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Can Organic Producers Compete?

A study of Organic Agriculture in Sweden

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Abstract

This paper studies profits in the organic agricultural industry, in order to see if the increase in the demand for organic produce over the past 10 years has had any impact on the premiums achieved for organic production. Several types of products were studied; mixed farming, several types of horticultural products, as well as some farms dealing mainly in husbandry. The general result is that while organic producers receive price premiums, these only seem large enough to cover the extra costs of organic production. Premiums were also in general found to be stable over time, but for some products were increasing/decreasing. The results obtained here seem to be consistent with developments in the market, and similar to related studies. This implies that, as was done in 2008, some extra reforms may be necessary if it is desired that Swedish organic agriculture continue developing. Increased subsidies may be an important driver, as profits for organic producers are not high enough to attract new producers by themselves.

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Common abbreviations used

KKV	Swedish Ministry of Competition (Konkurensverket)
HT	Hausman-Taylor estimation
IO	Industrial Organization
Krav	Main Organic certifier in Sweden
PCM	Price-Cost-Margins
SCB	Statistics Sweden (Statistics Central Byrån)
SCP	Structure-Conduct-Performance
SIC	Standard Industrial Classification
SJV	Swedish ministry of agriculture (Statens Jordbruksverk)

1) Introduction

The past few years have seen a marked increase in the demand for organic produce, which has contributed to a discrepancy between the amount of organic producers and the demands for their produce. According to classical economic theory this should cause an increase in profits, which would in turn attract new producers until the market was once again in equilibrium. This paper tests if the market for organic produce is functioning in the correct way by studying the premiums for different types of organic production, and how these have developed over time.

As agriculture is a central market, and one which due to the heavily industrialized nature of the field has significant environmental impacts (van der Worf & Petit, 2002), there is invested interest in ensuring the success of organic agriculture. As idealism will only be sufficient to take development so far, the ideal scenario is that organic agriculture is also able to attract new producers because it is profitable. If profits are uncertain or too small to attract new business, subsidies and other measures may be necessary to induce a shift.

The main results of the paper are that organic producers generally have significantly higher sales (when controlling for size and market characteristics) compared to conventional producers. This implies that they are able to take out a higher price for their products than conventional producers do, and that they may be selling more. Profit margins of organic producers are larger, but not significantly so, which indicates that they are not able to take out premiums that are significantly larger than their heightened costs of production. Results from accounting profits are varying, but are not traditionally indicative of real firm performance.

From a policy perspective, the results show that the increase in demand for organic produce has not had a significant effect on profitability of organic farmers in relation to conventional ones. This would imply that the market is not in disequilibrium, and that the presence of organic certification does not distort competition at the farm level. However, it also implies that if it is desired to expand the production of organic produce then alternative measures are necessary, such as continued/increased subsidies earmarked for organic farming, as there are no clear incentives to switch to organic production because it is more profitable.

2) Background

This section details the increase of the demand of organic foods, as well as presenting information on organic certification in Sweden. This is done to better understand the market as it is today, and the situations organic farmers are finding themselves in.

Many previous studies on organic agriculture use interviews to find incentives and/or characteristics of farmers who switch from conventional to organic agriculture (see Bjørkhaug & Blekesaune, 2013); alternatively study the retail sector to find and quantify price premiums for different organic products (see Lin, Smith, & Huang, 2008). There are some studies which focus in a more traditional sense on the organic producers, but there is little research done on the competitive power of organic producers, and how this has developed due to changing trends in organic consumption. Accordingly, this study may be interesting from several aspects. For the first, it traces how a lack of profitability may be behind the persistent gap between the supply and demand of organic produce. For the second, it can lend support to or speak against subsidies for organic farming.

2.1) Organic food in Sweden

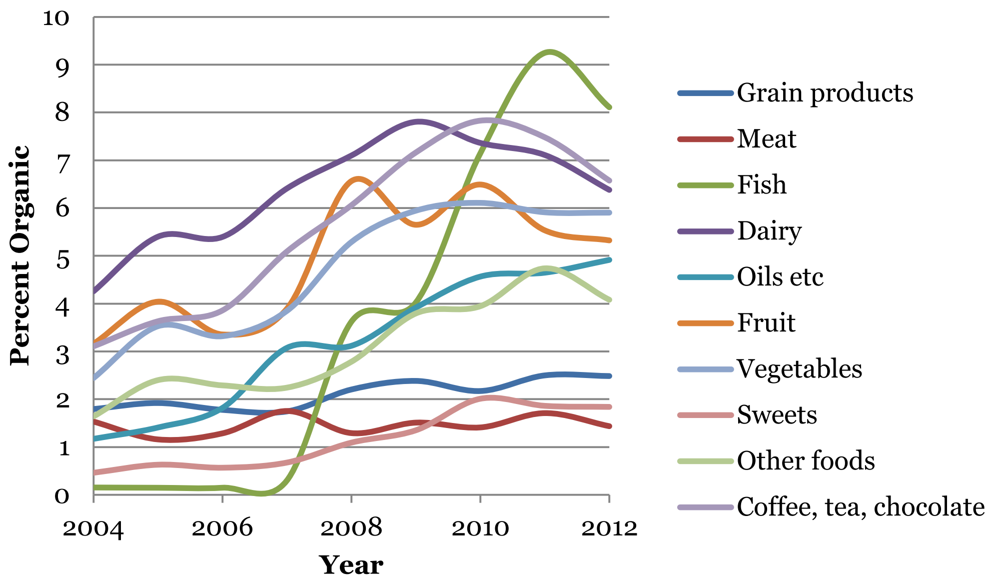
Over the past decades, organic food has moved from being a small, niche market and has become a high-grossing group of produce available in nearly all grocery stores. This trend can be gleamed in Figure 1, which shows the share of food sold under an organic certification. This strong trend in the organic mainstream movement raises the question of how the increase in demand has spread throughout the supply chain. Even though entry into organic agriculture is free, there are some structural barriers, mainly that products must be produced in an organic manner for some time until they are allowed to be sold as organic. To "attract" producers, profits should thus increase in these sectors.

Table 1 likewise traces the development of retail level premiums for organic produce. The table is constructed from several sources, and should not be given unwarranted interpretation. However, it shows that the relative retail price of organic versus conventional produce has been relatively constant across the years. This suggests that the increase shown in Figure 1 is primarily caused by an increase in demand[1] at least in part, as a pure increase in supply of

[1] In reality, an increase in demand of organic produce in relation to conventional produce.

organic produce should have tended to lower the price of organic produce relative to conventional. Results are supported in other surveys (for example Enhäll, 2014).

Figure 1: Organic retail sales as percent of total



Source: Statistics Sweden

Table 1: Development or organic retail price premiums

	2003[1]	2004[1]	2005[1]	...	2009[2]	2010[3]	2011[4]
Total	1,285	1,273	1,310	...	1,290	1,337	1,381
Bread/Grain	1,192	1,135	1,188	...	-	-	-
Meat	1,274	1,356	1,290	...	-	-	-
Dairy	1,204	1,190	1,212	...	-	-	-
Fruit/veg	1,547	1,532	1,700	...	-	-	-
Other	1,233	1,180	1,203	...	-	-	-

1) Data from Statistics Sweden
2) Data from PRO 2009 report
3) Data from PRO 2010 report
4) Data from PRO 2011 report

The most striking increase is found in the consumption of organic fish, but fruits, vegetables, and dairy based products have also developed strongly, while meat and grains have remained at a fairly constant level. This may reflect the trend that fruits and dairy based products are the most common "Gateway products" to organic consumption (Ryegård & Ryegård, 2013).

Organic farming has also expanded over the same period, albeit not as strongly. Table 2 illustrates how hectares of several product types have developed, while Table 3 shows the development of certified organic farmland and producers. Some greens (i.e. vegetables) have developed more strongly than others have, and the growth of organic land is greater than the growth in the number of producers.

Table 2: Organic production, by year and type

	2011	2010	2009	2008	2007
Berries	5,1	4,4	5,1	-	-
Cereals	8,8	8,2	7,5	6,7	7,0
Fruit, temperate	3,4	8,5	1,9	-	-
Oilseeds	2,4	2,3	1,9	-	-
Root crops	1,5	1,4	1,4	3,0	1,2
Vegetables	4,9	4,5	5,4	3,9	2,9

Source: FiBL-IFOAM

Table 3: Organic land and producers

Year	Area (ha)	Organic	Producers
2005	222 738	6.98 %	2 951
2006	225 431	7.06 %	2 380
2007	308 273	9.89 %	2 848
2008	336 439	10.79 %	3 686
2009	391 524	12.56 %	4 816
2010	438 693	14.07 %	5 208
2011	480 185	15.40 %	5 508

Source: FiBL-IFOAM

2.2) Organic certification, subsidies, and Barriers to entry

The Control Society for Alternative Farming, KRAV (Kontrollföreningen för Alternativ Odling) was founded in 1985 via a merger of several smaller certification bodies. Initially focused on husbandry and horticulture, the certification was soon extended to cover several other areas. Newly certified producers are controlled at least twice per year, and more established producers are controlled at least once per year (Krav, 2013). Before a producer is allowed to sell their products under an organic label, production must be carried out using organic methods for a certain period of time, commonly referred to as “waiting times” or time under conversion. Under conversion, producers can receive subsidies for organic production, but cannot sell for the premiums associated with organic produce. While the waiting time is generally around 2 years, for some products the time is shorter (egg production) and for others it is longer (fruit production). The full list of products and waiting times can be found in Appendix 1.

Besides Krav, there are other actors present in the market, who provide different certifications. Notable mentions are the Marine Stewardships Council's stamp for sustainable fishing, and Demeter for biodynamic production. Additionally, according to EU regulation any product which is sold as "Organic" in the EU must be marked with the "EU-leaf, which states that production meets certain centralized criteria. However, in Sweden the Krav stamp is by a landslide the most well known, meaning that they have a large market share and most likely the most power (Krav, 2014).

In a report commissioned 2008 of the Swedish ministry of agriculture (SJV), a series of interviews and case studies were conducted in order to find out why entry was lagging behind the increase in demand for organic products. They find that the decision to convert is highly dependent on individual characteristics, and that conversion is held back because many farmers consider conversion to organic production too risky an undertaking. Combined with the fact that it is difficult to convert only part of production; and the fact that organic produce cannot be sold for price premiums during the first years of production, this means that many farmers do not consider conversion to be an attractive option. Smaller crops and high variation in settlement prices are also contributing factors. Finally, as prices for conventional products have been high, many producers have not felt the pressure to convert in order to achieve price premiums (SJV, 2008).

There are several types of subsidies attainable. Some of these vary depending on how many apply for them, while others pay standard amounts. Also, while there are extra costs associated with organic certification (besides production oriented), a study by the Swedish organic farmers association showed that these costs were relatively slight when compared to the extra payment receivable from organic products. For example, a milk farmer with 70 cows was expected to cover the cost of certification by subsidies alone (Ekolantbrukarna, 2009). However this discounts the extra costs of organic husbandry, which may bias the profitability.

3) Literature review

This section discusses previous research pertaining to the development of organic agriculture; factors affecting consumer valuation of organic produce; and other factors affecting the agriculture business. This is generally found to support the need for a more quantitative study of organic agriculture, like this one. Some motivation for the study and variable choices can also be found.

In a report by the Swedish competition authority (KKV) from 2011, the market for agricultural products is described as having an “hourglass” shape. The implication of this is that market power is generally concentrated in the “middle” of the supply-chain, while farmers and consumers are generally price-takers. These actors with power might for example be the wholesalers and the large retail chains, even though the smaller actors can affect long-term prices by “voting with their feet”. However, several farmers/producers are included in large cooperatives with their own brands (such as Lantmännen), which may allow them greater power of setting prices. The general conclusion of the report is that the competition seems to be working well in the Swedish agri-food industry. However, the report does not discuss certification except in reference to previous studies (Lundin, 2011).

In a second report commissioned of KKV, the effects of organic certification on the market are described. The report primarily studies the possibility that organic certification is distorting the competitive equilibrium, as well as under which situations this might occur. Among other things they find that primary producers are in general less interested in certification than secondary stage producers/wholesalers are, both because they are more often than not price-takers, and that it is often up to them to pay the costs for certification. However, as there may be differences in costs and returns to scale between larger and smaller farmers, conversion is most likely a more attractive option for larger producers. Thus, the decision to convert may be largely contingent on subsidies, especially for small to mid-sized producers. One limitation, both of their own and previous research, that they discuss is that most studies concerning organic certification are based on case studies. To get a picture of the whole market, it would be interesting to conduct more encompassing studies (Andersson & Gullstrand, 2009).

Constance and Choi study UK price premiums for organic products, and how these are correlated with demand and number of certified producers. The data suggests that the price squeeze in organic agriculture has caused a shift from “organic” to “organic-light” type production. Also, while they find that national-level controls of organic production were in general beneficial to producers, it tends to favor organic agribusiness over smaller farmers. This uncertainty in receiving price premiums is one of the main worries which cause producers to forego organic farming, and may hinder further development (Constance & Choi, 2008).

Thörgesen summarizes a great deal of the literature concerning organic consumption over the past few decades, and discusses general themes. He concludes that the organic industry is in general a function of market and political characteristics. Market characteristics include supply side factors; such as soil conditions, relative prices, and the presence of distribution channels; while demand side characteristics include values and income effects. The political aspects include regulatory components, such as laws and subsidies; as well as development components, such as control and certification. Empirically, the evidence seems to suggest that the most successful countries have pushed organic produce both on the supply and demand sides (Thøgersen, 2010). In Sweden, the increase in demand can be seen as a market-side development, while the development of public purchases of organic food is a political aspect. Daugberg also discusses studies of the viability of organic consumption and incentive devices. The fist are policy instrument approaches, including state support and member state adoption of EU organic policies. The second are institutional approaches, which stress the conflict between organic and conventional policy in farming, agricultural policy, and the food market. According to his results, there is no clear trend in which instruments were better at promoting organic production (Daugbjerg & Halpin, 2008).

Bjørkhaug and Blekesaune study the development of organic agriculture from a spatial point of view. They find a "neighborhood" effect in the development of organic agricultural practices, implying a clustering of organic farming. They also find a connection between the total number of farms in a municipality, and the likelihood of organic farming (Bjørkhaug & Blekesaune, 2013). However, transitioning to organic farming, especially on a permanent basis, is not easy. Factors such as subsidies and established distribution networks may make the transitioning significantly smoother (Lamine, 2011). Defrancesco et al. study which factors make a farmer more or less likely to participate in agro-environmental initiatives like organic farming in Italy. Labor intensive farming and a high dependence on farm income is deterrent to participating in these types of networks. Farmer believes were shown to be a strong driving factor (Defrancesco, Gatto, Runge, & Trestini, 2008).

