Behavioural aspects of innovation decisions: the case of Hungarian food industry

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Abstract

In Hungary, the food sector plays an important role with high level of export share and positive trade balance. On the contrary, since 1990 the domestic sales of the Hungarian food companies decreased by 40 % (EFOSZ, 2016). Although its share in the output of Hungarian food industry has decreased over the past decade, the food processing industry still remains one of the most important sub-sectors of the country's economy. The industry employed 124,000 workers in 2011 and generated about 6% of the country's exports (EUGO, 2016). On the other hand, the innovation activities of the Hungarian food industry are far below the level needed for boosting the competitiveness (EFOSZ, 2016).

At the current growth rate of technical progress, the convergence between the Central- and Western European countries will be a very slow process (Gorton et. al., 2006). Very often the Central-European countries would need further progress in technology, in creation of new products, in procurement procedures which steps would require further substantial innovation and investment activities (Steffen W. Stephan, 2008). Central-European countries in general, and Hungary in particular have both a low level of innovation policies and low adoption rate of innovation (Caiazza et. al., 2015).

In our paper we investigate the behavioural motives and drivers of decisionmakers in the Hungarian food industry. This approach is applied very exceptionally, therefore we can contribute to better understanding the development of food innovation both at practitioner as well as policy level.

We use the empirical data of 2017 survey carried out in Hungary among the bigger food processing companies. 151 companies were questioned during the interviews. Theory of Planned Behaviour – TPB (Ajzen, 1991) was applied in order to explore the nature of individual drivers in the innovation decision making process. We used Structural Equation modelling for the analysis. Our investigation proves that TPB efficiently explain the development of innovation decision making progress. In Hungary, the positive attitude of managers towards innovative products, the positive evaluation of innovative products and the strategic intention of placing innovative products on the market have positive relationship with innovation performance. However, the lack of appropriate R&D capacities, resources as well as specific knowledge and skills are hindering the development of the desirable process.

Keywords: food innovation, behavioural decision making, Theory of Planned Behaviour, Structural Equation Modelling

Introduction

The paper investigates the innovation behaviour in the Hungarian food industry. Food industry plays important role in Hungary with substantial positive trade balance. Innovation is fundamental prerequisite in keeping the international competitiveness of the Hungarian food export. Our research can contribute to better understanding of the innovation behaviour in

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the Hungarian food processing companies, which might be useful both for policy decision makers and practitioners.

This analysis concentrates on the characterization of the behaviour of decisionmakers who are responsible for innovation decisions in food enterprises. Innovation is seen as "the introduction of a new or significantly improved product, process, organisational method, or marketing method" into the enterprise (CIS, 2012). It might be new only for the enterprise, but the new solution has to overtake the preceding one. Therefore, the role of decisionmaker with regard the innovation is crucial: whether he/she is continuously keen on improving the production-, processing-, marketing- and organisational capabilities of the enterprise characterizes his/her approach to innovation decisions. Consequently the analysis of behavioural aspect of innovation decisions can discover substantive interdependences within the decision making process.

We use data from a survey carried out in Hungary in 2017 among the food processing companies for empirical testing of our hypotheses. Theoretical consideration and hypotheses were derived from Theory of Planned Behaviour – TPB (Aizen, 1991). We have used Structural Equation Modelling (SEM) for empirical analysis, which seems to be handy tool for modelling latent endogenous variables.

Paper is structured as follows. First, we introduce the empirical background. The next part is about the theoretical concerns which will be followed by the exploration of hypotheses. After then we introduce the results and at the end we conclude.

Theoretical considerations

The Theory of Planned Behaviour (TPB) (Ajzen, 1991) is a belief-based social cognitive theory which was the successor to the earlier Theory of Reasoned Action (Fishbein and Ajzen, 1975). It assumes that people behave rationally, in terms of what they consider to be the implications of their actions. Both theories apply to situations involving a choice of behaviour, where reasons can be attributed to the choice made (Tonglet et al., 2004). The succession was the result of the discovery that behaviour did not appear to be entirely voluntary and under control, which resulted in the addition of perceived behavioural control. With this addition, the theory was called the Theory of Planned Behaviour. Aggregating the following concepts:

Attitude toward the behaviour: an individual's positive or negative evaluation of self-performance of the particular behaviour. The concept is the degree to which performance of the behaviour is positively or negatively valued. It is determined by the total set of accessible behavioural beliefs linking the behaviour to various outcomes and other attributes.

