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THE ROLE OF R&D AND LOCATION IN A CLUSTER ON TOTAL FACTOR PRODUCTIVITY GROWTH OF INDONESIAN MANUFACTURING

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Abstract

Indonesian manufacturing sector plays a key role in the effort to improve economic growth for making the largest contribution to the total GDP. However, the growth of manufacturing sector is still unstable and the realization of its growth is still below the expected target. On one hand, examining the total factor productivity (TFP) growth can help to explain the overall economic growth. On the other hand, R&D and industrial clustering have been considered as an important factor to improve the efficiency that leads to a higher TFP growth. This study attempts to examine the source that mainly driven the TFP and the determinant of TFP growth: particularly the effect of R&D activity and firms' location in the industrial cluster, since specific studies that investigate the effect of both factors are still limited. This study uses balanced panel data of Indonesian large and medium manufacturing firms in the chemical, textile, food and metal sectors for the period from 2003 to 2013. This study employs stochastic frontier analysis to calculate the efficiency and TFP growth decomposition. The finding shows that TFP growth on the chemical, metal, food and textile sector are 5.8%, 3.3%, 7.3% and 6.4%, respectively. The technical progress mainly contributes to TFP growth of all four sectors. Additionally, the result also shows that the R&D activity significantly affects the growth of TFP in the food and chemical sectors. Furthermore, the industrial cluster positively affects TFP growth in the food and textile and metal sectors, while it negatively affects the TFP growth in the chemical sector.

Key words

TFP growth, Efficiency, Manufacturing, Indonesia, R&D

INTRODUCTION

The industrial sector plays a key role in the effort to improve the economic growth. This sector can support the acceleration of GDP growth since it makes the largest contribution to the total GDP. The government has acknowledged the importance of this sector by targeting the industrial share at 24 to 30% of total GDP by 2020 and the

average growth rate of the industrial sector to reach 9.5 percent in the period of 2010-2020 (Ministry of Industry, 2012: 11). However, the growth of the industry is still unstable, and the realization is still below the expected target. The growth of medium and large manufacture production index plummeted in 2006 at -1.63%. In the next period from 2010 to 2015, the growth index slightly increased even though there was a decrease in 2014 and 2015. In 2015, the share of manufacturing to total GDP reached 21.5% and the growth of non-oil and gas manufacturing 5.34% in 2014. Both are still under the targets.

This uneven growth has been triggered many scholars to study what factors that lead the slowing economic growth and what factors that trigger it. Productivity has been viewed to have an important role in explaining the overall economic growth. By examining the total factor productivity (TFP) growth, we can see the other factors of the growth of output that are not accounted for, by the growth of the inputs in the production function. The growth accounting method is one way to measure the sources of growth by distinguishing input growth as one source and TFP growth reflected in the residual as a second source of growth. Furthermore, there is another way to analyze the source of TFP growth more deeply by decomposing the TFP. Unlike the growth accounting method, the decomposition of TFP growth assumes that not all firms are fully efficient in their production process, which is more relevant to the real world. Moreover, with the decomposition method we can identify the contributing factors of TFP growth.

Several studies have been conducted to examine the TFP growth of the Indonesian manufacturing sector using the decomposition method (Ikhsan, 2007; Margono & Sharma, 2006; Suyanto et al, 2009). However, none of these studies accounted for R&D activity and the location of firms in an industrial area as possible determinants of TFP growth. Griffith et al, (2004) note two channels where the R&D can have an impact on TFP growth. R&D activity of firms generates product and process innovation that leads to TFP growth. It also can create knowledge diffusion which works at three levels: as basic research, as applied research in the private sector and as applied research in the academic and state research institute. This knowledge diffusion will affect the long-run growth in the economy as reflected in the improvement of TFP growth.

Along with R&D, industrial clustering is also considered as an important factor to improve the efficiency of firms that leads to a higher TFP growth. Porter (1998) notes that firms can operate more productively as a member of a cluster since it benefits the members with better access to employees and suppliers, access to specialized information, and the complementarities as a host of industry linkages among member firms. Several studies found that the cluster of small-scale industries in Indonesia has a significant impact on the productivity of the firms (Najib et al, 2011; Berry et al, 1999). The positive effect from clustering on the productivity of small-

scale industries has made the Government of Indonesia to advocate the clustering for larger and medium manufacturing in the national industrial policy (Tijaja & Faisal, 2014: 14).

Since the specific studies that investigate the effect of R&D activity and the industrial cluster are still limited, this study aims to fill the gap by examining the role of firms' R&D activity and the industrial cluster on the efficiency and total factor productivity growth of the Indonesian manufacturing sector.

LITERATURE REVIEW

The pivotal point of TFP growth in explaining the economic growth can be traced back to the study of Abramovitz (1956) who argues that the TFP growth might be interpreted as a proxy to measure the economic growth. Solow (1957) proposes that the TFP growth might explain the difference in income per capita across countries and Romer (1990) provides a theoretical study to show that TFP endogenously explains the economic growth. The study by Klenow and Rodriguez-Clare (1997) argues that TFP growth represents 90% of the difference of output growth across nations.

Total factor productivity growth is the residual of the output growth that cannot be accounted for by inputs growth in the production function. The decomposition of TFP growth to the components of technical progress, technical efficiency and scale of firm operation explains the source of economic growth beyond those reflected in the production function.

In the case of Indonesia, the sharp difference of growth in the manufacturing sector before and after the economic crisis in the mid 1990's has led the increasing number of studies on productivity growth in this sector. Some of the studies estimate the TFP growth of the manufacturing sector in Indonesia, including a study by Timmer (1999) that find that annual TFP growth in Indonesian manufacturing during 1975-1999 was 2.8%. Aswincahyono and Hill (2002) note that the average TFP growth of Indonesian manufacturing during 1975-1993 was 2.3%. The growth increased between 1976 and 1981, but declined during the period 1981-1993 with negative growth rate of -4.9% per annum. Margono and Sharma (2006) study the TFP growth of four sectors of Indonesian manufacturing namely the chemical sector, food sector, metal sector and textile sector during 1993-2000 using the stochastic frontier model. They found that the productivity of the chemical, textile and metal sector decreases in that period but the productivity of chemical sector increases at the rate of 0.5%. The decomposition method identified that the growth is driven positively by technical efficiency changes in all four sectors; however, there is a decreasing technological progress in all four sectors during this period. Ikhsan (2007) studies the TFP growth in Indonesian manufacturing in the period 1988-2000 considering the

liberalization policies and the economic crisis in 1997. Using the stochastic frontier analysis with TFP decomposition, the finding showed that TFP grew by 1.5% between 1988 and 2000. The TFP growth is mostly driven by the technical progress and there is the negative trend in technical efficiency change reflecting the learning process of technology adoption that has not been used efficiently.

In analyzing the manufacturing sector, the study of the efficiency of firms is also important to measure industry performance. The level of efficiency in the industrial sector indicates how well the firms in that industry can produce maximum output with a given set of inputs. With the frontier approach introduced by Farrel (1957) we can examine the efficiency of firms in an industry by measuring the maximum production on the frontier and the actual production that is not on the frontier. This approach assumes that firms may operate below the frontier due to inefficiency.

The main independent variables used in this study are R&D, and location in an industrial area (hereafter cluster). The impact of R&D is expected to come from two channels that reflect the two faces of R&D (Griffith et al, 2004). On one hand, R&D generates process innovation by producing products more efficiently (for example: lower cost) or product innovation such as creating new products with better technology that will improve the TFP. On the other hand, R&D also can promote the absorptive capacity (Cohen % Levintahl, 1989; Zahra & George, 2002). It allows the identification, assimilation and exploitation of innovation by other R&D agents such as universities, specialized research institutes and other firms engaged in R&D that leads to improvement in TFP.

The idea that a cluster affects industrial performance and increases the competition was popularized by Porter (1998). He notes that firms can operate more productively as a member of a cluster. A cluster provides benefits for the members with better access to employees and suppliers, access to specialized information, and the complementarities as a host of industry linkages among member firms. Najib et al, (2011) find that small and medium firms in the food processing sector located in a cluster area have a higher performance compared to firms not located in a cluster due to the support from the government and the location that benefits to increase the performance of the firms in the cluster area. Another study by Berry et al, (1999) find that the clusters of small-scale industries in Indonesia have a significant impact on productivity due to the economy of scale in the purchasing of raw material and machinery, sale of output and spreading the economic risk.

METHODOLOGY

This study employs three-step estimation to examine the role of R&D activity and cluster on firms' TFP growth. First, we estimate the efficiency with stochastic frontier analysis using the Translog production function. From the first estimation, then we calculate the decomposition of TFP such as: technical efficiency change (TE), scale

component change (SC) and technological change (TC). Then we calculate the TFP growth as the summation of that three decompositions. Finally, in the third step, we construct the regression model to examine the role of R&D and cluster on the TFP growth.

In analyzing the efficiency of firms, the concept of frontier production function can be used to explain the maximum output that can be achieved by firms with given inputs under the technology reflected in its production function. Firms are technically efficient if they can operate on the frontier while firms that fall below the frontier are not technically efficient. The stochastic frontier approach can be used to estimate the inefficiency of firms by comparing the firms' actual output to the output level at the frontier. First, the level of output on the frontier that can be achieved if all available factors of production are used efficiently must be decided, as:

$$y_{it}^{*} = f(x_{it};\beta)\exp(\mathrm{v}_{it}), \tag{1}$$

y*it is the efficient level of output of the ith firm at time t, x_{it} is a vector of inputs for the ith firm at time t, β denotes as the parameters to be estimated, and v_{it} is a random error independently distributed as N(0, σ^2_v). The error captured on the frontier represents the random effect that cannot be controlled by firms. The output of firms (y_{it}) cannot surpass the frontier efficient level y^*_{it} since the technical inefficiency is embedded in the firm itself. However, firms can have a lower output level due to the inefficiency from the management, such as non-optimal usage of input during the production process. Then, the difference between the maximum and the actual output can be defined as the production inefficiency that is represented by an exponential factor of u_{it} on the equation below:

$$y_{it} = y_{it}^{*}\exp(-\mathrm{u}_{it}), \tag{2}$$

where $u_{it} \geq 0$ and $u_{it} \sim N^{+}(\mu, \sigma^2_u)$

Next, equation (1) and (2) can be combined to get a production function that captures the inefficiency as below:

$$y_{it} = f(x_{it};\mathrm{t},\beta)\exp(\mathrm{v}_{it}-u_{it}) = f(x_{it};\mathrm{t},\beta)\exp(\varepsilon_{it}) \tag{3}$$

where ε_{it} is the error term composed of v_{it} and u_{it} (i.e., $\varepsilon_{it} = v_{it} - u_{it}$),which are independent from each other and the time trend t is used to capture the technological change.

Rearranging the equation (2) we can measure the technical efficiency as a ratio of actual output to the maximum possible output.

$$TE_{it} = \frac{y_{it}}{y_{it}^{*}}, \; = E\left[\exp(-u_{it})|\varepsilon_i\right] \tag{4}$$

TE_{it} is the technical efficiency for the ith firm at time t and because $u_{it} \geq 0$, the ratio value will be between 0 and 1.

At the next step, a production function must be described in the functional form in equation (3) to measure the technical efficiency. Translog production function is employed in this study because this function is the most suitable production function after being tested with other production functions such as: Cobb-Douglass, Hicks-neutral and no technological progress production function. The equation of Translog production function, therefore was written in the following form:

$$\begin{aligned}\ln y_{it} &= \beta_0 + \beta_k \ln k_{it} + \beta_l \ln l_{it} + \beta_m \ln m_{it} + \beta_T T \\ &+ \frac{1}{2}\left[\beta_{kk}(\ln k_{it})^2 + \beta_{ll}(\ln l_{it})^2 + \beta_{mm}(\ln m_{it})^2 + \beta_{TT} \ln T^2\right] + \beta_{kl} \ln k_{it} \ln l_{it} \\ &+ \beta_{km} \ln k_{it} \ln m_{it} + \beta_{lm} \ln l_{it} \ln m_{it} + \beta_{kT} T \ln k_{it} + \beta_{lT} T \ln l_{it} + \beta_{mT} T \ln m_{it} + v_{it} - u_{it}\end{aligned} \quad (5)$$

where y is gross total output, k is capital, l is labor, m is material, T is t year and subscripts i and t indicate the i^{th} firm at t year for period 2003-2013 for each industry. This study assumes that all manufacturing sectors have the same production process and all inputs are given for each firm. Each firm makes its own decision to use a certain level of input to produce the output. Thus in that equation, output is the only endogenous variable used while capital, labor and intermediate input are the exogenous variables that influence the output.

