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# Quantitative assessment of impact of the farmers' self-reported bargaining power on price relations with input suppliers

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## Abstract

Based on a unique micro-survey data from dairy sector in Poland, we provide quantitative evidence documenting farmers' position towards input suppliers, an issue often overlooked in the literature, which typically focuses on sectors downstream from the farm. We proxy for farmers' bargaining power with their self-reported assessment. This differs from the approach commonly adopted in other studies which normally use for that purpose the farm size. Using an econometric analysis, we show that the latent variable measured by this proxy helps us to explain discounts at which farmers buy feed from input suppliers, in addition to what is explained by the farm size or the quality of farm output.

**Keywords:** farmers' self-reported bargaining power, input suppliers, price relations, dairy sector, Poland.

## 1 Introduction

Given important changes in the organization of agro-food supply chains which have happened worldwide in recent years, many concerns have been expressed about the unequal distribution of bargaining power in the food chain. Theoretical models have included for example interactions between concentration in global food chains and rent distribution in the presence of market imperfections and contract enforcement problems (for an overview of the issue see, for example, McCorrison, 2002; Sexton, 2013; or Swinnen and Vandeplas, 2010). There is also a number of empirical studies analyzing welfare effects resulting from dynamic changes in the food supply chains. A part of the literature has focused on a position of (small-scale) farmers in the modern supply chains dominated by the concentrated retail and processing sectors. These studies typically show both problems faced by farmers as well as opportunities and solutions to improve their situation on the evolving markets (e.g. Dries et al., 2009; Francesconi et al., 2010; Trebbin, 2014). Farmers are often believed to be particularly disadvantaged in these power relations. In response to this, an extensive literature on power distribution throughout the food chain tries to explain various consequences of this state of affairs. However, most of the existing studies concentrate on either farmer-processor or farmer-retailer relationships (some notable exceptions include Kuijpers, Swinnen, 2016; Jarzębowski, 2013). Instead, our understanding of farmer-input supplier relations is very limited. This is quite surprising given the fact that virtually almost all farmers need to purchase inputs and for quite many of them the relationship with an input supplier importantly affects both the quantity and quality of farm produce.

In this paper we aim to deepen our understanding of this issue and look at farmers' position towards input suppliers. More specifically, we focus on dairy farmers and feed suppliers. This is done with the help of the unique micro-data from interviews with 300 dairy households in Poland. Looking at dairy sector in this particular context is particularly interesting. This is because, in contrast to fertilizers or pesticides, feed is bought by dairy farmers on constant basis throughout the whole year. This in turn makes farmer-input supplier relations in this specific sector quite unique. What should be also noted, to increase their profitability, farmers often decide for custom feeding which further adds to the complexity of their relations with input suppliers. Last but not least, feed

accounts for a considerable share of total costs incurred in dairy production (in Poland this ranges from roughly 20% to 40% depending on the herd size; Wilczyński, 2012; Chazub, 2012). In effect, feed price is often of first order importance in negotiations between farmers and input suppliers. Taking this into account, in this paper we aim at improving our knowledge about farmers' bargaining power in their relations with feed suppliers and analyze to what extent it may help us to explain the variation in prices that farmers pay for feed.

To this end, we construct a proxy for farmers bargaining power based on their self-reported strength (for studies using a similar approach see e.g. Collins, 2007; Gorton et al., 2014; Xhoxhi et al., 2014). In consequence, we go beyond the standard proxies used in the literature, i.e. farm size, distance to contractors or the quality of farm output. We believe that thanks to this, we can much better capture the fact that farmers' bargaining power may also stem from several qualitative factors (having personal contacts, the length of the relationship, negotiating skills etc.) or the relative performance of a given farm as compared to the performance of other farmers in the neighborhood (see e.g. the discussion in Swinnen, 2007; Dries et al., 2009; Sauer et al., 2012; Gorton et al., 2014). Importantly, when creating our proxy we take into account that farmers' position towards input suppliers can be affected by farmers' position towards the downstream sectors (see further). To best of our knowledge, this paper is the first to empirically investigate farmers' bargaining power using this approach.

The remainder of the paper is organized as follows: the next section presents our data and empirical strategy. In Section 3 we discuss the results from econometric models. Finally, Section 4 concludes.

