



Central European Review of Economic Issues

EKONOMICKÁ REVUE



Application of decision analysis in the context of VAT rate changes

Kateřina RANDOVÁ*, Michal KRAJŇÁK

Department of Accounting, Faculty of Economics, VSB-Technical University of Ostrava, Sokolská 33, 701 21 Ostrava 1, Czech Republic.

Abstract

The paper is focused on the impact of the potential transfer of hairdressing services from the standard to the reduced value added tax rate. Owing to this legislative change, the suppliers of these services would gain available funds. The aim of this paper is to identify the optimal way of using these funds through the application of the decision analysis method. The relevant data were obtained by questionnaire research. During decision making, respondents took into account various criteria, the weights of which were determined by Saaty's method. They also took into account the effect of the risk of the given alternatives. The selected alternative was using the available funds for human capital, especially increasing the wages of current employees, which showed the best combination of the highest utility and the lowest risk level.

Keywords

Decision analysis, risk, Saaty's method, utility, value added tax, VAT rates.

JEL Classification: C81, D22, H25, K34

* katerina.randova@vsb.cz (corresponding author)

This paper was created with financial support from the Student Grant Competition Faculty of Economics, VSB-Technical University of Ostrava in the project SP2011/126 *Quantification of Impacts of Application of Reduced Value Added Tax Rate to Locally Supplied Services on the Suppliers of these Services.*

Application of decision analysis in the context of VAT rate changes

Kateřina RANDOVÁ, Michal KRAJŇÁK

1. Introduction

Value added tax (hereinafter referred to as VAT) is a general tax on consumption that falls on the total value of the realised supplies. For more about the principles of VAT, see Platteeuw and Pestana (2011), Schenk and Oldman (2007) and Jensen and Schjelderup (2011). The rules for the application of VAT within the frame of the European Union are regulated by Council Directive 2006/112/EC of 28 November 2006 on the common system of VAT (hereinafter referred to as the VAT Directive). This Directive has been amended many times since its entrance into the force. One of its amendments is the Council Directive 2009/47/EC of 5 May 2009 amending Directive 2006/112/EC as regards reduced VAT rates (hereinafter referred to as Council Directive 2009/47/EC), which entered into force on 1 June 2009. This Directive has been adopted on the conclusions of the study that focused on the economic impact of VAT rate application: *Study on reduced VAT applied to goods and services in the Member States of the European Union* (hereinafter referred to as *Copenhagen Economics Study*), from 2007. This Directive allows Member States to apply a reduced VAT rate on selected services on a permanent basis.

These are services that were included in Annex IV of the VAT Directive and since the adoption of the Directive 2009/47/EC they have been included in Annex III, for example:

- minor repairing of bicycles, shoes and leather goods, clothing and household linen (including mending and alteration),
- hairdressing,
- restaurant and catering services (including or excluding the supply of alcoholic and non-alcoholic beverages).

The provisions of Directive 2009/47/ES, which allow the transfer of the above-mentioned services from the standard to the reduced VAT rate, have not been implemented in the Czech legislative yet. For more about the harmonisation of VAT in the European Union, see Šíroký (2012).

The importance of the topic, among other things, is underlined by the fact that the European Commission in 2010 announced a public discussion: *Green paper on the future of VAT. Towards a simpler, more robust and*

efficient VAT system. The main reason for initiating such a discussion was the fact that after 40 years the time had come to have a critical look at the VAT system in consideration of strengthening its coherence with the single market and its capacity as a revenue raiser. Subsequently, in October 2012 the European Commission launched another public consultation titled *Review of existing legislation on VAT reduced rates*. The purpose of this consultation was to collect relevant evidence and information from stakeholders to help the Commission develop a reflection in this area (European Commission, Taxation and Customs Union, 2012). According to Buettner and Wamser (2009), the level of the VAT rate may also be the basis for a decision about whether to remain or to enter the country market.

One of the government's arguments against the application of the reduced VAT rate was that the economic effect of this legislative change would not be measurable. For this reason, the authors decided to carry out questionnaire research among the suppliers of these services in the Moravian-Silesian Region and compare the results with the conclusions of the Copenhagen Economics Study from 2007.

The aim of this paper is thus to determine by the application of the Decision Analysis method the best way of using the available funds that would be created by the transfer of labour-intensive services from the standard to the reduced VAT rate, especially the suppliers of hairdressing services.

Primarily, the results of this analysis could be used as recommendations for the suppliers of hairdressing services. Alternatively, they could be used as one of the supporting documents for the government's decision whether to amend the VAT act in this area.