But what is theory without some models to back them up? Sedjo and Swallow present a model based from the pulp industry, but applicable in other sectors as well, which details demand and supply of organic certification. Some factors in the market are explained to be detrimental to the possibility of producers achieving price premiums; for example if there is a relatively small demand for certified products, if costs of certification are high, and it is hard to create new demand, the price-premiums are going to be relatively modest, regardless of the presence of organic demand. Besides presenting the model, they discuss pros and cons of voluntary eco-labeling systems, stating that voluntary systems may cause excess supply of conventional products. (Sedjo & Swallow, 1999).

Sauer and Park study the development of organic farming in Scandinavia, mainly in Denmark as they have a very large percentage of organic farms. Exogenous variables used were capital and machinery investment, milk quota investment, organic subsidies, veterinary expenses, external income, et cetera. They study how said factors affect the productivity growth of organic milk producers. While there are significant differences between individual farmers, it was not possible to say that productivity of organic farms had fallen relative to conventional once. Subsidies were also found to be an important indicator of organic farm productivity and lowered the likelihood of exit (Sauer & Park, 2009).

4) Theoretical Framework

This section discusses the theory behind organic certification and the choice to convert to organic production. Certification can be said to be linked to product differentiation. In general, differentiation is divided into two main cases; differentiation of types (for example be the type of green), and differentiation of quality. By differentiating the product, a producer hopes to set higher premiums on their products, and achieve greater profits.

Organic production is usually considered a case of quality based differentiation. In some products differences in quality are easy to see, but in others they are not discernible, even after consumption. Thus there is an incentive for producers to lie about the qualities of the product in the hopes of raising prices without raising costs. However, consumers are aware of this and may not be willing to pay a premium for any good, even those actually of higher quality (Darby & Karni, 1973). In general, any time consumers are willing to pay a premium for quality goods, but the quality is not easily observable by studying the product, this type of moral hazard situation may arise. These goods are in general referred to as “credence goods” (Nelson, 1970), as there nature must be accepted as true by the purchaser.

As organic goods do not necessarily display characteristics by which they can be clearly distinguished (Fillion & Arazi, 2002), they are generally thought of just as credence goods. If there is no monitoring, it may be that producers are willing to sell products as "organic", without actually using organic production methods. Consumers know this, so a long-run equilibrium will not be viable. However, with some degree of monitoring (for example a third party who certifies the production), there can be a market for organic products free from the problems of moral hazard. Using a game-theory model, McCluskey proved that this is basically required for a market for organic products, and that alternative structures would not be viable in the long run. The results were contingent on consumers who were willing to pay premiums for organic produce (McCluskey, 2000).

This study focuses on several time periods, and the model can be considered to be a multi-period game. In each period, a producer has two choices of production, conventional and organic[2]. The choice of certification depends on what production method they believe to be most profitable. In this sense, the decision to partake in organic certification is a strategic decision, where the farmer chooses to participate (or not) in a market which may or may not be similarly competitive, but is operating under different conditions than conventional production. When deciding on the type of production, producers will consider the possible future profits that can be achieved by the respective type of certification.

The assumptions used in this paper are similar to McCluskey's model (discussed above). There are also similarities to the assumptions used by Sedjo and Swallow, who use a model based on the general equilibrium approach, and state that (voluntary) organic certification can lead to different equilibria, depending on the nature of the organic demand and the differences in costs between the production systems. The model considers an overall market for the good, split into a demand and supply for both organic and conventional products. The actual quantity supplied/demanded of the market will depend on, among other things, the prices of the two goods. If the price of the organic good is above equilibrium, producers will quit conventional production and produce organically. This will press down prices until the market is in equilibrium. As long as the costs of organic production are larger than the costs of conventional, the market will generally result in a price-premium in the long run. The equilibrium is contingent on there being enough consumers interested in purchasing said products, and that the extra costs of organic production are not too high (Sedjo & Swallow, 1999). If this is accepted as true, a well-functioning market should have significant and

[2] In reality, this will most likely be decide d on a 5-year basis, due to the nature of the subsidies scheme

robust premiums on organic products, but should not have significantly different profits, margins, et cetera. If these are present, it suggests that there are anti-competitive effects in the market, or that the market is not in equilibrium (Andersson & Gullstrand, 2009).

To assess how the profitability of organic farms differs from that of conventional farmers, a methodology based on the Structure-Conduct-Performance (SCP) paradigm of industrial organization will be used. This paradigm tests some measure of profitability (for example profits, or a Price-Cost margin) and its correlation with market structure and characteristics. The basic theory is that the profitability of the companies depends on their conduct, which in turn depends on market structure. Within this paradigm, the performance measures chosen are those which reflect profit, regardless of how it is defined. Under the assumption that higher profits reflect that the market is closer to acting as a monopoly, while lower profits reflect that the market is acting closer to perfect competition, a higher profit tends to reflect less competition in the market, either because of collusion or because of a naturally monopolistic nature. Structure parameters are chosen to reflect to the number and size of firms, barriers to entry, and other factors which can affect industry conduct. The conduct refers to how firms act in the market, whether in line with the level of competition that can be expected, or deviating from this in some way. The focus of an SCP is generally to analyze how a change in concentration affects profitability (Perloff, Karp, & Golan, 2007); however there are variations which study other characteristics. An example is the demand for hospital beds (Rivers, Fottler, & Younis, 2007) and returns to farmers selling directly to consumers (Bonanno, Cembalo, Caracciolo, Dentoni, & Pascucci, 2013). Relevant structural characteristics can in this case be region, number of producers (as an alternative to measuring concentration), and other relevant variables.

One advantage of this method is that it has a rich history, and when interpreted with some caution can lead to robust results. One of the critiques of the method is that it is built up to imply a direct causal relationship between structure and profitability, while these are factors which are often determined simultaneously in the market. However, if not given undue interpretation, results can still show a number of useful facts (Tirole, 1988). Also, past research exist which implies that this may not be a huge problem, especially in intra-industry studies. For example, it has generally been found that varying the model specification tends to return results which are different in economic size, but similar in terms of sign, significance, and general implications (Schmalensee, 1989). There are also critiques based on the choice of performance measures, but as this is primarily a problem of methodology, they will be discussed in the subsequent section.

Consider the demand for produce (organic and non-organic) as:

$$D = D(\theta_{rt}, P_{rt}, MS_{rt}, T)$$

In the model, θ can be thought of as describing the consumer's love of organic produce. Consumers with high valuations of organic production will be willing to pay larger premiums for the products than consumers with lower valuations. If there is a general demand increase, it should result from an increase of the valuation in θ, all else equal. MS symbolizes market characteristics (population and income), and τ symbolizes time-varying effects.

Supply is similarly set as a function of love of organic produce, farm structure, and region characteristics. In farm structure, capital and labor is included to control for size.

$$S = S(\theta_{rt}, FS_{it}, P, S_t, T)$$

The firm's profits are thus a function of the demand, and of the firm's own costs:

$$\pi_{it} = P_{it} * D(\theta_{rt}, P, MS_t, T) - C$$

Firms choose whether or not to get certified based on which alternative they believe will result in the largest future profits. If firms are price takers, they may make this choice to achieve short-term profits.

This paper will use a model assuming that the profitability is a function of both demand and supply side factors to test for the returns to organic certification. The model is constructed based on the assumptions above, and is presented as a reduced-form equation below.

$$\pi_{it} = \alpha + \beta * KRAV_{it} + \gamma * MS_t + \delta * FS_{it} + \tau * T_t + (u_i + \varepsilon_{it})$$

This method is similar to that used by Bonanno et al. who studied the effects of direct-selling on farmer profitability (Bonanno et al., 2013). The general model assumes that profitability is an effect of the variable of interest (organic certification), as well as other variables controlling for firm, market, and time characteristics. The details of which parameters will be included can be seen in Table 4 below:

This model sets the profitability measure as one of several, and runs a regression of the profit measure as a function of independent variables.

Table 4: Model and parameter description

Performance	KRAV	MS (Market Structure)	FS (Farm Structure)	T (Time)
Profit	Firm is Certified	Number of firms	Main crop	Time Fixed Effects
PCM		Number of Krav firms	Presence of other crops	
EITDA		Refinery concentration	Region of farm	
		Land use	Farm size	
			Year of establishment	

This model is used to test the main hypothesis of this paper, whether or not organic farms have a competitive advantage over their conventional counterparts. This is done by studying the sign, size and significance of the coefficient on the KRAV parameter. If this parameter is positive, it implies that competition may have become skewed in favor of organic firms, while if it is insignificant it implies that the market is (in theory) working as it should, and organic farms do not have a competitive advantage.

Hypothesis 1

H0: $\beta = 0$:	Organic farms do not have an advantage/disadvantage over conventional ones
HA: $\beta \neq 0$:	Organic farms are working under different conditions than conventional ones.

This is the main hypothesis which will be tested in this paper, and it will be carried out for several product types. The second main hypothesis that will be studied is if there has been a marked change in the level of profitability over the period (as there has been entry into the market).

5) Empirical Framework

5.1) Data Description

This analysis needs several pieces of information. The first thing is some measure of the performance of the firm, including sales and costs. Measures of firm characteristics like the age of the farm/farmer, region of the farm, main crop, et cetera are required to measure firm structure, and some measure of capital and the number of employees is necessary to account for firm size. All of this information can all be accessed from the database Retriever, which supplies financial statements from the Swedish Companies Registration Office (Bolagsverket). The database contains the full income statements and balance sheets for the past 10 years, as well as information pertaining to the owners of the corporation, founding/closing year, and address. The companies are identified by Region, year, and by main business type as defined by the SIC 2007 standard. The chosen companies are incorporated (or limited firms), from all regions in Sweden, within different categories of production. Many are chosen as they are common and important staples, which can found throughout all of Sweden. There is however a heavy concentration of farming activity in the south of Sweden (in particular Scania), particularly among horticultural products.

Information on the number of firms per region is obtained from the corporate barometer constructed by Statistics Sweden (SCB företagsbarometer). The database contains information on the number of firms by region and year, as classified by the 5-digit SIC codes. This data is compiled to achieve a variable on the number of firms of a particular type[3]. Sadly, this measure does not capture differences in firm size, only the total number of firms. In addition to this, complementary information is obtained from SCB concerning market characteristics, primarily concerning income and population.

Data on firms accredited for organic production is supplied by Krav. This method only captures firms with a Krav accreditation, ignoring firms with an EU-ECO accreditation, as well as firms producing under organic methods but which are not certified. However, most organic production in Sweden is Krav certified, so this will not be a huge problem, even though causes results lose generality.

[3] SNI-codes have changed over this period, but this is accounted for

Table 5: Entry/Exits from certification

Year	# Entries	# Exits
< 2003	2638	0
2004	42	0
2005	167	0
2006	134	0
2007	552	0
2008	1432	0
2009	1394	0
2010	1157	1
2011	619	31
2012	424	42
2013	192	52

*Data supplied by KRAV

Table 6: Number of KRAV-firms by region

Region	firms
Blekinge	115
Dalarna	263
Gävleborg	316
Gotland	319
Halland	271
Jämtland	190
Jönköping	377
Kalmar	347
Kronoberg	255
Norrbotten	110
Örebro	281
Östergötland	664
Skåne	786
Södermanland	353
Stockholm	670
Uppsala	398
Värmland	413
Västerbotten	164
Västernorrland	174
Västmanland	253
Västra Götaland	2038
Total	8757

The dataset additionally contains information about the activity that the producer takes part in. The most common activities are some form of horticultural activity (making up around 43% of the certified companies), followed by some form of husbandry-based activity (29%). Other common activities are food processing and restaurants. As of 2014, there are 8751 firms with a Krav accreditation, most of which were accredited between 2007 and 2010. Sadly, Krav does not supply information at a more specific level, but these are described in the full dataset for matched firms. The data also shows a tendency towards concentration in mid-southern Sweden, with Västra Götaland being the single region with the most Krav certified companies, primarily a large number of horticultural firms.

Summary statistics of relevant variables can be seen in Appendix 2. Some of this data requires a more in-depth analysis. The first important measure of farm structure is the type of production the farm mainly works with. The most general (mixed farming) is also the most common. It also seems the case that horticultural production is more common than animal husbandry. In the more specified cases, potato farming is the most common green, while milk production is the most common animal product.

Some measure of the size of the farm is necessary. The number of employees in a given firm is a good indicator of size and "activeness" of the firm, but may be problematic as it does not contain information on the number of seasonal workers, which may be quite common in agriculture. Intuitively, this may be less of a problem in production which has a relatively even distribution of work, like dairy farming and meat production, while it may be more sever in horticultural farming. The sample used here is heavily skewed towards smaller farms (an average of 3,5 employees per firm). This is most likely due to small-scale farms mainly being run by the owners, which are not required by accounting practice to be reported as employees. The capital statistics (here the capital-sales ratio is used) in general shows the same trend. This is a one reason why it is relevant to include a measure of capital to account for farm size, in addition to mitigating the bias that can be incurred by using variable costs instead of marginal costs as the outcome variable of interest (se next section). Although the capital measure seems to be relatively noisy as well, it in general seems to be in line with the findings from the labor measure, as the mean suggests that most farms have a relatively low capital-sales ratio.

Among the accounts data, some of the key variables of interest are sales, variable costs, and the EBITDA[4]. The profits are not really of interest in a formal IO study, as there is a general consensus that "creative accounting" can be used to cover up many problems, and to reflect a higher/lower profit than what is actually justified (Tremblay & Tremblay, 2012). Sales are harder to forge, as the farm income must be accounted for in some way, and while there may be some farms which have larger sales due to on-farm selling and similar activities, this will more directly show how the income of the farm is dependent on farm characteristics. The sales and EBITDA are both very skewed, and as this can induce bias, the log values are used. The average (log) sales is 7,02 (7,58 when removing 0 values), the average Price-Cost margin (PCM) is -0.09 (0.27 when accounting for the most extreme outlier), and the average (log) EBITDA is 5.90. All of these values are skewed towards zero, but relatively normally distributed around their mean (see Appendix 2). Of these profitability measures, only the EBITDA shows a significant difference between KRAV and non-KRAV producers.

Some main product groups will be studied individually. These groups are; mixed farming, grain farming, potato farming, vegetable farming (greenhouse and free land), fruit farming, milk production, beef production, pork production, egg production, and poultry production. Table 7 shows the number and percentage of firms in each respective group, and the percentage of the firms which are Krav certified. There are large differences in how many organic producers exist from specific product types, and organic production is especially

4 Earnings Before Interest, Taxes, Depreciation, and Amortization

common among pork, beef, and egg production. General t-tests of these companies (by sales, PCM, and EBITDA) generally show a higher profitability of certified farmers than of traditional ones. The average year of certification is 2004, but this is not necessarily representative. Many firms were certified at the generation of KRAV, and these are coded as 1900 in the sample, which may lower the sample average. When these observations are removed, the average year is 2005, so this should not incur that much bias.