From the Translog production function estimation, we can get useful economic information of how much output will increase when the level of inputs increases by examining the elasticity of output with respect to each input. This study follows the estimation of elasticities of output that used in Margono and Sharma (2006) with respect to capital, labor and material. Hence the elasticity of output with respect to capital, ek is estimated by:

$$e_k = \beta_k + \beta_{kk} \ln k_{it} + \beta_{kl} \ln l_{it} + \beta_{km} \ln m_{it} + \beta_{kT} T \quad (6)$$

whereas the elasticity of output with respect to labor el, is estimated by:

$$e_l = \beta_l + \beta_{ll} \ln l_{it} + \beta_{kl} \ln k_{it} + \beta_{lm} \ln m_{it} + \beta_{lT} T \quad (7)$$

and the elasticity of output with respect to materials, em is estimated by

$$e_m = \beta_m + \beta_{mm} \ln m_{it} + \beta_{lm} \ln l_{it} + \beta_{km} \ln k_{it} + \beta_{mT} T \quad (8)$$

Those elasticities are estimated at their mean values and the return to scale are estimated by summing up all the individual elasticity of output with respect to each input:

$$RTS = ek + el + em \quad (9)$$

This study obtained the total factor productivity (TFP) growth by the decomposition method following Kumbhakar and Lovell (2000: 286). The TFP growth denoted by $T\dot{F}P$ is decomposed into three parts: rate of *technological change (TC)*, *a scale component (SC)* and a change in *technical efficiency (ṪE)*. The *technological change* is a partial derivative of production function with respect to time; *scale component* is the elasticity of inputs contribution at the production frontier; and *technical efficiency change* is a derivative of technical efficiency with respect to time. That decomposition can be estimated with the equations below:

$$TC = \frac{\partial \ln(y_{it})}{\partial T} = \beta_T + \beta_{TT} T + \beta_{kT} \ln k_{it} + \beta_{lT} \ln l_{it} + \beta_{mT} \ln m_{it}, \tag{10}$$

$$SC = (\text{RTS}-1)\sum_j \left(\frac{e_j}{RTS}\right)\dot{x}_j, \tag{11}$$

$$\dot{TE} = -\frac{\partial u_{it}}{\partial t} \tag{12}$$

In the equation (11), the subscription j represents the inputs (capital, labor and material). e_j is elasticities of output with respect to input j,and $\dot{x}_j$ is the rate of change of input j. Thus, using the decomposition method, the TFP growth can be calculated as:

$$\begin{aligned} T\dot{F}P &= TC + SE + \dot{TE} \\ &= (\beta_T + \beta_{TT} T + \beta_{kT} \ln k_{it} + \beta_{lT} \ln l_{it} + \beta_{mT} \ln m_{it}) + (RTS - 1)\sum_j \left(\frac{e_j}{RTS}\right)\dot{x}_j - \frac{\partial u_{it}}{\partial t} \end{aligned} \tag{13}$$

To examine the role of R&D activities and cluster on the industry total factor productivity, we consider the following economics model as the function of firms' R&D activity, cluster and other control variables such as:

$$T\dot{F}P_{it} = f\left(RD, Cluster, X\right) \tag{14}$$

Where *TFP growth* ($T\dot{F}P$) is the dependent variable, *RD* is R&D variable that represent the R&D activity conducted by the firms and *cluster* is cluster variable that represent if the firm located in industrial cluster or not and the *X* is a set of control variables. The econometric equation of that model takes the following form:

$$\begin{aligned} T\dot{F}P_{it} = {} & \beta_0 + \beta_1 RD_{it} + \beta_2 Cluster_{it} + \beta_3 MAR_{it} + \beta_4 RD * MAR_{it} + \beta_5 \text{lAge}_{it} + \beta_6 \text{lAge}2_{it} \\ & + \beta_7 Export_{it-1} + \beta_8 Ownership_{it} + \beta_9 Regional_{it} + u_i + \varepsilon_{it} \end{aligned} \tag{15}$$

In the equation (15), *i* represents the *i*th firm, *t* represents time in years from 2003 to 2013. $T\dot{F}P$ is total factor productivity growth, *RD* is dummy R&D variable of firm, *cluster* is dummy of firms' location in industrial cluster, *MAR* is the concentration of

industry as proxy of competition, *RD*MAR* is the interaction variable that represents firms' R&D activity in concentrated area, *lAge* is firm's age, *lAge2* is a square of firm's age, $Export_{it-1}$ is lag of export dummy variable in t-1, *Ownership* is the ownership of firm, *Regional* is dummy regional variable, u is the individual or group effect that affect the TFP growth, while ε is the residual.

This study used unpublished firm level data from the annual survey of medium and large sized manufacturing firms conducted by Statistic Indonesia. A second data source is the World Bank for wholesale price index (WPI) which is used as a deflator for monetary variables. To get the balanced data for the period of 2003-2013, this study conducted several data adjustments. During the data preparation process, several adjustment steps were conducted in this study, by removing the zero and negative values; cleaning for noise by removing the outliers from the dataset; choosing only four selected sectors of industries of two digit of ISIC version 4 (chemical, food, metal and textile); deflating all monetary variables with wholesale price index provided by World Bank data at constant 2003 price; and constructing a balanced panel by matching firms in the selected period based on their identification codes. After the adjustment process and construction of the balanced panel data, the observations for each sector of the industry come to 3,530 observations for the chemical sector, 14,160 observations for the food sector, 360 observations for the metal sector and 4,130 observations for the textile sector. Since the data of R&D variable only available in 2006 and 2011, this variable for the period 2003-2010 followed the 2006 data and for the period 2011-2013, this variable is defined as equal to 2011.

RESULTS

Firstly, the model of production function form is needed to be decided first. There are four production functions to be tested, namely: Translog, Hicks-neutral, No-technological progress and Cobb-Douglass production function. The null hypotheses are Hicks-neutral, No-technological progress and Cobb-Douglass production function as the suitable production function. The alternate hypothesis is the Translog production function as the suitable production function. This study employed the generalized likelihood statistic to the test performed on the relevant null hypothesis with the formula below:

$$\lambda = -2\left[l(H_0) - l(H_1)\right] \square \ \chi^2_{0.99} \qquad (16)$$

Where λ is a likelihood ratio statistic , l(H1) is the log likelihood value of the Translog production function and l(H0) is the log likelihood value of the other production function. The critical value for this test is taken from Table 1 of Kodde and Palm (1986). The summary of the result of this test is presented in the Table 1. The result shows that the Translog production function is found to be the suitable form of the production function for this study to represent the data. For that reason,

the Translog production function is used to estimate efficiency and productivity growth.

TABLE 1. RESULT OF PRODUCTION FUNCTION TEST

Production Function	H_0	χ^2 (0.99)	Chem Λ	Food λ	Metal λ	Text λ	Conclusion
Hiks Neutral	$\beta_{kT}=\beta_{lT}=\beta_{mT}=0$	10.50	25.89	849.40	38.65	84.59	**Reject Hiks Neutral**
No-technological progress	$\beta_T=\beta_{kT}=\beta_{lT}=\beta_{mT}=\beta_{TT}=0$	14.33	396.06	3293.16	123.15	592.37	**Reject No-technological**
Cobb-Douglass	$\beta_{nk}=\beta_t=\beta_{kT}=\beta_{lT}=\beta_{mT}=\beta_{tt}=0$	24.05	774.96	5660.47	197.75	3275.42	**Reject Cobb-Douglass**

The result of estimation of the stochastic frontier model in the four sectors of industries is shown in the Table 2. The coefficient of year indicating the annual technical progress in the four sectors is all significant at 1% level. In the textile and chemical sectors, the coefficient of year and year square showed that there was an annual technical progress, however at the certain time it would turn out to be the technical regress. In contrast, the metal sector showed that there was an annual technical regress and at the certain point of year it would turn out to be the technical progress. No significant coefficient variable of year square in the food sector showed that the annual technical progress in this sector will keep increasing through time.

The interaction coefficient of the year with labor in all sectors is positive suggesting that the technical progress for those sectors has been labor saving. While in the interaction of year and material, the significant and negative value of the coefficient shows that the technical progress is material using for all four sectors. The interaction coefficient of year and capital has a value near to zero for all sectors but the significant value is only shown by the textile sector.

The coefficient of interaction variables between capital-material, labor-material and capital-labor in the four sectors are negative and significant at 1% level, suggesting a complementary effect between those variables. The gamma coefficient represents the annual percentage change in inefficiency. Since the efficiency of the metal sector is time invariant, this sector does not have a gamma coefficient, indicating that there is no improvement nor decline on inefficiency along this period. The percentage change in inefficiency for the chemical, textile and food sector is 1.9%, 3.2% and 6.5% per annum respectively.

TABLE 2. ESTIMATION OF STOCHASTIC FRONTIER

Variables	Parameter	Chemical Loutput		Metal Loutput		Textile Loutput		Food Loutput	
		Coef	Std Err	Coef	Std Err	Coef	Std Err	Coef	Std Err
*L*capital	β_k	0.178***	0.036	0.000	0.102	0.192***	0.026	0.202***	0.015
*L*labor	β_l	1.142***	0.108	2.388***	0.309	0.814***	0.057	1.082***	0.040
*L*material	β_m	0.125***	0.026	0.289***	0.102	-0.121***	0.009	0.106***	0.012
*l*capital2	β_{kk}	0.038***	0.003	0.039***	0.006	0.029***	0.003	0.034***	0.001
*l*labor2	β_{ll}	0.055**	0.022	-0.075	0.062	0.048***	0.012	-0.016**	0.009
*l*material2	β_{mm}	0.068***	0.001	0.073***	0.003	0.065***	0.001	0.070***	0.001
capital*labor	β_{kl}	-0.011**	0.005	-0.006	0.011	-0.033***	0.005	-0.007***	0.003
capital*material	β_{km}	-0.028***	0.002	-0.024***	0.005	-0.015***	0.001	-0.028***	0.001
labor*material	β_{lm}	-0.056***	0.003	-0.097***	0.018	-0.023***	0.001	-0.043***	0.002
Year	β_T	0.190***	0.021	0.271***	0.068	0.174***	0.013	0.283***	0.009
year2	β_{TT}	-0.005***	0.002	0.008**	0.004	-0.003**	0.001	0.000	0.001
year*labor	β_{Tl}	0.002	0.003	0.021***	0.007	0.005***	0.002	0.015***	0.001
year*material	β_{Tm}	-0.005***	0.001	-0.019***	0.004	-0.004***	0.000	-0.015***	0.001
year*capital	β_{Tc}	-0.003	0.002	0.000	0.004	-0.003**	0.001	0.000	0.001
Constant		6.192***	0.386	2.174**	1.242	7.854***	0.188	5.425***	0.144
γ		-0.019***	0.006			0.032***	0.010	0.065***	0.004
Usigmas		-0.570***	0.132	-1.608***	0.466	-1.609***	0.137	-0.068	0.066
vsigmas		-1.746***	0.025	-2.152***	0.075	-2.157***	0.022	-2.209***	0.013
Log Likelihood		-2571.70		-170.34		-1885.61		-6836.75	
Number of observation		3,883		396		4,543		15576	
*** p<0.01, ** p<0.05, * p<0.1									

Table 3 shows the elasticity of output with respect to capital, labor and material in the four sectors. The value of return to scale in the chemical and food sectors for more than 1.05 indicates that those sectors have a mild increasing return to scale. The values of RTS of metal and textile sectors for less than 1.05 indicates that those sectors exhibit the constant return to scale. The elasticity of output with respect to material is the largest compared with capital and labor. Therefore, we can say that the output in all sectors is mainly driven by the material rather than by capital and labor.

TABLE 3. ELASTICITY OF OUTPUT WITH RESPECT TO CAPITAL, LABOR AND MATERIAL

Sectors	e_l	e_k	e_m	RTS
Chemical	0.333129	0.140771	0.578533	1.052432
Food	0.352281	0.118454	0.592467	1.063202
Metal	0.265239	0.080389	0.677077	1.022704
Textile	0.378432	0.153547	0.439539	0.971518

Table 4 shows that the *TFP growth* is driven primarily by the positive technical change in all four sectors. Since the technical change represents the shift in the production function, this result reflects progress in the production function due to the technology improvement in Indonesian manufacturing.

In the chemical sector, the *TFP growth* is driven by the positive change in technical efficiency, scale component, and technological change. While in the metal sector, the scale component gives the negative contribution that offset the positive contribution of *TC* growth. The scale component measures the advantage of the economies of scale. The negative sign implies that when a firm increases the output, the cost per unit input also increasing. In this case, firms in the metal sectors must face the higher per unit input cost if they want to expand their output. In the food sector, the *TFP* growth due to the positive contribution of the *technical change* along with the scale component. However, the negative change in the *technical efficiency* offsets the positive change in the two other decompositions. The negative sign in the *technical* efficiency change indicates the inability of firms in using the available technology in the production process. Less output is produced with the same amount of input or the same amount of output is produced with more input. In textile sector, the negative technical efficiency and scale component offset the positive change of technical change in the decomposition of its TFP growth.

TABLE 4. THE DECOMPOSITION OF TFP GROWTH, 2003-2013

Variable	Chemical		Metal		Food		Textile	
	Obs	Mean	Obs	Mean	Obs	Mean	Obs	Mean
TC	3,530	0.043	360	0.068	14,160	0.109	4,130	0.092
TEC	3,530	0.013	360	0	14,160	-0.042	4,130	-0.010
Scale	3,530	0.002	360	-0.036	14,160	0.006	4,130	-0.018
TFP	3,530	0.058	360	0.033	14,160	0.073	4,130	0.064

Among the four sectors, the significant coefficient of *RD* only occurs in the chemical and the food sectors, as shown in the Table 5. In the food sector, firms that conduct R&D activity in a competitive location significantly have higher TFP growth than

firms without R&D activity. Meanwhile, in the chemical sector, the significant coefficient of *RD* and *RD*MAR* indicates that firms in the competitive location with R&D activity have lower *TFP growth* than firms without R&D activity. The insignificant coefficient of *RD* in the metal and the textile sectors indicate that there is no difference of total factor productivity growth between firms with R&D activity and without R&D activity in both sectors. Even though the firms with R&D activities in the chemical sectors have less TFP growth compared with firms without the R&D activities and for the other sectors the firms with and without R&D activity shows no different in the TFP growth, it doesn't mean that the R&D activity has negative or no effect on the TFP growth of the firms. If the information about the performance of R&D activity of firms is available, we could further examine the impact of firms' R&D activity on their TFP performance.

The effect of *cluster* shows positive, significant results for *TFP growth* in the food, metal and textile sector. This means that firms located in a cluster get higher TFP growth in those three sectors. This result in line with the argument by Porter (1998) who states that being in a cluster will benefit the firms and increase their productivity. While for the chemical sector, the negative sign of *cluster* shows that firms located in a cluster get lower TFP growth compared with firms that not located in the cluster. Firms that located in the industrial cluster can also have the negative effect of congestion that cause the increasing in the cost of production such as excessive pollution, and higher infrastructure cost because of the emergence of new firms in cluster area (Press, 2006: 54). The negative sign in this result indicates the congestion effect of cluster that gives negative effect on a firm's productivity in the cluster.

