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**Econometric Analysis of Pork Meat Supply-Demand Relations in the
Czech Republic**

Diploma Thesis

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Summary

The aim of the diploma thesis is to determine and to evaluate supply-demand relations at Pork Meat Market in the Czech Republic in the selected period (2000-2018). The aim was fulfilled based on the partial aims. Those are to identify and verify factors, which may influence the consumption and consumer price of pork. Then, several hypotheses were defined and verified.

The diploma thesis is covered by both theoretical and empirical part. Theoretical part contains theoretical background of the selected topic as well as the methodological framework, description of consumer behaviour on the market dealing specifically with consumption of a pork meat and its demand, and furthermore, econometric background overview necessary to establish the second part of the thesis. Scientific literature was used to prepare the literature overview. The empirical analysis was based mainly on the econometric analysis of the time series analysis. Other suitable methods were employed as well. Secondary data from CSO were used for calculations. Based on the empirical analysis the results were presented and some recommendations suggested.

Keywords: supply, demand, domestic pigs, pork meat, time series, econometric model, consumption

Souhrn

Cílem diplomové práce je zjistit a zhodnotit vztahy nabídky a poptávky na trhu s vepřovým masem v České republice ve vybraném období (2000–2018). Cíl byl naplněn na základě dílčích cílů. Zejména se jedná se o identifikaci a ověření faktorů, které mohou ovlivnit spotřebu a spotřebitelskou cenu vepřového masa. Poté bylo definováno a ověřeno několik hypotéz.

Diplomová práce zahrnuje teoretickou i empirickou část. Teoretická část obsahuje teoretické základy vybraného tématu a metodický rámec, popis chování spotřebitele na trhu, který se konkrétně zabývá spotřebou vepřového masa a jeho poptávky, a dále ekonometrický přehled, který je nezbytný pro vytvoření druhé části práce. K přípravě literární rešerše byla použita odborná literatura. Empirická analýza byla založena zejména na ekonometrické analýze analýzy časových řad. Jiné vhodné metody byly také použity. K výpočtům byla použita sekundární data z ČSU. Na základě empirické analýzy budou prezentovány výsledky a navrhnutá některá doporučení.

Klíčová slova: nabídka, poptávka, prase domácí, vepřové maso, časové řady, ekonometrický model, spotřeba

Introduction

The consumption creates a major part of our lives. We consume goods and services on the daily basis even without noticing or being aware of this fact. The approach of us, consumers, has changed in the beginning of 20th century. We do not consume because it is a necessity anymore, but the want is the main reason that drive our consumption. Thanks to the globalization across the world, it became easier to buy goods or services from anywhere around it. The competition on the market increased. The producers attract us with different methods, whether is a lowering of the prices, the high quality of the product or services advertising or just very attractive promotions, nowadays, mainly on social media.

Nevertheless, some products do not need promotion. Such as basic items from the grocery, our cuisine cannot lack – such as a meat. Meat is very important for our nutrition. Consumers prefer different kinds and types according to different ages, genders, tradition, culture, nutritional needs based on lifestyles or health condition or restrictions, budget constraints, education and others. Meat is consumed by greater part of the present population in the Czech Republic. Especially pork is indispensable in the Czech Republic as it is a basis for traditional Czech cuisine. The price is low and therefore is one of the most favourite meat in Czech households and restaurants.

This work determines and evaluates the role of price and role of other influences in relation to one of the most consumed kinds of meat, the pork, in the Czech Republic on the microeconomic level.

Objectives

The aim of the diploma thesis is to determine and to evaluate supply-demand relations at Pork Meat Market in the Czech Republic, in the selected period (2000-2018). The objectives will be fulfilled based on the partial aims. Those are to identify and verify factors, which may influence the consumption and consumer price of pork, followed by the assumptions were stated with several hypotheses that were defined and verified that are introduced in the empirical part.

Methodology

The diploma thesis will cover both theoretical and empirical part. Theoretical part will contain theoretical background of the selected topic as well as the methodological framework, description of consumer behaviour on the market dealing specifically with consumption of a pork meat and its

demand, and furthermore, econometric background overview necessary to establish the second part of the thesis. Scientific literature, research papers and internet sources are going to be used to prepare the literature overview. Annual period was selected from the year 2000 to 2018. The data on consumption for the year 2019 are not available yet and therefore, were not included to the thesis.

