
Figure 1: The three parties

Figure 2 distinguishes eight governance structures. The distinction between a producer and a consumer cooperative is that the former is forward integrated into a downstream stage, whereas the latter entails backward integration into an upstream stage.[7] A cross in a box indicates that this party has the power / authority to decide in unforeseen circumstances (Grossman and Hart, 1986 and Hart and Moore, 1990).[8]

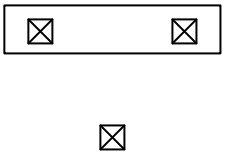
[6] Bolton and Whinston (1993) is most related to this article. They also consider the choice of governance structure in a setting with multilateral trading relationships. Their model consists of one upstream party and two downstream parties; with some probability, upstream capacity is insufficient to satisfy downstream demand. Its main focus is on supply assurance concerns when several downstream firms are competing for inputs in limited supply.

[7] A cooperative is usually conceived of as an organisation consisting of many independent producers / consumers jointly owning an enterprise at another stage of production. This seems to be at odds with figure 2, where the authority in a cooperative seems to be allocated to either one or two players. However, this turns out not to be problematic for the model in this article. It is straightforward to show that many identical producers / consumers will always prefer a governance structure in which they are united above a governance structure in which they are all independent, ceteris paribus. Countervailing power is driving this result. Each box in figure 1 can therefore be thought of as one grower, or as an association of many identical growers.

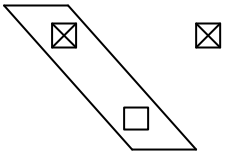
[8] Notice that a few additional governance structures can be distinguished. Two variations on governance structure V entail the elimination of one cross. However, this is not very realistic given the collective ownership feature of cooperatives.



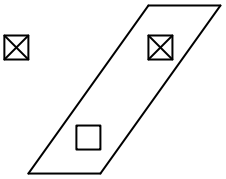
I Market exchange



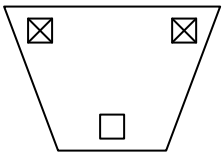
II Heterogeneuos association



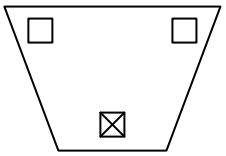
III High quality producer cooperative



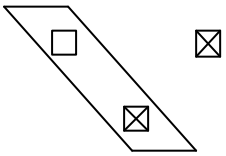
IV Low quality producer cooperative



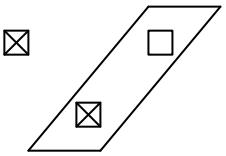
V Heterogeneous producer cooperative



VI Heterogeneous consumer cooperative



VII High quality consumer cooperative



VIII Low quality consumer cooperative

Figure 2: Eight governance structures

The decision rights characteristics of these eight governance structures are summarized in table 1. Residual control and priority access are distinguished. Residual control is indicated by a ‘cross’. It entails that this party is allowed to decide in unforeseen circumstances, i.e. this party has authority. Priority access of a grower means that the wholesaler is not allowed to reject the produce of this grower. The equality principle means that the revenues of the growers in a governance structure have to be shared equally between all the growers with authority. Notice that the equality principle is always actual when both growers have authority, either in one enterprise or in two enterprises. For example, the equality principle is present in governance structure I. There is no averaging of payoffs of different types of growers, because there is not collective ownership of different types of growers. The equality principle in the governance structures II and V entails pooling regarding revenues as well as deliveries of different growers.

Add column ‘ Equality principle’.

Governance structure	Residual control grower 1	Residual control grower 2	Residual control wholesaler	Priority access grower 1	Priority access grower 2
I	Yes	Yes	Yes	No	No
II	Yes	Yes	Yes	No	No
III	Yes	Yes	No	Yes	No
IV	Yes	Yes	No	No	Yes
V	Yes	Yes	No	Yes	Yes
VI	No	No	Yes	No	No
VII	No	Yes	Yes	Yes	No
VIII	Yes	No	Yes	No	Yes

Table 1: Decision rights in the eight governance structures

The systematic investigation of the interactions between authority, access, and countervailing power in the various governance structures is facilitated by translating these qualitative features of decision and income rights into quantitative measures. The tool of co-operative game theory (Hendrikse, 2003) will be adopted for this purpose[9]. The feature of the model that growers may offer produce of different quality in excess supply to a wholesaler will now be made precise. Assume that grower 1 produces one unit with value A and grower 2 produces one unit with value B (<A). Growers are assumed to take an all or nothing decision regarding investment. Define x_i as the investment by grower i, where i=1,2. The level of investment of grower I is therefore $x_i = 0$ when grower i does not invest and $x_i = 1$ when grower i invests. The wholesaler wants to buy only one unit of the product of the growers. It is assumed that the wholesaler is essential for the growers to bring their produce to value.