Subjective norm: an individual's perception about the particular behaviour, which is influenced by the judgment of significant others (e.g., parents, spouse, friends, teachers).
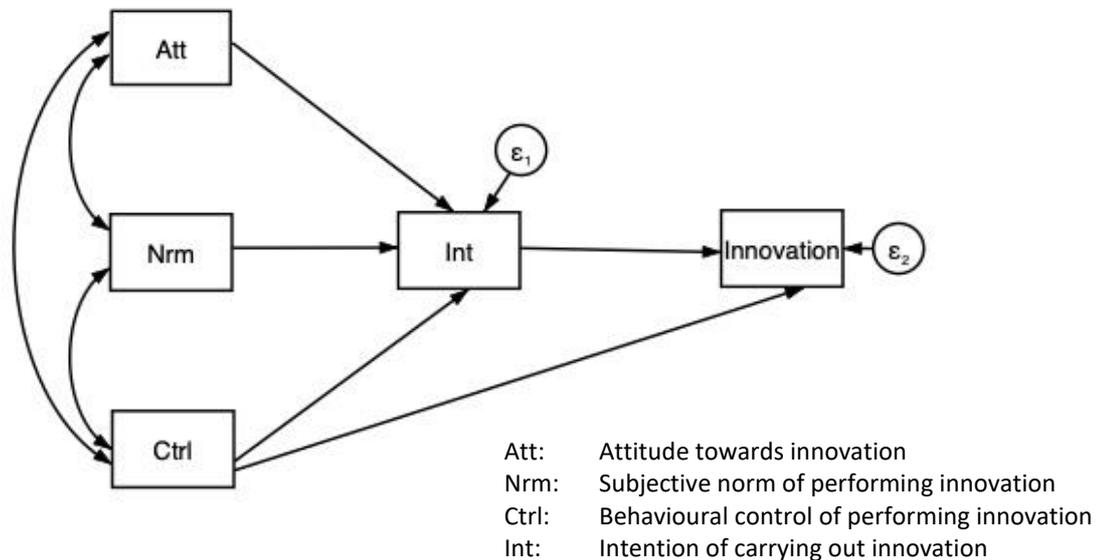
Perceived behavioural control: an individual's perceived ease or difficulty of performing the particular behaviour. This comprises a person's self-efficacy (i.e., ease or difficulty in performing a behaviour) and perceived controllability (i.e., ability to perform the behaviour) (Ajzen, 2002).

The attitude toward the behaviour, the subjective norm, and the perception of behavioural control are the factors leading to the formation of a behavioural intention. Thus, the more favourable the attitude and the subjective norm, and the greater the perceived control, the stronger the person's intention to perform the behaviour in question.

Finally, given a sufficient degree of actual control over the behaviour, people are expected to carry out their intentions when the opportunity arises. Intention is thus assumed to be the immediate antecedent of behaviour.

The following figure (Figure 1) shows all the concepts in relation to each other.

Figure 1. General structure of TPB applied for innovation

Att: Attitude towards innovation
Nrm: Subjective norm of performing innovation
Ctrl: Behavioural control of performing innovation
Int: Intention of carrying out innovation

Source: own compilation based on Aizen (1991)

The TPB has been widely supported across multiple disciplines, however, there is an argument that the model is not suitable for evaluating decisions in an organizational context because of the dynamic and intricate nature of decision processes in organizations (Johnston and Lewin, 1996; Thompson and Panayiotopoulos, 1999). Still, this argument is not as strong when it comes to small businesses, because their small-scale decisions tend to be the domain of a single individual (Southey, 2011) and the Hungarian food companies cannot be regarded as big ones in international comparison. By making use of the TPB, we investigate the factors influencing food industry players' attitude, subjective norms, behavioural control and intention for innovation behaviour.

Innovation was defined as the introduction of a new or significantly improved product, service, process, organisational-, or marketing method by the enterprise. Innovation must have characteristics or intended that it is new, or which provide a significant improvement over what was previously used or sold by the enterprise. However, an innovation can fail or take time to prove itself. An innovation need only be new or significantly improved for the enterprise. It could have been originally developed or used by other enterprises (CIS 2012).

Innovation was measured by answering the question: "How many times in last 5 years happened that your firm has introduced at least 1 new foodstuff?" The average answer was 2 with a standard deviation of 1,96.

Hypotheses
Based on the theory we have determined the following hypotheses.

H1: Attitude towards innovation, Subjective norm of performing innovation, Behavioural control of performing innovation and Intention of carrying out innovation are latent constructs of observable characters of the firms.

H2: Attitude toward the innovation positively influence the intention of performing it.

H3: Subjective norm of performing innovation has got positive effect on the intention.