The paper first describes the method of determining the sample of the population used in the research. Using the data, there is first determined the absolute utility and then the relative utility of the i -th alternative. During decision making, the respondents take into account various criteria. The weight of each criterion is determined by Saaty's method. Subsequently, the weighted utility matrix C is established. Before selecting the optimal alternative, there is also considered the negative effects of the implementation of the i -th alternatives. The obtained results are evaluated and interpreted in Section 5.

2. Research and decision analysis

The Decision Analysis method was used for processing the obtained data because of its versatility. For more about the choice of decision methods, see e.g. Bierman et al. (1986) and Bonini (1987). The analysed data were obtained from the questionnaire research. The questionnaire includes questions on whether the providers of these services:

- Would reduce the average cost of supplied services (if so, quantifying how much%),
- Would expect an increase in demand (if so, quantifying how much%).

The above-mentioned figures were also taken into account by each respondent when calculating expected data, in particular in relation to the determination of tax liability. Therefore, every respondent first conducted his or her own analysis of demand according to the specifics of his or her premises.

Furthermore, there were given questions related to how the available free funds generated by this legislative change would be used: amount and type of investment in fixed assets, criteria for decision making and the perceived risk associated with these investments. The data were processed for the month period. For respondents who reported a quarterly tax period, data were converted into average monthly values for the purposes of this analysis.

The sample size (number of respondents) of the population was determined in such a way to get representative data not only from the population as a whole but also from its subgroups. In cases where the research was conducted at institutions within the regional frame, the recommended sample size ranged from 200 to 500 respondents (Sudman, 1976). The samples of respondents were providers of catering services, hairdressing services, minor repairing of bicycles, shoes and leather goods. They were divided into several groups according to the subject of service and location of establishment.

By using data from the Czech Statistical Office, the number of respondents in the subgroups was determined. For the analysis of the subgroups of the population, it was necessary to make further adjustments to the last two subgroups. The data in Table 1 show that according to these calculations the sample size of the subgroup *minor repairing of shoes and leather goods* was only two respondents, while there were only three respondents for the subgroup *minor repairing of bicycles*. Such a set of number of respondents does not have sufficient statistical power.

In the case of the fulfilment of condition of the Moivre–Laplace theorem on the convergence of binomial distribution, there will be provided sufficient predicative ability. According to Newbold et al. (2007) and Wisniewski (1996), the normal distribution pro-

vides a good approximation for the binomial distribution when

$$nP(1 - P) > 9. \quad (1)$$

Table 1 The calculations to determine sample size

Population	13,472	100%	250 questionnaires
Restaurant services	8,658	64.27%	161
Hairdressing services	4,515	33.51%	84
Minor repairing of shoes and leather goods	122	0.91%	2
Minor repairing of bicycles	177	1.31%	3

Source: authors' calculations according to data from the Czech Statistical Office

By substituting the value $p = 0.5$ to relation (1), it is found that the condition of the Moivre–Laplace theorem is true if there were collected data from at least 36 minor repairing of shoes and leather goods and 36 minor repairing of bicycles:

$$n0.5(1 - 0.5) > 9 \\ 36 > 9.$$

Based on the application of relation (1), we expanded the sample size up to 317 respondents. The structure of the population is stated in Table 2. This step allowed analysing not only the population as a complex but also its subgroups (i.e. restaurant services, hairdressing services, minor repairing of shoes and leather goods and minor repairing of bicycles).

Table 2 Population and sample size according to the subgroups

Population	Sample size (number of respondents)
Restaurant services	161
Hairdressing services	84
Minor repairing of shoes and leather goods	36
Minor repairing of bicycles	36
Total	317

Source: authors' calculations according to data from the Czech Statistical Office

The overall size of the population was 317 respondents. The way of the determination of the sample size is in detail described in Randová and Krajňák (2012). After the adjustments, the sample size is sufficiently representative for the subsequent analysis. The paper analyses in detail the results for the segment hairdressing services.

The supporting information for the decision (data obtained from the questionnaire research) is entered into the criteria matrix A (Figure 1), where each element a_{ij} expresses the absolute utility of the i -th alternative when taking into account the j -th criterion. A_1 – A_n are alternatives, while C_1 – C_m criteria.

$$A = \begin{matrix} & A_1 & A_2 & \dots & A_n \\ \begin{matrix} C_1 \\ C_2 \\ \vdots \\ C_m \end{matrix} & \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1j} \\ a_{21} & a_{22} & \dots & a_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ a_{i1} & a_{i2} & \dots & a_{in} \end{pmatrix} \end{matrix}$$

Figure 1 Criteria matrix A

The construction principle of elements b_{ij} is based on the rule that the best value option (depending on the criterion character – maximisation or minimisation) is given the value 100, the worst value option 0 and the other elements directly proportionally to the absolute level of utility. This suggests the relative importance of matrix B (Figure 2), where each element b_{ij} expresses the relative utility of the i -th alternative when taking into account the j -th criterion.