Table 7: Distribution of firms and percent with KRAV certification (in %)

	Percent	Sum	KRAV
Mixed Farming	44.98	10699	4.6
Grain Farming	16.97	5124	3.9
Potato Farming	3.49	1076	5.6
Vegetable Farming	5.43	1679	8.0
Fruit Farming	2.17	569	5.6
Milk Farming	16.96	5160	8.1
Beef Producer	5.68	1756	9.7
Pork Producer	0.53	76	15.8
Egg Producer	2.83	894	16.4
Poultry Producer	0.34	104	10.2.

Data on the number of refineries/wholesalers (which are assumed to be the farmers principal clients) will in this analysis work as a proxy for the effects of competition among purchasers. There is some variation in the amount of refineries in the selected markets, but the concentration is still higher in the south. For example; Scania, Stockholm, and Västra Götaland have significantly more refineries than other regions. This is only to be expected, as most farms and agricultural businesses are located in southern Sweden, and the regions are large, and very populous. Market channels for different product groups have developed at different speeds, and in different ways. Grain is marketed to a combination of wholesalers and fodder producers, with a traditionally skewed tendency towards selling to the retail market rather than the fodder industry. For dairy production, organic and conventional, the main refinery is Arla, with some competitors such as Falköpings Mejerier and Hjordnära. Within the meat industry, packaging and abattoirs have become fairly de-centralized, with one larger co-operative SQM (Swedish Quality Meat), besides several smaller actors. A large share of organic vegetables is sold by the cooperative Samodlarna and Lantmännen, while some farmers sell individually to restaurants and stores. Organic egg production has been less stable, due to difficulties in creating incentives for farmers to convert from conventional agriculture (Källander, 2000).

Scan is another large producer in the meat industry, having a significantly large share in especially the pork industry (ca 90% of KRAV-pork), but even in Lamb and beef production. There are also several large and prominent sellers dealing only in organic meat, like the company Green Farms (Gröna Gårdar). While there is a strong and growing demand for organic poultry, most organic chickens are reared and sold by one cooperative in Sweden (Bosarp, Scania). However, they only stand for circa 0,07% of the production of total chickens, so the supply to the market is very low. (Vand der Krogt & Larsson, 2008). Milk production is particularly concentrated in the area called the "dairy belt", which runs through Halland, Småland, and out to Öland. As both production and refineries are relatively concentrated, it may be argued that using regions as a market for a milk farmer may be an accurate market definition. A second preferable definition, but beyond the scope of this study, may be to study markets within a given distance to each place of production, but this would require detailed knowledge about the location of milk farmers. It may well be a stretch to apply the same paradigm to producers of fruit, vegetables, and potatoes as is done to milk and beef, since the production in the previous industries is much more disaggregate, and there are far more actors in the wholesale market. For example, ICA has a department called ICA Fruit and Greens (Frukt och Grönt), which manages purchases and Imports to ICA stores (Azbel, Blom, & Karlsson), CooP buys a significant portion from Everfresh (Coop, 2008), and in 2006 the Axfood group decided to concentrate purchases of Fruit and vegetables to one producer, Saba (Kroon, 2006). But nearly all of these retailers buy meat and dairy products from Scan and Arla.

5.2) Method

Initially, studying agriculture as a whole may be considered. However this will most likely bias results, as firms are heterogeneous, and the demands for the respective products separate. Therefore, studying firms at the 5-level SIC[5] level is likely to be the best option available. The industries chosen here are; mixed farming, grain products, potatoes, vegetables, fruits, milk, beef, pork, eggs, and poultry. While not a perfect division, it is an intuitive one. This method of dividing firms is used in past IO studies, but is far from a perfect measure. However, setting a more distinct market will be tricky, as it is hard to state at the appropriate geographic level. Consider milk for example, where Arla (the biggest buyer) has 19 reception places for several thousand milk farmers, where this division may be appropriate. However,

[5] Standard Industrial Codes, a description of the activity of the firm

for fruit and vegetable farmers, the buyer concentration is much lower, and a more disaggregate market may be best. See Appendix 3 for a full discussion of market concentration, average mark-ups, and price setting.

Seller & buyer concentration have been found to be important determinants of results, in addition to the degree of product differentiation and the barriers to entry (Clodius & Mueller, 1961). In many IO studies focusing on agriculture, farmers are assumed to be price takers. This assumption is not improbable in any way, but does not negate the possibility of strategic effects within farming, and differences in profitability, certification, et cetera (Sexton, 2000).

Thus, the structure parameters used in this study are the number of firms (to account for competition between firms), the number of organic firms (to account for competition among organic firms), and the refinery concentration (used as a proxy for buyer concentration). As there is currently no good concentration ratio for farms, this is most likely the best specification available. Data on the number of farms of specific types are taken from the Corporate Barometer from Statistics Sweden, and is obtained at the regional level. Concentration ratios could be calculated directly from the accounting data, but this may miss a number of firms whose information is not accessible via the corporate registration office. This can be justified as the food processing industry in Sweden is highly concentrated compared to farms, and apart from regional selling it is unlikely that farms compete heavily on a municipal level. Also, a report from SJV stated that while there is a not insignificant part of the agricultural companies in Sweden that are large (over 100 ha), many companies are of a small to medium size. The differences are even greater for some crops, for instance wheat and barley (Olsson, 2014).

There may be some factors which affect production on a more local level. Some examples of this are the quality of the soil, climate, et cetera. Also the size of organic subsidies is set on a regional level, which may affect concentration of farmers. To account for this, region fixed effects will be controlled for. To account for fixed-year income (which should include at least in part other farming subsidies), for inflation, and to control for year-to-year variations in weather patterns (rainfall, hours of sunlight) year fixed effects will be controlled for as well. Practically, this is done by including binary year and region variables in the regression.

Several econometric techniques are possible to test this hypothesis. One possibility is to use a pooled OLS, and clustering Standard-Errors around the individual observation. However, it is most likely better to use a Panel data model, with the farms individual organization number as the panel variable, and the year as the time variable (data available over a 10 year period).

Using a panel regression, it is possible to account for unobserved characteristics which are invariant over time, observation, et cetera. For example, unobservable characteristics relevant to production (like ability of the farmer, and overall conditions of the soil in the farm) can be accounted for[6]. If this is distributed randomly, a panel regression with Random-Effects can be sufficient, but if there is correlation between the unobserved heterogeneity and the independent variables a regression with Fixed-Effects must be used (Verbeek, 2004). It is noteworthy, however, that FE models can have problems with attenuation bias and measurement error, due to changes in variables or misrepresentation. In cases such as individual ability, this is most likely not a problem (Angrist & Psichke, 2008). In this paper, a RE model is used, as certification may not vary enough over time, and as general results are similar across model specification.

The Panel used here is an "unbalanced panel", meaning that every individual is not present in each year, for whatever reason. Unless this is accounted for, an unbalanced panel may be problematic if the observations are missing due to an endogenous reason, and if there are a large amount of them (Wooldridge, 2013). A description of the unbalanced panel shows that this should not cause problems here. Most firms were represented over the whole period, and of the firms which were not represented in the whole sample, most were missing only in the last year (2013). This may be because the database is lagging behind the current year in accounting, and that after assembling, auditing, and controlling the accounts for 2013, it will still take time to enter all the extra data into the database. This should be an exogenous reason for exclusion, and thus unproblematic. The second most common deviation consists of firms which enter the panel after 2004. Entry should, if the market is competitive, drive results downwards, which would tend to bias results downwards rather than upwards, which is usually considered less sever. After these two effects are accounted for, the balanced panel makes up over 90% of the observations, indicating that while there may be some problems due to an unbalanced panel, the bias is unlikely to be economically large. Some previous studies are discussed in Appendix 4.

Farmers may self-select into/out of certification, which could bias results. To control for endogeneity, two main models can be used. The first entails using a 2-stage least squared

[6] This is commonly referred to as "Unobserved Heterogeneity"

estimation (2SLS), where a variable is used to instrument for the endogenous factor (organic production). The second estimator is a Hausman-Taylor estimation (HT), which utilizes means of time-varying exogenous characteristics to instrument for endogenous characteristics without requiring additional instruments (Hausman & Taylor, 1981). For lack of good instruments, and as it can be argued that most variation is individual rather than overall, a HT estimation will be used in this paper.

There are several limitations to this study which must be addressed. One is due to sample selection bias. This study does not cover all agricultural markets, but the ones studied are chosen because they are larger, fairly distinct, and well represented in comparative studied (i.e. by Ekoweb and Ekolantbrukarna). Thus, results cannot really show generality in the agricultural markets. The second is due to the fact that firms are selected based on availability of data via Bolagsverket. As many farmers are not incorporated, they are not represented in Bolagsverkets accounts database, and are not included in the analysis. If companies of a certain size or standard tend towards incorporation, this could create sample selection bias. An alternative would be to use average settlement prices or spot prices and proxies for variable costs (i.e. organic feed and fertilizer spot prices). This might be overly generalizing of the market, however.

A third limitation has to do with the nature of the performance measures used, all of which have their respective benefits and limitations. Of the traditional profit measures (Sales and EBITDA), the main advantages are that the measures are intuitive, are common profitability metrics, and can effectively capture ongoing operating results. Additionally, the sales measure is relatively robust. Some disadvantages of these are that they ignore investment levels, can be influenced by non-operating measures, and are hard to compare across industries without controlling for size accurately (Meridian Compensation Partners, 2011). Price-cost margins are in general better measures of profitability, which indicate the mark-up the firm can take on their marginal costs. This measure, also called the Learner index, is 0 when the firm acts in perfect competition and close to 1 if the firm is acting as a monopolist. The main disadvantage of these measures is that unless the marginal costs are known, the only measure that can be generated is the price-variable cost margin. The margins are usually calculated as revenue less payroll and material costs divided by revenue. It can be shown that this causes a bias in the results:

$$\frac{P - TVC}{P} = -\frac{1}{\varepsilon} + (r + \delta) * \frac{P_k * K}{p * q}$$

This is often corrected for by including some measure of the capital in the underlying regression (as is done in this study), but this may not accurately capture the variation (Perloff, Karp, & Golan, 2007). These problems may not be too severe, as long as results are interpreted with some degree of caution. As both the sales and EBITDA these measures are relatively skewed, the natural logarithm will be taken, without losing generality in results (Wooldridge, 2013). The margin is constructed using Net sales, less the costs of Raw materials, wage costs, and depreciation. Different margin constructions were tried, and all results were similar.

The final main problem is a problem of methodology. The main issue is that the model cannot be interpreted in a causal manner (i.e. organic certification causes greater profits) without making very strong assumptions. Rather, the main results imply a correlation (i.e. when controlling for relative factors, organic certified firms tend to have greater profits). This result may be interesting in and of itself, but does not really allow for policy implications. For example, if farmers with greater drive and ability choose to become certified, this will bias the results (assuming that these farmers can achieve greater profit regardless of certification). Also, farmers with larger areas of land may be more able to use economies of scale to achieve profits. Thirdly, if profits are higher in the organic sector, farmers may self-select into certification, causing two-way causality. This is one of the central motivations for using some form of instrumental variable approach when conducting this study. For the purpose of this study, when results are referred to as large or small, it will be in reference to their size. When discussing significance, it will only be with regard to the statistical significance of the results.

6) Results

This section will discuss the results obtained using the method described above. First general premiums to organic products will be briefly discussed, after which the full market level results will be presented. This is in order to study the general trend, and to be able to compare individual products to the aggregate returns to organic certification. The development of returns to organic certification across the sample period will also be traced. To control for endogeneity, instrumental variable regressions will be carried out. Finally, robustness checks and sensitivity analysis will be carried out.

6.1) Main results

Before showing regression results, some preliminary tests are called for. Table 8 shows unconditional and conditional differences[7] of profitability estimates for the organic and conventional farms, as well as the two-sample P-value between the two. The same trend across the period is traced out in Figure 2. These tests generally support the motivation of doing this study.

Table 8: Initial comparison of firm performance

	Unconditional Means			Conditional Means		
	Conventional	**KRAV**	**t-test**	**OLS**	**RE**	**FE**
ROA	3,15	5,17	0,77	-	-	-
	(1.7)	(0.58)				
Profit margin	1.84	15,2	0,88	-	-	-
	(23.9)	(4.9)				
Gross Margin	**-57,3**	**10,2**	**0,0554**	**-**	**-**	**-**
	(8,75)	(2.81)				
Sales[1]	**6.96**	**7.89**	**0,0000**	**0.231**	**0.299**	**0.322**
	(0.014)	(0.048)		(0.0588)	(0.0481)	(0.0574)
EBITDA[1]	**5.86**	**6.44**	**0,0000**	**0.238**	**0.187**	**0.162**
	(0.011)	(0.036)		(0.061)	(0.044)	(0.052)
Profit	332	303	0,8934	-	-	-
	(54.6)	(40.5)				
PCM	-0.107	0.245	0.135	0.0512	0.0504	0.0130
	(0.06)	(0.06)		(0.0998)	(0.258)	(0.380)

Significant coefficients are bolded

Robust S.E. in parentheses

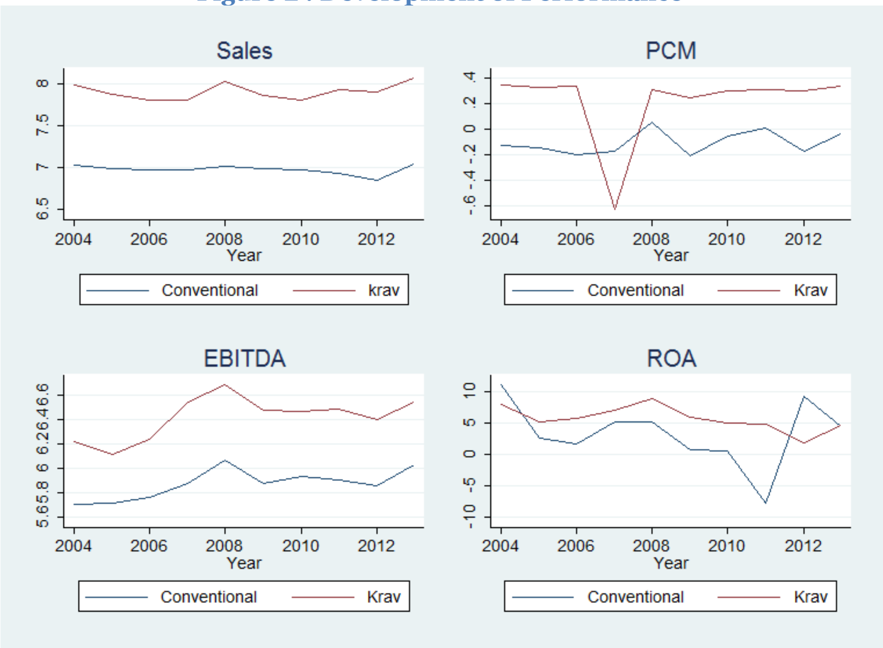
1) Results presented are logarithmic

For most of the performance measures, the certified organic farms seem to have a greater profitability than the conventional ones, significantly so for the Gross Margin, the Sales, and the EBITDA, however the results are very noisy. It is possible that this is due to differences in firm characteristics, which are controllable. If the difference in profitability persists even after controlling for observable characteristics, it implies that certified organic firms do in general tend to have higher profit margins than conventional ones do, and that the growing trend may have given organic firms a competitive edge. Otherwise it will imply that there is

7 Differences with/without controlling for size, production, et cetera.

some form of long-run equilibrium in place, and further conversion may need to be driven by other factors.

