ŽEMĖS ŪKIO MOKSLAI. 2007. T. 14. Priedas. P. 181–183

The modelling of meat consumption in Slovakia

Daniela Kunova,

Peter Bielik

Slovak Agricultural University in Nitra, Tr. A. Hlinku 2, 949 76 Nitra, Slovakia
E-mail: daniela.kunova@fem.uniag.sk, Peter.Bielik@uniag.sk

The research interest has stemmed not only from the fact that meat constitutes a major item in national food spending (accounting for more than 20% of national food expenditure), but also from a series of significant developments in the meat industry due to changing dietary patterns and health awareness. A set of panel data was used for model estimation. The data set covers the most consummated sorts of meat in Slovakia – beef, pork and poultry. According to panel data available, the model was estimated as a fixed-effects model. Data were obtained from the Household Budget Survey of the Slovak Statistical Office.

Key words: econometric modelling, „fixed effects" method, meat demand, beef, pork, poultry

INTRODUCTION

This paper focuses on the impact factors that the consumers' meat demand. A common procedure in empirical demand analysis is to estimate a system of demand equations.

Recently, the average meat consumption undergoes significant changes. In the consumer food demand patterns, meat has an outstanding position. The research interest has stemmed not only from the fact that meat constitutes a major item in the national food spending (accounting for more than 20%), but also from a series of significant developments in the meat industry due to changing dietary patterns and health awareness.

METHODS AND CONDITIONS

Data

Analysis of individual meat sorts' consumption in Slovakia was based on documents of Statistical Office of the Slovak Republic, Ministry of Agriculture, Ministry of Economy, Research Institute of Agricultural and Food Economics as well as on documents of the EU and FAO.

A set of panel data was used for model estimation. The data set covers the most popular sorts of meat in Slovakia – beef, pork and poultry. The Household Budget Survey of the Slovak Statistical Office was used for the period 1993–2003. Because the survey methodology changed in 2004, we employed a time series of the years 1993 till 2003 in pursuit of data consistence. The data include yearly observations of beef, pork and poultry consumption, average annual consumer prices of beef, pork and poultry meat and net income per capita.

Methodology

In the estimation process, the fixed effect specification of the panel data is used. Fixed effect specification is preferred in case of omitted variable problems in the regressions, by means of capturing idiosyncratic factors that might have affected the demand and meat consumption. The White period robust coefficient variance estimator was applied to accommodate the arbitrary serial correlation and time-varying variances in the disturbances.

The fixed effect model assumes that individual specific time invariant effects should be treated as an intercept term of the regression. This presents opportunities for a number of transformations of the data, which eliminate this effect. Essentially, any transformation that rids the model of the fixed effect produces a fixed effect estimator (Baltagi, 2001).

By far the most extensively discussed and used estimator of fixed effects is the least squares dummy variable estimator, also referred to as the within estimator (Greene, 2000; Hsiao, 1986).

The fixed effects estimation method is regarded as ridden with problems in the literature. The least squares dummy variable approach has been widely criticized. Less importantly, the LSDV approach presents a loss in the degrees of freedom due to the large number of parameters being estimated, which may or may not be a problem in practice, depending on the number of observations available (Wooldridge, 2002).

More importantly, the fixed effects approach rids the regression of all fixed effects, regardless of whether they are contained as unobservable within the intercept term or as observable in the matrix of regressors. Thus, the effects of individual specific regressors, such as sex or place of birth, on the dependent variable cannot be estimated under the approach of fixed effects (Baltagi, 2001).

The dependent variable has been chosen to represent per capita consumption of beef, pork and poultry meat. The coefficients are estimated by the OLS method.

The meat demand equation was specified as follows:

$$ln\,(Y_i) = \beta_0 + \beta_1 \times ln\,(P_B) + \beta_2 \times ln\,(P_{PK}) + \beta_3 \times ln\,(P_{PL}) + \beta_4 \times ln\,(I) + \beta_5 \times (t) + \beta_6 \times (d_1) + ln\,\varepsilon$$

(for symbols, see Table 1).

Table 1. **Variables used in the econometric model**

Variable	Explanation
Y_i	\per capita meat consumption for i (I = beef, pork, poultry)
P_B	real price of beef meat (Sk/kg)
P_{PK}	real price of pork meat (Sk/kg)
P_{PL}	real price of poultry meat (Sk/kg)
I	real income per capita
t	trend
d_1	a dummy variable that measures the impact of BSE. The variable takes the value 1 if the BSE was observed in the Slovak Republic and 0 otherwise.