## **2 Empirical framework**

### **2.1 Data**

Our empirical analysis is based on the survey data gathered in Mazowieckie region, which is the largest milk producing region in Poland, located in the central part of the country. The survey was held in June 2014. It was designed to be representative at a regional level with respect to the farm structure according to the herd size. In total, 300 individual dairy farms were surveyed via face to face interviews using a standardized questionnaire.

In principle, the survey from June 2014 gathered information as of the year 2013/2014. Together with some retrospective questions though, we are also able to control for the main dynamics taking place at the farm between 2004 and 2013/2014. The survey-data include detailed information about relations with both dairy processor and feed supplier. For example, questions asked related to the length of the relationship, intentions to maintain the relationship in the future, or potential contractors available in the neighborhood. Moreover, the survey included a range of questions aiming at eliciting farmers' subjective opinion on their position in the food chain which we use to construct the proxy for farmers' bargaining power.

Our data allows us to distinguish two main channels through which farmers buy feed: a direct purchase from a feed producing company and a purchase from an intermediary operating in the animal feed sector (e.g. local shops which offer different feeds). In our sample 45% of respondents purchase feed directly from the feed producing company and 49% - source feed from the feed intermediaries. It is also possible to purchase feed through the dairy processing company, but this option was not common among respondents – only 4% of farmers used this source of feed. The reason for such a low share could be availability of such option at the dairy processor they deliver to.

## 2.2 Constructing a proxy for farmers' self-reported bargaining power

To construct a proxy for farmers' bargaining power we used farmers' answers to questions about possibility of replacing them by other suppliers (delivering milk to a given dairy company) or buyers (purchasing feed from a given feed supplier). We asked the following questions: "How easy it would be for your dairy company to find a substitute for your milk deliveries?" and „How easy it would be for your feed supplier to find substitute for your feed purchases?". When responding to these questions farmers could have selected one out of five answers ordered according to a Likert scale: 'very easy', 'easy', 'neutral', 'difficult', 'very difficult'.

These questions allow to elicit how confident farmers feel about their position in the food chain. In addition and importantly, with these questions, we should be able to capture not only the strength which results from farmers' own assets, but also the strength which results from the weakness of other farmers who may potentially be used by dairy companies/feed suppliers as their substitutes. In line with arguments presented above, farmer's position should be the stronger, the more difficult it is for processors/input suppliers to switch to alternative suppliers/purchasers.

Figure 1 presents the distribution of answers to these two questions in our sample. It is important to note that there are relatively few observations which can be considered to be strong in only one relation (either with processors or input suppliers). Indeed, we observe only 22 such farmers (7% of the sample).<sup>1</sup> This in turn is consistent with the argument presented earlier, namely that farmers bargaining power might simultaneously result from their relationships towards input suppliers and processors. As a result, farmers' strong position towards input suppliers should translate into their position towards processors and vice versa.

*Figure 1. Farmers' subjective opinion on their position vis-à-vis dairy processors and feed suppliers (frequency of answers)\**

To have a more robust evidence on that we test this assumption with two methods. In particular, using both Mokken scale analysis and principal component analysis, we check whether farmers' responses to the two questions presented above can be used as an indicator for a single latent variable, which we refer to farmers' bargaining power. Both these methods are unanimous in allowing to make such an assumption.<sup>2</sup> We therefore combine information coming from these two questions and use it to single out farmers who could be treated as having (relatively) strong bargaining position vis-a-vis their contractors. More specifically, we code as such those who answered both questions: "difficult" or "very difficult". In total we have 36 respondents in this category. In Figure 1 these farmers are located in the upper-right corner, marked in red. In order to have a better understanding of specific characteristics which distinguish these farmers from the others we also define farmers with (relatively) weak bargaining position. These are farmers who answered both questions: "easy" or "very easy". In total we have 74 observations classified in this category. In Figure 1 these are farms located in the bottom-left corner, marked in green.

## 2.3 Empirical model

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<sup>1</sup> In Figure 1 these are observations marked in different shades of blue, located in either bottom-right or upper-left corner.

<sup>2</sup> The results of these analyses are not shown for brevity reasons but may be obtained from authors upon request. In the Mokken analysis, the Loevinger's scalability coefficient is equal to 0.403 and thus above the threshold of 0.3 suggested in the literature. It allows therefore to assume that responses to the two questions can be considered as unidimensional measure. A principal component analysis of this data leads to one eigenvalue larger than 1 (1.39).