$$B = \begin{matrix} & A_1 & A_2 & \dots & A_n \\ \begin{matrix} C_1 \\ C_2 \\ \vdots \\ C_m \end{matrix} & \begin{pmatrix} b_{11} & b_{12} & \dots & b_{1j} \\ b_{21} & b_{22} & \dots & b_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ b_{i1} & b_{i2} & \dots & b_{in} \end{pmatrix} \end{matrix}$$

Figure 2 Relative importance matrix

2.1 The determination of the weights of criteria

The weight of each criterion was determined by Saaty’s method. This is *one of the most used methods* (Jablonský, 2007) for estimating criteria weights. The advantage of this method is that it determines the preference value that is described by the number of elements from the selected scale. Saaty’s scale is set out in Table 3.

Table 3 Description of Saaty’s scale

Number of points	Descriptor
1	The criteria are equally important
3	The first criterion is slightly more important than the second criterion
5	The first criterion is rather more important than the second criterion
7	The first criterion is clearly more important than the second criterion
9	The first criterion is absolutely more important than the second criterion

Source: Fotr and Švecová (2010)

The elements of matrix s_{ij} describe the ratio of the relative importance of the elements – weights of criteria v_i and v_j . If the criterion in the line is more important than the criterion in the column, then the value of the preference criteria in the criteria line in the column is written to the relevant field. If the criterion in the column is more important than the criterion in a line, the inverse value of the preference is written into the field.

The elements on the diagonal become the values $s_{ii} = 1$, while the elements on the left triangular part are

the inverse values of the elements set out under the diagonal, as determined by equation (2)

$$s_{ij} = \frac{1}{s_{ji}} \tag{2}$$

The formation of Saaty’s matrix S in the following form (Figure 3) is the output.

$$S = \begin{matrix} & k_1 & k_2 & \dots & k_j \\ \begin{matrix} k_1 \\ k_2 \\ \vdots \\ k_i \end{matrix} & \begin{pmatrix} 1 & s_{12} & \dots & s_{1j} \\ \frac{1}{s_{12}} & 1 & \dots & s_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ s_{i1} & s_{i2} & \dots & 1 \end{pmatrix} \end{matrix}$$

Figure 3 Saaty’s matrix

This matrix is constructed by using the relative importance of the alternatives in terms of each criterion (Triantaphyllou and Sánchez, 1997). The weights of the final criteria v_i are determined by the approximate processes. For determining the weights v_i , the criteria are shown in (3):

$$v_i = \frac{R_i}{\sum_{i=1}^N R_i} \tag{3}$$

where R_i is the geometric mean of the lines of Saaty’s matrix. The geometric mean R_i is determined by equation (4):

$$R_i = \left[\prod_{j=1}^n s_{ij} \right]^{1/n} \tag{4}$$

where s_{ij} is the corresponding element of Saaty’s matrix. After determining the weights of the criteria, the weighted utility matrix C is established. The values of the matrix of the weighted utility C are obtained by the product of the weight of criterion v_i determined by Saaty’s method and the values from the simple utility matrix:

$$c_{ij} = v_i \cdot b_{ij} \tag{5}$$

where c_{ij} is the corresponding element of matrix C and b_{ij} is the corresponding element of matrix B.

2.2 Risk factors

All interviewed respondents are exposed to risk during decision making. In the risk matrix, the degree of risk is presented as the risk of each alternative and of how to use the available funds. The degree of threat DT is determined by the application of equation (6):

$$DT_n = w_n \cdot p_n \tag{6}$$

where w_n is the weight of the negative effect and p_n the probability of the negative effect.

The risk R represents the percentage degree of risk alternative A_n and the sum of the degrees of danger of all variants

$$R = \frac{DT_n}{\sum_{n=1}^n DT} \tag{7}$$

2.3 The choice of the optimal alternative

The calculation of the final effect E on which basis an optimal strategy is determined is based on

$$E = \frac{RU}{\sum_{R=1}^6 DT}, \quad (8)$$

where RU is utility and DT the risk of the alternative of using the available funds.

The alternative where E takes the highest value ($E = \max$) is recommended for realisation.

3. The application of the decision analysis for selecting the optimal use of available funds

The analysed data were obtained from the questionnaire research among respondents in the Moravian-Silesian region. There were 317 respondents in total. Respondents answered whether labour-intensive services eventually transferring from the standard to the reduced VAT rate (which is the matter of the Copenhagen Economics Study) would create available funds and how they would use them in the case of a positive answer. It was found that approximately in 98% cases this would be actually incurred.

