Centrum pro otázky
životního prostředí
Univerzita Karlova v Praze

Determinants and barries of organic food consumption in the Czech Republic

A pilot study of the Prague's population

Jan Urban, Milan Ščasný

CUEC WORKING PAPER
3/2007

Acknowledgement

This research has been supported by the National Research Program II Project 2D06029 „Distributional and Social Effects of Sectoral Policies". This support is gratefully acknowledged.

Abstract

The main objective of the paper is to present results from a CVM pilot study conducted in mid-2006 on a small (N = 351), yet representative sample of Prague's inhabitants. The study aimed at elicitation of respondents' revealed and stated willingness to pay for conventional food and for organic food.

The paper presents main results obtained from the survey and compares them with results of similar surveys that have been carried out in the Czech Republic recently. Furthermore, several models of pro-environmental consumption behaviour, including indicators of attitudes and social norms, are tested in order to explain consumer's purchasing decision related to organic food.

Although the results from the study should be understood as mainly indicative for the population of Prague (due to limited size of the sample), they represent the first attempt to derive maximal stated willingness to pay for organic food in the Czech Republic.

Introduction

Household consumption is recognised as one of the key driving forces resulting in increasing environmental burden. Particularly, food was an important consumption item in the recent household budgets of the Czech Republic. Indeed, expenditures on food and non-alcoholic beverages presented on average more than one fifth of the total household consumer expenditures in the Czech Republic in 2005 (CSO, 2006). On the other hand, negative impact of food consumption on the environment can be reduced by purchasing environmentally responsible food, usually so-called organic food. Market with organic food belongs to some of the most dynamic ones. This market has emerged thanks to growing public support measures introduced in order to change individual preferences of consumers. Boccaletti (2006) in his extensive review of empirical literature examines the degree, to which consumers are becoming more concerned about food quality attributes, including effects on the environment, health and safety.

Following neoclassical economics, the demand for organic food can be modelled using demand models and systems like AIDS and QAIDS (see Ščasný and Brůha, 2005), using the framework of random utility theory in choice modelling, or applying contingent valuation method in order to elicit willingness to pay for buying such goods.

As shown in Boccaletti's review, the research on demand for organic food and fair trade products has been conducted extensively in Western Europe and North America, especially during the last ten years. In the Czech Republic, such studies present rather a pioneering piece of work. For instance, Janda (1994) estimates linear demand system for several types of meat, while Janda with his co-authors (1997; 2000) estimated demand for food imports. Póč (2006) conducted a marketing study to assess the potential for the development of the organic food market in the Czech Republic. Using the data from a survey conducted on 1,000 respondents representing Czech population, he focused on knowledge of the respondents about organic products and on their awareness of organic food logo, satisfaction with organic food supply, and perception of the main barriers to increase in organic food demand.

Ščasný, Urban and Nevečeřalová (2005) conducted a case study on demand for food and organic food based on analysis of statistical data and a qualitative sociological research. Based on data from a survey conducted by Ščasný, Urban et Nevečeřalová in 2005, Nevečeřalová (2006) analysed household expenditures on organic food on the sample of Prague residents. More comprehensive analysis of the data from this survey, including willingness to pay for organic food and several other food items, is reported by Urban and Ščasný (2007). The results presented in this paper are also based on their survey.

The aim of the current paper is particularly to analyse the demand of Czech households for organic food. More specifically, we aim at analysing current household expenditures on organic food and examine factors that influence the demand for organic food.

The paper proceeds as follows. Firstly, we describe the survey and the main characteristics of the sample. Then we focus on current expenditures on organic food and we present the results of a binary logit model that used socioeconomic and demographic characteristics to explain, whether respondents' household was currently buying organic food. Then we analyse the perceived barriers to larger organic food demand. Consequently, a binary logistic model and lognormal model are run to explain positive maximal willingness to pay for organic food and

the amount that the respondents reported as their maximal willingness to pay for organic quality of food of currently demanded basket of food.