The empirical analysis will be based mainly on the econometric analysis of the time series, using software Gretl. The relationship among selected variables is going to be investigated using ordinary least square method or two-staged least square method due to the model type. Other suitable methods will be employed as well. In the first phase of practical part the development of meat consumption individually for the mainly consumed kinds of meats and as whole, the development of prices of pork is going to be evaluate based on elemental characteristics of time series. Time series of meat consumption is going to be appointed by the most suitable trend functions. Based on that, the forecast of for the years 2019 and 2020 is going to be elaborated by extrapolation. The results of empirical analysis will be presented and some recommendations will be suggested.

Conclusion

The chapter of the empirical part is divided into two phases. In the first phase the development of meat consumption individually for the mainly consumed kinds of meats and as whole, followed by the development of prices of pork was evaluated and compared based on elemental characteristics of time series. Time series of meat consumption was appointed by the most suitable trend functions. Based on that, the forecast of for the years 2019 and 2020 was elaborated by extrapolation. Development of time series of income in the Czech Republic was also introduced. The second phase presents three econometric models. Two of them are one equation models and one is multiple equations model. All of them contains the economic and econometric model presented together with the input data. The model was subsequently estimated and verified economically, statistically and econometrically. Models were applied for elasticities interpretation and estimation of future developments, scenarios simulations and ex-post prognosis.

In the first one equation model, there was analysed the *consumption of pork* in the Czech Republic and on its independent exogenous variables - consumer price of beef, income and time trend. In the model, there was detected high multicollinearity among the price of beef and the income, which was later eliminated by transformation of one of these two variables by relative differences but due

to this one year of observations was lost. The economic assumptions defined at the beginning of the project were confirmed except one variable (consumer price of beef), where there was suggested the possible explanation of this phenomena and why it was not confirmed. The statistical verification showed that all of the variables and its parameters proved the statistical significance. The quality of model was very good, since the R^2 was 70%.

In case of multiple-equations model, the *consumer price of pork* was a dependent variable of the second equation. The data set had been modified exactly the same way as in the first model due to the persistent multicollinearity, one observation was lost again. In identification of the model, it was determined that both equations are over-identified. In the 1st equation, the only variable x_2 (consumer price of beef) was considered as statistically insignificant, while the others were found statistically significant. In the 2nd equation, only variables x_5 (number of pigs) and x_6 (slaughtered pigs) were found statistically significant. Coefficients of determination were in both equations very high, which indicated the strong dependency of endogenous on exogenous variables. Economic verification in the first equation showed the same result as in the first model. In the second equation, number of pigs went oppositely to expected assumption. Otherwise, all stated economic assumptions agreed with our results. In both equation there is no autocorrelation, there is homoscedasticity and the residuals have been normally distributed. Quality of the model is 83.3%.

Regarding the last model, the examined dependent variable was *consumer price of pork meat* in the Czech Republic. The independent exogenous variables were selected as consumption of pork meat, number of pigs, slaughtered pigs and price of rape seed. In the model, there was detected high multicollinearity among the variables number of pigs, slaughtered pigs and price of rape seed. Given the quality of the model that is 82.9% (R^2), the multicollinearity had not been eliminated and thus, there was no loss in observations. The expected economic assumptions were all successfully confirmed with one exception of number of pigs. All of the variables and its parameters proved the statistical significance.

In application of model there were found and expressed elasticities of the variables, the simulation of scenario had been applied and finally the ex-post analysis had been elaborated that confirmed its quality in all three cases where the prediction is not much different from the real values and therefore, can be recommended for further forecasts.

What is disturbing is the finding that the relationship between consumption of pork meat and its own consumer price was not proven. It might be caused by international trade, that the worldwide competition suppress the Czech farmers to lower the prices to the possible minimum that might not reflect the actual cost of production and the real value for the final products of certain quality. Also, the illnesses of animals accompanied by epidemics might cause the fear from buying such a good that might lead again to forcing the Czech farmers to decrease the prices to reduce the fear of consumers. It might be also given by a fact that no matter how much the pork meat costs, if it is still in the range of what consumers consider as acceptable, they are going to keep buying this commodity. Afterall, as the results of current situation of meat preferences show, the pork meat is the most favourite kind of meat of the Czech population throughout the time.

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