In this section we present an econometric approach which we use to check whether farmers with more bargaining power, according to the definition presented above, receive more favorable prices when dealing with their contractors than farmers with weaker negotiating position towards input suppliers and processors. However, one important remark should be mentioned here. We use farmers' perceptions to construct a variable describing farmers' bargaining power. This could be subject to criticism as cognitive factors may affect the way people answer subjective questions. This reservation should be definitely kept in mind when interpreting our results. That said, the recent experimental and empirical work allows to be less skeptical in this respect. This seems to be the case especially when one uses variables that the subjective questions attempt to uncover as explanatory variables and not as dependent variables (see e.g. Bertrand and Mullainathan, 2001). What should be noted, this is precisely the approach which we follow in our paper.

The analysis presented below is based on estimating the following model:

$$p_i = \beta strong_i + \alpha size_i + \vartheta distance_i + \mu X_i + \varepsilon_i$$

where  $p_i$  is, a discount (in %) at which a farmer  $i$  buys feed.

The data on discounts are reported by farmers themselves. It refers to the average discount which farmers receive when purchasing feed. The reference category is the price mentioned in a price list distributed to farmers by feed suppliers. The reason why, when investigating the relationships with feed suppliers, we look at discounts received rather than prices paid is that prices for feed are not comparable across farms. There are simply too many specific characteristics regarding the feed supplied for cows and consequently so many different blends of feed that reducing the final price to the common denominator is not possible. That said, the way we collect the data on discounts might negatively affect their quality and this should be kept in mind when interpreting our results.

On the right hand side of our model we include a number of covariates. Most importantly we have a variable *strong*, which is a dummy variable equal to one if a farmer is classified as having (relatively) strong bargaining power, as defined above, and equal to zero otherwise.<sup>3</sup> In addition, we include three variables: *size*, and *distance*. The former one measures the (logarithm of) number of cows (alternatively we use milk quota in kg), The variable *distance* in turn measures the distance in kilometers between a farm and its contractor. These two variables (*size* and *distance*) are included in order to see whether our bargaining power variable adds anything to what we can get by using standard proxies for farmers bargaining power. Finally, vector  $X$  includes a number of covariates that we use to test the robustness of our results and which will be introduced later. What should be noted is that all our specifications include farmers age (in years) and three dummy variables capturing subsequent levels of education (the reference category is elementary school). This way we control for farmers' human capital which can be argued to importantly affect both the way the farm is managed and the relationships with contractors.

The model presented above is estimated using tobit method. What should be stressed though is that in all our estimations we include municipality fixed effects. What follows, we control for all potentially time-invariant factors common to all farmers living in a given municipality. This is important since, thanks to this, our findings exploit variation within farmers' from the same neighborhood and thus should not be driven by (potentially large) differences between municipalities. By doing so we control, for example, for the fact that farmer-input supplier

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<sup>3</sup> To test the robustness of our results we also apply an alternative strategy to define this variable. More specifically, we limit our sample to strong and weak farmers only, i.e. we exclude from our analysis all farmers with a moderate bargaining power. In that case our key variable of interest is defined as equal to one if a farmer is relatively strong and zero if farmer is relatively weak. Using this approach, the coefficient on the variable measuring farmers' bargaining power is larger in magnitude. It is not always as precisely estimated (due to smaller sample size) but remains statistically significant at least at 10% level. These results are not shown for brevity reasons but can be obtained from authors upon request.

relationships might differ across the various forms of the input supplying company. The error term  $\varepsilon_i$  includes all other unobservable shocks to prices faced by farmers.

### 3 Results

#### 3.1 Descriptive analysis

Before discussing results of econometric analysis, we first present some descriptive statistics. The most important differences between various types of farmers with regard to their perception on how confident they feel about their position in the food chain (see Figure 1) are reported in Table 1.

*Table 1. Selected descriptive statistics for the variables used in the analysis (mean, standard deviation)*

First, farms, which have the relatively *strong* position in both relations: with the dairy factory and also with input supplier are significantly larger (in terms of the number of cows and land owned) than *weak* farmers. Importantly, this difference is persistent over time as we observe it both for 2013 and 2004. However, we do not find any statistically significant difference between these two groups with regard to milk quality parameters (fat and protein content). Strong farmers receive, on average, higher milk price than the weak farmers and this difference is statistically significant. This could be driven therefore either by a larger quantities delivered or by some factors affecting farmers bargaining power other than the quality of milk they deliver.