The estimation results on the age variable show that as the firms get older, they are becoming more productive (in the food, chemical and textile sectors). However, when they reach a certain age, their productivity will decline. This finding indicates that the learning process and accumulation of experience through time tend to promote TFP Growth. The export dummy variable is statistically significant and has a positive effect on the productivity only on chemical sector. This finding indicates that firms in that sector that conduct an export activity tend to achieve a higher growth in total factor productivity. This result confirms Greenaway and Keller (2007) study that a firm can get "learning effect" from the export activity and imply their improvement in productivity. Meanwhile, the regional dummy variable shows the various result for the four sectors.

Finally, this study recommends some insights for the future research. In this study, only a dummy variable for R&D activity was employed. However, a more precise result might be obtained when using research expenditure as the proxy of R&D activity. In addition, a study that includes other information related to R&D activities such as the number of R&D employees, the level of education of the R&D

employees or the number of patents might offer a more comprehensive analysis to the related research.

TABLE 5. RESULT OF TFP GROWTH REGRESSION IN FOUR INDUSTRIAL SECTORS

VARIABLES	(1) Chemical TFP	(2) Food TFP	(3) Metal TFP	(4) Textile TFP
RD	-0.0114**	0.0103**	-0.0768	-0.0371
	(0.00580)	(0.00388)	(0.0702)	(0.0264)
Cluster	-0.517***	0.135***	0.0465**	0.429*
	(0.0324)	(0.0144)	(0.0198)	(0.232)
MAR	0.000277	0.00726**	-0.0193	0.00110
	(0.00146)	(0.00298)	(0.0126)	(0.00530)
RD*MAR	0.00172*	0.00538**	0.0282	-0.00747
	(0.00088)	(0.00174)	(0.0266)	(0.00620)
***L*age**	0.0846***	0.0601***	-0.127	0.124**
	(0.0117)	(0.00928)	(0.197)	(0.0489)
***l*age2**	-0.0471***	-0.0322***	0.0193	-0.0360***
	(0.00274)	(0.00265)	(0.0348)	(0.0103)
Lag of export	0.00738**	0.00105	-0.0127	-0.0207
	(0.00345)	(0.00315)	(0.0304)	(0.0126)
Ownership	-4.14e-05	-3.02e-05	5.45e-05	0.000594
	(7.83e-05)	(2.59e-05)	(0.000242)	(0.000542)
Regional Dummy	0.408***	-0.158***	-0.0185	-0.574
	(0.0264)	(0.0104)	(0.0652)	(0.238)
Constant	0.169***	0.170***	0.300	0.186***
	(0.0188)	(0.00940)	(0.283)	(0.0514)
Observations	3,517	14,103	360	4,121
R-squared	0.412	0.376	0.110	0.117
F	11.33	102.3	-	5.727
P-value	0.0000	0.0000	-	0.0000
Number of firms	353	1416	36	413

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

CONCLUSION

This study examine the role of R&D activity and firms' location in an industrial cluster to the total factor productivity growth for manufacturing sector in Indonesia using a balanced panel data in four sectors of manufacturing (chemical, food, textile and metal). Stochastic frontier analysis is employed to estimate the efficiency of firms and decomposed the total factor productivity growth.

The finding shows that R&D activity significantly affects the TFP growth of firms on the food and chemical sectors. However, R&D activity does not significantly affect the metal and textile sectors. These results might be due to the data limitation used in this study that not capture the performance of the R&D unit of firms specifically. Additionally, compared to the firms that are not located in cluster, on the food, metal and textile sectors, the firms that perform their activities in the industrial cluster tend to gain a higher TFP growth. Nevertheless, on the chemical sector, the firms that are located in a cluster is found to get lower TFP growth compared to firms outside industrial cluster, indicating the congestion effect of cluster. These findings conclude that in general, being in a cluster will benefit the firms to get higher TFP growth. However the congestion effect also should be considered to avoid the negative effect of the cluster. The results of this study also show that TFP growth on chemical, metal, food and textile sector are 5.8%, 3.3%, 7.3% and 6.4% respectively. The technical progress mainly contributes to the total factor productivity growth.

RECOMMENDATION

The main finding of this study indicates that R&D activity and industrial cluster positively affect the TFP growth of the firms. Therefore, to stimulate the improvement of TFP growth, the government should give incentive to encourage the firms conducting R&D activity and continue the policy of industrial cluster to stimulate the innovation by taking account the congestion effect of the cluster. In addition, the quality of labor must always be enhanced to improve the adaptation of technology.

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OPEN ACCESS ARTICLE

FUTURE SCENARIOS AND EFFICIENT TRANSPORTATION 2030 – DB SCHENKER

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Abstract

This paper refers to a vision of the future in terms of logistics and transportation provided and developed by the team from the worldwide company of German origin, DB Schenker. This company is among the best in the area, not just the perfect function in over 2,000 locations around the world and actually works with great success, but recently released and presented his plan or vision for the future scenarios in terms of transport and logistics Germany. First growth of logistics in Germany is shown as a percentage, and then through pictures and urban planning are shown visions or future scenarios to be completed by 2030. In this study is used the method of research for both current and previous logistic situations in Germany, and the vision for 2030 determined by inquiries of employees, experts at DB Schenker and under agreements with the Government of Germany.

Key words

Transport, Predictions, Environment, Logistic management

INTRODUCTION

The demand for freight transportation has been rising for many years at both national and global level. Existing transport volumes are already overloading today's infrastructure at difficult-to-expand bottlenecks. At the same time, population shifts are in evidence, indicating a growing number of people living in cities and metropolitan regions, while increasing individualization is another factor that will transform the logistics of tomorrow. These are just some of the trends that will intensify in the coming years, leading us to ask: How can Germany cope with transport volumes up to the year 2030 with its existing infrastructure? To answer this question, the Fraunhofer Institute for Material Flow and Logistics (IML) has produced its "Visions of the Future: Transportation and Logistics 2030" study, initiated by Daimler and DB Schenker. The study highlights the impact and developments associated with the megatrends that have been identified – globalization,

demographic change, urbanization, sustainability and resource scarcity – and presents approaches to solving these. It places these in nine future scenarios that combine the potential synergies of the individual approaches and identify and describe the research needed in the years ahead. The scenarios show ways of meeting the challenges of tomorrow and increasing the efficiency of transportation while protecting the environment and safeguarding the supply of goods.

Focusing on road and rail transportation in Germany, this paper presents the impacts and developments that have been identified and divides them into the five megatrends: globalization, demographic change, urbanization, sustainability and resource scarcity. Alongside recent studies and publications, it draws upon expert industry knowledge taken from interviews and discussions. Also there are previous researches from the work of DB Schenker by a highly professional team, and the results of previous plans and forecasts.

LITERATURE REVIEW

Main culprits or responsible for starting this so called project or plan views Logistics 2030 are Prof. Dr. Uwe Clausen, Fraunhofer Institut für Materialfluß und Logistik (IML) & Institut für Transportlogistik (ITL), Technische Universität Dortmund, Director, Klaus-Dieter Holloh, Daimler AG, Head of Advanced Engineering, Daimler Trucks and Michael Kadow, DB Mobility Logistics AG, Vice President Business Excellence DB Schenker. Setting the foundation for writing these predictions logistics in 2030, heads of DB Schenker and Daimler are served with the previous work of DB Schenker, the results of the past, previous planning and realization as well as literature and facts from other major companies, banks and government of Republic of Germany as well as many others, like: Acatech (2010), BMVBS Federal Ministry of Transport, Building and Housing (2011), BP Statistical Review of World Energy (2013), Bpb - German Federal Agency for Civic Education (2009), Bundesregierung (German Federal Government) (2009), Daimler Trucks (2012), Deutsche Post AG (2009), DVWG (German Association of Transport Sciences) (2009), Frankfurter Allgemeine Zeitung (2012), Holtbrügge & Welge (2010), Institute for Mobility Research (2005), Pfohl & Flickinger (1998), ProgTrans AG (2007), DB Schenker (2012), Schmidt & Kille (2008), Wietschel (2008) and the World Bank (2014).

FUTURE SCENARIOS 2030

Nine future scenarios are developed for road and rail freight transportation in the context of innovative and sustainable transport systems. These build on the trends and innovations already identified.

Integrating systems to enable goods in transit to be monitored and managed in real time

Increasing digitization and networking of objects provides the basis for the Internet of Things (cyber-physical systems). This gives rise to intelligent load carriers, which provide transport information for immediate processing. The rapid provision of information and communication between the load carriers themselves creates self-controlling and flexible transportation chains. The freight makes real-time decisions, based on real data and events, on the route it will take though the transportation network. It is possible to change the route or mode of transport at short notice and optimize transportation chains in terms of capacity utilization, transport time, environmental factors and costs. There is therefore more focus on the integration of different modes of transport and decentralized decision making in real time when it comes to scheduling and shipping. Managing the Internet of Things and combing it with intelligent traffic guidance systems makes better use of existing infrastructure capacity. For example, longer routes increase the transport volume but also save time and improve reliability. This has an impact on the internal processes of transportation and transshipment companies. The rapid provision of electronic information streamlines processes and eliminates the need for time-consuming data collection upon the cargo's arrival at its destination. A further advantage is the optimized planning and utilization of resources enabled by the preannounced arrival times. Vehicle-to-vehicle communication is extensively introduced. Transmitting data on status and surroundings means danger can be reduced or avoided as vehicle electronics intervene directly or warn the human driver. The Internet of Things helps to bring about new services based on the automated control of load carriers by the transportation network.

Using infrastructure efficiently with intelligent traffic guidance systems

In future, all road users' vehicles are equipped with ever more modern navigation devices. This enables extensive data to be transferred and offers new options to assist navigation. Infrastructure, too, becomes ever more closely integrated with such intelligent guidance systems. The integration of different modes of transport and infrastructure provides real-time data to guide road users. Freight traffic is clearly distinguished from private transport so that individualized traffic forecasts for different road users become a reality. To avoid traffic congestion, alternative routing shows each road user the most resource-efficient and quickest way to their destination and is customized to their individual needs. A precise forecast or arrival time can be given, enabling more efficient route planning in freight transportation. The route calculation not only includes major roads and highways, but also smaller roads. It

additionally takes into account environmental zones, preferred routes for trucks and road closures.

Individualized routing, customized to the type of vehicle and with networked assistance systems, therefore means more resource-efficient transportation on roads and rails alike. To make this system work, vehicles must be equipped over the coming years with the technologies needed to continuously transmit and receive real-time data.

Safe and efficient transportation with driver assistance systems

Greater communication and networking between road users in future is achieved by equipping growing numbers of vehicles with modern technologies. This increases the number of information sources that can be used to create a safe and efficient flow of traffic. Radar, infrared and video cameras on modern vehicle fleets, for example, enable additional information and hazards to be detected and identified. Networked assistance systems can use this data and inform the driver visually or acoustically. This takes the burden off drivers by supporting them in their work environment. Depending on the extent to which these technologies are applied in future, they take the form of individual driver aids to assist, for example, in maintaining a safe distance, keeping in lane and driving at night, or are developed and combined to make the leap from driver assistance to autonomous driving. Truck convoys are one possible use for this technology. The trucks drive themselves in a line at equal distance from one another, all controlled by a driver in the truck at the front of the convoy. The remaining trucks are accompanied by trained staff able to intervene in an emergency. In the shorter term, these autonomous technologies are used for internal transportation on self-enclosed factory sites, greatly facilitating processes on the ground. Combining autonomous vehicles with the integration of systems, i.e. using the Internet of Things – enables goods or products to be transported autonomously around the factory from one stage of the process chain to the next. Combing different approaches thus generates further potential synergy effects, improving the safety and efficiency of transportation.

Optimizing processes with intelligent freight cars

Intelligent freight cars are complemented by technological innovations such as automatic couplers and electro-pneumatic brakes. This leads to shorter process times in forming and dividing trains, reduced braking distance and faster response times by the train. The result is more effective use of tracks and improved safety thanks to advanced technology. Synergy effects exist here, for example with intelligent traffic guidance systems and integration of different modes of transport. The freight cars are able to decide their own transport route depending on the information provided. This direct communication simplifies processes and saves valuable resources in future.

Low noise levels in city logistics with alternative propulsion and new logistics concepts

Quiet nighttime transport in city logistics still offers major potential to take the strain off infrastructure as re-urbanization takes its course. If deliveries are to become so quiet that they can be moved to the nighttime, however, there is still a great deal of research work to be done, particularly in vehicle and propulsion technologies. Batteries must be made powerful enough to drive larger trucks or cover greater distances without needing a recharge.

Using capacity efficiently with modular container design for small transport volumes

To take the pressure off city centers, the modular containers are combined at intercompany handover points on the edges of urban areas, forming large loading units for the line haul, or prepared for delivery. Importantly, this requires an international standard for the containers to enable the principle to work across different companies and the different smaller loading units to be packed together efficiently into larger ones. This cooperative consolidation of transport volumes is used in future to provide appealing, individualized and efficient transportation services in CT networks.

Consolidating transport volumes with multimodal integration of different modes of transport

The integration of different modes of transport is complemented by the use of innovative, high-speed cargo handling technologies. Together with optimized interfaces, designing individualized and attractive CT networks enables improved capacity utilization across all transportation modes and companies. Harmful emissions of pollution and exposure to it, for example noise caused by city traffic, is reduced as a result. There is enormous potential to reduce costs at economic level through efficient resource use.

Modern work environments to make the logistics industry more appealing

Networked assistance systems and modern vehicle fleets support staff at their workplaces and ease the pressure on them. Such technology also makes it easier for people to join the industry, including those moving from other careers. Ergonomic and attractively designed workplaces, such as truck and train cabs, are another factor. Improving the industry's attractiveness and long-term training provision for skilled employees strengthens logistics and does not come at the expense of people's own private and professional goals.

More environmentally friendly transportation with alternative vehicle and propulsion technologies

Society's call for "green logistics" demands more environmentally friendly transportation in future. This is provided by modern vehicle fleets used in a way that optimizes energy use and carbon emissions. It involves developing both vehicle technologies, such as better aerodynamics to reduce CO2, and propulsion technologies. There is unused potential, not only in electric and natural gas propulsion, but also in existing combustion engine technology, which can be converted into further CO2 savings through changes to vehicle technologies. Trucks and locomotives can achieve additional energy efficiency in future with waste heat utilization. This greater engine efficiency cuts fuel consumption and thus conserves resources. In future, transportation concepts achieve considerable CO2 efficiency using optimized vehicle and propulsion technologies that are adapted to the situation. Modern vehicle fleets therefore save resources and make greater use of environmentally friendly energy sources. Combining adaptable, individualized route planning with intelligent traffic control systems enables further resource savings.