Table 2. **Per capita average meat consumption in kg**

Year	Beef	Pork	Poultry
1993	14.9	36.2	11.8
1994	13.7	36.4	11.9
1995	11.8	36.8	13.4
1996	11.6	37.3	14.4
1997	11.7	37.2	15.5
1998	11.4	36.9	16.0
1999	10.2	35.9	17.4
2000	9.1	33.1	17.1
2001	6.9	31.8	18.5
2002	6.7	31.3	18.5
2003	6.8	32.3	20.7
2004	6.2	31.9	20.4
2005	6.3	29.8	20.3
2006	6.3	29.0	20.4

RESULTS AND DISCUSSION

Recent years have witnessed structural changes in the demand for meat products, especially beef. The declining per capita consumption of red meat and the increasing consumption of pork and poultry meat reflect consumer preferences not only in Slovakia. The course of average meat consumption in Slovakia is presented in Table 2.

The average consumption of beef meat per year during 1993–2005 in Slovakia was 52 549 tons. In the analysed period, the average beef meat consumption decreased by 45 540 tons (57%). A considerable effect on this fact has the occurrence of BSE disease in Europe and later in Slovakia.

Slovakia counts among states with predominant pork meat consumption. Pork meat presents a considerable proportion in meat consumption per inhabitant and per year (51.1% in 2005). Pork meat consumption started to decrease moderately in the recent period.

During the analysed period, poultry meat consumption increased by 45 366 tons. Poultry meat consumption has a long increasing course, but it still didn't reach the level of average consumption in the E-15. We suppose that the annual rise of poultry meat consumption in Slovakia will continue.

Another issue solved in the present research is demand modelling. A simple linear demand model was applied. Most of the estimated coefficients are significant.

The significant variables that affect beef meat consumption are beef meat price, pork meat price, income, trend and occurrence of BSE disease. Beef meat demand is inelastic with respect to its price. As expected, pork meat is a substitute for beef meat. According to our results, the price of poultry meat has no effect on beef consumption. Based on the income elasticity coefficient, beef meat is a normal commodity for an average household in Slovakia.

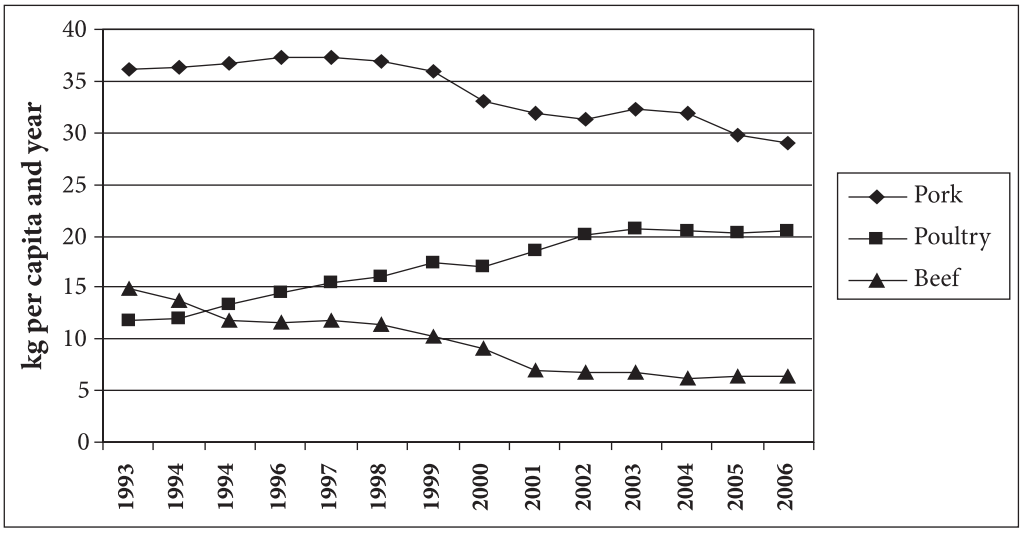

Figure. Comparison of average meat consumption in Slovakia

Table 3. **Estimation results. Dependent variable *ln* (Y_i)**

	Beef	Pork	Poultry
CONSTANT	197.9543***	22.4283	–34.3893*
ln (P_B)	–0.4707***	0.3385***	0.1508***
ln (P_{PK})	0.7886***	–0.9778***	0.0793
ln (P_{PL})	0.0324	0.0937	–1.0038***
ln (I)	0.8919***	0.3823	0.7106***
d_1	–0.1037***	–0.0109	0.0161
d_2	–0.3581***	0.0326	0.0863***
Adjusted R-squared	0.9018	0.8706	0.9561

* Significant at α = 0.1.

** Significant at α = 0.05.

*** Significant at α = 0.01.

During the analysed period, beef meat demand declined by 10% yearly. This trend was caused by a change in consumers' preferences in favour of pork meat. Occurrence of BSE disease also significantly contributed to a decrease in beef consumption. Beef meat consumption dropped by more than 30% as a result of BSE.