Interestingly, sample averages do not allow to argue that the two groups under study differ in terms of the discount obtained from feed supplier. In fact, while the discount seems to be higher for strong farmers, the difference with respect to weak farmers is not statistically significant. There is a correlation (0.31;  $p < 0.01$ ) of discount level with the size of the dairy herd. This observation seems to be supported by opinion of farmers, that the discount mainly depends on the size of feed purchases (60% of farmers declared this) and being a loyal client (36%).

Further, about 63% of farmers with a relatively strong bargaining power is sourcing the feed directly from the feed producer instead of intermediates. This share is larger than that observed for farmers with a relatively weaker position in the food chain and this difference is statistically significant. Farmers more confident about their bargaining power are also those who more often consider changing contractors and tend to have significantly larger choice of feed suppliers than farmers with weaker position.

Regarding price negotiations which seems be an important part of the pricing policy of feed suppliers but also an indication of a power of farmers, 59% of farmers answered that they negotiate the prices for the feed. Significantly more farmers negotiate prices in the case of purchasing feed from producers (71.7%) than from intermediaries (47.3%). The frequency of negotiations is positively correlated with the farm size and the discount level (in both supply channels), which seems to suggest that larger farms more often negotiate the prices.

Interestingly though, the two groups do not seem to differ, at least based on the sample averages, in terms of age, sex or farming experience. The same applies to farmers' connections to a mayor, member of the board of a dairy company or a manager in a feed supplier company (not shown). What seems to differentiate between the two groups though is their belief regarding the effectiveness of group negotiations. Compared to farmers with relatively weaker position, farmers with relatively strong bargaining power more often agree with the statement that collective action may be helpful in getting more favorable conditions from feed suppliers and having an impact on

dairy decisions. This is interesting as it suggests that farmers' bargaining power may be shaped by their attitude to cooperation.

We also asked farmers to answer the question 'How do you assess your relationship with your feed supplier'. This meant to capture the level of farmers' satisfaction with their current contractors. Interestingly, a great majority of our respondents (94%) perceive relationship with feed supplier as either good or very good, and never as bad or very bad. When asking about the main features of the relation farmers could choose three main characteristics of the relation (out of nine available). Not surprisingly price and the quality of the feed were the most often chosen as the most important aspect of the relation. Price level was indicated as the first important feature by 38.9% of farmers (and as one of three main characteristics by 64%). The feed quality was chosen as the first important aspect by 29.6% of farmers (as one of three main important features by 65%). %) and price stability (9.3% and 39.6%).

In general we find that farmers have on average a long and stable cooperation with feed suppliers (6.5 years). They also replace feed suppliers quite rarely - within the last 10 years average number of changes of feed suppliers equalled 1.1. Further, over the last 10 years, roughly 45% have not changed their feed supplier. Surprisingly, the relation of a farmer with feed supplier is usually not strengthened by having a written contract. In fact, over 90% of farmers do not have a contract with feed suppliers. Taken together, this may explain the farmers' perception about the easiness to change the feed supplier. As presented before, ca. 94% of our respondents find it 'easy' to change a feed supplier.

The general picture that emerges from these statistics inclines to assume that farmers from our sample are not in the disadvantageous position versus feed suppliers, they can negotiate prices and receive discounts, even though they do not have a written contract with suppliers.

### **3.2 Impact of farmers' bargaining power on input prices**

In this section, we provide an analysis of the relationships between our proxy for farmers' bargaining power and input prices, using econometric modeling. While doing so, we control for farms' characteristics such as their size or location, which are commonly assumed to determine farmers' negotiating position (Sauer et al., 2012; Xhoxhi et al., 2014). In addition, we control for factors which may correlate with farmers' bargaining power as suggested by the statistics reported in Table 1.

Our results are reported in Table 2. As the dependent variable is the discount at which farmers buy feed to estimate these models we use tobit model. This is because the discount variable is censored from below which results in the fact that it takes many zeros (for those farmers who report no discount). For this kind of data, simple OLS method provides inconsistent estimates (see e.g. Long, 1997). Throughout the paper all standard errors are robust, clustered at the feed supplier level to allow for an arbitrary variance-covariance matrix capturing potential serial correlation in the residual term.