Survey

The survey targeted population of Prague aged 18 to 65. The quota sampling was used to get small (N=351), yet representative sample of Prague's population using quotas for age, gender, education and living area within Prague. In the sample, there were 47% of males. Around 13% of respondents lived in the city center (Prague 1 to 3), 52% lived in larger city center (Prague 4 to 10) and 32% lived on the outskirts (Prague 11 to 22). There were some 14% of respondents in the sample, who reported only elementary level of education, other 29% attended only technical schools without state leaving exam, 39% reported high-school degree (maturita) and some 18% reported university degree. Other socioeconomic and demographic characteristics of the sample are displayed in the appendix 1.[1]

Importantly, only those respondents, who have "significant" experience with purchase of food (i.e. were buying at least 25% of groceries for the household) were included in the sample).[2]

The data were collected from May to September 2006 mostly by questioning the respondents in their households. Standardized structured interviews were used to elicit the information from respondents.

The structure of the questionnaire was as follows:

i) questions on current household expenditures for all food, and for specific items such as diary products, meat, fruit, vegetables, and eggs,

ii) questions on factors that influence purchase of a specific brand from the same type of conventional food (such as yogurts),

iii) questions on awareness of organic food label,

iv) questions on actual household expenditures for organic food,

v) questions on perceived barriers to, and motivating factors for consumption of organic food,

vi) questions on willingness to pay extra for organic quality of currently consumed basket of food for the household under the condition that the barriers hindering current consumption of organic food were removed,

[1] The χ^2 test shows that the structure of the sample is similar in terms of quota characteristics to the one of Prague's population according to the data of the Czech Statistical Office.

[2] This might have surely weakened the representativeness of the sample for the population of Prague but as far as we are aware there is no statistical data that would allow us to construct sampling frame for quota sampling of respondents who have significant experience with purchase of food for their household. For this reason we presume that that there is no relationship between "purchasing experience" and quota variables. However, in reality, especially gender might be associated with the actual purchasing of food for the household.

vii) question on social norms related to the consumption of organic food,

viii) questions on the relative importance of different motivational factors of purchase,

ix) questions on attitudes (environmental attitudes and attitudes to one's own health),

x) standard socio-economic and demographic indicators,

xi) debriefing section that was completed by interviewers themselves (they reported their evaluation of the interview process).

The average time to complete the questionnaire was around 40 minutes and interviewers reported that interviewees remained focused on the topic for the whole time of interviewing.

Results

Buying of conventional and organic food

On average, respondents reported that their household spent 4320 CZK (144 €) monthly for food alone. This is in accordance with the information that could be obtained from the household budget survey conducted regularly by the Czech Statistical Office (see the table bellow).

Table 1: Average household expenditures, Household Budget Survey 2005.

	Average household	Households of			
		employees	farmers	self-employed	retired
Total expenditures	275 615	330 378	305 417	335 303	138 202
Consumer expenditures	213 139	240 709	224 517	282 757	126 180
Expenditures on food and beverages (COICOP 1)	43 934	46 371	47 143	53 644	33 883
Monthly expenditures on food (COICOP 1)	3 661	3 864	3 929	4 470	2 824
Food expenditures on total consumer expenditures	20,6%	19,3%	21,0%	19,0%	26,9%

Slightly higher food expenditures in our sample reflect the fact that prices of food are somewhat higher in Prague area than in the rest of the country.

In our sample, some 51% of respondents (175 respondents) reported that they have bought organic food in the last 6 months. The distribution of expenditures for organic food was right-skewed. On average, respondents spent 230 CZK (7.6 €) monthly for organic food (with median interval 0 – 100 CZK or 0 – 3.5 €). Those, who actually bought organic food, spent on average 470 CZK (or 15.6 €) with median interval 100 - 500 CZK (or 16.6 - 15.7 €).

To find out who the consumers of organic food were in terms of their socio-economic and demographic characteristics, we ran a binary logistic model. This model was a standard binary logistic model as shown in formula 1, where P_{ni} is logit probability, x_{nj} is a vector of observed variables relating to one of the alternatives i, and β' are estimated coefficients.

$$P_{ni} = \frac{e^{\beta' x_{ni}}}{\sum_j e^{\beta' x_{nj}}} \qquad (1)$$

The results of the best model that we estimated are displayed in the table bellow.

Table 2: Binary logistic model (purchase of organic food)

	Exp(B)	Sig.
socio	1,740	0,0011
attitudes	2,035	0,0001
kids	2,184	0,0004
Log likelihood = 134,247		
Cox & Snell R Square = 0,203		

It appears that social norms related to consumption of organic food, pro-environmental attitudes and presence of children in the household are significant predictors of whether or not the household has bought organic food in the last 6 months.[3] If we replaced indicators of norms and attitudes with an indicator of education level, we found out that it had also significant effect on purchasing decision (lower education level associated with lower probability of buying organic food). However, the effect of education was very likely mediated with attitudes and social norms and was a weaker predictor.