Figure 2 : Development of Performance



Development of four performance measures across the sample period

Market level regression results (also in Table 8, rightmost columns) testing how performance varies with farm characteristics and organic certification show that certified farms on average have significantly higher sales and accounting profits. They also have higher profit-margins, but not significantly so. Without strictly controlling for output (hopefully captured by the labor and capital measures) it is not possible to concretely state that this corresponds to organic firms achieving a mark-up on their products, but it is suggestive. Average settlement prices generally show higher prices for organic produce than conventional, so this is a fairly intuitive result. Results are relatively robust to model specification, but model tests return inconclusive results[8]. A RE model will be used for the desirable estimation properties discussed above.

[8] This is true of the individual markets as well.

6.1.1) Competition per product type

The results presented above are likely to misrepresent the true market dynamics, being far too aggregate. The most logical division is to study separate product markets. The reason for this is intuitive, dairy farmers do most likely not compete with beef farmers, nor should the number of potato farmers affect the number of fruit growers. The parameter values of interest from these regressions are reported in Table 9[9]. The table presents β coefficients for the variable of interest (Organic certification), as well as indicating the level of significance.

Table 9 : Marginal correlation of certification by product type

	Sales	PCM	EBITDA
Mixed Farming	0.317***	0.0603	0.209***
Grain Farming	0.364***	-0.188	0.256*
Potatoes	0.257	0.382	0.526**
Vegetables	0.377***	-0.158	0.279*
Fruits	0.152	0.433	-0.144
Milk	0.314***	0.0862*	0.275***
Beef	0.362**	1.416	0.128
Pork	-0.329	-0.381*	-0.426
Egg	0.142	0.186	-0.182
Poultry	-0.295	0.309***	0.874***

***: Significant at the 1% level;
**: Significant at the 5% level;
*: Significant at the 10% level
2) Possible small sample problems

Some interesting results can be gleamed from this table. One factor is that while the value added to sales seems contingent on the type of produce, many produce have premiums of similar size. For example, all of the significant and positive coefficients seem to indicate a price-premium of between 30 and 40 percent. Some results are strongly significant and positive, while other results are not significant at all, or only weekly significant. Farmers working with mixed farming, grain, vegetables, milk, and beef production seem to achieve higher markups than the market in general. Contrary to this, potato farmers, Fruit farmers, and egg producers have lower margins than average. Organic pork and poultry producers

[9] Full regression results are presented in Appendix 5

seem to have lower sales than conventional pork producers. These two groups may suffer from some bias, as there are very few organic poultry producers (Helmerson, 2012), and not many organic pork producers either. Also, profits in pork production have been debated more strongly than others.

The PCM measure for each product type seems to contain more variation, both within and between producers. One effect of this is that most results are insignificant, even though some results are economically large. Among potato farmers, fruit farmers, and beef producers the premiums for organic products are on average significantly larger than those for conventional producers (many values implying a 40% higher ratio). That being said, results are so noisy that it is not possible to say that they are significant. Only among milk producers are results significant.

For the accounting profit measure studied here (EBITDA), the results are in general similar to the findings from the Price-Costs margins. However, there is a significantly larger spread between the amount of negative and positive coefficients on the organic parameter. It is unclear if this variation is due to accounting practices, or some fundamental difference in the cost structures of the firms in question. However, many of the individual product types (Mixed farming and pork) seem to earn on average higher profits under certification.

So what do these results imply of the market? Generally, they imply that while organic producers are in able to achieve premiums on their products, they do not have the market power to set prices significantly higher than the proportional increase in their running costs. Only milk-farmers seem to be able to set prices to achieve a margin-premium, but this may be due to the attractiveness of organic milk. Pork producers seem to be characterized of a significantly negative premium, but as discussed above the profitability of organic production in this sector has long been contested.

6.1.2) The change in returns to organic certification over time

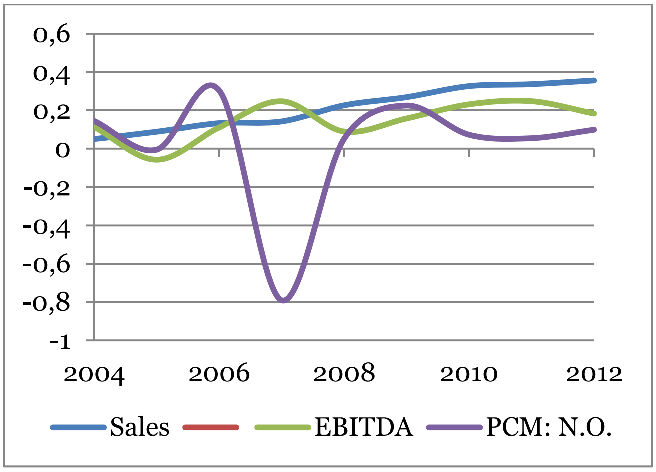
As one of the purposes of this paper is to study not only the premiums obtained, but to study for how this has changed over time, an interaction term is used to show how returns to certification have varied since 2004. Recall Table 3 and Table 6, which show that there has been an increase in the number of KRAV-certified firms over time. Table 10 shows the change in returns to certification over time, and the same trend is traced in Figure 3. Sales-premiums have increased steadily over the period, while the PCM has been generally weakly positive (with a large dip in 2007). Profit-premiums seem to be positive and cyclical, and not necessarily trending in any way.

Table 10: Development of returns to organic certification, aggregate market

	Sales	PCM	EBITDA
2004	0,05	-0,0152	0,114
2005	0,088	-0,0140	-0,057
2006	0,133	0,0147	0,1102
2007	0,142	0,0314	0,2468
2008	0,226	0,0296	0,0895
2009	0,2688	0,0222	0,1573
2010	0,3264	0,0016	0,2308
2011	0,3366	-0,0179	0,2471
2012	0,356	-0,0202	0,183

Table shows regression coefficients over time

Figure 3: Development of organic premiums



Same development, but illustrated graphically

As general Krav-premiums seem relatively consistent around the long-run value despite this fact (even in the years with most entry), it may imply either that the market is working under perfectly free entry, however because of the waiting times this should not be the case. This would speak against the theory that the entry of more organic firms would significantly affect profitability (remember that it takes time for firms to be able to take advantage of the premiums for organic certification).

There seems to be a large dip in PCM's around 2007. This may be due to the financial crisis[10], or be caused by outliers. A third alternative is the fact that the rules regarding organic certification changed during this period, resulting both in an increase in the certified area and changes in which fertilizers and pesticides were allowed (Clarin, Gustavsson, Söderberg, & Wallander, 2010). This may have affected costs, etc through the increased costs of certification, land area, and changes in inputs. This analysis would bear repeating in a few years, when more data is available. As this is not really present when studying the development per product group, this dip is most likely not very relevant.

When studying the development of the KRAV-parameter over time for each product group separately, some different trends in different product groups emerge. Full results are presented in Appendix 6, but two examples are presented here, and all results are discussed.

10 Sadly, there is not enough data after the crisis to ascertain whether there is some long-run effect unrelated to the change in demand for organic produce.

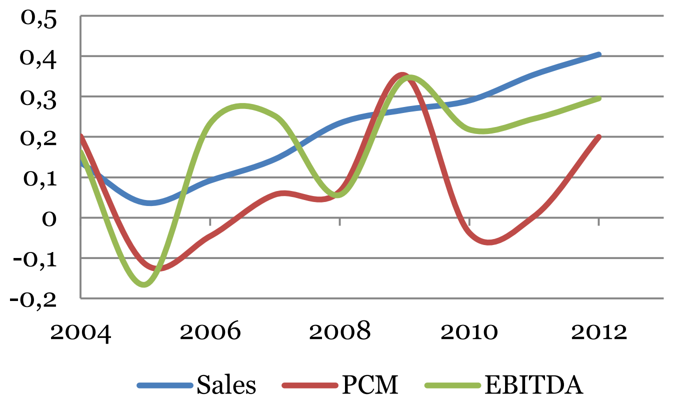
For two groups, mixed farming and pork production, returns to organic certification seem to be trending slightly upwards. For mixed farming the trend seems generally positive, while for pork production the trend seems to come from the fact that profitability was very low in the beginning of the period. This seems to have been amended in recent years (possibly by raising subsidies).

Mixed Farming

Change in returns to Organic Certification over time

	Sales	PCM	EBITDA
2004	0,137	0,20166	0,162
2005	0,037	-0,115	-0,166
2006	0,092	-0,046	0,2328
2007	0,145	0,057	0,2518
2008	0,234	0,065	0,056
2009	0,267	0,353	0,3434
2010	0,29	-0,037	0,2181
2011	0,3542	0,003	0,2447
2012	0,404	0,2	0,295

Parameter Development



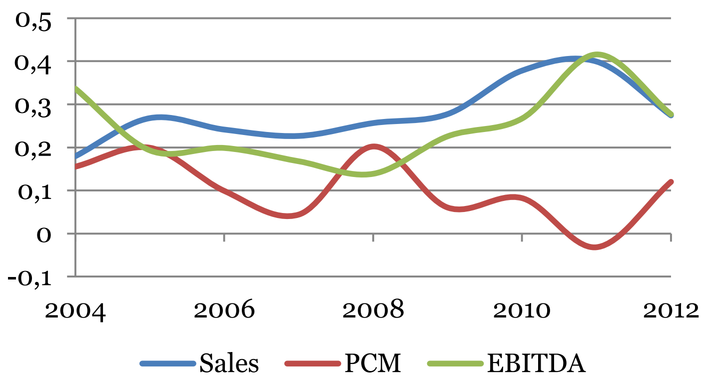
For others, the coefficients seem to be trending around zero. These product groups are grain farming, vegetable farming, fruit farming, egg farming, and poultry farming. Potato farming, fruit farming, milk farming, and beef farming seem to be trending constantly at a positive value.

Milk Farming

Change in returns to Organic Certification over time

	Sales	PCM	EBITDA
2004	0,1794	0,1553	0,3365
2005	0,2678	0,1992	0,1933
2006	0,2411	0,0989	0,1989
2007	0,2264	0,0439	0,168
2008	0,2563	0,2021	0,139
2009	0,2771	0,0602	0,226
2010	0,378	0,0821	0,26733
2011	0,399	-0,032	0,416
2012	0,274	0,12	0,277

Parameter Development



In general, sales premiums have been trending upwards. This is most likely caused by a combination of increased sales and possible price. The one exception is organic poultry. The PCM's are in general much noisier, and can show large spikes, but are also more constant around a long run value. Some seem to be trending upwards (beef production) and some tend to be trending slightly downwards (poultry).

While some of these results are sensitive towards outliers, the general trends seem relatively consistent. How these results compare to other market results and analysis will be studied in section 7, but the results are in general consistent with other findings.

6.1.3) Accounting for Endogeneity

As discussed previously, the results obtained above are most likely affected by endogeneity regarding farmer's choices of production method (organic vs. conventional). If it is believed that choice of certification is correlated with the idiosyncratic error (variation across time *and* individuals), a 2SLS type regression is used, while if it is only correlated with individual-random effects (variation *only* across individuals), Hausman-Taylor (HT) estimation can be employed. General 2SLS regressions here tend to generate very noisy results, with many nonsensical values. Several instruments have been tested; but none returned reasonable results. As it is generally known that a bad instrument can give worse results than a biased regression, this will be disregarded here.

Fortunately, most factors which should affect the returns to organic certification should be on an individual level. For example ability (which was discussed above), and other factors like returns to farm scale, should be tied to the individual farmer. Additionally, many other factors are taken into account by incorporating regional and time fixed effects are accounted for in the regression. Factors which may not be taken into account is if one of the groups tended to expand more than others, but this is likely to be true of only a small number of farmers

On a basic level, the HT approach entails using means of time-varying characteristics not only to estimate their own coefficients, but also to estimate the coefficients on the variables that have endogeneity problems. In some cases, this was shown to yield better, more consistent measures of the endogenous variable than the 2SLS did, especially when good instruments are hard to come by (Hausman & Taylor, 1981). The approach works if there are at least some exogenous, time-varying variables present in the regression, as these can act as identifiers for their own parameters and instruments for the endogenous variables (Green, 2012).

The results of the HT estimation are reported in Table 11. While the same general trend is present in the HT estimation as is found in the main estimation, the sizes of the coefficients are somewhat different (recall Table 9). The sales estimation does not change drastically, however some estimates show significantly lower results. The coefficients describing the profit-margins have changed more, and generally show smaller results than the traditional estimation. The profit measure is in general still larger than the profit-margins, but there is less significance, and some even report negative results!

Table 11: Hausman-Taylor estimation results

	Sales	PCM	EBITDA
Mixed	0.375***	0.00636	0.277***
	(0.0805)	(0.0598)	(0.0960)
Grain	0.388***	-0.0766	0.209
	(0.117)	(0.0792)	(0.159)
Potato Farming	0.214	0.0802	0.448
	(0.168)	(0.103)	(0.279)
Vegetables	0.429***	0.131*	0.324**
	(0.126)	(0.0761)	(0.158)
Fruits	0.0993	0.132	-0.128
	(0.205)	(0.154)	(0.299)
Milk	0.349***	-0.0152	0.280***
	(0.0665)	(0.0362)	(0.0790)
Beef	0.423***	-0.0257	0.0880
	(0.111)	(0.104)	(0.171)
Pork	-0.473	-0.187	-1.087*
	(0.549)	(0.165)	(0.642)
Eggs	-0.0573	0.0431	-0.453**
	(0.147)	(0.240)	(0.219)
Poultry	-0.396*	-0.0258	0.874***
	(0.215)	(0.137)	(0.276)

Despite these differences, what is shown here generally underlines the results obtained in the main regression. They still tend to indicate that sales premiums are only large enough to cover extra costs obtained, and that for most products results are significantly smaller than in the standard regression. It would be very interesting to see if the development of the premiums to organic certification is robust to endogeneity as well, but instruments used in interaction-terms and across years must be very strong to achieve parsimonious results, so this cannot be done here.

6.2) Robustness Check

Even though every model specification is an estimation of how the real world works, results are most credible if they are strong enough to be (at least in terms of sign and significance) robust to model and method. In the main regressions, three models were tested (although for the sake of brevity not all results were presented), and the general conclusions were persistent across specification. Additionally, before the final specification detailed above was reached, other models were tried, also resulting in similar correlations (not presented here). A final check for robustness is to check if certain sub-groups are sufficiently different that they might be "driving" the result in a certain way. Finally, the results sensitivity to outlier values and the nature of the panel will be tested.