Pork meat demand is price-inelastic with respect to home price. Pork demand is income-inelastic which means that income grows faster than does pork meat consumption.

For poultry meat demand, significant variables are poultry meat price, beef meat price, income, and occurrence of BSE disease. Poultry demand is price-elastic with respect to its price. Poultry meat is substituted with beef meat. Poultry meat demand is income-elastic.

Due to BSE occurrence, poultry meat consumption increased by around 9%. Consumers substituted beef meat mainly with poultry meat as a result of BSE. The impact of BSE on pork meat demand is insignificant.

CONCLUSIONS

This paper has used the method of fixed effects for the modelling of meat demand in Slovakia.

According to research results, the most popular meat in Slovakia is pork. Beef consumption in the recent period has declined in spite of the increasing poultry meat demand. BSE disease in Europe and later in Slovakia, as well as changed preferences have made a significant contribution to this fact.

Estimation outcomes indicate a significant influence on beef meat consumption of beef meat price, pork meat price, income, trend and occurrence of BSE disease. The significant variables that affect pork consumption are pork and beef meat prices. For poultry meat demand, significant variables are poultry meat price, beef meat price, income and the occurrence of BSE disease.

References

1. Alston J. M., Chalfant J. A., Piggott N. E. Estimating and testing the compensated double-log demand model // Applied Economics. 2002. Vol. 34. P. 1177–86.
2. Baltagi B. Econonometric Analysis of Panel Data, 2nd Edition, Wiley, 2001.
3. Ciaian P., Qineti A., Sojkova Z. et al. European Integration: The case of agricultural farms in Slovak Republic // Journal of Economics (*Ekonomický Časopis*). 2001. Vol. 49. No. 2. P. 330–357.
4. Greene W. Econometric Analysis. New Jersey: Prentice Hall, 2000.
5. Hsiao C. Analysis of Panel Data. Cambridge: Cambridge University Press, 1986.
6. Jabarin A. S. Estimation of meat demand system in Jordan: an almost ideal demand system // International Journal of Consumer Studies. 2005. Vol. 29. P. 232–238.
7. Mazzocchi M., Delle Monache D., Lobb E. A. A structural time series approach to modelling multiple and resurgent meat scares in Italy // Applied Economics. 2006. Vol. 38. P. 1677–1688.
8. Verbeek M. A Guide to Modern Econometrics. Chichester, UK: John Wiley and Sons, LTD, 2000. 386 p.
9. Wooldridge J. M. Econometric Analysis of Cross-Section and Panel Data. London, UK: Mit Press, 2002. 735 p.

Daniela Kunova, Peter Bielik

MĖSOS VARTOJIMO SLOVAKIJOJE MODELIAVIMAS

S a n t r a u k a

Straipsnyje analizuojamas mėsos suvartojimas Slovakijoje. Atlikti šį mokslinį tyrimą paskatino tai, kad šalyje mėsos suvartojimas sudaro svarbią išlaidų maistui dalį (daugiau kaip 20% visų šalies išlaidų maistui); be to, dėl gyventojų susirūpinimo sveika mityba ir pokyčių mitybos struktūroje ženkliai pasikeitė situacija mėsos pramonėje. Modelio apskaičiavimui buvo naudota informacija apie labiausiai vartojamas mėsos rūšis Slovakijoje – jautieną, kiaulieną ir paukštieną. Remiantis turimais duomenimis buvo apskaičiuotas fiksuoto efekto modelis. Be to, atliekant tyrimą buvo remtasi Slovakijos statistikos departamento namų ūkių biudžeto apžvalgos rezultatais.

Raktažodžiai: ekonometrinis modeliavimas, fiksuoto efekto metodas, jautiena, kiauliena, mėsos paklausa, paukštiena

Данела Кунова, Петер Биелик

МОДЕЛИРОВАНИЕ ПОТРЕБЛЕНИЯ МЯСА В СЛОВАКИИ

Р е з ю м е

В статье анализируется потребление мяса в Словакии. Стимулом проведения научного исследования послужило то обстоятельство, что потребление мяса составляет важную статью расходов на питание у населения (более 20% всех расходов на питание). Кроме того, из-за в результате озабоченности населения вопросами здорового питания и, соответственно, изменений в структуре питания резко изменилась ситуация в мясной промышленности. При создании модели использована информация о широко потребляемых видах мяса в Словакии – говядине, свинине и птичьего мяса. На основе имеющихся данных рассчитана модель фиксированного эффекта. Также были обобщены итоги обзоров бюджетов домашних хозяйств, предоставленных Статистическим департаментом Словакии.

Ключевые слова: говядина, метод „фиксированного эффекта", птичье мясо, свинина, спрос на мясо, эконометрическое моделирование