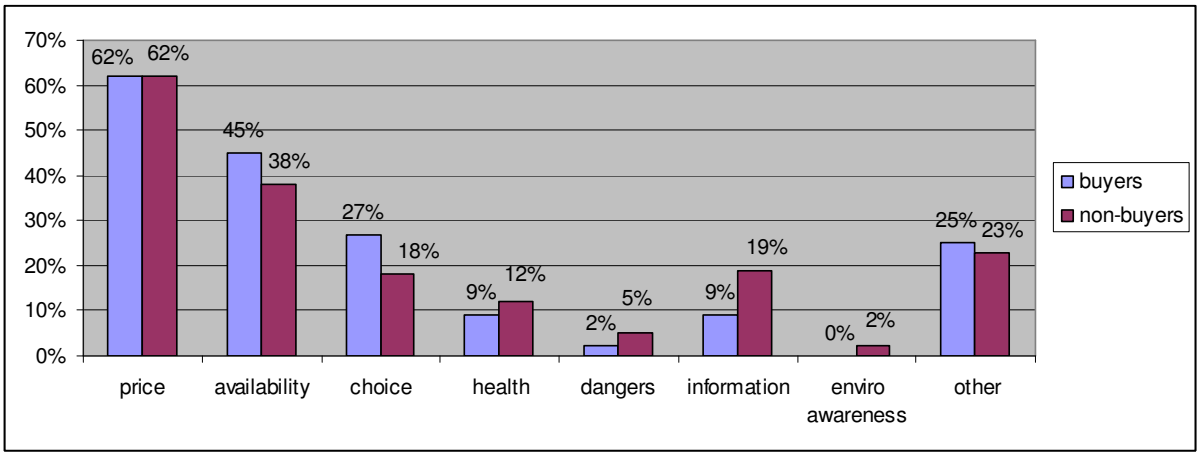
Interestingly enough, it turned out in other models that were tested as an alternative to the model presented above, that personal income of respondent and household income did not have any significant effect on whether the household bought organic food or not in the last 6 months. Other factors such as gender, area of residence in Prague (downtown vs. outskirts), and age of respondent did not have any significant effect either.

Perceived barriers to consumption of organic food

Since 49% of respondents reported that they did not buy any organic food in the last 6 months, the question may arise what are the most important barriers to higher consumption of organic food. The table bellow displays the main reasons stated by respondents for not buying organic food.

[3] The indicator of social norms was constructed as normalized summed score of responses to questions eliciting whether different significant others would support respondent in buying organic food and his or her willingness to comply with the perceived social pressures. In this we followed the conceptualization of social norms in the theory of planned behavior (see Ajzen 1991, see appendix 2 and 3 for precise wording of questions). Indicator of pro-environmental attitudes was constructed as a normalized regression score from the factor analysis of the battery of questions eliciting respondents' pro-environmental attitudes. Factor analysis revealed that the one factor extracted was responsible for 52% of variation in responses to this battery. Anyway, reliability of this battery was rather modest (with Crombach's alpha = .671).

Graph 1: Perceived barriers to consumption of organic food for buyers and non-buyers (rel. frequency)



Respondents indicated that the main barrier to consumption of organic food was the price. Other important factors were the availability of organic food and the choice of products. Low awareness about health benefits and dangers of organic food consumption and general lack of information about organic food were rather less important factors. Interestingly, buyers and non-buyers identified the same barriers to larger consumption of organic food. The only statistically significant difference was that non-buyers stated significantly more often that lack of general information about organic food was a barrier to organic food consumption for them.

Stated willingness to pay for organic food

Following the section on actual expenditures on organic food, respondents were asked how much they would have been willing to pay had the above indicated barriers been removed. The question elicited specifically willingness to pay extra for the currently demanded basket of food if it was in organic quality.

Average stated willingness to pay extra every month for organic food amounted to 730 CZK (or 24.2 €), with median value of 500 CZK (or 16.7 €). Not surprisingly, buyers expressed statistically significantly higher WTP (mean 880 CZK) than non-buyers (mean 637 CZK). Characteristically, the distribution of WTP's was right-skewed with large proportions of zeros (around 21% of all WTP's).