6.2.1) Robustness Check

It is important to establish if there are any specific factors which are driving the results. One possible factor which may cause problems is regional differences. For example, many regions in the south of Sweden (i.e. Scania) have significantly more horticulture than other regions, while many dairy farms are in the "dairy belt" regions. If farmers compete in a very intense manner with each other, as many traditional IO and neoclassical economic assumptions would assume they do, then this large competition could lead to a price press. Another possibility is that access to good fertilizer, feed, and other necessities of the farming trade may be better in some regions than others. Soil quality and the quality of the climate may also play a significant role. In the southern regions, the warmer climate, longer days, and perhaps more fertile soil may cause more farmers to locate there, causing endogeneity. This may also imply that these farmers can achieve a larger yield with fewer inputs, meaning that these farmers may be more profitable in general. Also, as there are more organic farms in this region, structures supplying aid, knowledge et cetera may be better in these regions. If this effect is very strong, simply controlling for the region effects may not be enough. Finally, this market definition may suit some products (i.e. the Vegetable and Fruit industries) better that the more aggregate market does.

Table 12 traces the differences in the B-coefficient of the PCM regression by region. Here there is some clear difference between the regions in both terms of economic and statistic significance. However, it is less clear how the regions may be driving the results, if at all. Within sales and EBITDA, most of the significant coefficients are close to the general results. This is the only result presented here (for brevity), but the regression results for the aggregate market are reported in the appendix. Other results can be obtained from the author.

Table 12: PCM by market and region

	Mixed	Grain	Potato	Veg	Fruit	Milk	Beef	Pork	Egg	Pol
Blekinge län	-	-	-	-	-	-	-	-	-	-
Dalarnas län	-0,088	-	-0,097	-	-	0,090	-0,157	-	-	-
Gotlands län	0,116	-	0,166	-0,015	-	0,207	-	-	0,140	-
Gävleborgs län	-0,216	-	-	-	-	0,055	-	-	-	-
Hallands län	-0,492	-	-	-0,515	-	0,743	-	-	-	-
Jämtlands län	8,369	-	-	-	-	0,147	-	-	-	-
Jönköpings län	0,105	-	-	-	-	-0,087	-0,403	-	-	-
Kalmar län	0,234	-	-	-	-0,788	-	-	-	-0,110	-
Kronobergs län	-0,091	-	-	-	-	-	-	-	-	-
Norbottens län	0,206	-	-	-	-	0,204	-	-	-	-
Skåne län	0,243	0,654	1,180	0,166	0,222	0,122	0,135	-	-	-
Stockholm län	0,691	3,248	-	-	-	1,733	0,441	0,120	-	-
Södermanlands län	-0,045	0,827	-	-	-	-0,086	0,044	-	-	-
Uppsala län	0,033	0,959	-	-	-	0,042	-	-	-	-
Värmlands län	0,029	0,145	-	-	-	-0,029	0,416	-	-	-
Västerbottens län	0,200	-	-	0,232	-	0,024	-0,068	-	0,543	-
Västernorrlands län	-	-	-	-	-	-	-	-	-	-
Västmanlands län	-0,091	-	-	-	-	0,090	-	-	-	-
Västra Götalands län	0,377	-0,032	-0,088	-0,115	-	-0,021	6,772	-0,765	0,662	-
Örebros län	-0,106	-0,160	-	-	-	-0,195	-0,057	-	-	-
Östergötlands län	0,021	-0,275	-0,432	-0,010	-	-0,062	0,023	-0,172	-	-

The results from studying the PCM per product type and region are somewhat inconclusive, not the least as many product groups contain too few observations to estimate a parameter for every region in the sample. As there are so many missing products this is an imperfect measure of results, but does indicate that because of the lack of industries southern regions may be driving results. As can be seen, most farms are located in the south of Sweden, most notably in Scania, V.Götaland, and Östergötland. However, most parameter estimates from these areas are not significantly larger than average. This same trend is found in all performance measures. Milk, mixed, and beef farming are sufficiently well represented to offer an estimation in almost all regions, but even here results are inconclusive.

6.2.2) Checking the Balanced Panel

The previous regression has used the entire panel to test the hypothesis that organic farms have higher profitability, which is the recommended protocol here since there may be endogeneity issues based on self-selection. However, to check for robustness in the results, the regression will be rerun using only the balanced observations. These results are presented in Appendix 8: Balanced Table.

These results are in general consistent with the results in the main regression. In particular mixed farming, milk production, beef, pork, and poultry are showing very similar trends. For most products, the sales premiums remain clear and consistent in terms of sign and size. Only Fruit farms show a significant change in sign and size. For this, and some other produce, a relatively low share is present in the whole sample, which may bias these results more heavily. Among grain producers, the balanced panel shows similar trends in sales and accounting profits, but highly significant and positive PCM's. This may be due to significant exit from grain production.

This implies that (as was discussed in the methodology section), results may be sensitive to entry exit dynamics if they are significant, but in general the main results still hold.

6.3) Sensitivity Analysis

The main sensitivity check will be to control for outliers. In econometric analysis it is always a debated topic whether or not to exclude outliers as this can throw away information which may be pertinent to the analysis. However, as many econometric techniques are sensitive to outliers, omitting these can lead to a result which is closer to the way the industry works for the "normal" companies. This will be done by trimming the top/bottom 5% of the data for the dependent variables. Table 13 below presents outlier values for these margins, as well as the min and maximum values. Some of these may clearly be causing bias, in particular for the margin.

Table 13: Minimum/maximum performance values

	p5	p50	p95	min	max
Sales	0.00	7.66	9.64	0	16
EBTIDA	2.94	6.14	8.02	0	14
PCM	-0.31	0.34	0.93	-800	1

Table 14: Organic by product, less outliers

Product	Sales	EBITDA	PCM
Mixed	0.246**	-0.0496***	0.225**
Grain	0.272***	0.0167	0.266*
Potato	0.246*	0.0676	0.526**
Vegetables	0.301**	0.0611	0.277*
Fruits	-0.0183	-0.0382	-0.176
Milk	0.292***	-0.0176	0.272***
Beef	0.225*	0.0122	0.149
Pork	-0.360	-0.244**	-0.452
Eggs	0.101	0.00897	-0.140
Poultry	0.171	0.152	0.874***

Within both sales and profits, the main outliers seem to be at the top (firms who may have unnaturally high profits), while for the margins the unnatural profits are on the bottom. From the sales/EBITDA, the top 5% is cut away.

Table 14 shows the result of the regression less outliers, and is comparable to Table 11 seen above. Although the results are not exactly similar, the overall size of the Sales and EBTIDA coefficients are very similar to the first results. However, the results of the margins are significantly smaller to the results obtained above, implying that the margins are sensitive to outliers. While the results are still positive, they are significantly smaller than previously. As seen above, this is most likely because some few firms have costs that are significantly higher than average, leading to very low PCM's and a more positive β coefficient.

7) Analysis and Discussion

First, the general implications of the findings will be discussed. After that, the results for the separate products will be compared to previous studies and market results, and what this would imply for the market for that produce will be analyzed. Finally, conclusion about possible policy measures and an analysis of what has happened so far will be made.

If the results obtained above can be taken at face value, it will confirm some things about the market for agricultural produce. One is that organic producers generally obtain price-premiums compared to conventional producers, which can be an incentive to convert in its own right. However, when price-cost margins are studied, the competitive edge seems to disappear, implying that extra income is only sufficient to cover extra costs of production. In market equilibrium, this is similar to what is suggested by Sedjo and Swallow when there are extra costs of production and consumers who are willing to pay premiums for organic products. If this is true, then price- and profit-premiums cannot be used as incentive devices to attract more organic farmers. While there may still be some endogeneity issues due to lack of good instruments, the general results seem robust to specification and model choice. The remaining bias may come from factors correlated with the idiosyncratic error, but the model above and the strength of the results still imply that these results are worthwhile. Additionally, while some traditional instruments may be used, bad instruments generally return worse results than a biased regression; these would most likely show an incorrect picture of the market.

Though there are no similar studies as of yet, is possible to compare these results to general market trends. Both conversion rates and price-premiums can be studied, as well as overall reports on the agriculture market. There has under the period been a general increase both in the number of animals and areal of land under conversion. This indicates that there seems to be some response to the increase in demand, even though it may not be from an increase in the number of producers. Generally conversion seemed to be behind demand until circa 2009 (Cahlin, et al., 2008), reaching a peak in 2010 before lagging off again (Johansson, 2014). While there are still discrepancies, the market in 2012 can be said to be considerable better balanced than the market in 2008 was. Also, there seems some change in the nature of farmers converting, as they state that economic incentives (mainly with regards to subsidies) to be a larger incentive than before.

The producers who seem to enjoy the highest returns to certification are those working with mixed farming, milk-farmers and beef production. These producers seem to have significantly larger sales, and larger but not significant profit-margins. Among both beef and dairy farmers, there has been an expansion of the market, and an increase in the number of animals under conversion (see Appendix 9). Also, the graphs in Appendix 6 show that premiums seem to have been constantly positive for milk farmers, and consistently around zero for beef farmers. For milk farmers, the demand for their products has been especially strong, and price-premiums have been stable (van der Krogt & Larsson, 2008).

While producers working with mixed farming are not very homogenous, they are a so many that they cannot be ignored as a group. These farmers generally work with a mix of husbandry and horticulture, and seem to have a high profitability, which has generally been echoed in other studies (Ländel, Persson, & Wahlstedt, 2008)

For the vegetable farmers premiums have in general been significant and positive. Carrots have historically been the most important vegetable, followed by beats, cabbage, and onions. The number of vegetable farmers has fluctuated around the same level during the past 10 years, with a slight decrease towards the end. The demand has been increasing consistently, so a large share of products is imported. In general, there are two types of vegetable farmers. Smaller farmers often sell to consumers directly; while larger sell to kitchens and wholesalers. For the latter group, the increase in communal purchases has been thought to be a strong driving factor, which may explain the positive coefficient. However, while these purchases have increased, the same trend cannot be seen in how returns to certification have developed over the period.

Returns to fruit farmers have in general been positive, but not significantly so. Accordingly, production has been relatively constant, but increased slightly towards the end of the period. Apples and pears are the most common products, and most producers are new, as it is difficult to convert a conventional fruit farm to an organic one. In general, the market for organic fruit works in a similar manner to that of organic vegetables.

The hectares of areas devoted to potato farming have also been relatively constant over the period, but has also decreased towards the end. Potato farming is tricky, as the plants are highly susceptible to blight and other pests. For this reason, profitability would need to be very high to make it economically viable. This is mirrored in the results, as returns were smaller towards the end of the period than in the beginning. Margins were in general smaller, and even sales premiums not significantly larger than conventional ones.

For grain farmers, the analysis suggests a positive sales-margin, and a positive but insignificant profit margin. In some cases, the margins obtained are even negative. This is similar to results by SJV which states that the grain market is still small and profits are sensitive to demand and climate. Prices, premiums, and yields vary greatly between groups, and the increase in organic husbandry may be driving prices. There is still an excess demand, especially from organic fodder markets but even from the retail sector. While price-margins were in general higher in 2009 than in earlier years, there was much variation. The amount of grain production has increased, but is more pronounced in certain grains than in others, and grain farming was one of the crops with the largest relative exit rates in the sample.

Producers of milk, the main “gateway” product to organic purchases, have in general had significant price-premiums, but PCM’s and profits have not been as high. In general, sales seem just enough to cover extra costs. Though demand is strong, and profitability has general been observed to be better than on conventional dairy farms, the average settlement price has trended downwards recently. This may be because organic milk is not as scarce as it once was. Premiums for beef producers have in general been positive, even on the margin, and seem to be climbing steadily. Beef producers have been increasing the number of animals under conversion in recent years, and there has generally been more entry than exit. This has led to more organic beef cows, but the number put anew into conversion has gone back to the previous lower levels.

Pork producers and poultry producers in general seem to have a harder time compared to others, having both lower sales premiums and profit premiums than their conventional counterparts. Results for these producers should be interpreted with some degree of caution, as these two groups are among those who have the fewest producers in the sample. The number of organic pigs in the market was low until a sharp increase in conversion under 2010, but there is not enough data in the market to see any effect of this yet. In the mid 2000's subsidies for organic pork producers increased; and in 2009 prices for organic pork went up, which may have caused this to happen. Profits in organic pork production have long been contested, some reflecting bad profits (Lindberg, 2013), while others state that the organic pork producers are stronger and relatively robust to market cycles (Goth, 2011). For organic poultry, the market is still very small (as discussed above), and expansion has been proving difficult (Bremen, 2010). While there has been some increase in the amount of organic poultry, the increase has been moderate. However, the demand is growing steadily. One possible problem that these products are having is that they are in general considered to be "cheap", and consumers may be less willing to pay premiums for these products.

Among egg producers, the number of individual farmers has gone down, while the number of chickens per producer seems to have increased (leading to increased concentration). However, the margins have been relatively constant over the time period, and very small. In general, many producers have felt that prices are very pressed in the production of organic eggs, which has only become worse in recent years.

In a report by KKV, average margins in some agribusinesses were positive and significant, implying that they have profits which exceed their variable costs. Among these were the beef and meat industry, the fodder industry, the dairy industry, and the fruit industry. Farmers working with mixed farming, other greens/vegetables, and grain production have lower, but still significant margins (Lundin, 2011). Many of the products which were functioning well in normal agribusiness also seemed to function well under organic certification. Another report discussed how the structure of the market made the main profits of organic certification stay among retailers and wholesalers, rather than return to producers. While there is nothing found in this report to negate this theory (although positive margins were found in certain sectors), it was found that when market and producer characteristics were accounted for the producers generally received a price premium only large enough to cover variable costs. This would be indicative of the “hourglass” structure in the market, which makes it harder for organic producers to receive premiums for their produce despite the increase in demand for organic products. While there are also costs of certification, organic producers also have access to subsidies that conventional producers do not have access to, which would be able to compensate for these costs. How these two cases compare in size is not known, so they cannot be (directly) accounted for in this analysis.

Similar results are also found by the Organic farmers association in previous studies. Between 2004 and 2008 the market for organic products increased greatly. Both production and sales of grain has increased, both of the certified production and the area of production which is produced under organic means but not certified. For fruits and vegetables there was a slight increase, but it was not as large due to the large share of imported goods in the market. For meat products, the demand was generally found to be above supply, but market forces seemed to be working to correct this for at least some products. For dairy products and eggs, the demand was growing strongly. The demand for organic milk was especially strong (Vand der Krogt & Larsson, 2008).

It is also possible to compare results to a set of case studies also conducted by SJV. Similar markets as in this report are studied, focusing on profitability, prices, and conversion rates. They conclude that greenhouse vegetable production, egg production, and pork production had larger costs of organic production than other producers, but that they also received larger premiums. Results shown here imply that this may not be true in the market as a whole, since pork production especially was one area where problems were found, and this may confirm reports from other individual farmers that organic pork production is very costly. On the other hand, premiums for organic certified milk production were especially strong, a result which is somewhat echoed in the results obtained above (Cahlin, et al., 2008).

