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INFLUENCE OF INVESTMENT INCENTIVES ON DEVELOPMENT OF REGIONAL UNEMPLOYMENT IN THE CZECH REPUBLIC

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ABSTRACT

The aim of this paper is to assess the influence of investment incentives on development of regional unemployment in the Czech Republic and with proposal of recommendations related to utilization of investment incentives as an instrument for promoting employment and development of regions as well as for reduction of differences in economic activity of regions. Time series from 1998 to 2014 were used to solve the problem when regional unemployment was chosen as a dependent variable, for which econometric model was created using panel regression and including investment incentives. Results of testing prove that investment incentives have positive and statistically significant influence on regional employment.

KEY WORDS

regional unemployment, investment incentives, foreign direct investments, panel regression

JEL CODES

C23, E24, F21

1 INTRODUCTION

The unemployment was under government control in the Czech Republic till 1989. Since that time Czech economy has changed a lot. In the beginning of nineties the average level of unemployment was about 4.3%. The outflow of foreign investment led to growth of unemployment in the second half of nineties. Moreover regional disparities have become serious problem.

The aim of this article is to assess the influence of investment incentives on development of regional unemployment in the Czech Republic.

Investment incentives have been adopted in the Czech Republic in 1998. Despite the laws has changed several time the investment incentives are still frequently discussed and its influence on macroeconomic variables is disputant.

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Paper is structured as follows. There are theoretical backgrounds in Chapter 2. There is explained theoretical relationship between investments and unemployment. You can find review of empirical literature in that chapter as well. Chapter 3 deals with used methods and data. There is explained how we construct our models and which econometric techniques we use. Also data used in our model are defined there. Chapter 4 summarizes results of our models. Outcomes of models are presented there by tables and figures. We conclude and discuss our results in the last chapter of this paper.

2 THEORETICAL FRAMEWORK

Investment incentives and its influence on real economy is widely discussed topic nowadays. Some authors claim that incentives lead to growth of investment and lower level of unemployment whereas others say that there is either no relationship between these variables or that there is even opposite relation. Theoretical approaches to investment incentives are described in the first part of this chapter. Then there is a review of empirical papers which deal with this topic in the second part of chapter.

2.1 Theoretical Backgrounds

Authors such as Kunešová, Cihelková et al. (2006) or Dobrylovský and Löster (2009) show number of positive effects of incentives such as:

- increase of economic growth,
- creating new jobs,
- lowering rate of unemployment,
- increasing domestic export or
- revitalization of region.

On the other hand, there are authors such as Blomström and Kokko (2003) who doubt influence of incentives on real economy. They claim that the question if benefits come from investment flow can outweigh their costs is at issue. Štěrbová et al. (2013) say that investment incentives are one of the most discussed and most controversial topics nowadays. She mentions that they influence competition in the country which adopts them. Schwarz et al. (2007) mention that most of incentives go to richer regions with lower level of unemployment. This fact even worsens regional disparity due to migration of workforce from poorer to richer regions. Košan (2013) states that incentives improve both employment and fiscal income. On the other hand he claims that incentives cause appreciation of domestic currency (due to investment inflow) which worsens export possibilities. As another problem connected with incentives can be considered corruption, growth of government debt or environmental impact.

2.2 Review of Empirical Literature

As concerns other empirical papers they can be divided into two groups. The first group deals with investment incentives just like we do. The other group try to find relationship between foreign direct investment and unemployment. The first group contain authors such as Karaalp (2014) who use panel regression analysis to prove relationship between investment incentives and unemployment in Turkey; or Schalk and Untiedt (2000) who find that incentives reduce unemployment in Germany using error correction model.

Dobrylovský and Löster (2009) focus on influence of foreign investments on unemployment in the Czech Republic. They find that foreign investment even worsen level of unemployment. On the other hand Domesová (2006) or Zamrazilová (2006) do not find any correlation between investments and rate of unemployment in the Czech Republic. It is obvious that choice of variables matters. Another reason why there are so many contradictory results might be neglect of lags. Craigwell (2006) analyses relationship between investments and employment in Caribbean. He finds significant relationship while using delays.

Finally, there are papers which claim that positive effect of investment can be found in

the short run only (see Balcerzak and Żurek, 2011 or Pinn et al., 2011). The problem in the Czech Republic is that investment incentives have existed no longer than 17 years yet.

3 METHODS AND DATA

At first graphical and correlation analyzes are made to assess the relation between investment incentives and unemployment. Then panel regression model is estimated using Weighted Least Squares Method (WLS). Model is based on Bondonio and Greenbaum (2006) and includes territorial and regional dummy variable, volume of incentives, lagged level of unemployment and variables specifying each region (e.g. number of crimes, population density, number of jobs in industry).