H4: Behavioural control of carrying out innovation positively helps in developing the intention and directly helps in performing innovation.

H5: The greater the intention to perform innovation the greater the outcome of innovation is.

Empirical background

The new market needs require from the Hungarian food companies that they continuously develop their dynamic capabilities. Firms need to be able to absorb and adopt new solutions and reconfigure their processes and assets according to the changing market demands. This concept is very much in line with the innovativeness requirements.

Therefore, within the frame of a four-year research project aiming at the resilience of the Hungarian food industry we carried out a survey in 2017 among the Hungarian food processing companies about their innovation characters including their behavioural approach towards innovation.

The survey has covered 151 food companies, with approximately 7 million € as average net turnover in 2016 and 195 employees. The distribution of the turnover and number of employees can be seen on Figure 2. and Figure 3., respectively.

Figure 2. Distribution of net turnover in 2016 (thousand €)
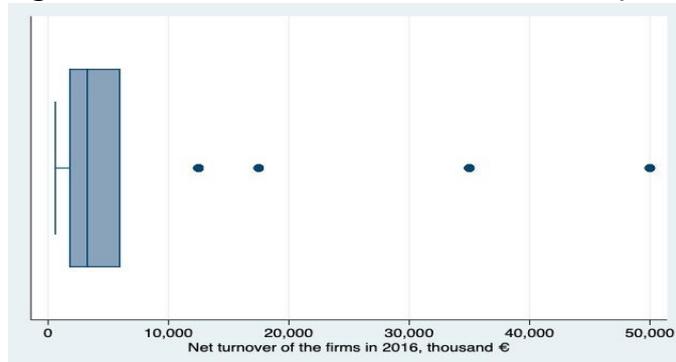
Source: own calculation based on survey data

Figure 3. Distribution of employees in 2017 (head)
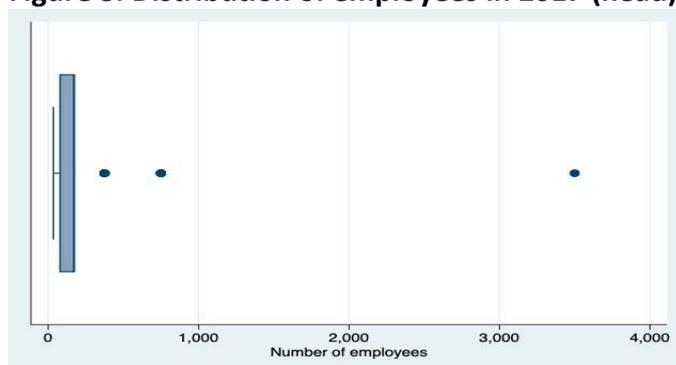
Source: own calculation based on survey data

We got the same picture from both of the above figures: the Hungarian food industry consist of rather small- or medium sized companies with a very few exceptions. Regarding these circumstances the innovation decisions are within the reach of the general managers, therefore the behavioural characters of the decision making process are of high importance.

Method

In order to test our hypotheses, we employed Structural Equation Modelling (SEM) using Stata 15. Structural equation modelling is a general term that has been used to describe a large number of statistical models used to evaluate the validity of substantive theories with empirical data. One of the primary advantages of SEM (vs. other applications) is that it can be used to study the relationships among latent constructs (like Attitude, Subjective norm, Behavioural control, Intention and Innovation) that are indicated by multiple measures. SEM takes a confirmatory (hypothesis testing) approach to the multivariate analysis of a structural theory, one that stipulates causal relations among multiple variables (Lei, Pui-Wa and Wu, Qiong 2007).

SEM is a family of statistical techniques which builds upon multiple regression and incorporates and integrates path analysis and factor analysis.

SEM simultaneously:

(a)   models causal processes represented by a series of regression equations, and

(b)   provides the ability to include unobserved (latent) variables and takes into account measurement error.

In line with that, the structural equation modelling process focuses on two steps: (i) validating the measurement model – accomplished through confirmatory factor analysis and (ii) fitting the structural model – accomplished through path analysis with latent variables.

Usually the term SEM refers to hybrid models with both multiple indicators for each latent variable (sometimes called factor), and directional paths specified connecting these latent variables.

In our case SEM was used first for identifying factors which create appropriate constructs for Attitude, Subjective norm, Behavioural control, Intention and Innovation, after then we have fit the structural model utilizing the latent variables. Constructs have been identified by Cornbach's alpha.

Results – latent constructs

Supported by the methodological design first we have determined the appropriate latent constructs (LC) from individual variables.