Using P-P graph, we tested several distributions for WTP for organic quality of food. Lognormal distribution appeared to approximate empirical distribution the best. Therefore we used linear lognormal regression model to estimate willingness to pay extra for organic quality of food.

We also tested several alternative models that included socio-economic and demographic variables. Moreover, we attempted to include indicators of social norms related to consumption of organic food (see above) and pro-environmental attitudes.

The model that performed best is displayed in the table bellow. This model was quite good for prediction of positive values of WTP, however, its efficiency decreases when we used it for prediction of both zero values and positive values (now with adj. R^2 around 0.015

suggesting that maybe different type of model such as spike model, Tobit model, or Heckman two stage procedure would be required for modeling both positive and zero values).

Table 3: Linear lognormal regression model (positive willingnes to pay for OF)

	Unstandardized Coefficients	Standardized Coefficients	Sig.
	B	Beta	
(Constant)	5,547323247		0,00000
age	0,006450015	0,11665841	0,05352
element	-0,262637786	-0,15110525	0,01522
expend	0,199051404	0,503883029	0,00000
hinc	0,000139	0,000953804	0,98723
R square = .279			
Adj. R square = .266			

In the model, positive willingness to pay extra for organic quality of food is significantly determined by the level of education (people with only elementary education tend to state lower WTP) and overall current expenditures for food (the higher the current expenditures the higher is also WTP for organic food). The influence of age is on the edge of statistical significance (at alpha = 0.05). However, it seems that older people tend to state higher willingness to pay extra for organic quality.

Interestingly enough, household income (per person in the household) did not have any statistically significant effect in the model. In alternative models we tested also the effect of personal income. In these alternative models, we also found out that that the effect of personal income and of household income on positive willingness to pay was not statistically significant.

Now the question may arise as to what stochastic mechanism was responsible for stating zero willingness to pay rather than any positive value of WTP. To answer this question we tested several binary logistic models that would account for the switch between zero and positive WTP.

Table 4: Binary logit model for positive and zero values

	B	Exp(B)	Sig.
kids	-0,0054	0,9946	0,9874
socio	0,8567	2,3553	0,0000
hincome[4]	0,0012	1,0012	0,0000
male	0,0491	1,0503	0,8762
element	0,1746	1,1908	0,6102
Log likelihood = -111,996			
Cox & Snell R Square = 0,329			

In the table above we can see the model that explained the best the switch between positive and zero values of willingness to pay extra for organic quality.

[4] Household income divided by 1000 in CZK.

We see in the model that social norms and household income are significant predictors of positive values of WTP. People who feel social pressures to buy organic food (esp. from family members) and people with higher household incomes per capita reported more often positive values of WTP. On the other hand, we see in this model that gender, presence of children in the household and level of education did not have any significant effect on whether the respondent stated positive willingness to pay extra for organic quality.

Conclusions

The paper presented results of a pilot survey conducted on a small sample of Prague's adult population in 2006. The survey focused primarily on consumption of conventional food, consumption of organic food and stated willingness to pay extra for the currently demanded basket of food in organic quality. Furthermore, determinants of both actual consumption of organic food and willingness to pay for organic food were analyzed using binary logistic regression and linear regression analysis with lognormal model.

Respondents reported that their household spent on average 4,320 CZK (144 €) for food monthly. Some 51% respondents from the sample stated that they have bought organic food in the last 6 months. Buyers and non-buyers spent on average 230 CZK monthly for organic food, those who actually buy organic food spent on average 470 CZK.

Using binary logistic model to predict whether respondent's household bought organic food in the last 6 month, we found that social norms related to purchase of organic food, pro-environmental attitudes and presence of children in the household had significant effect on the organic food purchase in the household. On the other hand, such socioeconomic and demographic variables as personal or household income, age of respondents, their education, area of Prague they were living in, and gender of respondents did not have any significant effect on whether the household bought organic food in the last 6 months.

Further, we focused on the barriers that either prevented respondents from purchase of organic food or that hindered their current consumption of organic food. Interestingly enough, both buyers and non-buyers indicated price, availability, and limited choice of organic food as the main barrier to consumption of organic food. The only factor where buyers and non-buyers differed was the perceived lack of general information among non-buyers. Non-buyers significantly more often expressed that the lack of general information about organic food was an important barrier for them.