3.1 Alternatives of the possible available funds usage

A total of 84 respondents from the hairdressing segment were asked. Except the data about the sum of turnover, sales, expenditures, number of respondents and trade margin, respondents were asked in which way they would use potential available funds. The alternatives and their usage are shown in Table 6 (in the Appendix).

On average, every respondent supposed the creation of available funds of about 8,175 CZK per month. If hairdressing services were burdened with only the reduced VAT rate, the VAT liability of respondents would decrease on average by this amount.

Analysis of individual alternatives

The *first alternative* (A_1) is increasing the number of employees. According to the research, the average wage of the analysed segment is about 14,000 CZK. The available funds could be used, for example, to take on a part-time auxiliary worker who would be employed on a contract for work. The conclusion of this type of contract does not bring about any obligation for the employer in the form of the payment of social and health insurance. Employing another worker would lead to the further improvement of working conditions or widening the range of services due to the specialisation of individual employees. Increasing sales (expected 2%) would be, on one hand, reflected by higher profit, and, on the other hand, by increasing expenditures (2%).

Except renting another employee, there is the *possibility* of increasing of wages to current employees (A_2). Each respondent has two employees on average. Respondents are, according to the results of the research, willing to increase the average wage of each of their

employees by 1,085 CZK. The rest of the available funds would be used for promoting their services. Raising the awareness of the services in the area would affect sales and expenditures (estimated growth of 4%).

Another alternative (A_3) of using the available funds is to ensure the development of the knowledge and skills of employees through training. Faster, more professional and better services increase demand, sales, profits but also expenditures. The expected growth of revenues and expenditures is 2%.

The *fourth alternative* (A_4) is the expansion of the range of services (e.g. sale of hair care products with expert advertising). The advantage of this alternative is the possibility of increasing sales and profit. The respondent should not forget, however, that in this case he or she would need to rent another employee whose job would involve providing the additional services. There is a presumption to rent an employee on a temporary or a part-time job with a salary of 4,000 CZK a month. The employer in this case is not obliged to pay social and health insurance from salaries. Owing to the additional services, sales would increase (by about 10%). However, for this additional service, there is a presumption of a higher margin, which is why the expected increase in expenditures is only 8%.

The *fifth alternative* (A_5) concerns the expansion of production capacity, e.g. by extending working hours by approximately three hours per day on weekdays and two hours per day on Saturdays. The average wage per hour is according to the research 92 CZK. This would lead to an increase in wage expenditures of 6,808 CZK a month. The owner of the establishment would pay the remaining part of funds to him- or herself as a reward for entrepreneurial risk-taking. The larger amount of outputs (increase in average sales and profit) would lead to increasing inputs (increasing expenditures).

If the respondent decided for the *sixth alternative* (A_6), he or she would use the funds to invest into short-term tangible assets, e.g. the purchase of a more modern dryer, hairdryers, quality hairdressing scissors, shampoo dispensers, coffee maker, etc. Using short-term tangible assets in the business would be reflected by a higher quality and more efficient services. This would lead to a decrease in expenditures per unit, sales growth and profit. The average increase in demand is expected to be 5%, which would result in an increase of sales by 4,400 CZK per a month. The expected return on investment is therefore only two months.

The *seventh alternative* (A_7) predicts paying these available funds to the owner of the establishment or to the partners. This alternative would lead neither to increasing expenditures (material, wages) nor to the possible risk of investments in assets. Anyway, it stagnates business activities, as the quality and range of services do not change. In addition, the skills and working conditions of employees do not change.

3.2 Criteria and their weights

Each of the respondents has different preferences of using the available funds that would arise in the case of the above-mentioned legislative change. This results in the various importance levels of criteria. According to the alternatives in Section 3.1. the following criteria were created:

- C₁ – personal expenditures
- C₂ – improvement in the working conditions of employees (training, retraining, better organisation of work tasks)
- C₃ – range and quality of supplied services
- C₄ – increasing expenditures for raw materials
- C₅ – return on investment
- C₆ – amount of remuneration paid to the owner, partners or shareholders
- C₇ – increasing profit

The higher the frequency of occurrence of the *j*-th criterion, which would be taken into account during the realisation of the selected alternative by respondents, the more important is the criterion.