EFFICIENT TRANSPORTATION 2030

Germany is one of the world's most important logistics centers. This is thanks both to its location at the heart of Europe and its well-developed infrastructure. Figure 1 shows the geographical locations of Europe's largest logistics regions and illustrates their importance.

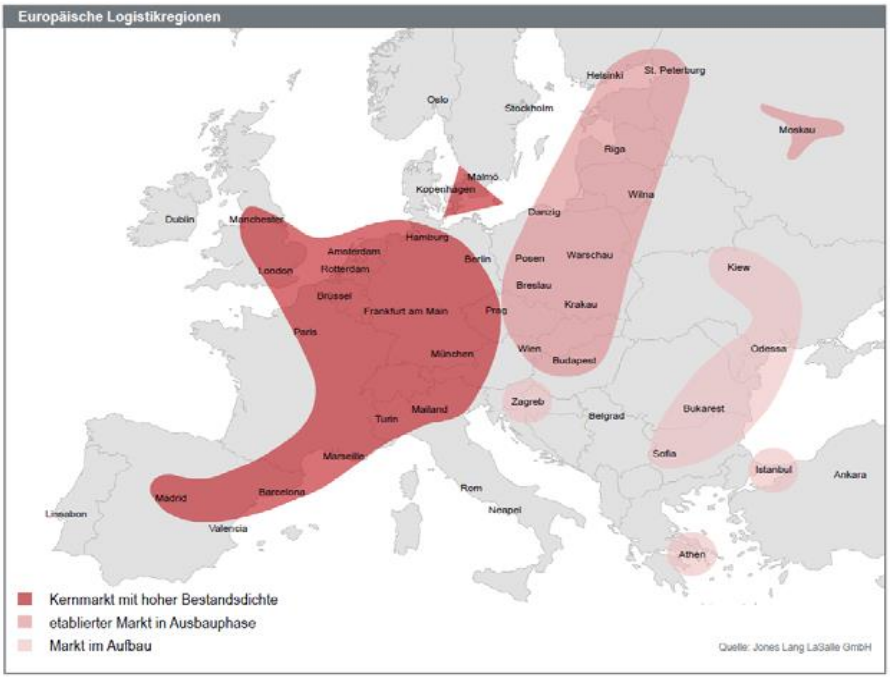

FIGURE 1. EUROPEAN LOGISTICS REGIONS

Source: Fraunhofer IML | Daimler AG | DB Mobility Logistics AG

The interaction of the nine future scenarios creates the overall picture of efficient transportation. The increase in digitization, in information flows before and during transport, and the ongoing development of vehicle and propulsion technologies, combined with networked assistance systems, are the prerequisites for efficient transportation and competitive industries in Germany in the year 2030. Optimizing the interaction between these individual visions enables further potential for improving efficiency to be leveraged. For example, technical improvements like intelligent freight cars support solutions of a more organizational nature – e.g. consolidation of transport volumes through multimodal integration of carriers. The Figure 2 shows this development in freight transport for Germany.

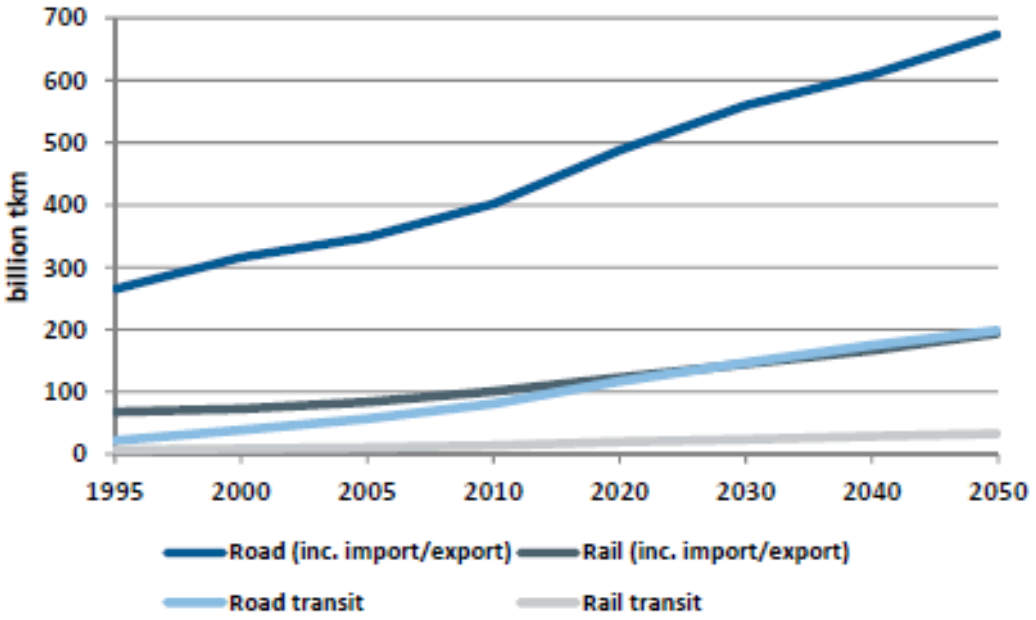

FIGURE 2: FORECAST OF VOLUME SOLD IN FREIGHT TRANSPORTATION, GERMANY UP TO THE YEAR 2050

Source: ProgTrans (2012: 94)

AREAS FOR ACTION

The future scenarios described here for achieving the objectives set and minimizing the impacts point to various areas for action that will help us to realize the vision of efficient transportation in the year 2030. The solutions present individual measures that, despite being full of potential, can only achieve the impact described in the future scenarios if they are combined with one another.

Like the individual solutions, the areas for action are categorized into the three areas of innovation: digitization, technology and flexible management. While digitization enables optimized planning based on real-time data, improving technology leads to optimized, energy-efficient and safe processes. Flexible management supports collaboration within and between companies. The areas for action identified are also grouped into four types of transportation: cross-carrier, rail freight, and local and long-distance road traffic. Figure 3 summarizes the areas for action in a matrix.

	Cross-carrier	Rail freight	Road (regional traffic)	Road (long-distance-traffic)
Digitization	Internet of Things (syber physical systems)	Intelligent freight cars Internet of Things (syber physical systems)	Intelligent traffic guidance systems Internet of Things (syber physical systems)	Intelligent traffic guidance systems Internet of Things (syber physical systems)
Flexible management	Deceleration Cooperative consolidation of transport volumes CT networks Integrating mode of transport	Attractive workplace design Cooperative consolidation of transport volumes	Quiet nighttime transport Cooperative consolidation of transport volumes	Attractive workplace design Cooperative consolidation of transport volumes
Technology	CT Networks Modular container design	Waste heat utilization Automatic coupling Autonoumos driving Hybrid locomotive	Vehicle and propulsion technologies Autonoumos driving Modern vehicle fleets Waste heat utilization Networked assistence systems	Vehicle and propulsion technologies Autonumos driving Modern vehicle fleets Waste energy utilization Networked assistence systems

FIGURE 3. MATRIX - SUMMARIZED AREAS FOR ACTIONS

CONCLUSION AND RECOMMENDATIONS

The future scenario we describe aims to achieve the objectives set and minimize impacts. It shows various areas for action that have been identified for efficient transportation in the year 2030. We categorize these into the three areas of innovation: digitization, technology and flexible management.

While digitization enables optimized planning based on real-time data, improving technology leads to optimized, energy-efficient and safe processes. Flexible

management supports collaboration within and between companies. These areas for action and their potential synergies give rise to the vision of efficient transportation in the year 2030.

With a focus on road and rail freight, scenarios are examined and developed for the future based on innovative and sustainable transportation systems in the context of growing transport volumes. Those scenarios require no more than minor changes to infrastructure. As well as identifying global trends, influential factors and effects on the efficiency of transportation, various solutions are described as capable of tackling future challenges and fulfilling the target requirements set.

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OPEN ACCESS ARTICLE

TOURISM DEMAND IN THE SOUTH-WEST PLANNING REGION OF MACEDONIA

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Abstract

The paper makes an attempt to forecast tourism demand in the South-west Planning Region (SWPR) of Macedonia. The author applies the trend analysis model and the simple linear regression model for that purpose. The linear regression model gave better and more accurate results. According to the ten-year-forecasts obtained from the linear regression results, it is expected an insignificant increase of tourism demand in the SWPR. Yet, according to the ten-year forecasts obtained from the trend analysis model, it is expected a great increase of tourism demand in this region. It should always have in mind that the forecasts can never be absolute accurate due to many influential factors. Regardless the applied method, it cannot explain the changes and reasons behind that.

Key words

Forecasting, Tourism demand, South-west Planning Region, Macedonia

INTRODUCTION

Tourism today is a global industry involving hundreds of millions of people in the international and domestic trips each year. The World Tourism Organization (WTO) estimated that in 2015 there were 1.184 million international travellers although some of this activity consists of the same travellers involved in more than one trip per year and the precise scale of the tourism industry is in doubt.

Tens of millions of people globally work directly in the industry and many more are employed indirectly. Hundreds of millions of people receive income from tourist activities because they live in so-called destination areas as "homely" population. Millions of dollars are spent each year to advertise and promote vacations and travel products. For much of recorded history, the journey was difficult, inconvenient, expensive, and often dangerous. However, journeys were undertaken and it suggests some strong motivating factors. In the last 150 years, travel has become more

affordable and not so hard, so that those who travel were prepared to admit that the pleasure was one of the motivations for their trip.

20 years ago, the key objectives of tourism planning were summarized as follows: "to ensure that visitors have a chance to gain a satisfactory and pleasurable experience and at the same time to provide funds to improve the lives of residents and areas of destination." Williams (Mason, 2016) suggested a number of overall objectives for tourism planning. He pointed out that can help to shape and control schemes for development, to save limited resources and provide a framework for active promotion and marketing destinations and can be a mechanism for integrating tourism with other sectors. He proposed a number of key objectives in tourism planning:

- Create a mechanism for structured commission for tourist facilities within the very large geographical areas;
- Coordination of the fragmented nature of tourism (especially in terms of accommodation, transport, marketing and human resources);
- Specific interventions to save resources and increase the benefits for the local community in an effort to achieve sustainability (usually through tourism development or management plan); and
- Distribution of tourism benefits (development of new tourism sites or economic regroupings of places that tourists began to leave).

The paper is structured in several parts. After the introductory section, it proceeds with a section that briefly describes tourism demand and explains the term 'tourism demand'. The third section is a background material on forecasting, which describes the phases of forecasting. After that, there is section with some basic information on the South-west Planning Region. The paper proceeds with explanation of methodology, while the final part is the conclusion.

TOURISM DEMAND

Tourism demand is a broad term that encompasses the factors that regulate the level of demand, the spatial characteristics of the demand, various types of demand and the reasons for making such requests. Cooper et al, (1998) define the demand as a "schedule of the amount of any product or service that people want and are willing to buy of each specific price in a set of possible prices during a period of time". Individuals known as tourists generate tourism demand. This happens to a certain place called "tourist destination". The scope and magnitude of demand vary over time, and sometimes with the seasons. Time demand for tourist services either promotes or changes. Such changes may be due to the emergence of so-called "new tourists" who

want to experience something new and expect high quality services and value for their money. New tourists carry different levels of demand.

There are three main types of demand: the real, hidden and latent demand. The real demand which is also called effective demand comes from tourists who are involved in the actual process of tourism. The second type of demand is the so-called repressed demand created by two categories of people who are usually able to travel due to circumstances beyond their control. The first group includes those sections of the population who would like to be involved in tourism, but for one reason or another cannot. Because they can participate at a later date, this situation is called potential demand. Delayed demand describes the second subcategory of suppressed demand that the trip was postponed due to problems of supply in the environment. The third type is latent demand. It refers to the spatial and temporal expression of the demand of a particular country, for example, demand for tourist accommodations or travel service to a particular destination. Tourism demand can be defined in different ways depending on the economic, political, psychological and geographical point of view of the author (Petrevska, 2014).

The size of demand for travel to a particular destination is very important for everyone involved in tourism. The vital data on demand include: (1) How many visitors arrived; (2) Means of transport; (3) Duration of stay and type of accommodation; and (4) Money spent. There are various measures of demand, some are very easy to obtain and are usually of a more general interest than others. There are also techniques for predicting the demand. Such estimates are of great interest to anyone involved in planning tourism development. More precisely, the demand for travel to a particular destination may be a function of the propensity of a person to travel and the resistance to travel.

$$D = f(propensity, resistance) \quad (1)$$

In equation (1) there are two arguments: the tendency that depends on the psychological profile, socio-economic status and resistance to marketing and travel-dependent economic distance, cultural distance, the cost of tourism services, service quality and seasonality. Propensity can be considered as a predisposition of a person to travel, in other words, if the person is ready to travel, what types of trips he/she wants, and what types of destinations are considered. Propensity of a person to travel, obviously, may be determined largely by its psychographic profile and motivation for the trip. In addition, the socio-economic status may have an important impact on the propensity to travel. It follows that to estimate the propensity for traveling, we must first understand the psychographic and demographic variables related to the personality. Propensity is directly linked to the demand. On the other hand, the resistance refers to the relative attractiveness of different destinations. This factor is a function of several variables, such as economic distance, cultural distance, the cost of tourist services in the destination, quality of service of destination, the effectiveness of

advertising and promotion and the season. Hence, the resistance is inversely related to demand.

The economic distance refers to the time and cost involved in traveling from the origin to the area of destination and back. The higher economic distance, the greater the resistance to that destination and consequently reduced demand. One may conclude that between any origin and destination point, if travel time or travel expenses can be reduced, demand will increase.

