DYNAMIC PRODUCTIVITY GROWTH IN THE EUROPEAN FOOD PROCESSING INDUSTRY

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Abstract

This poster presents total factor productivity (TFP) growth measures in the European food processing industry over the period 2001-2008 by using the well-established method of data envelopment analysis (DEA). The Malmquist productivity growth indicator is used to identify the contributions of technical change, technical efficiency change and scale change. The study contributes to the scientific knowledge by analysing the dairy and meat processing industries in eight European countries based on an extensive sample of 4,584 firms. Results will underline differences between these countries concerning the productivity growth measures as well as differences between different company sizes. Further research steps should include an impulse response analysis to account for the effect of investment spikes.

Keywords

Total factor productivity, Malmquist-Index, dairy industry, meat industry.

1 Introduction

The analysis of firm performance is one of the fundamental fields in economic research. Besides the analysis of profitability several studies have focused on the measurement of efficiency and productivity growth. As regards the food industry the majority of recent studies have either focused on a specific subsector in one country (e.g. Kapelko et al. 2012, Keramidou et al. 2011) or on the food industry in a single country (e.g. Kumar and Basu 2008). As the EU food industry is the most important manufacturing subsector contributing around 15% to total turnover (Eurostat 2014) a detailed cross country/cross-subsector analysis of this industry regarding total factor productivity appears meaningful. We therefore analyze TFP of firms in the dairy and meat processing industries -two of the largest food industry subsectors- in eight European countries. To ensure homogeneity in technology each 4-digit NACE subsector within the meat and dairy sector is analyzed separately for each country. To the best of our knowledge this is the first study that analyses TFP in the European food industry in such detail.

2 Data

The data used in this study derive from the AMADEUS database which contains the financial accounts of European companies. The sample includes all companies that operate in the processing of meat as well as dairy products (NACE 151 and 155, respectively) for which complete balance sheet data was available for the period 2001-2008. The analysis is restricted to this time period as data availability in the pre-2001 and the post-2008 period is poor. We aim to analyse TFP for a homogeneous sample of firms over several years. Therefore, pre-2001 and post-2008 observations were not included. The analysis accounts for all size categories (micro, small, medium-sized, large) and is not restricted to any specific legal form. After screening the final sample includes 4,584 firms that operate in the meat and dairy processing sectors in the following seven EU member states: Belgium, Finland, France, Italy, Romania, Spain and Sweden. In addition Norway -which is not an EU member- is included. The countries were selected due to data availability. However a representation of the contrast between Scandinavian and southern countries as well as the contrast between established western and new eastern EU member states is ensured.

Total sales plus the change in the value of the stock is used as the output measure. On the input side three measures were used namely material costs, labour costs and fixed assets. Input and Output variables have been deflated using industrial price indexes from Eurostat (2014).

3 Methodology

The assessment of total productivity growth is based on the Malmquist productivity index, which was introduced by CAVES ET AL (1982) and further improved by FÄRE ET AL. (1994). For each company, the output-orientation Malmquist productivity index is defined as follows (COELLI ET AL. 2005):

$$M_o(x_{i,t,}y_{i,t}, x_{i,t+1}, \mathrm{y}_{i,t+1}) = \frac{d^o_{t+1}(x_{t+1}, \mathrm{y}_{t+1})}{d^o_t(x_t, \mathrm{y}_t)} * \left[\frac{d^o_t(x_{t+1}, \mathrm{y}_{t+1})}{d^o_{t+1}(x_{t+1}, \mathrm{y}_{t+1})} * \frac{d^o_t(x_t, \mathrm{y}_t)}{d^o_{t+1}(x_t, \mathrm{y}_t)} \right]^{1/2} \quad (1)$$

The notation $d^o_t(x_{t+1}, \mathrm{y}_{t+1})$ represents the output distance from the period t+1 observation which is estimated by using period t technology as the reference technology. The TFP rate is given by M_o. Values less than one indicate a TFP decline from period t to period t+1 while values greater than one point towards a positive TFP growth rate. The Malmquist Index in equation (1) can be decomposed in efficiency change and technological change. The computation of the Malmquist Index requires the derivation of numerical measures for the distance function. Therefore two main approaches exists in the literature namely the Data Envelopment Analysis (DEA) and the Stochastic Frontier Analysis (SFA). While the SFA has the potential advantage to separate noise in the data from genuine variations in efficiency the DEA attributes all measurement errors to inefficiency. However, due to the non-parametric character of the DEA there is no need for specifying a functional form for the production frontier which reduces the risk of misspecification. Keeping this in mind the study uses the DEA to compute the output distance functions.

4 Expected Results

The results will underline important changes in the analysed countries concerning productivity growth and its components. Moreover the results offer a comparison between different company size classes in these countries. This will help to shed light on the past development and build a bridge for future research to analyse later periods. Further research steps will contain an impulse response analysis to account for the effects of investments spikes on productivity growth rates.

Literature

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