The characteristic function depends on the choice of governance structure (G) and the choice of investment (x) by the growers. Three cases regarding investment are distinguished. Consider first the situation where only grower 1 invests. The creation of value requires a coalition consisting of of at least the produce of grower 1 and the outlet at the wholesaler stage of production. Table 2 presents the characteristic function of the various governance structures. For example, all parties are independent in governance structure I. So, the value A is only generated when at least grower 1 and the wholesaler are present. It implies that only v(13) and v(123) are equal to A. All other coalitions have value 0. Governance structure III reflects the situation of forward integration by grower 1 into wholesaling. The only requirement for the generation of value A by a coalition is that grower 1 is part of the coalition. The change from governance structure I to governance structure III shows the effect of increased ownership over assets.

[9] A cooperative game is summarised by the characteristic function (N,v), where N is the set of players and v specifies a payoff for every possible subset of the set of players.

x	G	v(1)	v(2)	v(3)	v(12)	v(13)	v(23)	v(123)
(1,0)	I	0	0	0	0	A	0	A
(1,0)	II	0	0	0	0	A	0	A
(1,0)	III	A	0	0	A	A	0	A
(1,0)	IV	0	0	0	A	0	0	A
(1,0)	V	A	0	0	A	A	0	A
(1,0)	VI	0	0	A	0	A	A	A
(1,0)	VII	0	0	A	0	A	A	A
(1,0)	VIII	0	0	0	0	A	0	A

Table 2: Characteristic function form when only grower 1 invests

The second case consists of the situation where only grower 2 invests. Table 3 presents the characteristic function, which is similar to table 2.

x	G	v(1)	v(2)	v(3)	v(12)	v(13)	v(23)	v(123)
(0,1)	I	0	0	0	0	0	B	B
(0,1)	II	0	0	0	0	0	B	B
(0,1)	III	0	0	0	B	0	0	B
(0,1)	IV	0	B	0	B	0	B	B
(0,1)	V	0	B	0	B	0	B	B
(0,1)	VI	0	0	B	0	B	B	B
(0,1)	VII	0	0	0	0	0	B	B
(0,1)	VIII	0	0	B	0	B	B	B

Table 3: Characteristic function form when only grower 2 invests

Table 4 presents the characteristic function for each governance structure when both growers invest. Governance structure I shows the effect of excess supply. The wholesaler adds value to the singleton coalitions {1} and {2}, i.e. v(13) and v(23) are positive. The difference between v(13) =A and v(23)=B reflects the heterogeneity between the growers. The equality principle regarding revenues as well as delivery shows up in the characteristic function of the governance structures II and V. Priority access is illustrated by the difference between IV and VIII. Coalition {1, 2} has only value B in governance structure IV, while they also have the high quality produce A available. The coalition {1, 3} has value A in governance structure VIII, because the wholesaler has the power.

x	G	v(1)	v(2)	v(3)	v(12)	v(13)	v(23)	v(123)
(1,1)	I	0	0	0	0	A	B	A
(1,1)	II	0	0	0	0	(A+B)/4	(A+B)/4	(A+B)/2
(1,1)	III	A	0	0	A	A	0	A
(1,1)	IV	0	B	0	B	0	B	B
(1,1)	V	(A+B)/4	(A+B)/4	0	(A+B)/2	(A+B)/4	(A+B)/4	(A+B)/2
(1,1)	VI	0	0	A	0	A	A	A
(1,1)	VII	0	0	A	0	A	A	A
(1,1)	VIII	0	0	B	0	A	B	A

Table 4: Characteristic function for every governance structure and every investment choice

3 Investment incentives

The choice of governance structure and the incentive to invest is analysed with the incomplete contracting model of Grossman and Hart (1986) and Hart and Moore (1990). It consists of a non-cooperative game of two stages: a governance structure stage and an investment stage. The choice of governance structure determines the bargaining strength of each party in the first stage, while bargaining positions are determined by the choice of the level of investment in the second stage. The relationship between the first and the second stage is that the allocation of bargaining power (to a player by a governance structure) in the first stage determines the incentive to invest in the second stage.