In the next section of the paper, stated willingness to pay extra for organic quality of currently demanded basket of food, under the condition that the barriers were removed, was elicited. Stated WTP for buyers was significantly higher (mean 880 CZK or 24.2 €) than for non-buyers (mean 637 CZK). Around 21% of respondents stated zero WTP.

To explain willingness to pay extra for organic quality of currently demanded basket of food we tested several lognormal linear regression models. The model that best explained willingness to pay extra for organic quality used age of respondents, their level of education and their current expenditures as statistically significant predictors. Older people, people with high-school education level or higher and people with higher expenditures for food stated also significantly higher willingness to pay extra for organic quality of their currently demanded food basket.

Importantly, household income as well as personal income proved to be statistically insignificant predictors on this and alternative models. Indeed, gender was not a significant predictor either.

However, the described model predicted well only positive values of willingness to pay but its predictive power decreased when used for prediction of all WTP's including zero values. To analyze the binary switch between positive and zero WTP's, we ran several binary logistic models. In the model that best explained the switch between zero and positive values there were the following significant predictors: perceived social pressures (social norms) to buy organic food and household income. Zero stated willingness to pay was significantly more likely for people with lower incomes and for people who did not feel any social pressures to buy organic food.

Because different stochastic mechanism was apparently responsible for the switch between zero and positive WTP and between different positive values of WTP, we suggest that the spike model (Kristrom, 1997) or Tobit model (Tobin 1958) should be used to estimate the parameters for both positive and zero WTP values. Such models would allow for modelling of zero "spike" in the WTP distribution. More sophisticated models like Heckman two-stage procedure combining dichotomous choice model for zero - positive value switch and the regression model with appropriate distribution for positive values could be also an alternative. However, more extensive dataset would be required to test these models than the current data sample from a pilot study.

Although our pilot study provides many interesting data, one should be aware of the fact that its rather small sample size does not allow to provide aggregate indicators, not even for the population of Prague.

Appendix 1: Socio-demographic characteristics of the sample

		Sample		Prague's population
		(Abs.)	(Rel.)	(Rel.)
WHOLE SAMPLE		351	100	
GENDER				
	male	166,0	47,3	47,8
	female	185,0	52,7	52,2
AGE				
	15-34	138,0	41,9	36,9
	35-54	106,0	32,2	34,7
	55-74	85,0	25,8	28,4
EDUCATION				
	element. + technical	133,0	40,0	43,5
	highschool	135,0	40,6	35,7
	university	64,0	19,3	18,8
AREA OF PRAGUE				
	P 1-3	44,0	13,0	13,0
	P 4-10	181,0	53,6	53,0
	P 11-22	113,0	33,4	34,0
NET PERSONAL MONTHLY INCOME (CZK)				
	0 - 5.500	66	20,6	
	5.501- 7000	24	7,5	
	7.001 - 8.500	25	7,8	
	8.501-10.000	45	14,1	
	10.501-13.000	36	11,3	
	13.001-15.500	37	11,6	
	15.501-18.000	29	9,1	
	18.001-24.000	26	8,1	
	24.001-35.000	20	6,3	
	35.000 and more	12	3,8	
NET HOUSEHOLD MONTHLY INCOME				
	0 - 9.000	24	7,7	
	9.001-13.000	27	8,7	
	13.001-15.500	28	9	
	15.501-18.000	32	10,3	
	18.001-23.000	47	15,1	
	23.001-29.000	45	14,5	
	29.001-35.000	39	12,5	
	35.001-45.000	35	11,3	
	45.001-55.000	20	6,4	
	55.001 and more	14	4,5	

Appendix 2: indicators of social norms related to consumption of organic food

Motivation to comply with social norms

„Everybody can be sometimes influenced by opinion of his/her family members, friends, or colleagues. How important do you think are for you opinions of the following people around you? We will list different groups of people and ask you how important their opinions are for you. Mark 1 if their opinion is unimportant to you and 5 when it is very important to you."

(Following is a list of significant others: partner, mother, father, children, other relatives, friends, colleagues. For each of them respondent indicated how important their opinions are to him/her on a 5-point scale.)

Normative beliefs

"To what degree would these people agree with your purchase of organic food?"