Model should include variables characterising particular regions of the Czech Republic. It is clear that unemployment is influenced by demographical trends. Higher number of inhabitants leads to higher level of unemployment, since there will be more applicants per position. Also there should be a negative correlation between GDP and unemployment in particular regions. Number of positions is another important variable influencing unemployment. The more jobs are available in region the lower level of unemployment should be. Neftçi (1978) claims, that there is positive correlation between salaries and unemployment as well. Next specialisation in particular sector limited applicants to find a job, so we expected that the more region is specialized the higher level of unemployment will be. The most important variable are investment incentives which should increase level of investment in regions and it should lower level of unemployment. The last variable is lagged level of unemployment according to Bondonio and Greenbaum (2006), capturing rigidity of unemployment.

To sum it dependent variable is unemployment expressed as number of job applicants (U) and independent variables are:

- volume of investment (I),
- new positions (N),
- maximum level of incentives (M),
- available positions (V),
- workforce (P),
- average monthly salary (A),
- gross domestic product (Y),
- number of inhabitants (O_s),
- population density (O_h),
- specialization of region (S).

Data for variables U, V and P are gathered from Czech Ministry of Labour and Social Affairs (MPSV). Monthly data were converted into quarterly. CzechInvest provide data for variables I, N and M. We converted data into quarterly. Variable A is full-time equivalent of average salary in each region provided by Czech Statistical Office (CSU, 2014). Variable Y represents nominal GDP in each region. Only yearly data are available in CSU (2014) regional account database so we converted them into quarterly assuming constant development of GDP during year. Similar problem appeared while computing variables characterising population (O_s and O_h). CSU (2014) provides yearly data only. Since the development of populations is constant during year we assume that converting data into quarterly form does not influence our results. The last variable S is based on RIS3 strategy document provided by Czech Ministry of Education Youth and Sports. This is a dummy variable where 1 means that investment is consistent with region's specialization, while 0 means that it is not. In the case that there are two investments (0 and 1) we consider it as 0. If there are more than two investments we use majority rule.

Quarterly data covers 1998–2014 periods (68 observations) for each of 14 regions in the Czech Republic. We expect that some of variables (such as number of inhabitants and population density) are multicollinear, so only one of them is included in the model. Another problem might be caused by heteroscedasticity which can be lower by logarithmical transformation. We use both semi-logarithm and logarithm model in this paper. It is also possible that depended variable (unemployment) responds

to changes in independent variables with a delay. That is why we use lagged values of unemployment in time t, $(t-1)$, $(t-2)$ and $(t-3)$. The number of lags was based on Mazouch and Fischer (2011) who claim that there is a half year delay and Miskolczi, Langhamrová and Fiala (2011) who identify delay in the Czech Republic in the length of 3 quarters. Furthermore we expect that the date when incentive was accepted does not match the date it can influence real economy. We was not able to find any theory which claims how long it can take, so we expect that this delay should not take more the 5 quarters and variables I, N a M are lagged by $0, 1, 2, \ldots, 5$ periods. Model is estimated using panel regression with fixed effects. The first estimating method is Generalized Least Squares method (GLS).

Model then looks as follows:

$$\begin{aligned} y_{it} &= \alpha + \beta X_{jit} + \epsilon_{it}, \qquad (1)\\ & \quad j = 1, 2, \ldots, J,\\ & \quad i = 1, 2, \ldots, I,\\ & \quad t = 1, 2, \ldots, T, \end{aligned}$$

where y is dependent variable, denotes interception, is vector of parameters, X means value of variable, stands for error, i represents observation, j variable and t time. Since we expect heteroscedasticity we use also Weighted Least Squares method (WLS). It estimates parameters:

$$\begin{aligned} \text{WSSE} &= \sum_{i=1}^{n} w_i \Big[y_i - \big(\hat{\beta}_0 + \hat{\beta}_1 x_{i,1} + \\ & \quad + \hat{\beta}_2 x_{i,2} + \ldots + \hat{\beta}_k x_{i,k}\big)\Big]^2, \qquad (2) \end{aligned}$$

where w denotes weights (based on variance of errors of each unit) and n is number of observations. As mentioned before we include lagged values of depended variables into the model as well:

$$\begin{aligned} Y_{it} &= \gamma y_{i,t-1} + \alpha + \beta X_{jit} + \epsilon_{it}, \qquad (3)\\ & \quad j = 1, 2, \ldots, J,\\ & \quad i = 1, 2, \ldots, I,\\ & \quad t = 1, 2, \ldots, T. \end{aligned}$$

Then we estimate three forms of the model:

- linear form (with origin data):

$$\begin{aligned} U_{it} &= \gamma U_{i,t-1} + \alpha + \beta_1 I_{it} + \beta_2 V_{it} + \\ & \quad + \beta_3 P_{it} + \beta_4 A_{it} + \beta_5 Y_{it} + \\ & \quad + \beta_6 O_{s_{it}} + \beta_7 S_{it} + \epsilon_{it}, \qquad (4) \end{aligned}$$

- semi-logarithm form:

$$\begin{aligned} U_{it} &= \gamma I_{i,t-1} + \alpha + \beta_1 \log I_{it} + \\ & \quad + \beta_2 \log V_{it} + \beta_3 \log P_{it} + \\ & \quad + \beta_4 \log A_{it} + \beta_5 \log Y_{it} + \\ & \quad + \beta_6 \log O_{s_{it}} + \beta_7 S_{it} + \epsilon_{it} \qquad (5) \end{aligned}$$

- and logarithm form:

$$\begin{aligned} \log U_{it} &= \gamma \log U_{i,t-1} + \alpha + \\ & \quad + \beta_1 \log I_{it} + \beta_2 \log V_{it} + \\ & \quad + \beta_3 \log P_{it} + \beta_4 \log A_{it} + \\ & \quad + \beta_5 \log Y_{it} + \beta_6 \log O_{s_{it}} + \\ & \quad + \beta_7 S_{it} + \epsilon_{it}. \qquad (6) \end{aligned}$$

We include only statistically significant variables into the final form of our model. The final form of model is selected depending on significance of variables, coefficient of determination, specification of model and Akaike information criterion.

4 RESULTS

In this chapter the results are interpreted. First we make graphical analysis followed by simple correlation analyses. Then the outcomes of several model are discussed.

4.1 Investment incentives and unemployment in the Czech Republic

There is development of unemployment and investment incentives depicted in the Fig. 1. We can see periods (such as 2000 or 2007) when level of unemployment lower after increase of incentives, but graphical analysis generally does not provide exact results. In the next steps we use more sophisticated techniques such as correlation and regression analyzes.

4.2 Correlation Analysis

We try to find relationship between unemployment and investment incentives expressed as volume of investment (I), new positions (N) and maximum level of incentives (M). The results depicted in Tab. 1 claim that there is no correlation between these variables on aggregate level. Hence we compute correlation coefficients in the individual level (for each region). Results are depicted in Tab. 2.

It is obvious that there is no correlation neither on regional level.

4.3 Regression analysis

There are outputs of linear, semi-logarithm and logarithm form of model depicted in Tab. 5, 6 and 7. GLS method was used for these models. From linear model (Tab. 5) it can be seen that modifications 2, 3 and 5 provide best statistical results. Nevertheless variable A in model 2 has not right sign, variables Y and P are correlated (0.82) in model 3 and there is low value of R^2 in model 5, hence linear form does not seem as good one. As concerns semi-logarithm (Tab. 6) form model variable A still has not right sign. Model 1 provides higher R^2 than model 5 but after including incentives (variant 7) it can be seen that they are positive. Probably best modification of semi-logarithm form is variant 8 where all variables has a right sign and are significant. The weakness of this model is that R^2 is only about 20%. We try logarithm form (Tab. 7) as well but the results did not get better. Since the results of our models was not satisfying we compute next models with delays or using WLS.

4.3.1 Regression with lagged variables

First we make a model with lagged variables. We choose those connected with GDP (Y) and incentives (I, N, M). We focus on fact if delay of these variables enhances our model. We also exclude variable V, because it was found insignificant in previous models. Only important results are depicted in Tab. 3. All variables are significant and have a right signs. Nevertheless all models have low coefficient of determination. We are not able to say which of these models the best one is. In the last step we decided to use WLS method.

4.3.2 Panel regression – WLS

Since we have not found optimum model yet, it is possible that we did not use right estimation method. Results of WLS are presented in this part of paper. We use same variables as was described in part 4.3.1. Only semi-logarithm and logarithm form results are presented in table for, because all variants of linear form were worsen than before. It is obvious that logarithm form provides best results from Tab. 4. All variables connected to incentives (I, N, M) are significant and values od R^2 are high enough.