We follow Hart and Moore (1990) in equating the choice of governance structure to the choice of a bargaining power distribution. A standard way to capture the distribution of bargaining power is the Shapley value (Shapley, 1953), which is a solution concept in cooperative game theory. It consists of a specification of a payoff for each player. The Shapley value is determined for each governance structure and each investment decision in the tables 2 - 4 and is presented in the tables 5-7. The economic interpretation of the Shapley value is that it provides a measure for the intensity of the incentive to invest. Governance structures can therefore be ranked in terms of the incentive to invest for each grower. The explanation of the ranking of the governance structures will be formulated in terms of the four variables in our model: countervailing power, allocation of authority, allocation of priority access, and member heterogeneity.

Table 5 presents the Shapley values belonging to the characteristic functions of table 2. If only grower 1 invests, i.e. x = (1,0), then the incentive to invest for grower 1 in the various governance structures ranks as:

VI = VII < I = II = IV = VIII < III =V.

The attractiveness of the various governance structures for the wholesaler is:

III = IV = V < I = II = VIII < VI = VII.

The explanation is straightforward. Ownership over assets determines the distribution of bargaining power completely. Grower 1 owns all the relevant assets in governance structures III and V. The relevant assets are shared between grower 1 and another party in the governance structures I, II, IV, and VIII. Finally, grower 1 has no incentive to invest in the governance structures VI and VII because these governance structures allocate no assets, and therefore no bargaining power, to grower 1.

X	**G**	**Shapley value grower 1**	**Shapley value grower 2**	**Shapley value wholesaler**
(1,0)	I	A/2	0	A/2
(1,0)	II	A/2	0	A/2
(1,0)	III	A	0	0
(1,0)	IV	A/2	A/2	0
(1,0)	V	A	0	0
(1,0)	VI	0	0	A
(1,0)	VII	0	0	A
(1,0)	VIII	A/2	0	A/2

Table 5: Shapley values of the eight governance structures when only grower 1 invests

Table 6 presents the Shapley values belonging to the characteristic functions of table 3. The ranking of governance structures in terms of the incentive to invest for grower 2 when only grower 2 invests, i.e. x = (0,1), is:

VI = VIII < I = II = III = VII < IV = V.

The attractiveness of the various governance structures for the wholesaler is:

III = IV = V < I = II = VII < VI = VIII.

The explanation is identical to the explanation of table 5.

X	**G**	**Shapley value grower 1**	**Shapley value growe r 2**	**Shapley value wholesaler**
(0,1)	I	0	B/2	B/2
(0,1)	II	0	B/2	B/2
(0,1)	III	B/2	B/2	0
(0,1)	IV	0	B	0
(0,1)	V	0	B	0
(0,1)	VI	0	0	B
(0,1)	VII	0	B/2	B/2
(0,1)	VIII	0	0	B

Table 6: Shapley values of the eight governance structures when only grower 2 invests

If both growers have invested, i.e. x = (1,1), then the ranking, and especially the explanation of the ranking, of the various governance structures is more involved. It can be computed from table 7 that the ranking of governance structures in terms of the intensity to invest for grower 1 is:

IV = VI = VII < VIII < I < **II** < **V** < III, when A < 11B/9
< VIII < **II** < I < **V** < III, when 11B/9 < A < 5B/3
< **II** < VIII < I < **V** < III, when 5B/3 < A < 7B/3
< **II** < VIII < **V** < I < III, when 7B/3 < A < 3B
< **II** < **V** < VIII < I < III, when 3B < A.

Similar, the ranking of governance structures for grower 2 is:

III = VI = VII = VIII < I < II < V < **IV** when A < 3B
< II < **IV** < V when 3B < A < 7B
< **IV** < II < V when A > 7B.