The cultural distance refers to the extent in which the culture of the region of origin of the tourist is different from the culture of the host region. In general, the greater the cultural distance,the greater the resistance is. The greater cost of tourist services, the greater the resistance to travel to the destination is and therefore we will have a reduction of tourist demand. This variable captures the famous inverse relationship between the price of a product or service and the demand for it (Goeldner and Ritchie, 2003).

The higher the quality of services is, there will be less resistance to travel to the destination. Although the relationship between quality of service and demand is clear enough, difficulties emerge in the interpretation and evaluation of quality. The assessment of quality is a very personal thing, and the quality for one tourist does not mean quality for another. Second, if the tourist has no previous experience with the travel destination, how can he accurately judge the quality of services there? In this case, the tourist should choose a destination based on the quality of service. Very often for the wrong ads or inaccurate information from the other, the perception of quality of tourist services cannot be reached within the destination. This situation has serious implications for establishing repeat customers, which is an important ingredient for success in tourism business. As a result, the destination must be accurate in projecting the correct image.

The effect of seasonality of demand is quite obvious. The relative attractiveness of a particular destination will depend on the time of year that the holiday is planned. For ski resort, for example, demand will be the highest during the winter months, while the resistance is the least at this season.

BACKGROUND MATERIAL ON FORECASTING

Scientific approach to tourism planning involves forecasting tourism demand as a starting point in the planning process. The forecast warns of useful actions to be taken to achieve the objectives. Success depends primarily on the accuracy of predictions. Although it is almost impossible to conduct accurate forecasting of tourism demand, it will greatly affect the reduction of uncertainty about the movements of a particular phenomenon or event in the future.

Given that demand is not stable on tourism market, well performed prediction is a key prerequisite for success. The tourism demand is characterized by large seasonal fluctuations that typically occur as a consequence of the change of season during the year, which is very notable in tourist destinations offering sun and beach. However, there are other factors that may cause cycles in tourist movements, such as school holidays, vacations, or special events in the tourist destination (festivals, exhibitions, sporting events, etc.). At the same time, the movement of tourist demand may affect both unpredictable and irregular elements, such as sudden changes in prices, epidemics, floods, war, etc. Therefore, when forecasting tourism demand, we must know the main methods of prediction and the advantages and disadvantages of each selected model.

Forecasting is the process of organizing the past data order to predict its future. Hence, the prediction process is created to predict future events. Moreover, when it comes to tourism demand as an event can be considered: the number of tourists in a particular tourist destination; number of overnight stays in a hotel or group of hotels; number of passengers traveling from one tourist spot; the number of tourist brochures distributed to potential tourists, etc. Each item, which is subject to prediction has two characteristics: the time dimension, and the result. This result shows the exact size of the demand. However, it may occur qualitative results, and then the predicted next year tourism demand will be higher, lower or the same than the previous.

The process of forecasting tourism demand consists of the following four main phases: (1) Preparation phase; (2) Phase of specification i.e. detailed description; (3) Implementation phase; and (4) Evaluation. They are aimed at establishing a system that is used continuously for prediction (Frechtling, 1996).

Phase 1. In the preparation phase, the planner chooses the appropriate method for prediction i.e. the technique for individual design of future events, and not the model. Thus, to successfully implement this stage, it is necessary to follow these steps:

- Defining the problem;
- Determining what is needed. Primarily relates to the basic required information;
- Determining variables that shall be predicted;
- Determining available resources;
- Hypotheses;
- Determining availability of data;
- Listing available methods for prediction;
- Application of preliminary selection criteria; and
- Preliminary selection of method.

Phase 2. The second stage of forecasting tourism demand is the phase of specification, i.e. detailed description. Here actually it is selected the model for prediction, within the already defined method. So, after the chosen qualitative or quantitative method, it

follows the detailed analysis, testing and selection of the most appropriate model for prediction.

Phase 3. In the implementation phase, the prediction is implemented, documented and presented. If a quantitative method is used, then the selected model should import values necessary for calculations. If qualitative method is used, then the prediction is developed based on the responses received from experts involved. Next, if necessary, an adjustment is performed in the line of correction of the results. The next step is documenting the applied model. That means in a form of a written report to describe all previously implemented stages, which models have been tested, rejected and the reasons for that, and the need to correct the results if that was the case. Only then the results of the forecasting process can be presented.

Phase 4. Evaluation is the final phase. It begins by testing the accuracy of the forecasts. That actually means monitoring the ratio between the actual and predicted values. Thus, the evaluation can be measured by various commonly applied indicators, as: the Mean Absolute Error (MAE), the Mean Absolute Percentage Error (MAPE), the Root Mean Squared Error (RMSE), the Theil inequality Coefficient (TIC), etc. If the assessment shows that there are indeed differences, it is important to determine the cause (Frechtling, 2012).

The methods for forecasting tourism demand can be divided in two main categories: quantitative and qualitative. Quantitative methods organize information from the past phenomenon according to mathematical rules by using basic data patterns. These methods require objective numerical measurements that are consistent and valid for a certain historical period. These methods assume that some past patterns will continue in the future. The data for these methods requires can be obtained from primary or secondary sources.

There are two main subcategories of quantitative methods: methods of extrapolation and, the causal methods. The methods of extrapolation are also called methods of time series analysis and they assume that the movement of the variable in the past will appear in the future. Patterns in data during the past are used to design or extrapolate future values. Causal links are ignored. They are often used for tourism demand forecasting for products for which there is a relatively stable demand, but if they are not applicable for products with highly variable demand. These methods do not count the effects of various factors on the movement of tourism demand and still provide relatively good forecasts. Their results are particularly advantageous when the prediction is for a shorter period, and at the same time are cheaper than causal methods. Another subset of quantitative methods is causal methods. They are based on data from the past movement of tourism demand. Starting from the assumption that there is a relationship between the forecasting variable and other measurable

independent variables. The causal methods seek to determine the correct mathematical expression of this ratio.

The qualitative methods are also called "assessment methods". Previous information for forecasting variable are organized by experts using their judgment rather than mathematical rules. They are not necessarily cheaper or easier to implement methods but have an advantage because they do not require historical data series (Petrevska, 2014).

BACKGROUND MATERIAL ON THE SOUTH-WEST PLANNING REGION

The South-west Planning Region (SWPR) covers the Ohrid Lake and river Treska and covers an area of 3,340 km^2 or 13.4% of the territory of Macedonia. It is one of the eight planning regions in Macedonia and encompases 13 municipalities: Vevcani, Vraneshnica, Debar, Debarca, Drugovo, Zajas, Oslomej, Ohrid, Kicevo, Makedosnki Brod, Plasnica, Struga and Centar Zupa. The basic information on the SWPR is presented in Table 2.

TABLE 2. BASIC INFORMATION ON THE SWPR, 2011

Number of municipalities	13
Number of populated places	286
Estimation of population	10,83% of total population
Employment rate	27.7%
Unemployment rate	42.4%
GDP per capita	1,807 Euro

Source: State Statistical Office. (2011).

Tourism development is the most distinctive characteristic of the SWPR. This is due to the fact that it is the most developed region in tourism manner in Macedonia. Natural features, rich cultural heritage, protected spatial units and long tradition are the basis for dynamics in tourism. The region has a number of resources at the level of potential for inclusion in the tourism supply. Also thermal baths are of great importance for visiting and the development of tourism in this region, while the large number of churches and historical sites contribute to cultural tourism development.

TABLE 3. TOURISM STATISTICS FOR SWPR, 2014-2015

Item	2014	2015
Total number of tourists	269,547	298,057
Domestic tourists	125,320	136,637
Foreign tourists	144,227	161,420
Total overnights	1,095,452	1,201,927
Overnights of domestic tourists	694,229	745,473
Overnights of foreign tourists	401,223	456,454
Number of rooms	16,304	16,370
Number of beds	42,025	41,917

Source: State Statistical Office. (various years).

Based on Table 3 one may note in 2015, an increase in the total number of tourists as well as domestic and foreign, and the number of overnights. It mostly due to the promotion of Macedonia and Ohrid as a tourist destination, especially in the world through various advertisements, promotions, exhibitions, videos, programs, etc. Hence, the foreign tourists are informed and interested in Ohrid, Lake Ohrid and Macedonia in general, as a country rich with tourist attractions and natural beauties that are worth to visit. The SWPR has potentials for different types of tourism (Table 4).

TABLE 4. TOURISM POTENTIALS OF THE SWPR

Locality	Type of tourism
Ohrid and Lake Ohrid	Lake, cultural, fishing, transit, religious, city tourism
Debar	Lake, transit, thermal bath tourism
Galicica	Mountain, eco-tourism, hunting tourism
Vevcani	Rural, cultural tourism
Struga	Lake,cultural,fishing,city tourism,transit
Jablanica	Mountain,eco-tourism,hunting
Globocica	Lake tourism, fishing

Source: (Government of the Republic of Macedonia, 2012)

METHODOLOGY

The main aim of the paper is to predict tourism demand in the SWPR. For that purpose, two models are applied: the trend analysis model, and the linear regression model. The main variable is the data on tourist arrivals obtained from the State Statistical Office. The data set covers the period 2007-2015 (Table 5) for the trend analysis model, with a projection time 2015-2025. For the linear regression model, the data set spreads over the period from 2003-2013, with a projection interval 2013-2023.

TABLE 5. TOURIST ARRIVALS IN THE SWPR, 2007-2015

Year	Tourist arrivals
2007	255,257
2008	276,669
2009	257,480
2010	234,665
2011	249,746
2012	251,462
2013	264,826
2014	269,547
2015	298,057

Source: State Statistical Office. (various years).

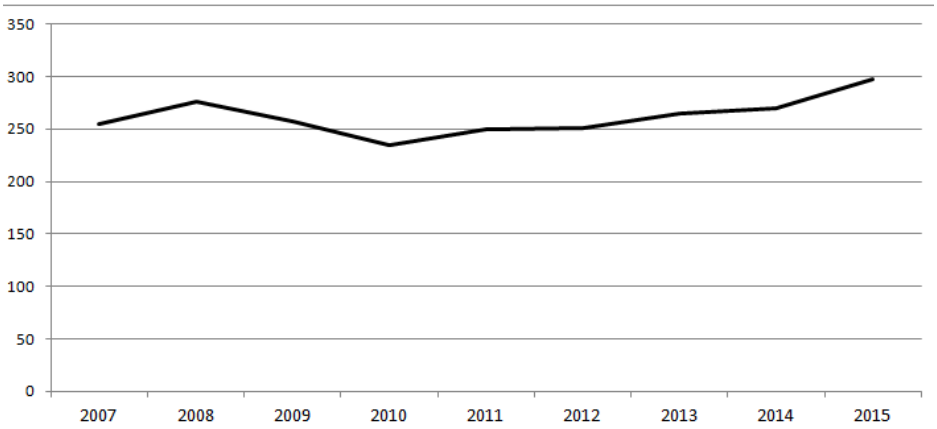

FIGURE 3. TOURISM DEMAND IN THE SWPR, 2007-2015

Figure 3 visually presents tourists demand for the period 2007-2015. Based on that, the type of trend is determined that best presents the changes. Whence by continuing the trend line, we get the forecasted tourism demand by 2025 (Figure 4).

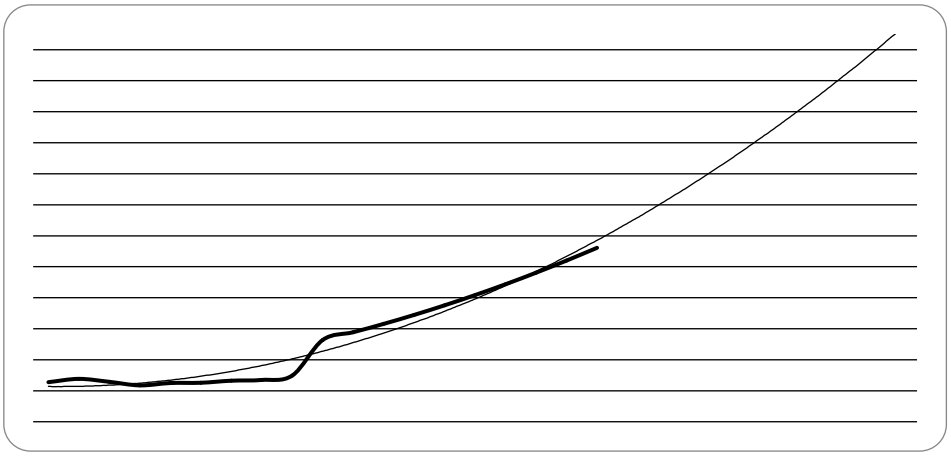

FIGURE 4. FORECASTED TOURISM DEMAND FOR THE SWPR, 2015-2025

On Figure 4 we can see that the trend line is parabolic and for each subsequent year increases to higher values. If we carefully take a look at the past data (2007-2015), we may notice that by 2008 there was a growth of tourism demand, followed by a significant decrease in 2008 and reaching the lowest value of 234,665 arrivals in 2010. This significant decrease is due to many reasons out of which the most important is the world economic crisis. The crisis provoked negative impacts in all industries, including tourism industry, thus provoking drastically decrease in tourism demand. Then in 2011, a slight increase in noted when tourism demand is getting back on track, and then it stagnated in 2013, followed by an increase in 2014 and 2015. As reasons for this drastic increase we can mention the re-commissioning of the airport in Ohrid. This was followed by many subventions for low-budget flights which resulted in increased number of passengers, thus boosting development. There was also development of infrastructure for easier access to tourist resorts. The general promotion of Macedonia as a tourist destination, also played a major role in increasing tourism demand.

TABLE 6. FORECASTED TOURISM DEMAND IN THE SWPR, 2016-2025

Year	Total tourist arrivals
2016	527,679
2017	577,467
2018	631,321
2019	689,242
2020	751,230
2021	817,284
2022	887,405
2023	961,593
2024	1,039,847
2025	1,122,168

Table 6 presents the forecasted values for tourism demand in the SWPR, in terms of total tourist arrivals for the period 2016-2025. It is expected the demand continuously to increase, if the past and current measures that assist tourism development continue. In 2019, it is expected the total number of tourists that visit the SWPR to reach 689,242 tourists, which is almost additional 100,000 tourists compared to 2015. Up to 2025, it is expected the demand to reach up to 1,122,168 which, at a first glance looks overestimated, having in mind that that is the number for Macedonia as a country and it is very hard to be achieved by the SWPR.