Matrix of absolute utility

From the information obtained from the questionnaire research mentioned in Section 3.1, Table 3 is compiled that summarises the items of information. The criteria C₁, C₄, C₆ and C₇ are valued in CZK, while the criteria C₂ and C₃ are valued according to the level of benefit to the respondent (lowest benefit is valued 1, the highest benefit 6). Using the data shown in Table 7 (in the Appendix), the criteria matrix A is created (see Figure 4). The criteria C₁, C₄ and C₅ have minimisation characters, while the criteria C₂, C₃, C₆ and C₇ maximisation characters.

$$A = \begin{matrix} & A_1 & A_2 & A_3 & A_4 & A_5 & A_6 & A_7 \\ \begin{matrix} c_1 \\ c_2 \\ c_3 \\ c_4 \\ c_5 \\ c_6 \\ c_7 \end{matrix} & \begin{pmatrix} 22\ 745 & 16\ 470 & 14\ 300 & 18\ 300 & 21\ 108 & 14\ 300 & 14\ 300 \\ 4 & 2 & 6 & 5 & 3 & 3 & 1 \\ 3 & 2 & 5 & 6 & 4 & 2 & 1 \\ 909 & 1\ 818 & 909 & 3\ 636 & 1\ 363 & 1\ 818 & 0 \\ 0 & 0 & 0 & 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 0 & 1\ 367 & 0 & 8\ 175 \\ 8\ 941 & 9\ 707 & 8\ 941 & 12\ 911 & 10\ 590 & 10\ 087 & 8\ 175 \end{pmatrix} \end{pmatrix}$$

Figure 4 Criteria matrix absolute utilities A
Source: authors' calculations according to the data in Table 7

Simple utility matrix

The simple utility matrix B presented in Figure 5 is based on the application of the data from the matrix absolute utilities A. Since the criteria 1, 4 and 5 have minimisation characters, the element with the lowest value in matrix A is given the value 100, while the element with the highest value is given the value 0. The values of the remaining elements are determined proportionally. The opposite principle is applied to the criteria with maximisation characters.

$$B = \begin{matrix} & A_1 & A_2 & A_3 & A_4 & A_5 & A_6 & A_7 \\ \begin{matrix} c_1 \\ c_2 \\ c_3 \\ c_4 \\ c_5 \\ c_6 \\ c_7 \end{matrix} & \begin{pmatrix} 63 & 87 & 100 & 78 & 67 & 100 & 100 \\ 67 & 34 & 100 & 84 & 50 & 50 & 17 \\ 50 & 26 & 84 & 100 & 67 & 34 & 17 \\ 87 & 75 & 87 & 0 & 81 & 75 & 100 \\ 0 & 0 & 0 & 0 & 0 & 100 & 0 \\ 0 & 0 & 0 & 0 & 17 & 0 & 100 \\ 69 & 75 & 69 & 100 & 82 & 78 & 63 \end{pmatrix} \end{pmatrix}$$

Figure 5 Simple utility matrix B
Source: authors' calculations according to the data in Table 7

3.3 Determination of the weights of the criteria

By using the data on the preferences of individual alternatives obtained from the research, the weights of the criteria are defined. To determine the number of points, Saaty recommended a scale with descriptors as set out in Table 3. Saaty's matrix is documented in Figure 6.

$$S = \begin{matrix} & c_1 & c_2 & c_3 & c_4 & c_5 & c_6 & c_7 \\ \begin{matrix} c_1 \\ c_2 \\ c_3 \\ c_4 \\ c_5 \\ c_6 \\ c_7 \end{matrix} & \begin{pmatrix} 1 & 1 & 1/5 & 1/3 & 1/7 & 1/7 & 1/5 \\ 1 & 1 & 1/7 & 1/5 & 1/7 & 1/7 & 1/7 \\ 5 & 7 & 1 & 3 & 1/5 & 1/5 & 1/5 \\ 3 & 5 & 1/3 & 1 & 1 & 3 & 1/5 \\ 7 & 7 & 5 & 1 & 1 & 3 & 1 \\ 7 & 7 & 5 & 1/3 & 1/3 & 1 & 1/3 \\ 5 & 7 & 5 & 5 & 1 & 3 & 1 \end{pmatrix} \end{pmatrix}$$

Figure 6 Saaty's matrix
Source: authors' calculations according to the data obtained from the questionnaire research

Matrix consistency measured by the consistency index takes the value 0.016, which implies that the matrix meets the condition of consistency. By using equations (3) and (4), the weight of every criterion is determined. *The weights of the criteria are based on the geometric means of Saaty's matrix rows* (Zmeškal, 2009) (see Table 8 in the Appendix).