Finally, the ranking of the governance structures for the wholesaler is:

III = IV = V < II < I < **VIII** < VI = VII when A < 5B/3
II < **VIII** < I < VI = VII when 5B/3 < A < 3B
VIII < II < I < VI = VII when A > 3B.

X	G	Shapley value grower 1	Shapley value Grower 2	Shapley value wholesaler
(1,1)	I	(3A-2B)/6	B/6	(3A+B)/6
(1,1)	II	(A+B)/8	(A+B)/8	(A+B)/4
(1,1)	III	A	0	0
(1,1)	IV	0	B	0
(1,1)	V	(A+B)/4	(A+B)/4	0
(1,1)	VI	0	0	A
(1,1)	VII	0	0	A
(1,1)	VIII	(A-B)/2	0	(A+B)/2

Table 7: Shapley values of the eight governance structures when both growers invest

The explanation of the various forces which are involved in the ranking of the eight governance structures in terms of the incentive to invest for the growers will be organized around authority (3.1), countervailing power versus self-selection (3.2), priority access (3.3), and oversupply (3.4).

3.1 Authority

One way to determine the impact of ownership over assets is to vary authority, while keeping the amount of countervailing power constant. Both growers face stronger incentives to invest in governance structure V than in governance structure II.

Another way of investigating the impact of the control over assets on the incentive to invest is by holding the allocation of priority access constant. Observe that there are four different allocations of priority access:

1 Neither grower 1 nor grower 2 has priority access in the governance structures I, II, VI, VII, VIII;

2 Grower 1 has exclusive priority access in governance structure III;

3 Grower 2 has exclusive priority access in governance structure IV;

4 Both growers have priority access in governance structure V.

Governance structures I, II, VI, VII and VIII have the same allocation of priority access, but they differ in the allocation of authority. Grower 1 ranks these governance structures as

$$VI = VII < I, II, VIII.$$

The value of integration, i.e. authority, is clear. Governance structures VI and VII are worst in providing incentives to invest for grower 1 because grower 1 owns no assets. Increased ownership of / authority over assets, e.g. I, II and VIII, increases the incentive to invest. Similar, governance structures VI and VIII are worst in providing incentives for grower 2 to invest because the wholesaler has all the power.

A final illustration that ownership over more assets increases the incentive to invest is the switch from governance structure II to V. Both growers experience a stronger incentive to invest. This is due to the fact that power has shifted away from the wholesaler. This is the authority effect.

Notice that the allocation of authority entails an externality in the multilateral setting of this article. Grower 1 owns the same amount of assets in governance structure I as well as governance structure VIII, but still prefers I above VIII. The reason is that the wholesaler is able to create value B on its own in governance structure VIII, whereas this can not be done in governance structure I. Ownership of the assets of grower 2 by the wholesaler takes therefore some power, i.e. B/6, away from the grower 2 as well as grower 1. Similarly, grower 2 prefers

I above VII, despite owing the same amount of assets, because ownership over more assets by the wholesaler imposes a negative externality on grower 2.

3.2 Countervailing power versus self-selection

The impact of member heterogeneity is best illustrated by the Shapley value of governance structure I. It captures features of competition as well as bilateral monopoly. Suppose there is member heterogeneity, i.e. A = B. Each grower will receive 1/6 of the surplus, while the wholesaler receives 2/3. Competition between the growers is beneficial for the wholesaler. Increasing member heterogeneity, i.e. the difference between A and B becomes positive and is growing, is beneficial for grower 1, but goes at the expense of grower 2 as well as the wholesaler. If the difference between the growers becomes very large, then the market comes close to a bilateral monopoly. Grower 1 and the wholesaler capture each half of the surplus, while grower 2 receives nothing.

The impact of member heterogeneity on the incentive to invest in the various governance structures resides in the equality principle, which expresses itself in the forces of self-selection and countervailing power. Compare governance structures I and II. A switch from governance structure I to governance structure II is beneficial for the investment incentive of grower 2, i.e. $(A+B)/8 > (B+B)/8 = B/4 > B/6$, regardless the extent of member heterogeneity (Hendrikse and Bijman, 2002). First, there is the effect of establishing countervailing power. The growers are able to capture half of the surplus by switching to governance structure II, regardless the extent of member heterogeneity. They have effectively turned the market from a competitive situation into a bilateral monopoly. Second, grower 2 benefits from the equality principle in the heterogeneous association. Grower 2 receives part of the surplus which is generated by grower 1. The forces of countervailing power and the equality principle on the incentive to invest for grower 1 reinforce each other.