As discussed, premiums are one important factor that farmers consider when choosing whether or not to convert to organic production. This report in general shows that returns to organic agriculture can be subject to a large degree of variation, in addition to the normal uncertainty associated with farming. As the market is still small (though growing), a more stable business climate may be a stronger incentive to convert, as may be increased subsidization.

There has been some action taken to push organic conversion rates up further. For example, a supply-side measure is that subsidies have been increased for organic production, especially for those with a large environmental impact like pork, eggs, and potatoes. This was discussed earlier as a probable cause for the upturn in the number or organic pigs in Sweden, but it is too soon to tell how this will affect profitability. For now, the current goals have been reasonably well met for pork, milk, and beef production; but less so for organic fruit, roots, and vegetables. On the demand side, the main measure the Swedish government has taken to promote organic production has been to set a nation-wide goal that all municipalities in Sweden will have 25% organic consumption by the end of 2013 (Oskarsson, et al., 2010). Though this goal was not met, public consumption of organic produce has increased drastically in many municipalities, and some have a far higher percent of their produce as organic (Eko-Mat Cetnrum, 2013). Further goals and policy changes are thought to be required if the new goal of 20% organic farming area by 2020 is to be met. The need for more policy changes and increased subsidies is particularly strong for horticultural production, where conversion is currently lagging behind husbandry-based production. As there are differences in returns to production across the country, SJV recommends that subsidies be set in two parts, a base for the whole country, and an additional amount which will be contingent on where the producer is, and what they are producing (Wallander, et al., 2012).

This paper has, because of limits on time and data available, only studied one part of the supply chain for organic produce. Accordingly, an interesting aspect for future research may be to expand this, and study the price premiums across the entire chain on a more quantitative basis. For example, the mid-stage producers/wholesalers have significantly higher concentration than end-consumers do. For this reason, it can be possible to study how premiums that consumers pay in-store traverse this chain. Most likely, a good deal more will stay mid-chain. However, there may also be issues of double marginalization and similar effects. A second relevant area may be to see if organic producers who participate to a larger extent in direct sales have higher returns to their production than conventional producers do (as they can by-pass parts in the chain). A final possibility would be to more directly quantify if the increase in public purchases of organic produce has had any impact on conversion rates, particularly among fruit and vegetable farmers.

8) Conclusion

This paper has studied the competitive advantage that agricultural producers receive from partaking in organic farming measures by using accounting data, data on organic certification, as well as data on regional characteristics. This has been done by constructing a reduced form model built on both demand-side and supply-side factors, and using panel-data on profitability, main product, and other relevant characteristics. If this model is properly constructed, the coefficient on the organic-certification parameter should indicate whether or not these producers have market power.

The results of the regression are mixed. It is clear that for many products organic producers do receive a premium, and this result is strongly significant, although perhaps not extremely surprising. When studying price-cost margins the profitability factor basically disappears from most products, implying that the premiums set are such that they compensate the extra costs incurred from organic production (in line with more expensive input goods, et cetera). However, for certain groups, the development is more positive, in particular milk production, beef production, and mixed farming.

Even though both this paper, and some previous papers constructed in Sweden (by for example KKV and the Organic farmers association) have shown low premiums from organic farming, and especially when looking at margins, there seems to be a weak increase in the profit-margins of organic firms versus conventional ones over the years, and there has been a clear increase in the production/output of organic produce and the number of farmers. Whether this increase is mostly driven by increases in subsidies, spill-over demand, changing trends, or the access to premiums is beyond the scope of this study, but may be an interesting topic for future research. However, the results indicate that any future increase in organic production must be driven by factors other than pure market forces.

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List of Tables and Figures

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Appendix 1: Waiting times for different produce

Table A 1: Waiting times for Krav certification

Product	Strict waiting time
Meat based	
Beef	24 months
Milk	24 months
Pork	24 months
Eggs	6 months
Poultry	6 months
Plant based	
1 yr. General greens	24 months before sowing
1 yr. Fodder	24 months before reaping
Perennial (Fruit etc)	35 months before reaping

Presented above are general waiting times for products. However, if grazing land has started conversion before husbandry conversion, the conversion times may be somewhat shorter.

In general, these are in Swedish policy referred to as under a waiting time, but will be referred to as being under conversion during this report.

Data for meat-based products: Krav, 2013 “Karens djurhållning”, url: http://www.krav.se/karens-djurhallning . (checked 2014-May-23)

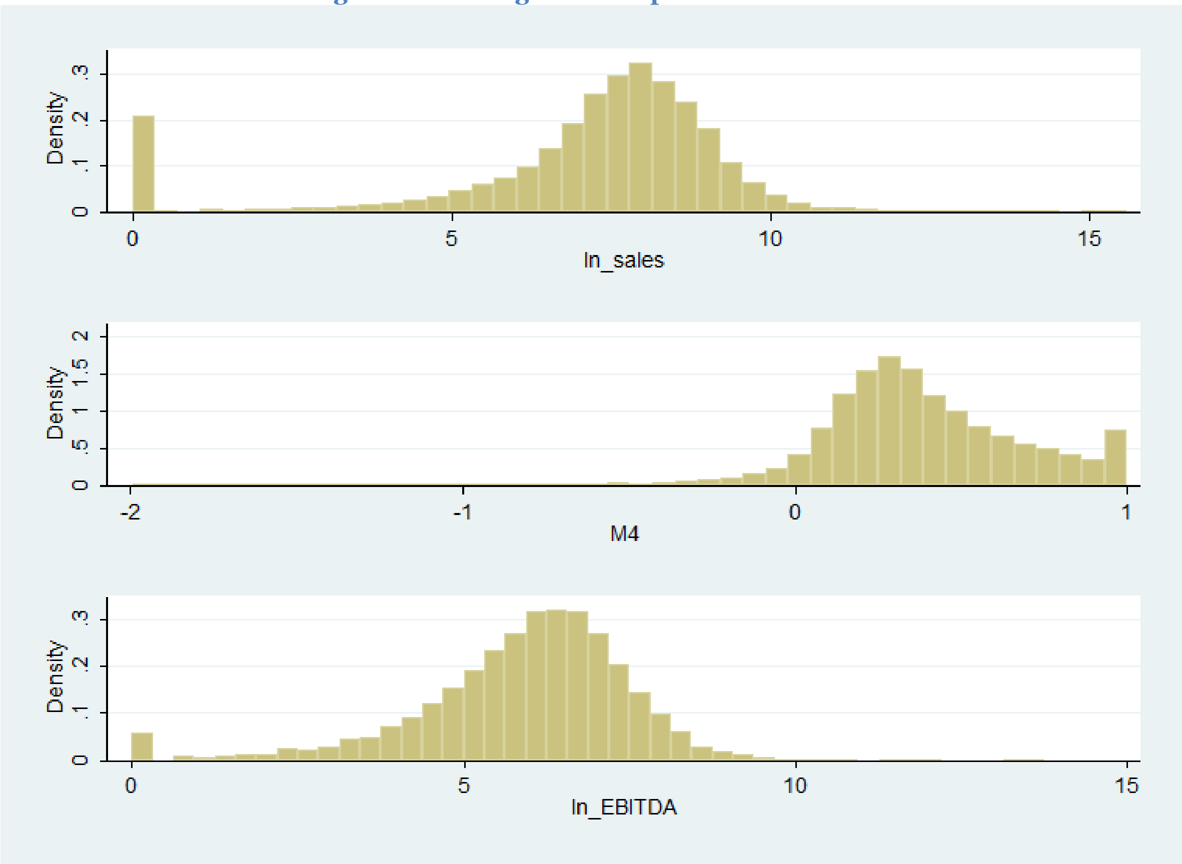
Data for plant-based products: Krav, 2013 “Karens Växtodling”, url: http://www.krav.se/karens-vaxtodling. (Checked 2014-May-23)

Appendix 2: Summary statistics of variables used

Table A 2: Summary Statistics of relevant variables

	mean	SD	min	max
KRAV	0.05	0.21	0	1
Egg Farmers	20.44	14.31	1	50
Fruit Farmers	67.73	81.91	6	233
Mixed Farmers	2657.26	2885.89	0	12149
Poultry Farmers	19.95	21.00	1	61
Potato Farmers	97.54	102.96	2	308
Milk Farmers	449.94	321.31	0	1414
Beef Farmers	556.25	521.17	0	1806
Organic Husbandry	16303.60	32453.95	0	144652
Organic Horticulture	7498.28	15839.53	0	80394
Converted land	543.44	1459.44	0	17094
Converted arable land	403.52	1062.92	0	10704
Converted grazing land	368.86	968.62	0	8460
Mixed farmer	0.37	0.48	0	1
Grain farmer	0.14	0.35	0	1
Potato farmer	0.03	0.17	0	1
Vegetable farmer	0.05	0.21	0	1
Fruit farmer	0.02	0.13	0	1
Milk farmer	0.14	0.34	0	1
Beef farmer	0.05	0.21	0	1
Pork farmer	0.00	0.06	0	1
Egg farmer	0.02	0.15	0	1
Poultry farmer	0.00	0.05	0	1
Capital-Sales ratio	2.95	57.17	0	6595
Employees	1.95	0.85	1	10
Year	2008.42	2.81	2004	2013
Region	13.09	5.88	1	22
Starting year	1991.73	11.64	1897	2013
Vegetable refineries	43.76	28.29	8	83
Dairy refineries	25.67	17.46	4	52
Meat refineries	81.28	63.17	8	177
Grain refineries	18.83	14.16	2	39
Krav registered	1991.73	11.64	1897	2013
Left Krav	93.69	423.84	0	2014
ln_sales	7.02	2.49	0	16
PCM	-0.09	9.60	-800	1
ln_EBITDA	5.90	1.62	0	14
Population	767434.78	609682.83	57004	2163042
Percent_Eco	3.36	6.43	0	43
Age of Farmer	52.26	10.31	15	92
Subsidies	18101.44	19111.42	422	83467
Other crops	0.33	0.47	0	1

Figure A 1: Histogram of Dependent variables



Though the data is mainly normally distributed, there are some outlier values which may cause problems. This will be analyzed in the section entitled "Sensitivity Analysis". In general, the main results of the report are not strongly affected by outlier values.

Appendix 3: Price setting

Product	Largest Purchaser	Organic Mark-ups	Concentration	Where
Grain	Lantmännen	Differs between types, circa 70%	High,	Mainly Southern Sweden
Potatoes	Samodlama	Circa 20%	Mid	Mainly Southern Sweden
Fruit & Veg	Samodlama	High product variation	Low (Size dependent)	Mainly Southern Sweden
Milk	Arla (64%) Also for organic	20 - 30%	High (slowly shrinking)	Most in the south, but relatively spread
Beef	Scan Abbatoir (51%)	15-20%	Mid (Shrinking)[1]	Fairly Spread
Pork	Scan Abbatoir (51%)	60-100%	Mid (Shrinking)[1]	Fairly Spread
Eggs	Stjämägg (40%)	70-100%	Mid	Mainly Southern Sweden
Poultry	Kronfågen & Guldfågeln (Joint ca. 80%). Bosarp largest for organic	70%	High (Growing)	Mainly Southern Sweden

Prices are set in different ways in different markets. For example, Arla (which is a cooperative of Dairy Farmers), sets prices depending on conditions, demand, et cetera. There are also additions to the price made to handle transportation and logistics, which seems fairly constant (Arla, Vanliga Frågor och Svar). Scan, which is the main meat-packer and abattoir in Sweden, sets interval prices which are also dependent on the location, et cetera (Scan). These are examples of the larger producers, but in general price setting will work in a similar manner for most purchasers.

Data sources:

Types of producers and concentration: SJV, From farm to counter

For mark-ups: Organic farmers association

Appendix 4: Previous agricultural studies

There are examples of using panel data on agricultural production, which allows controlling for factors which are impossible and/or hard to observe. It is possible to consider factors which are unobservable (coming in the error term), which may be farmer ability, soil-quality of the farm, etc. Farmers acting as independent producers will act in a profit maximizing way, perhaps with some degree of control over price, but most likely with a larger degree of control of selecting buyer, setting quantity, and in the long-run switching from one type of production to another. If this causes bias, it may be hard to control for using only panel methods. Some factors, like soil-quality, are relatively constant over time, and this can be controlled for using panel data methods, while others (like rainfall), will be exogenous. These factors can be assumed to be random (there is no serial correlation between rainfall in one year and the next). This might have been a problem in shorter time horizons, but should not be a big difficulty in yearly data (Arellano M. , 2003). Some of the problems associated with having an unbalanced panel may also be alleviated as long as some conditions are met. These include that there are some minimum number of observations for each entity, and that the conditions for unbiased panel estimation are otherwise met. Using the unbalanced panel may also lessen some problems due to self-selection bias in the sample, which is usually a common problem when using firm-level data (Arellano & Bond, 1991). Testing with this may be a good robustness check for the simpler model used in the main portion of this paper.