Although estimating extremely positive values, the trend analysis model does not give any clarification about the figures, but only determines the direction of change. The second model that was applied for forecasting tourism demand in the SWPR is the simple (linear) regression model. This model requires to possess data on tourism demand in recent years as the first variable, and the income per capita (Table 7). The dependence of the applied variables is graphically presented on Figure 5. The method of least squares is applied which resulted in a straight line ("best fit") explaining the inter relation between tourism demand and income per capita (Figure 6).

TABLE 7. TOURIST ARRIVALS AND PER CAPITA INCOME IN THE SWPR, 2003-2013

Year	Tourist arrivals	Per capita income (MKD)
2003	241,380	86,479
2004	222,950	95,209
2005	236,434	97,861
2006	233,218	106,970
2007	255,257	115,083
2008	276,669	150,771
2009	257,480	140,262
2010	234,665	161,492
2011	249,746	174,509
2012	251,462	170,493
2013	264,826	178,726

Source: State Statistical Office. (different years)

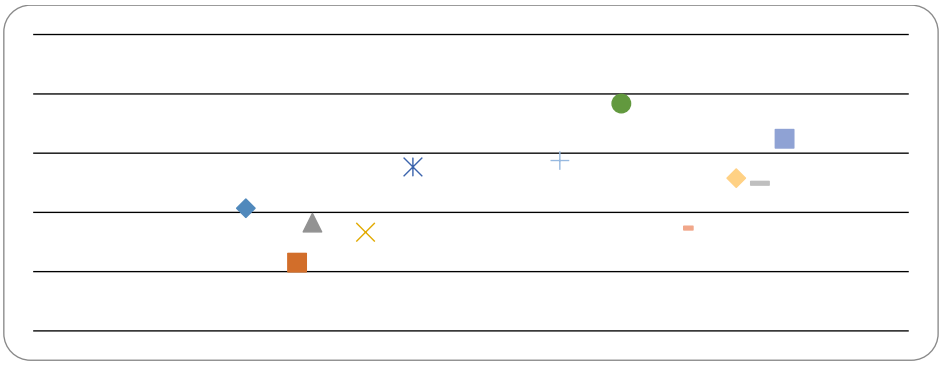

FIGURE 5. TOURIST ARRIVALS AND INCOME, 2003-2013

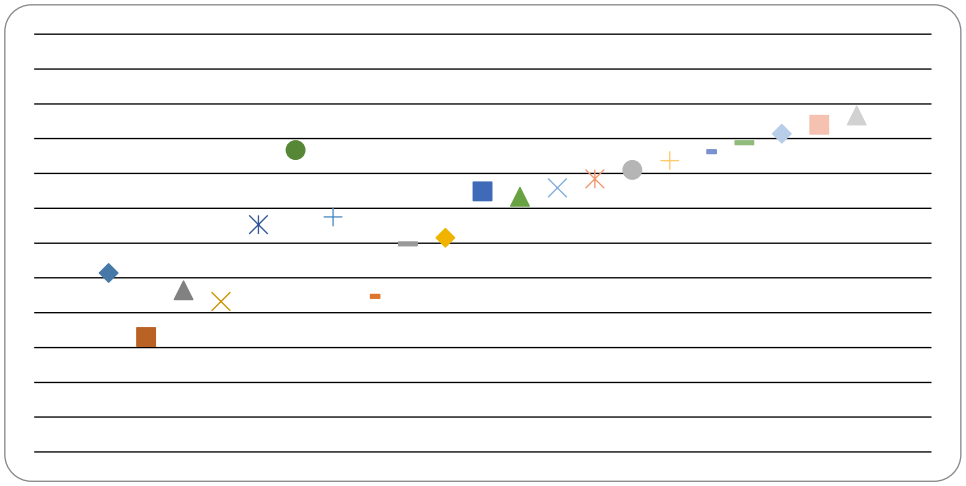

FIGURE 6. FORECASTED TOURISM DEMAND FOR THE SWPR, 2013-2023

Data presented in Figure 6, show the annual observations of pairs of two variables and the line is actually the line of "the best alignment". So, past data start in 2003 when the travel demand is 241,280 tourists and per capita income is 86,479 denars, and ends in 2013 with 264,825 tourists and an income of about 178,726 denars.

TABLE 8. FORECASTED VALUES FOR TOURISM DEMAND IN SOUTH-WEST REGION 2014-2023

Year	Income (MKD)	Tourist arrivals
2014	195,794	263213.6202
2015	206,035	265807.6655
2016	216,276	268401.7108
2017	226,517	270995.7561
2018	236,758	273589.8014
2019	246,999	276183.8467
2020	257,240	278777.892
2021	267,481	281371.9373
2022	277,722	283965.9826
2023	287,963	286560.0279

Table 8 shows the projected values of tourism demand in the SWPR from 2014 to 2023. The results were gotten using calculations in excel, based on the values of history from previous years. From the data obtained it can be noted that in the first three years of

the forecasted period (2014-2017), there are not some significant changes in the demand, and it ranges between 260,000 to about 290,000 tourists. As of 2018, the demand starts to grow from 273,589 tourists to 286,560 in 2023. The similar dynamics may be observed in the income, which starts with 195,794 denars in 2014, and reaches 287,963 denars in 2023. From these results it may be concluded that tourism demand in the SWPR will grow slightly from year to year and it will move in the same direction. Some major downs and increases are not expected in the next 10 years, which means that tourism demand will stagnate. The number of tourists is expected to grow for around 1% from year to year. The income is also expected to grow for average 4.5 % which is a significant percentage. From this information can be concluded that for income growth of 4.5% is expected increase of tourism demand for about 1% based on the data for previous years (2003-2013).

Taking in consideration that recently Skopje (the capital of Macedonia) has become an attractive tourist destination, slowly Ohrid (as the leading tourist destination in the SWPR) is losing the dominant position. Skopje received additional value with the construction of various monuments, museums and national landmarks, and all that supported with promotion in foreign countries, contributed Skopje to be more visited than Ohrid. Tourists whose main destination or only a transit destination is Skopje, visit the city and various tourist attractions, sites and landmarks there. All these factors allow us to expect to have reduced tourism demand compared to the past and on behalf of that we have increased tourism demand. We can expect the future increase in tourism demand in the region of Skopje. The line of best fit is a straight line where there are no sharp downs and increases, so we can conclude that tourism demand as the first variable and income as the second variable has insignificant increases in their values or stagnate for these reasons. Because disposable income is significant variable for tourism demand, the simple regression model clarifies demand. Hence, we conclude that this model has more advantages than other more sophisticated models, such as multiple regression and computer simulation.

CONCLUSION

Demand is undoubtedly a major measure of success for any region in attracting visitors. Introduction of methods for measuring or evaluating the current and future demand, as described in this article, should enable producing accurate data that can later be used for further research and forecasts. When it comes to tourism demand forecasting, there are many methods and models that can be applied. However, which one to use, depends on the available data. Yet, forecasts of tourism demand can never be 100% accurate because regardless of the model used to process them, they can always be affected by some external factors that are not in their scope of research so the method cannot explain the changes and the reasons for that. The South-west

planning region of Macedonia has the potential to grow into even more attractive tourism area, if some measures and activities are introduced in the line of supporting tourism development. The main intention of this article was to portray the current tourism development in the SWPR, and to present some expectations for the future, which are satisfactory.

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OPEN ACCESS ARTICLE

FACTORS OF THE TAX REPORTING COMPLIANCE OF THE SLOVAK RESIDENTS

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Abstract

Tax revenues collected from personal income tax represent important portion of the government budget tax revenues. International mobility of individuals enables individuals to earn income abroad. Most developed countries apply resident principle of taxation meaning that residents who earn foreign income have worldwide tax liability in their country of residence. However, application of this principle requires residents to submit tax return where they disclose their worldwide incomes. Income tax reporting compliance is important part of a broader topic of the tax compliance of taxpayers. This paper investigates factors that determine tax compliance of individuals, resident of Slovakia, who earn income abroad. We employed survey method and by application of factor analysis we identified the most important factors. Obtained knowledge about factors that influence individuals' tax compliance can be used by tax administration to enhance efficient collection of personal income tax.

Key words

Foreign Income, Tax Compliance, Individuals, Slovakia, Factor Analysis

INTRODUCTION

Globalization of the world economy stimulates international mobility of work forces. Along with globalization there are several factors that strengthen international and European mobility of work forces. Among push factors there is: high unemployment in host countries, worsening of political environment, and impact of crisis on intra-EU mobility of workers. Among pull factors there is language skills, wage differentials, host country's economic performance, attracting talents (Andor, 2014). Other factors include: allocation of jobs that require specific skills, demand for low or high skilled workers, cross-country matching of jobseekers and vacancies, cross-border differences in demand and rewards for health care workers, especially medical doctors and nurses, mutual recognition of professional qualifications, family ties in abroad,

occurrence of international marriages, transformation of formerly temporary stay in host country into to the center of living, shifts of homes motivated by more plausible weather, adventure, and searching for new experience.

There is one additional important force which intensifies international mobility of Slovak workforces: fundamental right to free mobility of work forces within the European Union. Slovak Republic, having been a Member State of the European Union since May 1, 2004, must follow provisions of the Treaty on the Functioning of the European Union (TFEU, hereinafter Lisbon Treaty), which has been in effect since January 1, 2009. Articles 45-48 of Lisbon Treaty laid down freedom of movement of citizens including workers within the internal market of the European Union.

The right to free movement of workforces has impact on cross-country movement of workforces. Intra-EU mobility flows declined considerably during the first phase of the economic crisis – in 2009 and 2010, mobility flows fell by 41% compared with 2007-2008. In 2011-2012 intra-EU labor mobility increased by 22% compared with 2000-2010. Some EU countries, among them Greece, Spain, Ireland, Hungary and Latvia experienced growing labor outflows due to extremely high level of unemployment. It is estimated that recently more than 1.2 million people work cross-border in the EU. Gross wages paid to cross-border and seasonal workers in 2010 amounted to €46.9 billion (European Commission, 2012). Worker mobility has been identified as one of the key potentials for increasing growth and employment in Europe. The importance of migration in Europe is shown also in the report of the German Destatis, which states that in January 2011 in the EU there were employed 33,2 million people who were not nationals of the country in which they work, while more than a third of them (12, 8 million) were citizens of another EU country. According Lászlo Andor, European Commissioner, in 2013 there were around 7 million EU citizens – or 3,3% of the EU's total labor force – working and living in a member country other than their country of citizenship. In addition, there were 1,1 million cross-border or frontier workers (Andor, 2014: 4). Eurostat data states that in 2014 there were 15.2 million persons living and working in an EU Member State of which they were not a citizen, accounting for 7.0% of total EU employment and 7.3 million of them were citizens from another EU Member State and 7.9 million were non-EU citizens (Eurostat, 2014). According to a 2010 Eurobarometer survey, 10% of people polled in the EU replied that they had lived and worked in another country at some point in the past, while 17% intended to take advantage of the right to free movement in the future (Eurobarometer survey, 2014).

From the perspective of the Slovak Republic, mobility of work forces has increased following the membership in the European Union and right to free movement of workforces. Most citizens of Slovak Republic migrate from Slovakia to work in Czech Republic, then other most frequently impact countries are Germany, Austria, United Kingdom, Ireland and other countries (Table 1).

TABLE 1. WORKERS ABROAD (000 PEOPLE)

Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Austria	7,0	9,7	11,6	15,1	17,6	19,9	23,9	25,6	29,3	36,5
Czech rep.	61,4	65,4	69,5	72,1	70,1	49,9	52,4	43,6	44,9	43,6
Germany	7,6	6,3	7,9	8,8	9,3	8,5	6,3	5,7	9,8	15,0
Hungary	6,7	11,8	16,6	19,5	18,9	14,5	11,6	9,8	7,3	6,7
Ireland	0,5	2,8	7,0	9,0	8,1	3,1	3,4	1,9	1,0	2,0
Italy	3,8	1,7	7,1	6,7	8,9	4,7	3,0	3,1	4,0	4,2
Netherland	0,6	0,8	2,5	2,7	2,9	4,2	5	5,9	6,4	5,0
United Kingdom	7,0	13,0	22,6	29,0	20,2	14,1	10,6	9,7	7,5	10,5
Other	9,0	13,9	13,3	14,3	11,6	10,1	10,5	9,8	10,5	12,8
Total	95,5	125,4	158,1	177,2	167,6	129	126,7	115,1	120,7	136,3

Source: Ministry of Foreign Affairs of the Slovak Republic. (2014: 29)
Note: Data for 2013 are for the second quarter.

Other sources, however, indicate even higher portion of individuals working abroad. Document British Annual Population Survey (APS) reported that in 2010, worked in England, 52,000 Slovaks (Office for National Statistics, 2015). Similarly, there are large differences in the figures for the Slovaks in Germany, Austria, Switzerland and elsewhere. In addition to the official data it is presented and various estimates and partial data according to which it is abroad significantly more citizens of Slovakia, then the Statistical Office of the Slovak Republic reports.

EURES states that in 2006 left Slovakia to work in EU countries 230,000 citizens and there is the high acceleration of migration. From 2000 to 2014, the number of Slovaks working abroad increased almost threefold (Ministry of Foreign Affairs of the Slovak Republic, 2014).

If individuals who work abroad keep their permanent address in Slovak Republic, they are deemed residents of the Slovak Republic. As stated in the provisions of the Income Tax Act No 595/2003 Coll. of Laws, individuals who are residents of the Slovak Republic have unlimited tax liability in the Slovak Republic. This implies that that at the end of the tax year individuals compulsory submit tax return in the Slovak Republic. Resident principle of taxation requires computation of residents' tax liability from *worldwide* income.