The effect of a switch from governance structure I to governance structure II on the incentive to invest for grower 1 depends on the extent of member heterogeneity. Grower 1 has a weaker incentive to invest in governance structure I than in the governance structure II when $(A/2–B/3) < (A+B)/8$, i.e. $A < 11B/9$. This reflects the situation where member heterogeneity is limited. There is a trade-off between two effects: self-selection versus countervailing power. The disadvantageous effect of the equality principle for grower 1 in governance structure II is not strong enough to eliminate the advantageous effect of countervailing power when member heterogeneity is limited. However, if the difference between growers 1 and 2 becomes larger, then the high quality growers will go for market exchange in order to escape the detrimental effect of the equality principle in the heterogeneous association. Governance structure V combines the countervailing power and increased ownership over assets in order to counter the self-selection effect. This is successful for intermediate values of A, i.e. $11B/9 < A < 7B/3$. The ranking of the governance structures regarding the investment incentive intensity for grower 1 is II < I < V. Finally, the self-selection effect dominates the joint forces of authority and countervailing power when the difference between grower 1 and 2 is large, i.e. II < V < I when $A > 7B/3$.

3.3 Priority access

The impact of priority access on the incentive to invest is determined by holding the allocation of authority constant. Observe that there are five different allocations of authority: 1 I, II; 2 III, IV, V; 3 VI; 4 VII; 5 VIII. Governance structures III, IV, and V have the same allocation of authority, i.e. the Shapley value for the wholesaler is 0 in all three governance structures, but they differ in the degree of exclusive priority access. Grower 1 ranks these governance structures as

IV < V < III.

The incentive to invest for grower 1 is zero in governance structure IV because it entails foreclosure. Governance structure V is more attractive for grower 1 because priority access is shared with grower 2. Finally, governance structure III is more attractive than governance structure V for grower 1 for three reasons. Grower 1 gains exclusive priority access and the equal delivery aspect as well as the equal sharing aspect of the equality principle are circumvented. The conclusion is that the strength of the incentive to invest increases for grower 1 when the degree of exclusive priority access increases.

The same result holds for grower 2, but priority access may not be strong to supersede countervailing power (and increased ownership). Grower 2 ranks these three governance structures as

III < II < V < IV when A < 3B
III < II < IV < V when 3B < A < 7B
III < IV < II < V when A > 7B.

The ranking of the low quality producer cooperative IV versus the heterogeneous association V depends on the trade-off between exclusive access priority and the equality principle. IV is stronger than V when A < 3B, i.e. exclusive access priority is more valuable than the equality principle. If 3B < A < 7B, then access priority effect of governance structure IV is strong enough to dominate the equality principle and reduced ownership over assets of governance structure II, but not strong enough to dominate the equality principle of governance structure V. Finally, if A > 7B, then governance structure IV is even worse for grower 2 than governance structure II. The huge member heterogeneity gives the equality principle in II sufficient force to supersede the attractiveness of priority access and increased ownership over assets of IV.

Notice that a switch from governance structure I to III increases the incentive to invest for grower 1 in two ways. First, grower 1 owns more assets. This is reflected in the characteristic function by the increase of v(1) from 0 to A. Second, grower 1 has exclusive priority access in governance structure III, whereas there is no priority access in governance structure I. The switch from I to III forecloses grower 2, i.e. v(23) drops from B to 0. A similar result can be stated regarding the incentive to invest for grower 2 when governance structures I and IV are compared.

3.4 Oversupply

The comparison of table 7 with the tables 5 and 6 provides various insights regarding the effect of oversupply on the incentive to invest in various governance structures. For example, grower 2 has no power in governance structures III and VII when both growers produce. This is due to the oversupply of inputs and grower 2 producing low quality. However, grower 2 captures half of the quasi-surplus when grower 1 is not producing, because grower 2 is a monopolist. Another observation regarding grower 2 is that II provides stronger incentives to invest than I when x = (1,1), whereas I is equal to II when x = (0,1). Governance structure II is not superior to governance structure I in terms of the investment incentive for grower 2 because grower 2 does not benefit from the equality principle due to grower 1 not producing. A result regarding grower 1 is that governance structure III provides stronger incentives to invest than governance structure V for grower 1 when x = (1,1), whereas they are equal when x = (1,0). Governance structure V gains in attractiveness for grower 1 because there is no competition (from grower 2) and the equality principle has no impact, because grower 2 does not produce.