The values of the weighted utility matrix C (see Figure 7) are gained from equation (5).

$$C = \begin{matrix} & A_1 & A_2 & A_3 & A_4 & A_5 & A_6 & A_7 \\ \begin{matrix} c_1 \\ c_2 \\ c_3 \\ c_4 \\ c_5 \\ c_6 \\ c_7 \end{matrix} & \begin{pmatrix} 2.003 & 2.767 & 3.180 & 2.480 & 2.131 & 3.180 & 3.180 \\ 1.802 & 0.915 & 2.690 & 2.260 & 1.345 & 1.345 & 0.457 \\ 5.010 & 2.605 & 8.417 & 10.020 & 6.715 & 3.407 & 1.704 \\ 10.457 & 9.015 & 10.457 & 0.000 & 9.736 & 9.015 & 12.020 \\ 0.000 & 0.000 & 0.000 & 0.000 & 0.000 & 26.380 & 0.000 \\ 0.000 & 0.000 & 0.000 & 0.000 & 2.394 & 0.000 & 14.080 \\ 21.832 & 23.730 & 21.832 & 31.640 & 25.949 & 24.679 & 19.933 \end{pmatrix} \end{pmatrix}$$

Figure 7 Weighted utility matrix
Source: own source based on the data from the questionnaire research

By summarising the values in the column of matrix C, the total utility (TU) of the *i*-th alternative is determined in Table 4. Alternative A₆ (investment into tangible assets) shows the highest utility, while the smallest utility is for alternative A₂ (increasing wages to current employees). Before selecting the optimal alternative, it is also necessary to consider the negative effects of this implementation.

Table 4 TU alternatives A_1 – A_7

A_N	A_1	A_2	A_3	A_4	A_5	A_6	A_7
TU	41.11	39.03	46.58	46.40	48.26	68.01	51.37

Source: authors' calculations according to the data obtained from the questionnaire research

3.4 The negative effects and risk matrix

When selecting the optimal alternative, not only is utility taken into account but also the risk arising from the implementation of the selected alternative. There were selected as the negative effects of risk:

- R_1 – competition
- R_2 – return on invested funds
- R_3 – insolvency
- R_4 – keeping or increasing sales
- R_5 – increasing expenditures on raw materials
- R_6 – quality and reliability of employees

The weights of the negative effects R_1 – R_6 are determined in Table 9 in the Appendix by using the data from the questionnaire research. The significance of the six mentioned risk factors is determined as the average value for the analysed subgroup. The higher the weight of the negative effect, the more important is the selective negative effect in comparison with the remaining range of negative effects.

Risk matrix

By applying equation (6), the degree of threat (DT) is determined. The risk of the i -th alternative for every negative effect is determined in Table 10 in the Appendix according to equation (7). Table 10 contains seven alternatives (A_1 – A_N), where p is the probability of each alternative, DT the degree of the threat of each alternative and w the weight of each alternative.

Alternative 5 (investing funds for production capacity expansion) has the highest criticality degree. The supplier of the selected services can extend working hours or introduce another shift. He or she carries the risk because the demand of consumers might not be increased according to the first assumptions and the additional operation would bring about a loss. The least risky is alternative A_3 .

4. Assessment of the alternatives according to utility and risk

The advantage of the decision analysis is the fact that each alternative is assessed not only in terms of utility but also in terms the risk that comes with the realisation of each alternative. Table 5 shows the utility (U) and risk (R) of each analysed alternative in numerical order.

The final effect E of the i -th alternative is shown in Table 11 in the Appendix. E is determined by equation (8), where RU is the utility and DT the risk of the alternative of using the available funds. When evaluat-

ing the effect of the considered alternatives, the highest effect is alternative A_3 , the essence of which is using the free funds for staff training. This alternative would be recommended as optimal, as it shows the highest advantage of the utility above risk. The smallest effect is alternative A_5 (production capacity expansion) because of the high criticality degree, which approximates to own utility. If the supplier of this service took into account only the utility of the alternatives, he or she would realise alternative A_6 even though this alternative brings about a high level of risk.

Table 5 Utility and risk of alternatives A_1 – A_7

Numerical order	1	2	3	4	5	6	7
U Utility	6	7	5	3	4	1	2
R Risk	3	2	7	1	4	6	5

Source: authors' calculations according to the data obtained from the questionnaire research

5. Results and discussion

According to the results of the research carried out within the frame of the research project, the potential transfer of labour-intensive services (in this case, hairdressing services) from the standard to the reduced VAT rate would have a positive influence not only on the suppliers of these services but also on customers – even though many respondents refused to lower the prices of their services despite a decrease in their tax burden.

Using the available funds for investing into employee training (which was from the point of view of utility the best way) would lead to the development of employee skills, higher outputs and higher business efficiency. The services provided by highly qualified staff should surely withstand tough business competition, which would affect the growth in demand, and subsequently sales and profit.

From a microeconomic perspective, the growth in demand could lead to the creation of new job vacancies that could partly contribute to reducing unemployment and increasing the living standards of inhabitants. From a macroeconomic point of view (when evaluating the impact on the Moravian-Silesian region), similar conclusions arrive – a drop in unemployment and economic growth.