Appendix 5: Full Regression Tables by market

VARIABLES	Mixed Farming Sales	PCM	EBITDA
KRAV	0.317***	0.0603	0.209***
	(0.103)	(0.0856)	(0.0499)
oth_crop	-0.193***	0.289**	-0.0834**
	(0.0643)	(0.135)	(0.0381)
total_mixed	-3.66e-06	-4.40e-06	1.67e-06
	(4.80e-06)	(2.73e-05)	(4.46e-06)
org_horticulture	-1.88e-06	-6.86e-06	1.18e-06
	(1.34e-06)	(6.86e-06)	(7.80e-07)
Total_converted	6.58e-06	-6.53e-06	8.66e-07
	(8.61e-06)	(3.19e-05)	(6.50e-06)
Areable_converted	-6.72e-07	1.89e-05	4.52e-06
	(1.17e-05)	(4.00e-05)	(9.11e-06)
Population	-5.71e-08	1.19e-06	1.01e-06**
	(7.49e-07)	(3.33e-06)	(4.87e-07)
Mean_income	-0.00751	0.0164	0.00365
	(0.0102)	(0.0225)	(0.00548)
Veg_ref	0.00434	-0.0174	-0.00574
	(0.0194)	(0.0384)	(0.0118)
Grain_ref	-0.0447	-0.0430	-0.00161
	(0.0557)	(0.0632)	(0.0321)
Sugar_ref	-0.599	0.175	-0.0270
	(0.410)	(0.450)	(0.212)
reg_on	0.00115	0.00893*	-0.00447***
	(0.00259)	(0.00509)	(0.00161)
KS1	-0.00576***	-0.119***	-0.000173**
	(0.00164)	(0.0162)	(8.71e-05)
Constant	5.746	-20.84*	12.84***
	(5.698)	(11.44)	(3.448)
Observations	11,133	27,303	23,086
Number of Orgno	1,641	3,737	3,591

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	Grain Farming Sales	PCM	EBITDA
KRAV	0.364***	-0.188	0.256*
	(0.110)	(0.300)	(0.147)
oth_crop	0.0897	0.398*	0.144
	(0.101)	(0.221)	(0.108)
total_grain	1.80e-05	-0.000194	-7.10e-06
	(1.87e-05)	(0.000127)	(3.32e-05)
org_horticulture	-4.23e-07	5.35e-06	8.46e-07
	(1.32e-06)	(7.70e-06)	(1.53e-06)
Total_converted	5.06e-07	5.79e-05	7.33e-06
	(6.97e-06)	(5.76e-05)	(1.04e-05)
Population	-7.86e-08	-2.56e-06	1.70e-06
	(9.53e-07)	(4.79e-06)	(1.13e-06)
Mean_income	0.00566	0.0630	-0.0198
	(0.0137)	(0.0876)	(0.0174)
Grain_ref	0.0123	-0.0314	0.0551
	(0.0965)	(0.117)	(0.0846)
reg_on	-0.00292	-0.000421	-0.00725**
	(0.00307)	(0.00819)	(0.00314)
KS1	-0.00154***	-0.143***	-8.18e-05***
	(0.000256)	(0.0116)	(1.80e-05)
Constant	10.94	-12.54	22.61***
	(7.223)	(28.28)	(7.514)
Observations	4,334	4,334	3,667
Number of Orgno	537	537	530

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	Potato Farming Sales	PCM	EBITDA
KRAV	0.257	0.382	0.526**
	(0.162)	(0.291)	(0.236)
oth_crop	-0.00931	0.107	0.223
	(0.243)	(0.144)	(0.242)
total_pot	0.00167	-0.0165	0.00405
	(0.00140)	(0.0167)	(0.00289)
org_horticulture	9.18e-07	-1.04e-05	2.87e-06
	(2.02e-06)	(1.17e-05)	(4.38e-06)
Total_converted	1.06e-05	-2.09e-05	1.80e-06
	(1.00e-05)	(2.97e-05)	(2.17e-05)
Population	-1.57e-06	7.68e-06	7.31e-07
	(2.74e-06)	(7.58e-06)	(4.40e-06)
Mean_income	0.000992	-0.0202	0.0610
	(0.0430)	(0.0358)	(0.0398)
Veg_ref	-0.0482	0.0224	-0.0633
	(0.0531)	(0.0508)	(0.0482)
Constant	25.42	-0.740	17.21
	(19.89)	(8.796)	(18.62)
Observations	963	963	825
Number of Orgno	123	123	121

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	Vegetable Farming Sales	PCM	EBITDA
KRAV	0.377***	-0.158	0.279*
	(0.146)	(0.298)	(0.143)
oth_crop	-0.384*	0.434	-0.252
	(0.215)	(0.288)	(0.173)
total_veg	-0.000545	0.0420	-0.00444
	(0.00515)	(0.0299)	(0.00584)
org_horticulture	1.90e-06	2.60e-05	9.17e-07
	(3.65e-06)	(2.14e-05)	(4.13e-06)
Areable_converted	6.89e-06	-6.06e-05	2.22e-06
	(1.43e-05)	(5.89e-05)	(1.92e-05)
Population	-2.71e-07	-1.31e-06	2.36e-06
	(2.26e-06)	(3.67e-06)	(1.98e-06)
Mean_income	-0.0161	0.177	0.0127
	(0.0212)	(0.134)	(0.0238)
Veg_ref	0.0117	-0.216	-0.0397
	(0.0487)	(0.216)	(0.0500)
Constant	44.81**	-30.85	19.40
	(18.77)	(47.06)	(18.48)
Observations	1,514	1,514	1,252
Number of Orgno	209	209	202

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	Fruit Farming Sales	PCM	EBITDA
KRAV	0.152	0.433	-0.144
	(0.242)	(0.372)	(0.270)
oth_crop	0.780***	1.152*	0.405*
	(0.234)	(0.639)	(0.230)
total_fruit	-0.00651	-0.0233	-0.00690
	(0.00543)	(0.0300)	(0.00921)
org_horticulture	-2.65e-06	1.01e-05	-3.67e-06
	(4.39e-06)	(1.04e-05)	(3.85e-06)
Areable_converted	4.12e-07	-0.000213	-1.12e-05
	(2.01e-05)	(0.000177)	(5.16e-05)
Population	-1.02e-06	1.07e-06	-2.66e-09
	(4.19e-06)	(5.19e-06)	(4.16e-06)
Mean_income	0.00751	-0.0755	0.0730
	(0.0298)	(0.0538)	(0.0498)
Veg_ref	-0.104	-0.106	-0.0992
	(0.0881)	(0.147)	(0.0894)
Constant	54.68*	37.66	-38.84
	(31.61)	(37.66)	(25.45)
Observations	599	599	488
Number of Orgno	87	87	79

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	Milk Farming Sales	PCM	EBITDA
KRAV	0.314***	0.0862*	0.275***
	(0.0984)	(0.0515)	(0.0946)
oth_crop	-0.00149	0.143*	0.0296
	(0.0880)	(0.0787)	(0.0955)
total_milk	-1.19e-05	-4.65e-05	0.000156*
	(4.89e-05)	(6.65e-05)	(8.17e-05)
org_husbandry	8.33e-07	-1.89e-06	3.08e-07
	(1.14e-06)	(1.51e-06)	(1.09e-06)
Grazing_converted	2.16e-05**	4.71e-05*	2.76e-05**
	(1.08e-05)	(2.48e-05)	(1.36e-05)
Population	2.17e-06	2.76e-06	3.17e-06**
	(1.42e-06)	(2.81e-06)	(1.61e-06)
Mean_income	0.00299	-0.00125	0.00165
	(0.0111)	(0.0196)	(0.00943)
Dairy_ref	-0.0325	-0.0981	-0.137**
	(0.0545)	(0.0819)	(0.0612)
Constant	-20.16	-8.049	-4.873
	(13.36)	(10.85)	(12.56)
Observations	4,813	4,813	4,463
Number of Orgno	601	601	596

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	Beef Farming Sales	PCM	EBITDA
KRAV	0.362**	1.416	0.128
	(0.141)	(1.693)	(0.176)
oth_crop	0.275*	0.930	0.226*
	(0.149)	(0.882)	(0.136)
total_beef	8.74e-05	1.90e-05	0.000107
	(5.89e-05)	(0.000239)	(0.000131)
org_husbandry	-1.71e-06	-4.27e-05	9.67e-08
	(2.51e-06)	(3.91e-05)	(2.31e-06)
Grazing_converted	2.81e-06	-0.000434	6.30e-05**
	(3.05e-05)	(0.000453)	(2.75e-05)
Population	1.67e-06	6.31e-06*	1.50e-06
	(1.99e-06)	(3.59e-06)	(2.48e-06)
Mean_income	0.00127	-0.0504	-0.0135
	(0.0174)	(0.0379)	(0.0242)
Meat_ref	0.0424**	-0.0206	0.0321
	(0.0177)	(0.0283)	(0.0202)
Constant	-12.46	-14.60	0.488
	(12.98)	(29.84)	(16.33)
Observations	1,564	1,564	1,366
Number of Orgno	206	206	201

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	Pork Farming Sales	PCM	EBITDA
KRAV	-0.329	-0.381*	-0.426
	(0.348)	(0.213)	(0.431)
oth_crop	0	0	0
	(0)	(0)	(0)
total_pork	-0.00475	-0.00278	-0.0112
	(0.00573)	(0.00297)	(0.0149)
org_husbandry	2.53e-06	1.75e-06	1.70e-06
	(7.71e-06)	(2.17e-06)	(6.66e-06)
Total_converted	0.000233***	-2.00e-05	-9.54e-06
	(7.28e-05)	(3.10e-05)	(0.000118)
Areable_converted	-0.000437***	4.85e-05	-4.34e-05
	(0.000128)	(3.92e-05)	(0.000156)
Grazing_converted	-1.72e-05	-4.15e-05	1.19e-06
	(0.000111)	(3.11e-05)	(0.000150)
pork_producer	0	0	0
	(0)	(0)	(0)
Population	-1.69e-05	2.59e-06	6.79e-07
	(1.21e-05)	(4.17e-06)	(1.51e-05)
Mean_income	0.178	-0.0119	0.164
	(0.119)	(0.0262)	(0.108)
Meat_ref	-0.400	0.143	-0.927
	(0.491)	(0.152)	(0.623)
Constant	0	0	0
	(0)	(0)	(0)
Observations	135	135	118
Number of Orgno	20	20	20

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	Egg Farming Sales	PCM	EBITDA
KRAV	0.142	0.186	-0.182
	(0.128)	(0.152)	(0.202)
oth_crop	-0.786	-1.417	0.351
	(0.480)	(0.967)	(0.512)
total_eggs	0.0230*	-0.000944	0.0220
	(0.0135)	(0.00939)	(0.0161)
org_husbandry	-8.92e-07	5.64e-07	-1.48e-06
	(1.69e-06)	(1.07e-06)	(2.16e-06)
Grazing_converted	-2.16e-05	1.04e-05	-1.50e-05
	(2.27e-05)	(1.59e-05)	(3.36e-05)
Population	-3.89e-06	2.12e-06	-4.57e-06*
	(2.45e-06)	(1.54e-06)	(2.78e-06)
Mean_income	0.0258	-0.0440	0.0388
	(0.0404)	(0.0328)	(0.0254)
Dairy_ref	0.0184	-0.0536	0.0554
	(0.0830)	(0.0690)	(0.0885)
Constant	2.913	-51.27	4.816
	(26.53)	(35.88)	(31.11)
Observations	811	811	742
Number of Orgno	112	112	109

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	Poultry Farming Sales	PCM	EBITDA
KRAV	-0.295	0.309***	0.874***
	(0.228)	(0.108)	(0.168)
oth_crop	0	0	0
	(0)	(0)	(0)
total_pol	0.00905	-0.00126	-0.00278
	(0.0161)	(0.00584)	(0.0273)
org_husbandry	8.87e-06***	-1.58e-06	-4.07e-06
	(3.41e-06)	(1.05e-06)	(6.53e-06)
Total_converted	-7.68e-05***	-9.95e-06	2.80e-05
	(2.62e-05)	(1.48e-05)	(5.13e-05)
Areable_converted	2.57e-05	2.55e-05	3.54e-05
	(4.15e-05)	(1.92e-05)	(6.79e-05)
Grazing_converted	-1.73e-05	9.82e-06	4.68e-05
	(8.42e-05)	(1.75e-05)	(0.000152)
Population	-7.59e-07	9.73e-07	8.47e-06
	(4.83e-06)	(2.85e-06)	(8.87e-06)
Mean_income	-0.0498**	0.0219	-0.0875*
	(0.0236)	(0.0220)	(0.0478)
Meat_ref	0.00850	-0.0103	-0.0643
	(0.0391)	(0.0228)	(0.0712)
Constant	95.83***	-14.39	112.5***
	(17.96)	(10.33)	(18.34)
Observations	95	95	86
Number of Orgno	13	13	13

Appendix 6: Development of KRAV-Parameter over time

The model specification used in this regression is:

$$\pi_{it} = \alpha + \beta_k * KRAV_{it} + \beta_{k,t} * KRAV_{it} * Year_t + \gamma * MS_t + \delta * FS_{it} + (u_i + \varepsilon_{it})$$

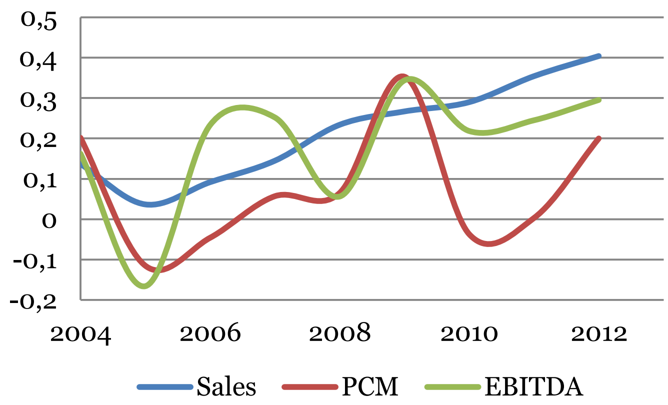
Resulting in a "baseline" parameter value of certification, and a vector of parameters tracing the development over time. Below are presented regression results, as well as graphs showing how the premium has developed over the years. Results are presented for each product type.

Mixed Farming

Parameter Values

	Sales	PCM	EBITDA
2004	0,137	0,20166	0,162
2005	0,037	-0,115	-0,166
2006	0,092	-0,046	0,2328
2007	0,145	0,057	0,2518
2008	0,234	0,065	0,056
2009	0,267	0,353	0,3434
2010	0,29	-0,037	0,2181
2011	0,3542	0,003	0,2447
2012	0,404	0,2	0,295

Parameter Development

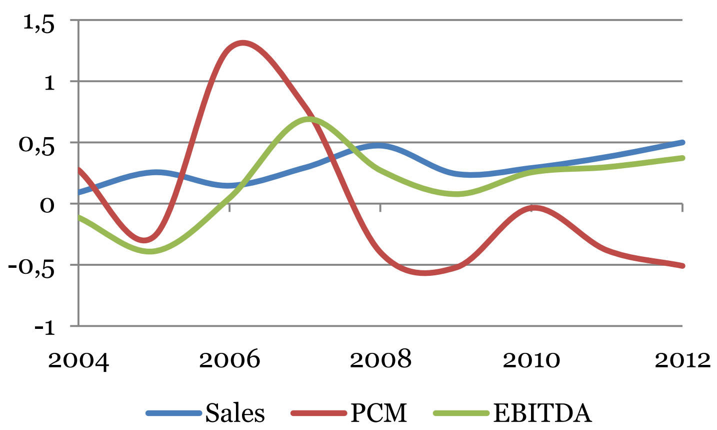


Grain Farming

Parameter values

	Sales	PCM	EBITDA
2004	0,091	0,276	-0,114
2005	0,256	-0,268	-0,39
2006	0,146	1,267	0,045
2007	0,294	0,792	0,687
2008	0,475	-0,397	0,271
2009	0,243	-0,5201	0,077
2010	0,291	-0,034	0,255
2011	0,382	-0,38	0,2975
2012	0,501	-0,507	0,372

Parameter development

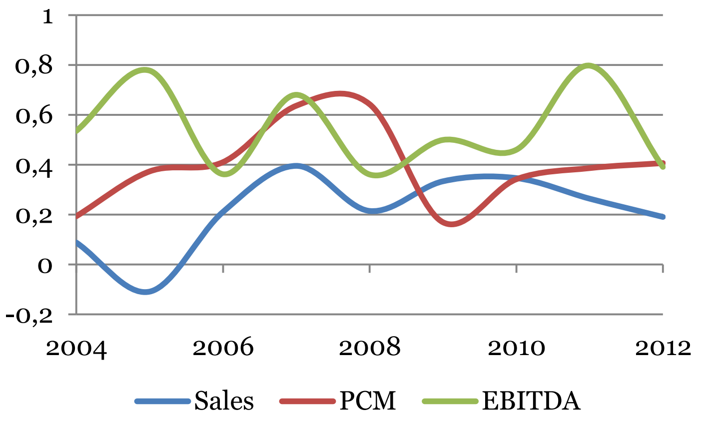


Potato Farming

Parameter values

	Sales	PCM	EBITDA
2004	0,088	0,194	0,535
2005	-0,109	0,3738	0,777
2006	0,2109	0,41071	0,3616
2007	0,396	0,637	0,68
2008	0,215	0,643	0,3606
2009	0,334	0,17	0,499
2010	0,347	0,3423	0,4595
2011	0,2643	0,3869	0,797
2012	0,191	0,407	0,391