4 Equilibrium

So far, the focus has been on the distribution of the revenues of the investments by growers 1 and 2, given a certain choice of governance structure. This section addresses the equilibrium choice of investment and the equilibrium choice of governance structure. First, the investment decision (in the second stage of the game) is determined by taking also the costs of investment into account. Define the sunk cost of investment for grower 1 as k_1 and the sunk cost of investment for grower 2 as k_2. The payoff a grower is determined by the difference between the Shapley value and sunk costs of that grower. A grower invests when this difference is positive. Second, the choice of governance structure, i.e. the first stage of the game, is determined.

4.1 Governance structure choice from the perspective of the grower(s)

Assume that grower 1 decides regarding investment before grower 2 decides. Figures 7-10 in appendix 1 present the extensive form of the game for the various governance structures. The relationship between governance structure and incentives can be presented in a figure with k_1 and k_2 on the axes. The subgame perfect investment choices and payoffs for the various governance structures are presented in the figures 11-14 in appendix 1.

4.1.1 Feasible governance structure choices

It is immediately clear that the growers will never invest when governance structure VI prevails. Neither grower 1 nor grower 2 will ever choose this governance structure. Figure 3 presents governance structure choices for various values of A and B which are not dominated by other governance structures from the perspective of either grower 1 or grower 2 or both. (The figures 15-18 in the appendix present some intermediate steps in ranking the various governance structures in order to make it easier for the reader to arrive at the figures 19 and 20.)