According to the opinions of the authors, it would be suitable to implement into the Czech legislation the provisions of the Directive 2009/47/EC that allows the Member State to burden the above-mentioned labour-intensive services with the reduced VAT rate. On one hand, the situation could lead to the decline in the revenues of the state budget in a short time period. On the other hand, when evaluating the effect from a long time period point of view, it could lead to higher demand for these services (in the context of the reduced

VAT rate), increasing wages to current employees or the creation of new job positions (in the context of direct taxes and social and health insurance and potentially decreasing social benefits). The specific evaluation of the impact from a macroeconomic point of view may be the subject of further research.

6. Conclusion

The aim of this paper was to determine the best way of using the available funds that would run to the suppliers of hairdressing services in the case of the transfer of these services from the standard to the reduced VAT rate. The evaluation of the results was carried out by using the decision analysis method. Furthermore, the approaches of comparison and the deductive method were used.

According to the data obtained by the questionnaire research, there was first determined the absolute utility and then the relative utility of the i -th alternative. As respondents took into account various criteria, the weight of each criterion was determined by Saaty's method, which allowed establishing a weighted utility matrix. The business environment was characterised by risk and uncertainty. Before selecting the optimal alternative, we also examined the negative effects of the implementation of the i -th alternative. The highest utility was for alternative A_6 (investment into tangible assets), whereas the least risky was for alternative A_3 (investment in human capital) because this showed the lowest negative effect.

Finally, it was found that the highest dominance of utility above risk was alternative A_3 , the essence of which is using the available funds for human capital, especially increasing the wages of current employees. Therefore, this alternative would be recommended to the suppliers of hairdressing services as the most appropriate use of the incurred available funds in the case of the above-mentioned legislative change.

References

- BIERMAN, H., BONINI, CH., HAUSMAN, W. (1986). *Quantitative Analysis for Business Decisions*. Irwin: Homewood.
- BONINI, CH., HAUSMAN, W., BIERMAN, H. (1997). *Quantitative Analysis for Management*. Irwin: Homewood.
- BUETTNER, T., WAMSER, G. (2009). The impact of non profit taxes on foreign direct investment: Evidence from German multinationals. *International Tax and Public Finance* 16(3): 298–320. <http://dx.doi.org/10.1007/s10797-008-9063-2>
- COPENHAGEN ECONOMICS. (2007). *Study on Reduced VAT Applied to Goods and Services in the*

Member States of the European Union. Copenhagen: Copenhagen Economics.

FOTR, J., ŠVECOVÁ, L. (2010). *Manažerské rozhodování*. Praha: Ekopress.

JABLONSKÝ, J. (2007). *Operační výzkum*. Příbram: Professional Publishing.

JENSEN, S., SCHJELDERUP, G. (2011). Indirect taxation and tax incidence under nonlinear pricing. *International Tax and Public Finance* 18(5): 519–532. <http://dx.doi.org/10.1007/s10797-011-9167-y>

NEWBOLD, P., CARLSON, W., THORNE, B. (2009) *Statistics for Business and Economics*. London: Pearson Education.

PLATTEEUW, Ch., PESTANA, P. (2011). *Quick Reference to European VAT Compliance*. Alphen aan den Rijn: Kluwer Law International.

RANDOVÁ, K., KRAJŇÁK, M. (2012). Selected aspects of the copenhagen economocs study on reduced VAT rates in the current conditions of the Moravian-Silesian region. *Financial Assets and Investing* 3(1): 21–41. <http://dx.doi.org/10.5817/FAI2012-1-2>

SCHENK, A., OLDMAN, O. (2007). *Value Added Tax. A Comparative Approach*. New York: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511618048>

SUDMAN, S. (1976). *Applied Sampling*. New York: Academic Press.

ŠIROKÝ, J. (2012). *Daně v Evropské unii*. Praha: Linde.

TRIANAPHYLLOU, E., SÁNCHEZ, A. (1997). A sensitivity analysis approach for some deterministic multi-criteria decision making methods. *Decision Sciences* 28(1): 151–194. <http://dx.doi.org/10.1111/j.1540-5915.1997.tb01306.x>

WISNIEWSKI, M. (1996). *Metody manažerského rozhodování*. Praha: Grada.

ZMEŠKAL, Z. (2009). Vícekriteriální hodnocení variant a analýza citlivosti při výběru produktů finančních institucí. In: *Finanční řízení podniků a finančních institucí*. Ostrava: VŠB-TUO, 485–490.

Other sources

European Commission, Taxation and Customs Union (2012). *Review of Existing Legislation on VAT Reduced Rates*. [online], [cit. 12. 03. 2012] available from <http://ec.europa.eu/taxation_customs/common/consultations/tax/2012_vat_rates_en.htm>.