In table 2 we check whether our proxy for farmers' bargaining power can contribute to our understanding of prices farmers pay when buying feed. In column (1) we start with a specification including only our key variable of interest and municipality fixed effects. As shown, we find a positive coefficient which is statistically significant at 10%. It implies that feeling confident about one's position in the food chain results in a discount larger by 1.89%. This is a sizeable effect given that the average discount in our sample is 3.13% (with standard deviation = 0.037).

*Table 2 Farmers' subjective bargaining power and discount obtained when buying feed*



Column (2) adds variables measuring farmers' age and education level. This inclusion has virtually no impact on the effect of our key variable of interest. In column (3) we include a variable measuring herd size and three variables describing the environment in which a given farm is operating. More specifically, we control for the number of feed suppliers that a given farmer could potentially approach. In addition we include two variables indicating whether in the farmer's neighborhood there are also other farms. This is done to control for the fact that feed suppliers may favor clients clustered geographically so to minimize transport costs. Consistent with expectations the coefficient by the variable measuring herd size is positive and highly significant, whereas the other covariates are not statistically significant. Our key variable of interest instead remains significant at 10% and of similar magnitude as before.

In column (4) we add two variables to account for the fact that farmers auguring well for the future cooperation might have been pre-selected by feed suppliers. For that purpose we include a dummy variable distinguishing farms that from time to time obtain some services from feed suppliers free of charge, and a dummy variable distinguishing farms which obtain regular consulting services regarding feeding their herd. Both these variables enter our regressions with a positive sign and are statistically significant which substantiate the hypothesis just mentioned. Importantly, however, the effect of our key variable of interest remains as before, notwithstanding the fact that age and education variables become now statistically significant.

In column (5) we test the robustness of our results to some other covariates: having written contract with feed supplier, experiencing problems with carrying out the contract with feed supplier, being a member of a producer group or having a successor to take over a farm. None of these variables is statistically significant. Our previous findings on the other hand remain robust to this exercise. Finally, in column (6) we check whether anything changes if in addition to herd size we include also a variable measuring the growth of milk quota over the period 2004-2014. While this variable is positive and statistically significant, our main variable of interest remains to be significant at 10% and of similar magnitude as before.

Overall therefore, we conclude that farmers' feeling about their position in the food chain is an important determinant of the discount at which they buy feed for their herd. This is remarkable, as this effect holds in many specifications in which we control for a range of factors that are likely to shape farmers' bargaining power. Our proxy therefore provides additional insights to that coming from using standard variables approximating farmers' position in the food chain.

## **4 Conclusions**

An extensive literature has focused on a position of farmers in the modern supply chains dominated by the concentrated retail and processing sectors. Farmers are often believed to be particularly disadvantaged in these power relations. In response to this, an extensive literature on power distribution throughout the food chain tries to explain various consequences of this state of affairs. However, most of the existing studies concentrate on either farmer-processor or farmer-retailer relations. In our study we aimed at improving understanding of the backward vertical spillovers between the farmers and input suppliers, which are not frequently analyzed in the literature.

Our analysis tries to fill in this gap and provides two main contributions. First it documents farmer-input supplier relations and shows that farmers are not in the disadvantageous position versus feed suppliers, they can negotiate prices and receive discounts. A great majority of farmers perceive their relationship with feed suppliers as either good or very good. Price and the quality of the feed are perceived as the most important aspect of the relation. Farmers have, on average a long and stable cooperation with feed suppliers despite the fact that over 90% of them do not have any written contract with their input providers.

Second, our analysis suggests that farmers' self-reported strength is a good predictor of discounts which dairy farmers obtain from input suppliers when buying feed. In particular, farmers who perceive themselves as having relatively “strong position” in the food chain receive higher discount from feed supplier. Importantly, these results remain robust when we control for a number of other potential determinants of prices/discounts. This result is important in two respects. On the one hand, it suggests that accounting for farmers' subjective assessment of their position in the chain may provide additional insights into farmers' bargaining power than that highlighted by farm size or farm's geographical location which are commonly used in other studies. On the other hand, our findings suggest that farmers' position in the food chain seems to be the outcome of their relationship with sectors both downstream and upstream from them. As a result focusing only on farmers-processors or farmers-retailers relationships, an approach often adopted in the existing literature, might lead to a picture which is incomplete. Thus our results are consistent with the growing evidence suggesting that input-output linkages at one segment in the value chain affect such linkages at other segments. To best of our knowledge, this paper is the first to assess farmers' bargaining power from this perspective.