LC1: Attitude towards innovation

Item	alpha
It is part of our business policy that we place at least one innovative food product on the market	0,97
For our firm it is desirable to place at least one innovative food product on the market	0,96
To place at least one innovative food product on the market has got an intrinsic value for us	0,96
For us it is profitable to place at least one innovative food product on the market	0,96

	0,97
To introduce at least one innovative food product on the market is exciting professional challenge for our company	0,97
Test scale	**0,97**

LC2: Subjective norm of performing innovation

Item	alpha
My colleagues whose opinion is important for me think that we need to place at least one innovative food product on the market	0,99
The market requires the introduction of new innovative food product continuously	0,99
My colleagues whose opinion is respected by me think positively about introducing a new innovative food product on the market	0,99
Our most important partners place at least one innovative food product on the market	0,99
The market always awards the introduction of innovative food product on the market	0,99
It is important for me that our company introduces at least one innovative food product on the market for the specific nutrition people	0,99
Our most important competitors introduce at least one innovative food product on the market	0,99
Our management think that we have to place at least one innovative food product on the market	0,99
Our management evaluates positively if we introduce at least one innovative food product on the market	0,99
Some specific nutrition people (flour sensitive, high blood sugar, etc) need to have innovative food products on the market	0,99
Test scale	**0,99**

LC3: Behavioural control of performing innovation

Item	alpha
We do have enough resources as well as research capacities in order to place at least one innovative food product on the market	0,97
Our company is able to place at least one innovative food product on the market without any difficulties	0,95
We do have enough specific knowledge and skills in order to place at least one innovative food product on the market	0,95
We do have enough external R&D capacities in order to introduce at least one innovative food product on the market	0,97
Test scale	**0,97**

LC4: Intention of carrying out innovation

Item	alpha

For the future we plan to place at least one innovative food product on the market	0,98
We intend to place at least one innovative food product on the market a year	0,97
Next year we try to introduce at least one innovative food product on the market	0,97
Test scale	**0,98**

Source: own calculation based on survey data

Results – structural model

Our structural model depicts the relationship between Attitude towards innovation, Subjective norm of performing innovation, Behavioural control of performing innovation and Intention of carrying out innovation. We can see from Figure 4 that the liaison is rather complicated: we experience the high level of correlation between Attitude and Subjective norm, Subjective norm and Behavioural control, but there is also strong connection between Attitude and Behavioural control as well. The standardized parameters support our hypotheses that all of the latent variables significantly affect the next level in the structure. Especially, the Attitude has got direct positive effect on intention and this is the situation with the subjective norm and intention as well. Interestingly, the behavioural control has got a double direct influence on attitude and innovation, respectively. However, the direction of these two effects is just the opposite: while the control abilities of the firms directly help in formulating the innovation, there is a hindering effect towards the intention.

Figure 4. Complex structure and estimated parameters of TPB in Hungary
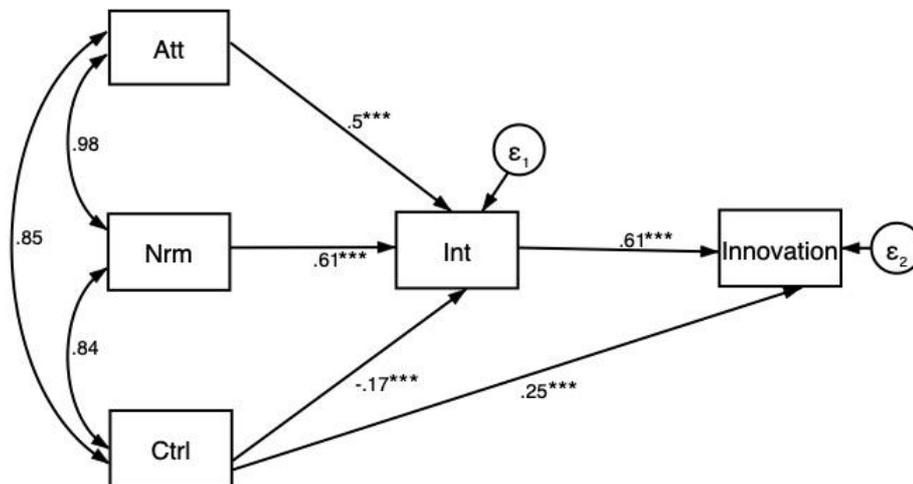
Source: own calculation based on survey data

