

## **Pattern and determinants of innovation in agri-food chain: the case of Hungarian food SMEs\***

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The innovation capacity (efforts, activities and results) of the individual small and medium sized enterprises (SMEs) is very limited. They have to restrict themselves due to their resource constraints. On the other side food production (including SMEs) has to fulfil food safety requirements in a rapidly increasing extent, which implies a continuous innovation and development process from all market players who are involved in the food chain (Jafari, Bourouni and Amiri, 2009, Gellynck, 2010). It is widely recognised that knowledge accumulation and coordination as base of innovative solutions for the production and technological processes can play decisive role in keeping the firms in competitive position (Alston, 2010).

Last two decades Hungarian agri-food sector has faced dramatic changes in its competitive environment. In addition the shock of transition process retail revolution has evolved much faster than in Western European countries. Structural change in retailing, processing and farming, together with growing market saturation and increasing consumers' concerns regarding product and process quality, have had strong influence not only on the organization and structures, but also on the generation of profits along the food chain. Moreover, the agri-food sector had to face a suddenly increased competition especially after the EU enlargement in 2004 (Csáki, 2005, 2007). As a results of these pressures, agri-food chain, which is generally assumed as mature and relatively low technology sector has been forced to introduce changes affecting all aspects of operation. The only chance for them to overcome the stress of the recent economic crisis is if they explore their innovation capacities through their improved networking activities (Gellynck, Vermeire and Viane, 2007, Gellynck, 2010).

This paper examines the efforts, activities and results in knowledge acquisition, utilisation, coordination and transfer in the Hungarian food SMEs. The aim of the paper is to determine the pattern of innovation along the food chain focusing on the relationships between the inclination to innovate and a set of firm characteristics. The novelties and contributions of the paper to the literature are twofold. First, although there is increasing literature on the innovation in food industry, but similar research is very limited in the Central and Eastern European countries. Second, contrary to previous studies which concentrated mainly on processors' innovation activity we investigate three stages of food chain: producers, processors, and retailers. This approach allows us to get more insights to better understanding of food chain.

Although innovation is a key concept in economics and widely investigated, there is no unified approach of measuring innovation. Following Lundwall (1992) definition of innovation we focus on four aspects of innovation: product innovation, process innovation, organisational innovation and market innovation. Previous research identified a wide range of determinants of innovation including internal and external factors. We focus on following variables: size, legal status, age of firm, human capital and financial capacity as internal

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\* The research is supported by Hungarian National Fund TÁMOP-4.2.1/B-09/1/KMR-2010-0005

factors. In addition, we assess the impact of external factors including market and export orientation.

Our sample is based on a stratified survey (325 SMSs from the agri-food chain: agricultural producers, processors and traders) carried out in Central Region of Hungary.

We present our results in steps. The first step in the empirical work was an exploratory analysis (principal component analysis) aimed at identifying factors that can help understand food firms' differentiations and that can be used to get an overview of the relationship between firm features and innovativeness. These relationships were first verified by testing for differences among means or using the  $\chi^2$  test, according to the quantitative nature, or otherwise, of the variables considered. We then carried out a quantitative analysis to correlate characteristics from PCA, as well as some discrete indicators not included in the PCA, to the propensity to innovate. Two models were developed: the first refers to the propensity to innovate in terms of product innovations; the second is related to process innovations. In the second step employ econometric analysis using a logit model where the dependent variable is the probability that a firm is product- (process-, organisation-, market-) innovative.

Both the explanatory and quantitative analyses revealed the importance of the presence of internal R&D and marketing variables to explain the propensity to innovate. The empirical analysis shows that, in the Hungarian agri-food sector, innovation adoption follows different patterns when product or process innovation and different level of food chain is considered. In particular, the probability of introducing product innovation is influenced by the quality of human capital, the geographical context and, to a lesser extent, the age of the firm. Our results highlight the need to provide for diversified intervention strategies to stimulate and enforce innovation in the Hungarian agri-food sector.