Council Directive 2006/112/EC of 28 November 2006 on the common system of value added tax.

Council Directive 2009/47/EC of 5 May 2009 amending Directive 2006/112/EC as regards reduced rates of value added tax.

Value added tax act No. 235/2004 Coll., as amended.

Appendix

Table 6 Using the available funds of suppliers of hairdressing services

Alternative A _n	Number of respondents
A ₁ Increasing number of employees	3
A ₂ Increasing wages to current employees	11
A ₃ Training staff	13
A ₄ Range of services expansion	18
A ₅ Production capacity expansion	18
A ₆ Investments in tangible assets	46
A ₇ Increasing in profit-sharing payments to a business owner	44

Source: authors' calculations according to the data obtained from the questionnaire research

Table 7 Matrix of absolute utility

Criterion		A ₁	A ₂	A ₃	A ₄	A ₅	A ₆	A ₇
C ₁	CZK/month	22,475	16,470	14,300	18,300	21,108	14,300	14,300
C ₂	–	4	2	6	5	3	3	1
C ₃	–	3	2	5	6	4	2	1
C ₄	CZK/month	909	1,818	909	3,636	1,363	1,818	0
C ₅	Number of months	0	0	0	0	0	2	0
C ₆	CZK/month	0	0	0	0	1367	0	8,175
C ₇	CZK/month	8,941	9,707	8,941	12,911	10,590	10,087	8,175

Source: authors' calculations according to the data obtained from the questionnaire research

Table 8 Weights of criteria

Criterion	C ₁	C ₂	C ₃	C ₄	C ₅	C ₆	C ₇	Π	R _i	A _i
C ₁	1	1	1/5	1/3	1/7	1/7	1/5	0.0003	0.3095	0.0318
C ₂	1	1	1/7	1/5	1/7	1/7	1/7	0.0001	0.2614	0.0269
C ₃	5	7	1	3	1/5	1/5	1/5	0.84	0.9754	0.1002
C ₄	3	5	1/3	1	1	3	1/5	3	1.1699	0.1202
C ₅	7	7	5	1	1	3	1	735	2.5673	0.2638
C ₆	7	7	5	1/3	1/3	1	1/3	9.0741	1.3703	0.1408
C ₇	5	7	5	5	1	3	1	2625	3.0793	0.3164
									9.7331	1

Source: authors' calculations according to the data obtained from the questionnaire research

Table 9 Weight of negative effects

Negative effect – risk	The weight of the negative effect
R ₁ – competition	20.8
R ₃ – insolvency	17.3
R ₄ – keeping or increasing of sales	17.2
R ₂ – return of invested funds	16.9
R ₅ – increasing of expenditures on the raw material	16.3
R ₆ – quality and reliability of the employees	11.6

Source: authors' calculations according to the data obtained from the questionnaire research

Table 10 Risk matrix

Alternative Negative effect	w	A ₁		A ₂		A ₃		A ₄		A ₅		A ₆		A ₇	
		P	DT	p	DT	p	DT	p	DT	p	DT	p	DT	p	DT
1	20.8	0.25	5.2	0.25	5.2	0.25	5.2	0.5	10.4	0.5	10.4	0.25	5.2	0	0
2	16.9	0	0	0	0	0	0	0	0	0.5	8.45	0.5	8.45	0	0
3	17.3	0.25	4.33	0.25	4.33	0	0	0.25	4.33	0.25	4.33	0.25	4.33	0.5	8.65
4	17.2	0.25	4.3	0	0	0.25	4.3	0.5	8.6	0.5	8.6	0.5	8.6	0.5	8.6
5	16.3	0.25	4.1	0	0	0	0	0.25	4.1	0.5	8.15	0.5	8.15	0	0
6	11.6	0.5	5.8	0.5	5.8	0.5	5.8	0.25	2.9	0.25	2.9	0.25	2.9	0	0
$\sum DT$			23.73		15.33		15.3		30.33		42.83		37.63		17.25
R			13		8.4		8.3		16.7		23.5		20.6		9.5

Source: authors' calculations according to the data obtained from the questionnaire research where A_1-A_N are the alternatives, w is weight, p is probability and DT is degree of threat

Table 11 The global assessment of alternatives

A_N	1	2	3	4	5	6	7
RU	41.11	39.03	46.58	46.40	48.26	68.01	51.37
$\sum DT$	23.73	15.33	15.30	30.33	42.83	37.63	17.25
E	1.73	2.55	3.04	1.53	1.13	1.81	2.98

Source: authors' calculations according to the data obtained from the questionnaire research where RU is relative utility, DT is degree of threat and E is effect