Worldwide income taxation requires residents to submit tax return and declare income earned from home country as well as income earned abroad. After worldwide income is computed, tax liability in the country of residence is computed and resident country tax provisions are applicable. If source country applied source principle of taxation, and imposed income tax on income earned there, and if at the same time home country applies resident principle of taxation, these conflicting principles of taxation may cause double international juridical taxation. In that case two options are

possible. Should there not be either unilateral measure to eliminate double international taxation or bilateral tax treaty, it is likely, that individual will definitely end up with income sourced abroad taxed twice. If there is bilateral tax treaty signed between Slovakia and foreign country where income was sourced, application of either ordinary tax credit or exemption method will secure foreign sourced income from being taxed twice.

To illustrate different impact of the two most frequent methods to eliminate double international juridical taxation, let us compare two examples. Assume that Mr. George S. is resident of Slovakia and he works in foreign country – let's label it A, where he earned gross salary of 28,000 Euro in 2014. Mr. George S. is also a member of statutory body in the SlovCo Ltd., Slovak resident company, where he earned in 2004 director's fees of 10,000 Euro. Assume that the effective tax rate on income from dependent activity is 7% in country A, while in Slovakia it is 19%. Mr. George S. will pay in country A 1,950 Euro (0.07 x 28,000). Now let us consider situation of Mrs. Kate B., resident of Slovakia, who works as a nurse in country B where she earned gross salary 28,000 Euro in 2014. The country B applies effective tax rate of 7%. Mrs. Kate B paid income tax of 1,950 Euro (0.07 x 28,000) withheld in source country B. Mrs. Kate B. is also member of the statutory body of SlovCo Ltd. and she earned director's fees of 10,000 Euro in 2014.

Now assume that there are bilateral tax treaties between Slovakia and both countries, country A and country B. While former treaty provides exemption method to eliminate double international juridical taxation of income from dependent activities, later treaty applies ordinary tax credit method on the same type of income sourced in country B. Mr. George S. fills tax return in Slovakia where he admits worldwide income of 38,000 Euro (28,000+10,000). However, his tax liability will be computed from income earned in resident country only, as income earned abroad is exempted from taxation in resident country. His final tax liability in Slovakia will be 1900 Euro (0.19 x 10,000). Mrs. Kate B's worldwide income is 38,000 Euro (28,000+10,000), her worldwide tax liability before foreign tax credit is 7,220 Euro (0.19 x 38,000), and after foreign tax credit is applied, her final tax liability in Slovakia equals 5,270 Euro (7,220-1,950). Our example shows, that individuals - residents of Slovakia may be motivated not to declare their income earned abroad. At the same time, tax administration has not enough information how many residents of Slovakia work abroad and how much income they earn abroad annually.

The aim of this paper is to search for factors that determine tax compliance of individuals - residents of Slovakia, more narrowly factors of compliance with obligation to fully admit income earned abroad and submit tax return and. To uncover factors that determine foreign income disclosure and submission of tax returns by Slovak residents we first gather data by questionnaire and then employ factor analysis. We expect that knowledge of identified factors may help understand tax

compliance behavior of Slovak residents and provide more information necessary to adopt efficient ways to increase tax compliance of individuals. Increased tax compliance may contribute to better income tax revenues of Slovak government budget.

The rest of this paper is organized as follows. Second section provides review of literature on tax compliance, section three presents questionnaire, gathered data and methodology, then section five provides results of factor analysis, and finally the sixth section offers conclusion.

LITERATURE REVIEW

Correct filling of tax return, including admission of income earned abroad, as well as submission of tax returns by individuals, are issues covered under the broad topic of the tax compliance. Not filling of tax return, not disclosure of income earned abroad or not submission of tax return at all are all covered by concept of tax non-compliance.

There is rich theoretical and empirical literature on tax compliance issues. In the course of time there appeared two classical approaches to modelling tax compliance in tax compliance literature: *microeconomic* and *behavioral* approach. (Gulyás et al, 2015). Some authors believe that there are three approaches to tax compliance theories (Bătrâncea et al, 2012; Sour, 2004).

The *microeconomic* approach was introduced in the seminal paper published by Alingham and Sandmo in 1972. A taxpayer who is rational and amoral maximizes expected utility which depends on income, frequency of tax audit, imposition of penalty which is linked to evaded income and tax rate. Those are key economic variables of the microeconomic tax evasion model (Allingham & Sandmo, 1972), (Sandmo, 2004). Taxpayer who does not comply with tax law must pay penalty the size of which depends on the amount of not admitted income. There is specific relation between tax rate and tax compliance: if tax rate increases the income then substitution effects may cause more or less likely compliance with tax law. As Gahramanov (2009) explains, "the substitution effect encourages evasion since the marginal benefit of cheating goes up with the tax rate", and on the contrary, "the income effect tends to suppress evasion since a higher tax rate makes the taxpayer with decreasing absolute risk aversion feel worse-off, and thus decrease risk-taking". Later on Yitzaki (1974) found out that if the size of penalty is derived from the amount of taxes then the substitution effect disappears and the remaining income effect causes that taxpayer cheats less, thus the higher tax rates encourage tax compliance (Gahramanov, 2009). Standard tax evasion model introduced by Allingham and Sandmo (1972) and like models investigate impact of economic factors on tax compliance, among them mainly influence of tax rates level, frequency, assurance or probability of tax audit and risk of discovering of tax non-compliance by tax administration, and size of penalties

(Gideon, 2009). Level of tax rates belongs to one of the most important economic factors of tax compliance. When Doerrenberg and Peichl reviewed determinants of tax morale they paid special attention to effect of progressive taxation on tax morale, as tax morale is positively linked to tax evasion (Doerrenberg & Peichl, 2010). Microeconomic theories pay attention to the role of tax audits and penalties in taxpayers' compliance. There is a question of what the government can do to foster better voluntary compliance, and whether tax audits may do the job. According the IRS study there is large, strongly significant, and positive deterrent effect of audits on the general population (Plumley, 1996). Blumental et al, (1998) run a controlled experiment in Minnesota to investigate role of tax audit in tax compliance of Minnesota taxpayers. Taxpayers were informed that their tax returns would be closely examined. They found out, that tax compliance of informed taxpayers varied depending on the level of their incomes. While low and middle income taxpayers increased reported income, high-level income taxpayers reported income fell sharply (Blumental et al, 1998). Bernasconi (1998) studied risk of tax audit and risk aversion of taxpayers as a factor of tax compliance. Friedland et al, (1978) examined impact of tax audit in comparison to fines on taxpayers' compliance. Economic cycle, especially recession, represents another possible force which influences tax compliance behavior of taxpayer (Lesnik, 2014). Several authors studied significant factors that affect tax compliance especially of juridical persons (Eze, 2014; Yamala et al, 2013).

The main shortage of microeconomic models is, that they do not offer a comprehensive perspective on the sociological and psychological factors that undoubtedly play, along with economic factors, decisive role in taxpayers' compliance. These factors are represented by attitudes, beliefs, norms, perceptions, motivations (Kirchler, 2007). *Behavioral* approach to tax compliance modelling pays attention to non-economic factors, mainly sociological and psychological factors like trust to tax authorities and the perception of the power of tax authorities (Giachi, 2014; Hageman, 2013; Lisi, 2015). Kirchler et al, (2008) proposed the "slippery slope" framework where trust in tax authorities and power of tax authorities increase tax compliance. Trust in tax authorities helps to increase voluntary compliance while power of tax authorities enhances enforced tax compliance (Alon et al, 2013; Azwadi et al, 2014; Hauptman et al, 2015; Kogler et al, 2013; Kirchler et al, 2014; Muehlbacher, 2010; Serim, 2014;). The relationship between taxpayers and tax authorities and the extend of respectful treatment of the taxpayers play important role in tax compliance behavior (Feld & Frey, 2007). Alabede et al, (2011) found that public governance quality has impact on tax compliance. Erard and Feinstein (1994) studied a link between honesty and evasion in the tax compliance game (Erard et al, 1994) and Togler (2002) investigated link between tax morale and tax compliance (Torgler, 2002). According Gordon (1989) reputation costs represent important socio-psychological role as a deterrent on tax non-compliance (Gordon, 1989). Existence of tax havens provides motivation and opportunity to tax non-compliance behavior (Kudrle, 2012).

There is also impact of tax law complexity, in particular perception of multiple tax returns, on tax compliance behavior (Bhattacharjee et al, 2015). In contrast supervision, knowledge and boosting of tax literacy increase tax compliance (Gangl et al, 2014; Nichita, 2015; Rhoades, 1999). Benk et al, (2012) examined the extent to which perceived vertical and horizontal tax equity, social and moral norms, and legal sanctions, namely detection risk and penalty magnitude, affect tax compliance intentions (Benk et al, 2012). Other factor which enhances tax compliance is information (Devos et al, 2015; Kosonen et al, 2015; Phillips, 2014). European Union pays close attention to how direct tax cross-border problems affect citizens (European Commission, 2012; European Parliament, 2015; Eurostat, 2014).

Tax compliance empirical research relies mostly on three types of data. Witte et al, (1987: 102), discuss three types of data that might be used to study compliance behavior, including their pros and cons: survey data, tax return data, audit data. The most frequently used methods used in empirical research of tax compliance are field experiments (Blumental et al, 1998; Durham et al, 2014; Gangl et al, 2014; Hallsworth, 2014; Iyer et al, 2010; Oğuz et al, 2013;), and factor analysis (Benk et al, 2012; Yamala et al, 2013). There are examples of tax compliance studies in individual country studies (Alabede et al, 2011; Azwadi et al, 2014; Eze, 2014) and cross-country studies as well (Wu et al, 2005).

DATA AND METHODOLOGY

As stated earlier, income earned by individuals abroad is part of the worldwide income that is subject to unlimited tax liability in Slovakia. Slovak residents must disclose income earned abroad by filling and submitting tax returns in Slovakia. If they do not comply with this obligation, no worldwide taxation happens, instead tax evasion take place. This may happen either unwillingly, as ordinary individuals who work abroad might not be sufficiently informed about their obligation, or willingly, if they know about such an obligation, however do not comply.

There may be several reasons why individuals - residents of Slovakia do not disclose their income earned abroad and reasons not to submit tax return to the Slovak Tax Authorities. To find possible factors that lead to this type of tax non-compliance, we used survey method. This section presents data gathered in the field study by the mean of electronic questionnaire.

To find answers on our questions, we elicited field survey by mean of electronic questionnaire. The questionnaire was prepared by using freely accessible web page docs.google.com. After questionnaire was prepared, it was spread among respondents by internet. To spread questionnaire, we used social networks of Slovak nationals living and working abroad, namely Facebook. The sample comes from the population of individuals - residents of Slovakia who earn income abroad.

TABLE 2 CODEBOOK: ITEMS, LABELS, FULL TEXT QUESTIONS, TEXT OF RESPONSES, AND CODES

Item No	Label	Full text of question
Item 1	*gend*	Gender 1=male; 0=female
Item 2	*age*	age 1=(18-24); 2=(25-32); 3=(33-44); 4=(45-65)
Item 3	*educ*	educational level 0=elementary school; 1=college; 2= secondary school without school-living examination; 3=secondary school with school-living examination; 4=university bachelor degree; 5=university magisterial degree; 6=university philosophies doctor degree
Item 4	*length*	How long have you been working or you had worked abroad within one calendar year? 0=less than 6 months; 1=more than 6 months
Item 5	*emplr*	Who was/is your employer in abroad? 0=labor agency; 1=Slovak company/person; 2=foreign company/person
Item 6	*euout*	Have you been employed/had you been employed outside the EU? 1=yes; 0=no
Item 7	*phmsr*	While working abroad, have you been keeping your permanent home in Slovakia? 1=yes; 0=no
Item 8	*jobonly*	Do you consider your stay abroad only as job-linked? 1=yes; 0=no
Item 9	*earn*	In the year when working abroad did you earn more than 1800,0 Euro (including income earned in sourced in Slovakia)? 1=yes; 0=no
Item 10	*sbmtr*	Did you submit tax return in the year to admit income earned abroad? 1=yes; 0=no
Item 11	*know*	Do you know that you must submit tax return in SR even if you earn income only abroad? 1=yes; 0=no
Item 12	*info*	Do you consider information provided by the state administration about this obligation satisfactory enough? 1=yes; 0=no
Item 13	*trown*	Do you fill your tax return yourself? 1=yes; 0=no
Item 14	*compl*	Do you think that filling/submission of tax return is complicated? 1=yes; 0=no
Item 15	*txasign*	Do you make tax assignation? 1=yes; 0=no
Item 16	*tpunlq*	Do you know who taxpayer with unlimited tax liability (resident) is? 1=yes; 0=no
Item 17	*tpunldf*	Define taxpayer with unlimited tax liability. (open question) 1=correct answer; 0=incorrect answer; 99=no answer
Item 18	*wincq*	Do you know what does it mean worldwide income? 1=yes; 0=no
Item 19	*wincdf*	Define worldwide income. (open question) 1=correct answer; 0=incorrect answer; 99=no answer

Item 20	*whrinf*	Where do you gather information necessary to understand your lawful tax obligations? 1=friends and professionals; 2=media; 3=media, friends, professionals; 4=media, legal acts, tax admin web; 5=media, legal acts, tax admin web, friends, professionals; 6=legal acts, tax Admin web; 0=legal acts, tax admin web, friends, professionals;
Item 21	*notsubmit*	Did it happen that you did not submit tax return even if you were legally obliged to? 1=yes; 0=no
Item 22	*web*	Do you know which web page provides information on BTTs? 1=yes ; 0=no

By the questions paced into the questionnaire, we asked individuals – residents of Slovakia, to reveal possible reasons and causes of their tax reporting compliance. There were 22 questions placed in the questionnaire. The complete wording of questionnaire items is exposed in the Table 2.

Our sample size was created based on answers received from 258 respondents - individuals who are residents of Slovakia and earn foreign income. Our sample size fits with the recommendations published by Comrey and Lee (1992), and by Gorsuch (1983) who states that the minimum sample size for the factor analysis purposes is given by evaluative determination of a sample size so that the number of observations should be 5 times the number of items in a questionnaire at least.