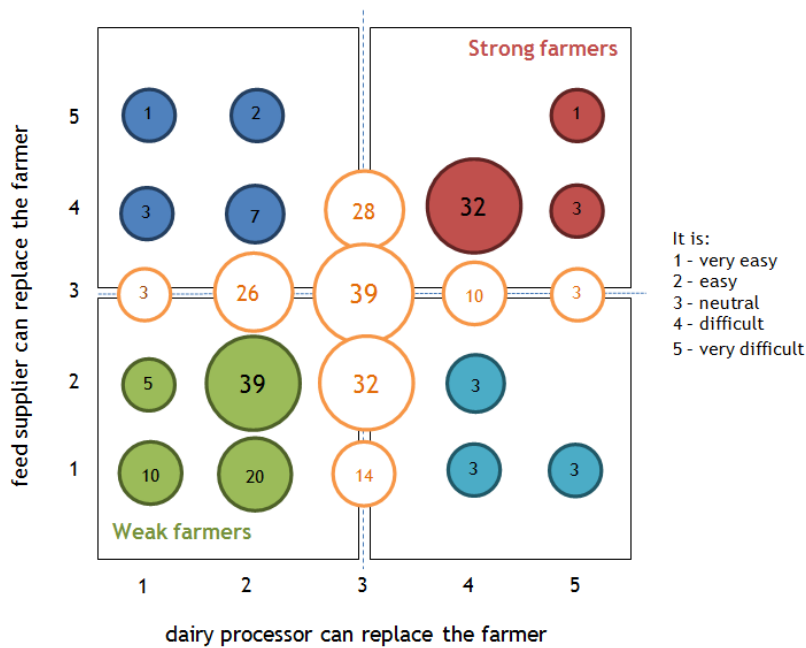
Understanding of farmer-input supplier relations is especially important for the research of the dynamic changes within food value chains. The specific example that we exploit comes from the Polish dairy sector which in recent years has experienced a thorough restructuring. Importantly, in many aspects, these changes resemble those observed elsewhere and thus we believe that what we uncover here might be of broader interest.

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**Figure 1. Farmers' subjective opinion on their position vis-à-vis dairy processors and feed suppliers (frequency of answers)\***



Source: Authors' presentation based on survey data.

\* The figure presents the number of respondents according to their answers to questions: "How easy it would be for your dairy company to find a substitute for your milk deliveries?" and „how easy it would be for your feed supplier to find substitute for your feed purchases?". The numbers on the axes from 1 to 5 refer to answers “very easy”, “easy”, “neutral”, “difficult”, and “very difficult” respectively.

**Table 1. Selected descriptive statistics for the variables used in the analysis (mean, standard deviation)**

Characteristics	Total sample (n=300)	Strong farmers (n=36)	Weak farmers (n=74)	Other farmers <sup>a</sup> (n=190)
Age (years)	44.3 (10.3)	44.5 (11.5)	45.7 (9.9)	43.7 (10.2)
Herd size 2013 (no. of cows)**	26.9 (20.6)	31.5 (20.9)	24.7 (21.3)	27.0 (20.2)
Land owned 2013**	29.1 (18.9)	33.4 (17.2)	25.3 (14.1)	29.7 (20.7)
Herd size 2004 (no. of cows)**	17.6 (13.0)	17.9 (8.4)	15.4 (10.5)	18.3 (14.6)
Land owned 2004**	24.1 (14.3)	25.1 (11.4)	21.2 (10.0)	25.0 (16.0)
Protein content of milk %	3.30 (0.22)	3.26 (0.26)	3.26 (0.20)	3.32 (0.22)
Fat content of milk %	4.04 (0.36)	4.05 (0.22)	4.05 (0.31)	4.04 (0.41)
Milk price (PLN per liter)***	1.43 (0.16)	1.49 (0.16)	1.41 (0.15)	1.46 (0.16)
Discount from feed supplier (as a % of the initial price offered)	3.1 (3.6)	3.1 (3.6)	2.8 (3.8)	3.3 (3.7)
Share of farmers considering change of dairy**	37%	64%	41%	30%
Share of farmers considering change of feed supplier (yes or from time to time)***	36%	72%	36%	29%
Frequency of feed purchases (share of farmers buying once a week and more often)	17%	17%	27%	15%
Share of farmers buying feed directly from feed producer*	42%	63%	42%	38%
Share of farmers delivering milk to a dairy cooperative	39%	33%	33%	42%
Number of potential dairy purchasers to which farmers can deliver milk	2.0 (0.9)	2.1 (0.8)	2.1 (1.1)	1.9 (0.9)
Number of potential feed suppliers***	2.1 (0.9)	2.5 (0.8)	2.0 (1.0)	2.0 (0.9)
Is it possible to get better conditions by a group negotiations with feed supplier** (% of yes)	63%	83%	57%	61%