Parameter development

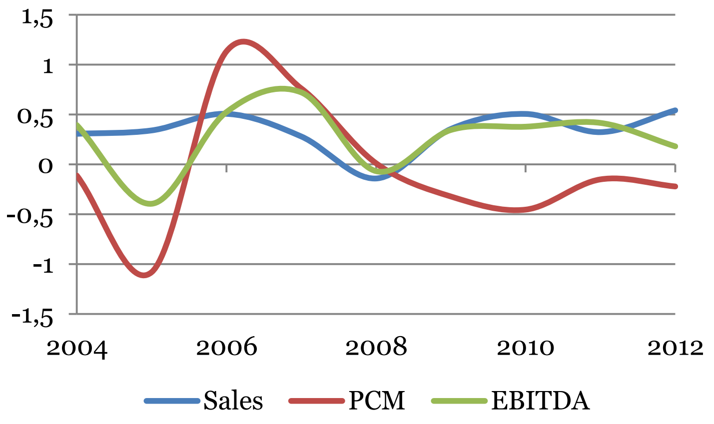


Vegetable Farming

Parameter values

	Sales	PCM	EBITDA
2004	0,306	-0,112	0,394
2005	0,34	-1,081	-0,394
2006	0,5059	1,131	0,524
2007	0,28	0,761	0,722
2008	-0,141	0,011	-0,067
2009	0,354	-0,322	0,345
2010	0,5051	-0,454	0,378
2011	0,323	-0,1508	0,416
2012	0,541	-0,222	0,181

Parameter development

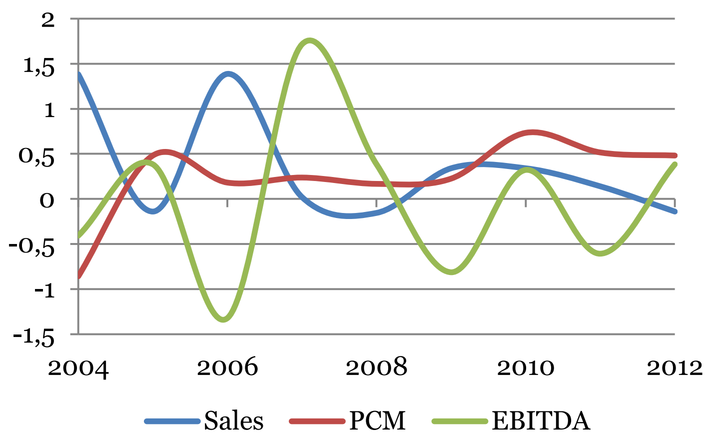


Fruit Farming

Parameter values

	Sales	PCM	EBITDA
2004	1,382	-0,857	-0,407
2005	-0,14	0,482	0,384
2006	1,387	0,182	-1,321
2007	0,02	0,238	1,715
2008	-0,155	0,168	0,384
2009	0,34	0,226	-0,813
2010	0,34	0,734	0,3218
2011	0,14	0,5161	-0,607
2012	-0,14	0,482	0,384

Parameter development

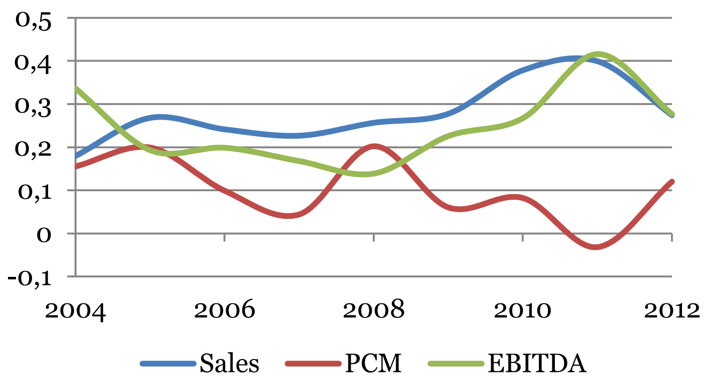


Milk Farming

Parameter values

	Sales	PCM	EBITDA
2004	0,1794	0,1553	0,3365
2005	0,2678	0,1992	0,1933
2006	0,2411	0,0989	0,1989
2007	0,2264	0,0439	0,168
2008	0,2563	0,2021	0,139
2009	0,2771	0,0602	0,226
2010	0,378	0,0821	0,26733
2011	0,399	-0,032	0,416
2012	0,274	0,12	0,277

Parameter development

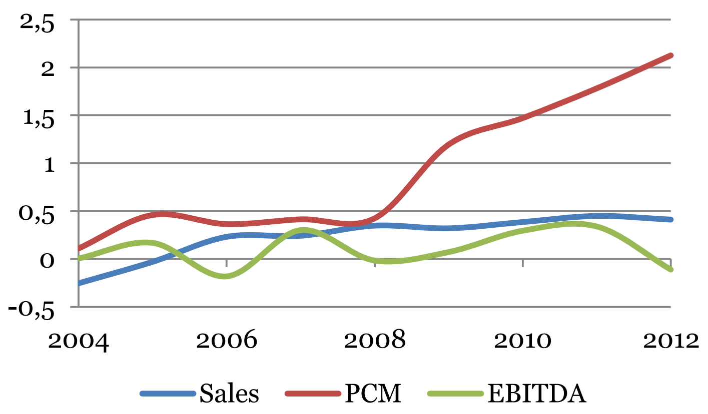


Beef

Parameter values

	Sales	PCM	EBITDA
2004	-0,254	0,11	0,005
2005	-0,03	0,459	0,168
2006	0,231	0,364	-0,1819
2007	0,242	0,414	0,301
2008	0,3478	0,424	-0,0164
2009	0,3202	1,194	0,072
2010	0,3855	1,47	0,295
2011	0,449	1,78	0,339
2012	0,411	2,124	-0,111

Parameter development

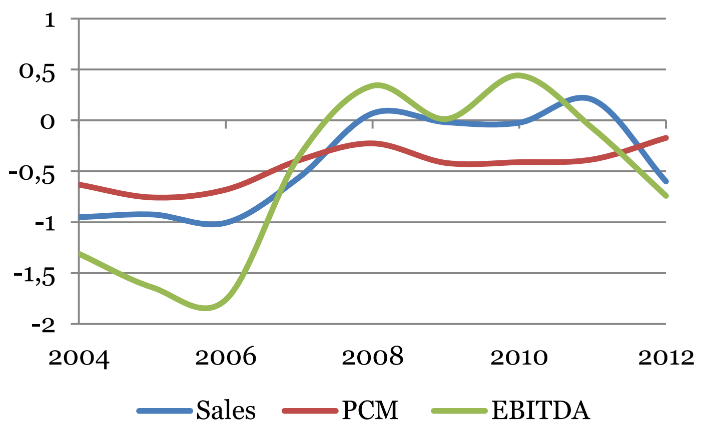


Pork

Parameter values

	Sales	PCM	EBITDA
2004	-0,952	-0,633	-1,312
2005	-0,925	-0,759	-1,642
2006	-1,007	-0,683	-1,765
2007	-0,5609	-0,393	-0,354
2008	0,068	-0,2269	0,338
2009	-0,018	-0,419	0,012
2010	-0,023	-0,412	0,44
2011	0,203	-0,385	-0,078
2012	-0,6	-0,173	-0,743

Parameter development

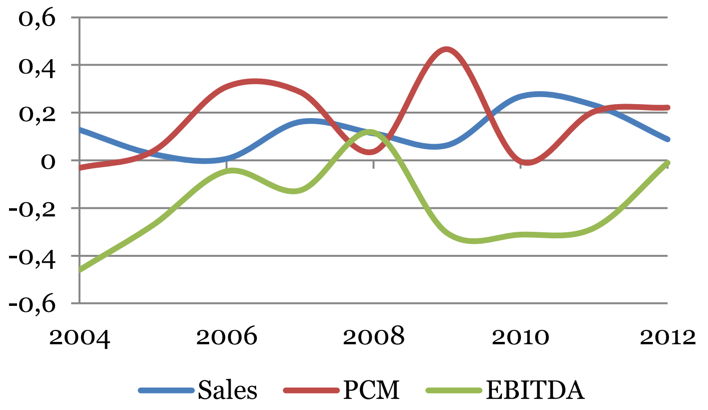


Eggs

Parameter values

	Sales	PCM	EBITDA
2004	0,1281	-0,031	-0,4594
2005	0,0268	0,039	-0,2714
2006	0,0068	0,3092	-0,0455
2007	0,1612	0,2875	-0,1264
2008	0,1134	0,037	0,1166
2009	0,0634	0,467	-0,3044
2010	0,2672	-0,004	-0,3114
2011	0,2312	0,205	-0,2834
2012	0,0882	0,222	-0,0104

Parameter development

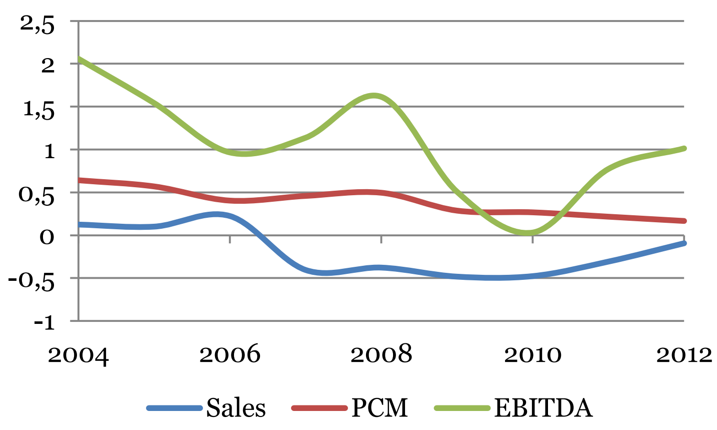


Poultry

Parameter values

	Sales	PCM	EBITDA
2004	0,1245	0,642	2,057
2005	0,1005	0,57	1,541
2006	0,2245	0,404	0,9659
2007	-0,4065	0,459	1,137
2008	-0,3785	0,496	1,614
2009	-0,4845	0,287	0,508
2010	-0,4785	0,267	0,032
2011	-0,3085	0,216	0,773
2012	-0,0945	0,166	1,013

Parameter development



Appendix 7: Robustness check results

Table A 3: KRAV parameter by Region

	Sales	M4	M5	EBITDA
General	0.299***	0.0504	0.0803	0.187***
Blekinge	N/A	N/A	N/A	N/A
Dalarna	0.250*	-0.0743	-0.0683	-0.120
Gotland	0.108	0.0646	0.0109	-0.341*
Gävleborg	0.276	-0.128**	-0.156**	0.105
Halland	0.402**	0.00694	0.0251	0.369
Jämtland	-0.158	-0.0517	-0.0408	0.125
Jönköping	0.486**	0.0287	0.0350	0.174
Kalmar	0.136	-0.0718	-0.0512	-0.0539
Kronoberg	0.449	-0.0301	-0.0541	0.646
Norrbotten	1.204**	-0.0593	-0.00805	1.005*
Skån	0.195*	0.0623*	0.0661**	0.0869
Stockholm	0.458	0.121	0.104	0.618
Södemanland	0.287*	-0.0291	-0.0517	0.195
Uppsala	0.355**	0.0154	-0.0666	0.0511
Värmland	0.177	0.145**	0.151**	0.183
Västerbotten	0.264**	0.0500	0.0460	0.224
Västernorrland	2.436**	0.635	0.544	3.258***
Västmanland	-0.261	0.0420	0.0568	-0.0171
Västra Götaland	0.308***	0.0124	0.00816	0.239**
Örebro	0.436**	-0.0695	-0.0603	0.111
Östergötland	0.369***	-0.0462*	-0.0673***	0.426***

***: Significant at the 1% level
**: Significant at the 5% level
*: Significant at the 10% level

Appendix 8: Balanced Table regression results

Table A 4: Results from the balanced panel

	Sales	PCM	EBITDA
Mixed	0.317***	0.0997	0.243**
	(0.103)	(0.0932)	(0.0953)
Grain	0.772***	0.700*	0.917***
	(0.116)	(0.418)	(0.309)
Potatoes	0.247	0.101*	0.909***
	(0.297)	(0.0586)	(0.224)
Vegetables	0.388	0.834	0.0818
	(0.274)	(0.932)	(0.203)
Fruits	-0.749***	-0.220***	-0.175
	(0.110)	(0.0295)	(0.348)
Milk	0.131	0.0474	0.194
	(0.108)	(0.0595)	(0.149)
Beef	0.694*	1.573	0.671**
	(0.387)	(1.402)	(0.313)
Pork	-0.147	-0.225***	-0.374
	(0.468)	(0.0810)	(0.460)
Eggs	0.379**	-0.0896	0.601*
	(0.176)	(0.128)	(0.313)
Poultry	-0.499***	-0.317***	1.472***
	(0.0992)	(0.0559)	(0.503)

Table A 5: Percent of balanced panel

	mean	Most common deviation
Mixed	1.00	No results for 2013
Grain	0.47	Exit
Potatoes	0.50	Last Year Entry
Vegetables	0.26	Entry
Fruits	0.27	Entry
Milk	0.39	Entry
Beef	0.41	Entry
Pork	0.81	Entry
Eggs	0.30	Entry
Poultry	0.59	Entry
Total	0.68	Entry
N	30391	

Appendix 9: Number of animals under conversion, share of organic land.

Table A 6: Number of animals under conversion

	2006	2007	2008	2009	2010
Beef	5134	19243	14159	18670	17697
Dairy-Cows	471	1030	1358	1658	5942
Sheep	2146	7339	5417	7138	6028
Lams	1289	6753	4263	5671	6374
Pork	94	98	42	55	1945

Table A 7: Percent of hectares under organic certification

	2011	2010	2009	2008	2007
Berries	5,1	4,4	5,1	-	-
Cereals	8,8	8,2	7,5	6,7	7,0
Fruit, temperate	3,4	8,5	1,9	-	-
Oilseeds	2,4	2,3	1,9	-	-
Root crops	1,5	1,4	1,4	3,0	1,2
Vegetables	4,9	4,5	5,4	3,9	2,9

Source: IFOAM

Table A 8: Organic land and producers

Year	Area (ha)	Organic	Producers
2005	222 738	6.98 %	2 951
2006	225 431	7.06 %	2 380
2007	308 273	9.89 %	2 848
2008	336 439	10.79 %	3 686
2009	391 524	12.56 %	4 816
2010	438 693	14.07 %	5 208
2011	480 185	15.40 %	5 508

Source: IFOAM