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How can the differences in German raw milk prices be explained? An empirical investigation of market power asymmetries and other price determinants

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Abstract

Addressing competition in Germany's dairy sector, this paper investigates imperfect competition on the raw milk market. By using the conjectural variation approach to determine dairy processors market power towards raw milk producers, regions in Germany with a high degree of imperfect competition can be detected. Therefore a panel data set of dairy processor's price data and related federal state level farm structural and market information data is used which also allows to analyze other price determinants like structural change and spatial aspects on raw milk prices.

Keywords: market power, conjectural variation, dairy, price determinants

1. Introduction

The competitiveness of the dairy sector in Europe is driven by the abolition of the quota regime, higher productivity, product development and innovation and is undergoing substantial changes. Addressing the milk market in Germany, raw milk production has increased in the last years since the decision to abolish the milk quota along with a decreasing number of farmers and dairy processors (BLE 2013 and ZMB 2013). Due to the high concentration of dairy processors and farmers' limited access to only those dairy processors within a certain market radius, it is essential to investigate the effects of imperfect competition and other price determinants like structural change and spatial aspects on raw milk prices.

There is a growing interest to analyze imperfect competition on agricultural markets which is important with respect to further research especially in terms of policy implications (McCorrsiton 2002). The conjectural variation approach in the framework of the New Empirical Industrial Organization (NEIO) (Bresnahan 1989; Lau 1982) has been frequently used to study oligopoly and oligopsony power on agricultural markets. Studies that are concerned with oligopsony power often focus on the retailing stage (e.g. Anders 2008 and Sckokai et al. 2013) and use national industry level data. Notable studies that specifically analyze oligopsony power of dairy processors are Perehozhuk et al. (2009) and Perehozhuk et al. (2011). These papers study oligopsony power in the Ukrainian dairy industry on a regional level as well as in the Hungarian dairy industry on plant level. Evidence of oligopsony power could be found in both studies. In a different strand of literature, determinants derived from the spatial economics literature were used to explain different degrees of market power. Focusing on the dairy sector, examples for this can be found in Alvarez et al. (2000), followed by Huck et al. (2006), Tribl (2012) and Koller (2012) where the latter two also included different organizational types of dairy processors to analyze the implications of firm transport pricing strategies on raw milk price differences.

The objective of this paper is to reveal the determinants of differences in raw milk prices across Germany. Based on the conjectural variation approach, a theoretical model of the dairy industry is set up. Using a panel of dairy processor price data and related farm structural and market information, this approach allows analysing market power of dairy processors towards raw milk producers. Subsequently, this model can be extended to include also raw milk price determinants resulting from farm structure or spatial economics. The paper contributes to the literature by providing an empirical up to date analysis of determinants of price differences across firms and regions which may constitute interesting information in the discussion about power asymmetries in the German raw milk market.

2. Theoretical framework

The conjectural variation approach estimates a conduct parameter that provides information on the degree of market power in the industry. Similar to Perekhozhuk et al. (2011) and Perekhozhuk et al. (2009) we assume that the dairy processing industry in a certain area a consisting of N dairies that produce a homogeneous output $Q_a = f_Q(X_a, S_a)$, where Q is a function of raw milk X , and other production factors S (number of other dairies in an area, transportation costs, labour, capital, energy, etc.). The production function of the i th dairy in the area a is then given by $q_i = f_Q(x_i, s_i)$. On the input market, the inverse supply function of all dairy farms within a certain area can be written as $W_a^X = f_W(X_a, Z_a)$ implying that the price for the raw milk, W_a^X , is a function of the demand for raw milk by the dairy industry $X_a = \sum_{i=1}^N x_i$ and Z_a consists of factors that influence the supply capacities of the farms in that area. Defining P as the price for the final processed dairy output (assumed to be a representative commodity) and W^o as a vector of prices for the other input factors of production, the profit of dairy industry in area a is defined as $\Pi_a = PQ_a - W_a^X X_a - W^o S_a$. For now, we assume that the prices P and W_0 are given and the same within the industry. The first order condition for profit maximizing input demand is provided by $W_a^X \left(1 + \frac{\theta_a}{\epsilon_a^{WX}}\right) = P \frac{\partial f_W}{\partial X_a}$, where θ_a measures the wedge between price and marginal costs and is the conduct parameter that gives information on the degree of market power and $\epsilon_a^{WX} = (\partial X_a / \partial W_a^X)(W_a^X / X_a)$ represents the market price elasticity of supply of raw milk.

3. Econometric specification and data description

The raw milk supply function for a certain area is specified as $M_a = f_M(W_a^X, C_a)$ depending on the raw milk price and other factors such as resource constraints or market structure determinants.

The market structure is characterized by a nonlinear simultaneous equation system consisting of the first order condition from above and the raw milk supply function. To estimate the model nonlinear three-stage least squares are used. The data is provided by regional and national agricultural statistics and the German Agricultural Market Information Organization (AMI).

4. Expected Results

The econometric estimation of the above equation system provides us with an estimate for the market power dairy processor in a certain region, but also with information about the influence of other determinants of the milk price. It is expected that market power leads to a lower price for raw milk. Further, we expect that the concentration of dairy processors has a significant effect on raw milk prices.

5. Literature

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