Table 3 presents number of observations received for each question, and minimum, maximum, mean and standard deviations.

TABLE 3. DESCRIPTIVE STATISTICS

	N	Min	Max	Mean	Std. dev
Age	258	1.00	4.00	1.9845	.88203
Do you think that filling/submission of tax return is complicated?	258	.00	1.00	.6357	.48218
In the year when working abroad did you earn more than 1800,0 Euro (including income earned in sourced in Slovakia)?	258	.00	1.00	.8760	.33026
Highest education level	258	.000	6.000	3.60853	1.169424
Who was/is your employer in abroad?	258	.00	2.00	1.7209	.65988
Have you been employed/had you been employed outside the EU?	258	.00	1.00	.2132	.41035
Gender	258	.00	1.00	.3760	.48531
Time mark	258	1.00	258.00	129.5000	74.62238
Do you consider information provided by the state administration about this obligation satisfactory enough?	258	.00	1.00	.1395	.34718
Do you consider your stay abroad only as job-linked?	258	.00	1.00	.3721	.48430
Do you know that you must submit tax return in SR even if you earn income only abroad?	258	.00	1.00	.4535	.49880
How long have you been working or you had worked abroad within one calendar year?	258	.00	1.00	.7171	.45131
Did it happen that you did not submit tax return even if you were legally obliged to?	256	.00	1.00	.2773	.44856
While working abroad, have you been keeping your permanent home in Slovakia?	258	.00	1.00	.8953	.30670
Did you submit tax return in the year to admit income earned abroad?	258	.00	1.00	.3101	.46342
Define taxpayer with unlimited tax liability (open question)	31	.00	1.00	.7097	.46141
Do you know who is taxpayer with unlimited tax liability (resident)?	258	.00	1.00	.1705	.37684
Do you fill your tax return yourself?	258	.00	1.00	.2674	.44349
Do you make tax assignation?	258	.00	1.00	.1822	.38674
Do you know which web page provides information on BTTs?	257	.00	1.00	.1128	.31702
Where do you gather information necessary to understand your lawful tax obligations?	258	.00	6.00	2.1395	1.78948
Define worldwide income (open question)	38	.00	1.00	.7632	.43085
Do you know what does it mean worldwide income?	258	.00	1.00	.2248	.41827

RESULTS OF FACTOR ANALYSIS

Inspection of the original correlation matrix with all 22 variables (not displayed here) disclosed that there were 18 items that produced correlation coefficients lower than 0.3. These variables are not appropriate for factor analysis (Hair et al, 1998) therefore they were excluded from our further analysis. The rest of variables that yield correlation coefficients higher than 0.3 are shown in correlation matrix (Table 4).

TABLE 4. CORRELATION MATRIX

	sbmtr	trown	tpunlq	know	compl	wincq	whrinf
sbmtr	1.000						
trown	0.049	1.000					
tpunlq	0.097	0.215	1.000				
know	0.534	0.136	0.270	1.000			
compl	-0.172	-0.307	-0.235	-0.135	1.000		
wincq	0.121	0.157	0.570	0.255	-0.190	1.000	
whrinf	-0.066	0.311	0.218	0.081	-0.275	0.181	1.000

To run factor analysis, we selected only variables that produce correlation coefficient higher than 0.3. Out of originally 22 items only 6 items (variables) in our analysis justified their availability to be involved into analysis of variance. They are: *sbmtr, trown, tpunlq, know, wincq, whrinf.* The rest of items showed lower correlation coefficient and they were not included into the further analysis. This is in line with the main purpose of principal component analysis, which is to reduce correlated observed variables to a smaller set of important independent comparative variables. In our case out of original set of 22 items, based on the level of the correlation coefficient among pairs of variables just 6 most important variables were chosen.

In the next step we determinate whether or not chosen variables can be grouped into smaller set of underlying factors, it means we have to test whether data will factor well. To indicate factorability of variables we executed the Kaiser-Meyer-Olkin test (KMO) the results of which are presented in the Table 5. According to Kaiser (1974) our result on KMO test is mediocre as KMO value lies in the interval 0.6-0.7, however being above 0.6 KMO test's result enables us to run factor analysis. Along with KMO test we run also Bartlett's test of sphericity that compares correlation matrix of our variables with identity matrix. To have factor analysis appropriate the Bartlett´s value should be significant. As displayed in the Table 5, the probability measured by p-value is more than 0.5, which suggests that it is possible to proceed with factor analysis.

TABLE 5. KMO AND BARTLETT'S TEST

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.631
Bartlett's Test of Sphericity	Approx. Chi-Square	310.962
	df	21
	Sig.	.000

Table 6 presents communalities, which are the percentages of variance explained by the extracted components. If communality is very low for the item, it suggests that variable is completely unrelated to the other items in the set. However, it is not our case, as values of all communalities for our variables exhibit level higher than 0.5. This suggests that questions were well understood and there is no bias in the answers of respondents.

TABLE 6. COMMUNALITIES

	Initial	Extraction
sbmtr	1.000	0.813
trown	1.000	0.578
tpunlq	1.000	0.771
know	1.000	0.724
compl	1.000	0.534
wincq	1.000	0.785
whrinf	1.000	0.557
Extraction Method: Principal Component Analysis.		

The purpose of principal component analysis is to explain as much variance as possible by using as few components as possible. Components are extracted based on the initial eigenvalues criterion, and components with eigenvalue more than 1.0 are chosen for further analysis. Information how much of the variable in the data has been explained by the extracted factors is reported in the Table 7. It shows three chosen components based on the initial eigenvalues, their values are 2,309 for component 1, then 1,386 for component 2, and 1,066 for component 3. All three chosen components explain altogether cumulatively 68.027% of total variance, and each of them separately explains approximately from 22.0-23.0% of variance.

TABLE 7. TOTAL VARIANCE EXPLAINED

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,309	32,990	32,990	2,309	32,990	32,990	1,604	22,921	22,921
2	1,386	19,802	52,792	1,386	19,802	52,792	1,597	22,810	45,732
3	1,066	15,235	68,027	1,066	15,235	68,027	1,561	22,295	68,027
4	0,721	10,302	78,329						
5	0,676	9,653	87,982						
6	0,439	6,273	94,255						
7	0,402	5,745	100,000						
Extraction Method: Principal Component Analysis.									

Initial levels of eigenvalue serve us as critical measure when determining how many components should be chosen to process analysis. Other tool is to visualize information on eigenvalue levels. Scree plot is useful graph which plots number of components on x-axis and eigenvalues on y-axis. To indicate an appropriate number of components we look at the inflation point located in the elbow of the curve. In our case we chose three components, the same number as decided by checking eigenvalues expressed in numerical form. Figure 1 presents the plot of eigenvalues.

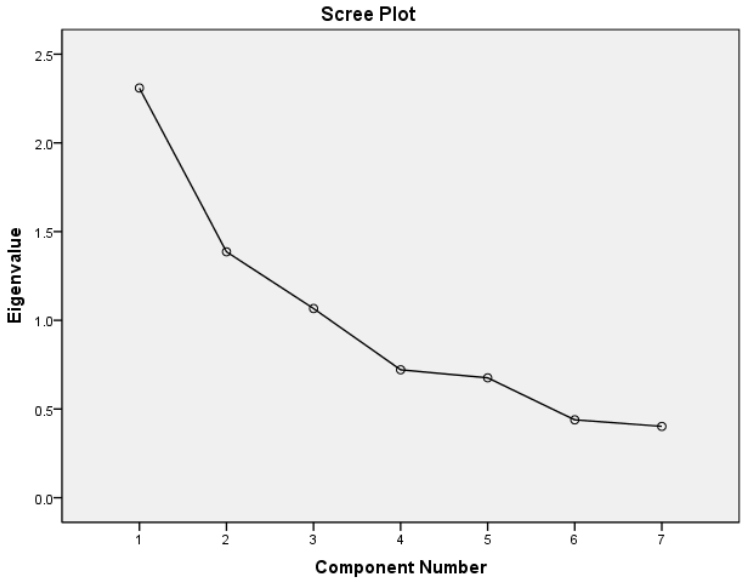

FIG. 1 SCREE PLOT

Component matrix shown in Table 8 presents only chosen components - those with initial eigenvalues more than 1.0. It displays factor loadings when values are unrotated.

TABLE 8. COMPONENT MATRIX

	Component		
	1	2	3
tpunlq	0.713	-0.101	0.502
wincq	0.676		0.572
compl	-0.564	0.223	0.408
trown	0.519	-0.376	-0.408
sbmtr	0.427	0.735	-0.301
know	0.595	0.598	-0.117
whrinf	0.469	-0.536	-0.223
Extraction Method: Principal Component Analysis.			
a. 3 components extracted.			

Rotated component matrix displayed by Table 9, shows how each variable loads into each component. We can see high numbers in component 1 and at the same time low or no numbers of those variables in component two and three. Contrary, high numbers for variables in component two are accompanied with low or no values of those variables in the component one and three.

TABLE 9. ROTATED COMPONENT MATRIX[A]

	Component		
	1	2	3
trown	0.755		
whrinf	0.707	0.185	-0.151
compl	-0.695		-0.210
wincq		0.875	0.109
tpunlq	0.189	0.852	
sbmtr			0.901
know		0.247	0.810
Extraction Method: Principal Component Analysis, Rotation Method: Varimax with Kaiser Normalization, a, Rotation converged in 4 iterations			

Component plot presented in the rotated space is a graphical help summarizing everything shown in previous tables (Figure 2).

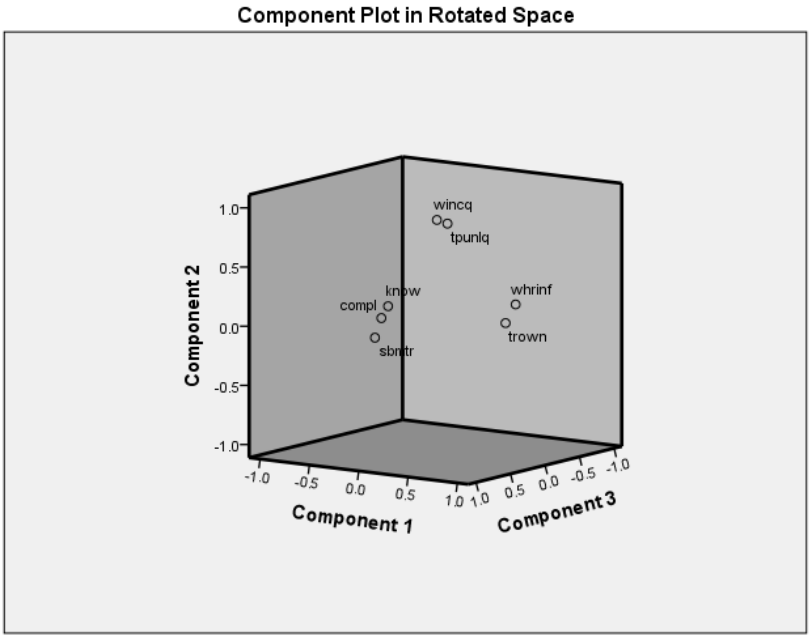

FIG. 2 COMPONENT PLOT IN ROTATED SPACE

CONCLUSION

Our factor analysis results allow us to identify and name some hidden factors that determine tax-reporting compliance of individuals - residents of Slovakia. According to our factor analysis there are three hidden factors of tax compliance of individuals - residents of Slovakia. Below we describe these three dimensions in order of their importance.

Component 1: ***Tax Complexity and Information***. This dimension represents 22.921% of the total variance. It consists of three items *trown, whrinf, compl.* Individuals who submit tax return themselves (*trown*, +), where they find information (*whrinf*, +) and degree of complexity of tax return form (*compl*, -). Our results are consistent with previous empirical research, for example with the finding, that tax compliance is

negatively related to complexity of tax returns (Bhattacharjee et al, 2015) and positively related to the accessibility of tax related information (Devos et al, 2015; Kosonen et al, 2015; Phillips, 2014). This result is in line with considerations of the EU which promoted settling up central one-stop-shop in tax administration where cross-border workers could seek reliable tax information (European Commision, 2015).

This finding implies, that in attempts to enhance tax compliance of individuals who reside in Slovakia, tax policy makers should pay closer attention on tax complexity and publication form, accessibility and easiness of tax related information.

Component 2: Tax Literacy. This dimension represents 22.810% of the total variance, and with component 1 it explains 45.732% of the total variance cumulatively. This component consists of two items: *wincq* and *tpunlq*. They focus on taxpayers' knowledge of tax law, especially on those tax law provisions that provide rules and requirements on income disclosure and obligation to submit tax return also by individuals who earn income abroad. One question asks about the meaning of the concept world income (*wincq, +)*, and the second question checks whether respondents understand clearly meaning of the concept of the taxpayer with unlimited tax liability (*tpunlq, +)*. Component 2 suggests that tax compliance of individuals who work abroad is closely linked and positively influenced by depth of knowledge of the tax law provisions and regulations. Our finding is consistent with findings in other empirical research studies (Gangl et al, 2014; Nichita, 2015; Rhoades; 1999). Policy implication is, that to improve tax compliance, Slovak government, including tax administration, should pay appropriate attention to quality education of individuals in the field of tax requirements.

Component 3: ***Foreign Income Level and Knowledge***. This dimension represents 22.295% of the total variance, and together with other two components it explains 65.027% of the total variability. It consists of two items. First, responses on question whether individual taxpayer submitted tax return to declare income above 1,800 Euro earned abroad in previous tax year (*sbmtr, +)*. Disclosure of foreign income earned abroad by individual taxpayers certainly increases tax compliance. It is interesting that this item is combined with item which examines whether individual taxpayers know that they have to submit tax return even if they earn income only abroad (*know*, +). Both items together indicate that individuals with higher income and more knowledgeable tend more likely to comply with tax obligations. This finding implies, that to boost tax compliance, Slovak government should pay more attention not only to higher income taxpayers, but also to individuals with lower income.

Our research proves that both, economic and behavioral factors, play important role in enhancing tax compliance of Slovak individuals who earn income abroad.

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