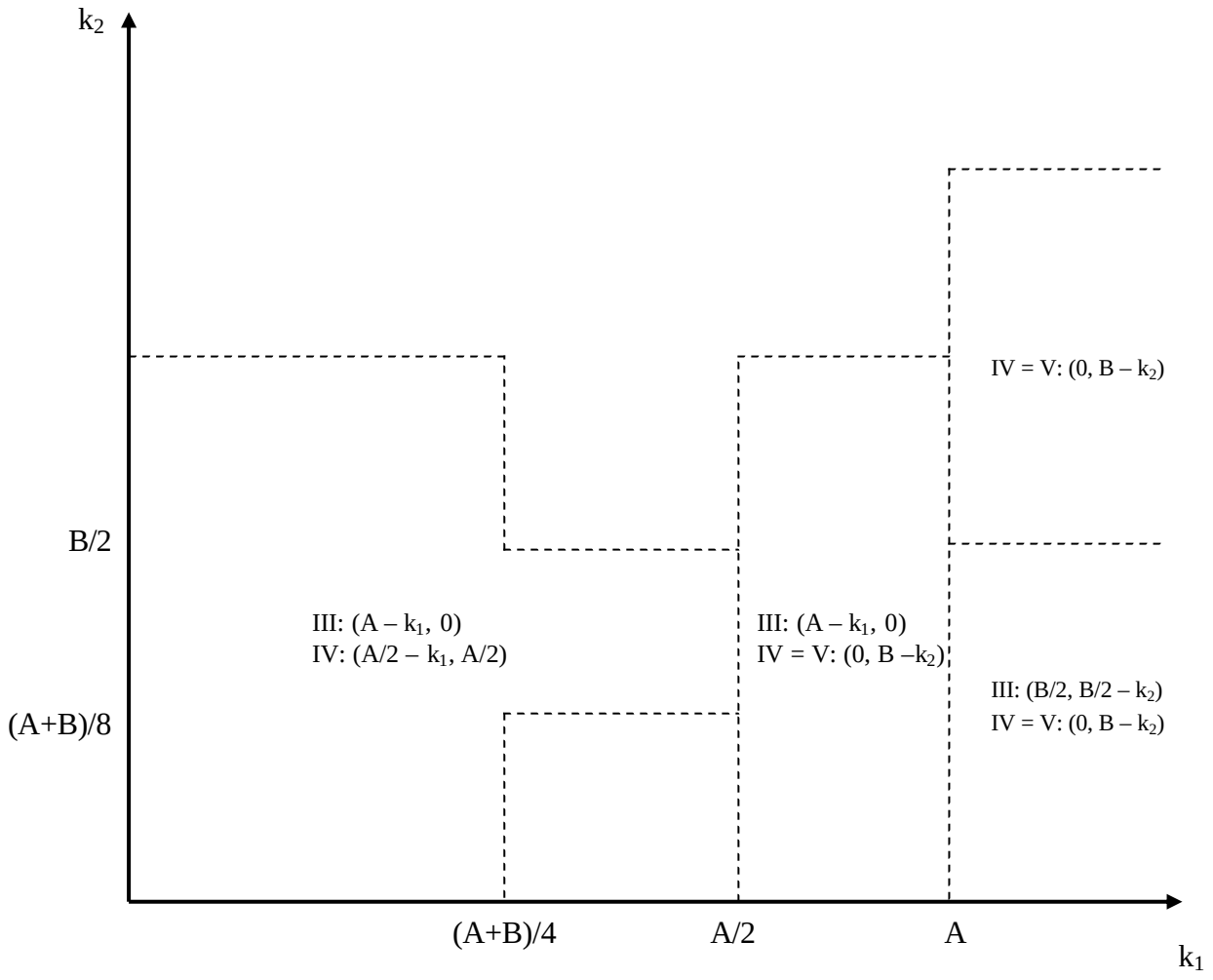


Figure 3: Feasible governance structures from the growers' perspective

Notice that only the governance structures III, IV and V are feasible from the perspective of the growers. They all entail forward vertical integration in order to shift power from the wholesaler to the farmer(s). Another conclusion is that these feasible governance structure choices entail that there is no oversupply in equilibrium, i.e. the inefficient situation x=(1,1) will not occur.

4.1.2 Efficient governance structure choice

Governance structure is efficient when it generates value equal to max {0, A- k_1, B- k_2}. Figure 4 depicts the efficient investment choices for the various values of k_1 and k_2.

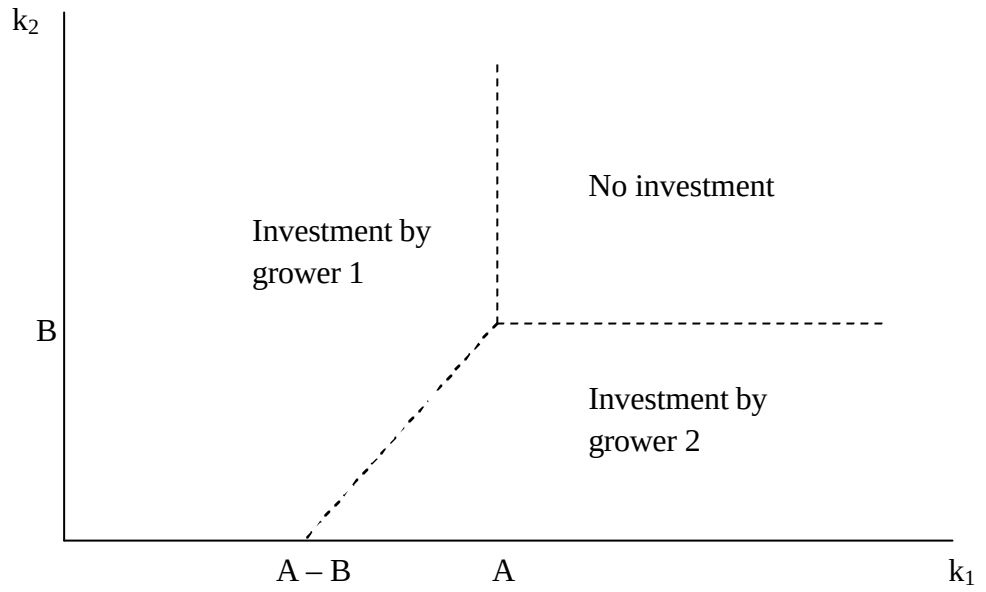


Figure 4: Efficient investment choices

Are there efficient governance structure choices which are not feasible? The assumption of no investment by the wholesaler simplifies the choice of governance structure when an efficiency perspective is taken. Give the wholesaler low incentives, because he does not invest. However, not all governance structure choices are efficient. For example, notice that the investment by grower 2 is inefficient when $k_2 > B$. This situation of overinvestment may occur when $A > 3B$ and either governance structure II or V is actual.