(Following is a list of significant others: partner, mother, father, children, other relatives, friends, colleagues. For each of them respondent indicated on a 5-point scale how much would this person (persons) agree with his/her purchase of organic food.)

Appendix 3: indicators of pro-environmental attitudes

"Now I will read for you few statements related to the environment. Please indicate to what degree you agree with them. Indicate your answer on a 5-point scale, 1 for strongly agree, 5 for strongly disagree."

(Respondents than used Likert scales to rate following statements.)

1) "I think that it is important that environmental courses are taught at elementary schools."

2) "Damage of the environment is a serious problem."

3) "Car traffic is an important source of air pollution in the Czech Republic."

4) "We contribute to greenhouse effect every time we burn coal, oil, or gas.

Appendix 4: willingness to pay extra for organic quality

"You said that your family spends on average ..... CZK for food. By how many percents would you be willing to raise these expenditures for all the food you buy if it was in organic quality? Please, take into account your current economic situation, your actual situation and you actual willingness to pay."

(Following this question, respondent could either choose among 12 intervals of percentual increase of current expenditures, or s/he could state certain sum of money.)

References:

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

Boccaletti, S. (2006). "Household Behaviour and Environmental Policy: Review of Empirical Studies on Environmentally Responsive Food Choice." Paper prepared for the OECD Workshop on Household Behaviour and Environmental Policy: Empirical Evidence and Policy Issues". OECD, 15-16 June 2006.

CSO (2006). "Incomes, Expenditures and Consumption of the Households Budget Survey Sample Households in 2005." Volumes I. Czech Statistical Office, Prague.
Heckman, J. (1979). "Sample selection bias as specification error." Econometrica 47 (1979), 153-161.

Janda, K., McCluskey, J. and Rausser, G. (2000). "Food Import Demand in the Czech Republic". Journal of Agricultural Economics, 2000, vol. 51, no. 1, p. 22 -- 44. ISSN 0021-857X,

Janda, K. and Rausser, G. (1997). "The Estimation of Hicksian and Expenditure Elasticities of Conditional Demand for Food in the Transition Economy 1993-1995." Central European Journal of Operations Research and Economics, 1997, vol. 5, no. 2, p. 155.

Janda, K. (1994). "The Estimation of Linear Demand System for Basic Types of Meat." Working Paper no. 69, CERGE-EI, Prague, 1994. 27 s.

Kriström B. (1997): "Spike Models in Contingent Valuation," American Journal of Agricultural Economics 79 (August) 1013-1023.

Nevečeřalová, I. (2006). "Poptávka po biopotravinách. Výzkum poptávky po biopotravinách na vzorku pražských obyvatel. Diploma thesis. Charles University in Prague, Prague.

Póč, I. (2006). "Potenciál BIO potravin na českém trhu. Marketingová studie. Prezentation for the Czech Ministry of Agriculture. Synergy Marketing and GfK Prague, Prague.

Ščasný M., Urban, Jan and I. Nevečeřalová (2005). "Úvod od analýzy spotřebitelských vzorců chování." (Introduction to analysis of consumption behavior patterns), Závěrečná zpráva VaV Nástroje (MŽP) (Final Report from a RaD project funded by Ministry of Environment, CUEC.

Ščasný, M., Brůha, J. (2005). "Analýza distribuční efektů regulace v oblasti spotřeby energií a dopravy." (Analysis of distributional effects due to regulation in energy and transport consumption area). Working Paper prepared for the Final Report of R&D Project 1C/4/73/04 „Environmental and Economic Effects of Economic Instruments in Environmental Protection). IREAS and Charles University Environment Center, Prague, mimeo (in Czech).

Tobin, J. (1958): Estimation of Relationships for Limited Dependent Variables. Econometrica, Journal of the Econometric Society, Vol. 26, No. 1, January, 1958. Northwestern University, Evanston, Illinois, USA.

Urban, J., Ščasný, M. (2007). Determinanty a bariéry spotřeby biopotravin v ČR: pilotní studie na populaci Prahy." CUEC Working Papers 3/2007. Praha: Centrum pro otázky životního prostředí UK. [Online: http://cozp.cuni.cz/COZP-999.html]

U Kříže 8, 158 00 Praha 5, Česká republika, tel.: 251 080 202, fax: 251 620 441, http://cozp.cuni.cz