<sup>a</sup> 'strong' farmers (see Figure 1) have strong position vs. both - dairy and feed supplier, 'weak' farmers have weak position vs. dairy and feed supplier and 'other' farmers are all those remaining apart from this two extremes.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1 significance levels calculated for a difference between strong and weak farmers. Standard deviations are given in brackets.

Source: Authors' calculations based on the survey sample.

**Table 2. Farmers' subjective bargaining power and discount obtained when buying feed**

	(1)	(2)	(3)	(4)	(5)	(6)
<b>Strong</b>	0.0189*	0.0209*	0.0193*	0.0180*	0.0197*	0.0197*
	(0.0107)	(0.0107)	(0.0101)	(0.0102)	(0.0101)	(0.0104)
<b>Herd size 2013</b>			0.000834***	0.000688***	0.000668***	0.000456***
			(0.000239)	(0.000201)	(0.000177)	(0.000163)
<b>Growth in milk quota (2013/2004)</b>						0.00789**
						(0.00316)
<b>Age in years</b>		-0.000500	-0.000658	-0.000733*	-0.000421	-0.000459
		(0.000349)	(0.000403)	(0.000392)	(0.000433)	(0.000409)
<b>Vocational education dummy</b>		0.0166	0.0338*	0.0321**	0.0329*	0.0340*
		(0.0194)	(0.0179)	(0.0161)	(0.0190)	(0.0187)
<b>Secondary education dummy</b>		0.0214	0.0357**	0.0304*	0.0318*	0.0318*
		(0.0203)	(0.0171)	(0.0163)	(0.0192)	(0.0188)
<b>Higher education dummy</b>		0.0119	-0.00167	-0.0111	-0.00946	-0.0149
		(0.0201)	(0.0187)	(0.0185)	(0.0214)	(0.0218)
<b>No. of potential feed suppliers</b>			0.00107	-0.00396	-0.00443	-0.00266
			(0.00497)	(0.00412)	(0.00388)	(0.00366)
<b>Lot of other farms in neighborhood</b>			9.03e-05	0.00907	-0.0461***	-0.0426***
			(0.0396)	(0.0324)	(0.0176)	(0.0163)
<b>Only few other farms in neighborhood</b>			-0.0340	-0.0143	-0.0717***	-0.0820***
			(0.0397)	(0.0323)	(0.0200)	(0.0181)
<b>Occasionally some services free of charge by feed supplier (1=yes, 0=no)</b>				0.0229**	0.0191*	0.0195*
				(0.00938)	(0.0113)	(0.0106)
<b>Consulting service by feed supplier (1=yes; 0=no)</b>				0.0275***	0.0258***	0.0256***
				(0.00680)	(0.00722)	(0.00599)
<b>Written contract with feed supplier (1=yes, 0=no)</b>					0.0150	0.00806
					(0.0125)	(0.0107)
<b>Farm failed to carry out a contract with feed supplier (1=yes, 0=no)</b>					0.0216	0.0215
					(0.0201)	(0.0206)
<b>Member of a producer group (1=yes, 0=no)</b>					-0.00273	-0.00696
					(0.0141)	(0.0136)
<b>Having a successor (1=yes, 0=no)</b>					-0.0130	-0.0112
					(0.00805)	(0.00747)
<b>Constant</b>	-0.0010	0.00560	0.0142	-0.000882	0.0481	0.0422
	(0.0116)	(0.0260)	(0.0477)	(0.0419)	(0.0293)	(0.0292)
<b>Observations</b>	284	284	240	240	236	232

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; Robust standard errors, clustered at feed supplying company level, in parentheses. All regressions include municipalities fixed effect.

Source: Authors' calculations based on the survey sample.