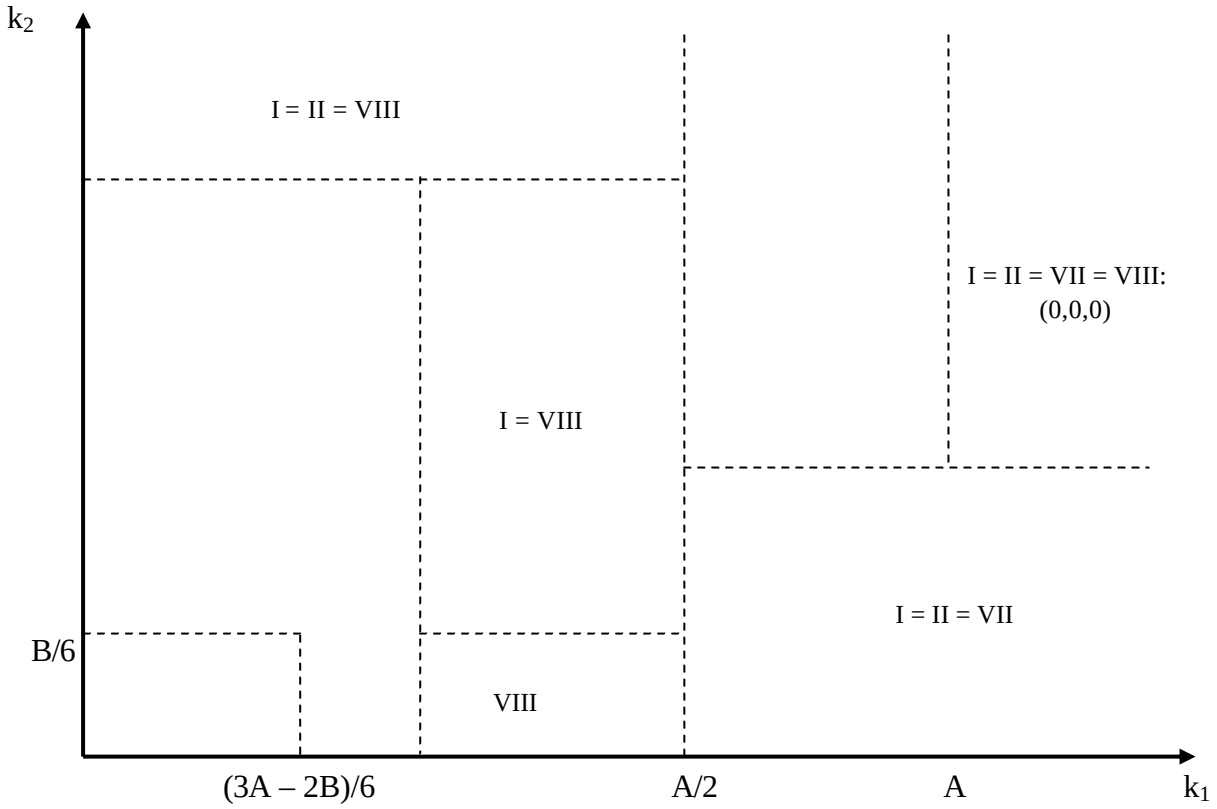


Figure 5: Feasible governance structures from the wholesaler's perspective

6 Conclusions

The increasing differentiation on the supply side of agricultural and horticultural markets has resulted in many governance structure changes between growers and wholesalers. For example, growers integrate forward into wholesaling, heterogeneous associations split up in various one product associations, marketing co-operatives are restructured, and so on. These developments are analysed from a governance perspective with an incomplete contracting model addressing horizontal relationships between growers as well as vertical relationships between growers and wholesalers is presented. The trade-offs and interaction between the horizontal force of countervailing power and the vertical forces of authority and access priority in the choice of governance structure are highlighted.

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