Table 1 Fit statistics of the SEM model

Fit statistic	Value	Description

Likelihood ratio		
chi2_ms(2)	2,729	model vs. saturated
p > chi2	0,256	
chi2_bs(7)	572,74	baseline vs. saturated
p > chi2	0	
Population error		
RMSEA	0,049	Root mean squared error of approximation
90% CI, lower bound	0	
upper bound	0,177	
pclose	0,379	Probability RMSEA <= 0,05
Information criteria		
AIC	1601,9	Akaike's information criterion
BIC	1656,2	Bayesian information criterion
Baseline comparison		
CFI	0,999	Comparative fit index
TLI	0,995	Tucker-Lewis index
Size of residuals		
SRMR	0,005	Standardized root mean squared residual
CD	0,934	Coefficient of determination

Source: own calculation based on survey data

The highly significant results and fit statistics unambiguously prove the validity of TPB theory with empirical data.

Discussion, conclusions

In Hungary – like anywhere in the world – food industry is seen as a matured one from innovation point of view. Breakthrough innovation occurs very rare. We could learn from other studies (Tóth et al., 2018) that the continuous effort to improve the product quality- and design, process arrangements, technological conditions exist at very low level: 57,5% of food processing firms did not carry out any kind of innovation activity[3] during the preceding 3 years before 2012.

Our analysis strongly supports the validity of planned behaviour theory. The positive attitude of managers towards innovation directly enhance the intention to make more innovation. If there exists encouraging subjective norms which help the decision makers, there will also directly increase the intention for innovation. The situation is a quite different with perceived and actual resources which are mostly responsible for carrying out innovation: the direct effect on intention is negative, although the direct influence on innovation is positive. It means that the Hungarian food companies feel that their capacities are weak and not enough to perform appropriate innovation projects, however in the reality they are able to do so. This is

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[3] These activities cover: new or significantly improved goods, or services, methods of manufacturing, logistics, supporting activities, new business practices for organising procedures, new methods of organising work responsibilities and decision making, new methods of organising external relations with other firms, significant changes to the aesthetic design or packaging of a good or service, new media or techniques for product promotion, new methods for product placement or sales channels and pricing goods or services.

a serious message for the managers: their adaptive capabilities with regard the innovation ought to be improved radically.

References

Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50, 179–211.

Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology, 32,* 665-683.

Caiazza, R., Richardson, A., Audretsch, D. (2015): Knowledge effects on competitiveness: from firms to regional advantage, Jornal Technology Transfer 40:899–909

CIS (2012). The Community Innovation Survey 2012, The Harmonised Survey Questionnaire, July 23, 2012

EFOSZ (2016): Hungarian National Association of food processors. *Available at* http://www.efosz.hu/prioritasok/versenykepesseg/ *Accessed: 8/12/2016*

EUGO (2016). Hungarian homepage of EUGO, Hungary's Point of Single Contact (PSC) for enterprises *Available at:* http://eugo.gov.hu/key-facts-about-hungary/main-industries *Accessed: 8/12/2016*

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research.* Reading, MA: Addison-Wesley.

Gorton M., Davidova S., Banse M., Bailey A. (2006). The international competitiveness of Hungarian agricul- ture: Past performance and future projections. Post- Communist Economies, 18: 69–84.

Johnston and Lewin, (1996). Organizational buying behavior: Toward an integrative framework, Journal of Business Research, Volume 35, Issue 1, Pages 1-15

Lei, Pui-Wa and Wu, Qiong (2007). "An NCME Instructional Module on Introduction to Structural Equation Modeling: Issues and Practical Considerations" http://ncme.org/linkservid/47EFEB5A-1320-5CAE-6EC90BFDF09AA39E/showMeta/0/, downloaded: 18 April 2013.

Southey, (2011). The Theories of Reasoned Action and Planned Behaviour Applied to Business Decisions: A Selective Annotated Bibliography, Journal of New Business Ideas & Trends, 9(1), pp. 43-50.

Steffen W. & Stephan J. (2008). The role of human capital and managerial skills in explaining productivity gaps between east and west. Eastern European Economics, 46: 5–24.

Thompson, K.E. & Panayiotopoulos, P. (1999). Prediciting Behavioural Intention in a Small Business Context, Journal of Marketing Practice, 3: 89-96.

Tonglet, M. et al. (2004). Using the Theory of Planned Behaviour to investigate the determinants of recycling behaviour: a case study from Brixworth, UK, Resources, Conservation and Recycling 41, 191–214

Toth, J. ; A., Torok ; J.M., Balogh, (2018). Networking theory of innovation in practice A Pan-European overview based on the Community Innovation Survey, In: 30th International Conference of Agricultural Economists