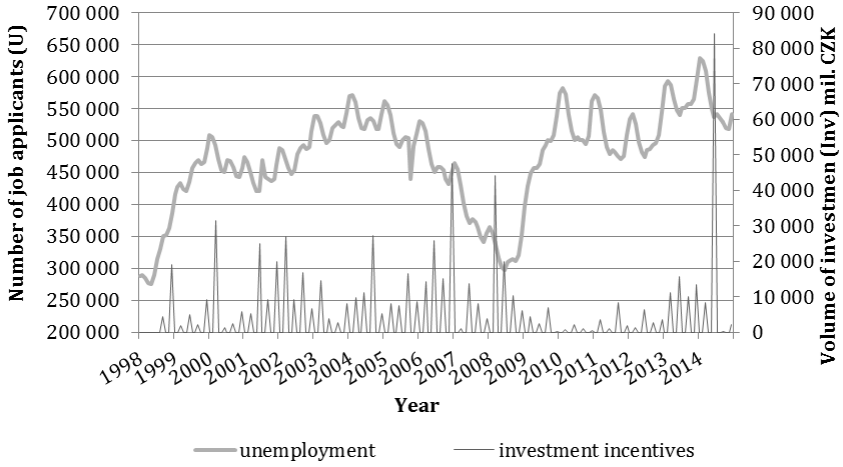

Fig. 1: Development of investment incentives and unemployment in the Czech Republic (1998–2014)

Tab. 1: Correlation coefficients (all regions)

	Unemployment (U)
Volume of investment (I)	0.242079
New positions (N)	0.24523444
Maximum level of incentives (M)	0.25112096

Tab. 2: Correlation coefficients (individual region)

Unemployment (U)	**Volume of investment** (I)	**New positions** (N)	**Maximum level of incentives** (M)
Hl. m. Praha	−0.03353	−0.03057	−0.02899
Jihočeský kraj	0.06902	0.04826	0.08837
Jihomoravský kraj	0.06959	0.07568	0.10165
Karlovarský kraj	−0.05193	−0.06860	−0.04019
Královéhradecký	−0.18125	−0.21239	−0.15322
Liberecký kraj	0.17177	0.17926	0.21622
Moravskoslezský kraj	−0.00317	−0.03175	0.02314
Olomoucký kraj	−0.00950	−0.03876	−0.03465
Pardubický kraj	−0.13007	−0.12745	−0.11810
Plzeňský kraj	0.06333	0.09637	0.06592
Středočeský kraj	−0.01377	0.05699	0.03472
Ústecký kraj	0.29530	0.24855	0.29838
Kraj Vysočina	−0.01988	0.05374	−0.01247
Zlínský kraj	0.13913	0.13373	0.14455

Tab. 3: Panel regression with lagged variables

	(1)	(2)	(3)	(4)
Depended variable	U	U	U	$\ln U$
const	−602,253***	−595,938***	−594,381***	−1.5884
	(−7.191)	(−7.267)	(−7.271)	(−0.674)
$\ln P$	72,724.9***	70,995.8***	70,718.1***	1.3679***
	(9.946)	(9.93)	(9.919)	(6.66)
$\ln A$	24,675.4***	23,440.2***	23,267.7***	0.7976***
	(7.858)	(7.616)	(7.582)	(9.021)
$\ln Y_1$	−47,836.6***	−45,340.9***	−45,003.3***	−1.20***
	(−12.77)	(−12.41)	(−12.35)	(−11.44)
$\ln M$	−135.143*			
	(−1.753)			
$\ln I$		−164.81**		−0.0076***
		(−2.559)		(−4.098)
$\ln N_2$			−261.4***	
			(−3.245)	
within R^2	0.273	0.2631	0.2671	0.2179
AIC	14,194.9	14,609.4	14,605.4	−617.05

Note: There are semi-logarithm and logarithm form, numbers depict length of delay; *, **, *** symbolizes 10%, 5% and 1% significance, t-values are in brackets.

Tab. 4: Panel regression – WLS

	(1)	(2)	(3)	(4)
Depended variable	U	U	U	$\ln U$
const	−241,124***	−1.58630***	1.58843***	1.69411***
	(−21.81)	(4.675)	(4.683)	(4.883)
$\ln Y$	−56,726.6***	−1.73721***	−1.73771***	−1.73576***
	(−31.52)	(−34.95)	(−35.00)	(−34.25)
$\ln P$	42,303.8***	1.28984***	1.29108***	1.28860***
	(43.67)	(59.02)	(58.89)	(58.49)
$\ln A$	37,505.4***	1.19085***	1.18953***	1.17978***
	(20.35)	(20.4)	(20.4)	(19.6)
$\ln I$	−81.9346	−0.00646***		
	(−1.134)	(−2.740)		
$\ln N$			−0.00829***	
			(−2.773)	
$\ln M$				−0.00623**
				(−2.222)
within R^2	0.727299	0.832481	0.832454	0.83443
AIC	1,990.367	2,067.39	2,067.553	2,007.902

Note: There are semi-logarithm and logarithm form, numbers depict length of delay; *, **, *** symbolizes 10%, 5% and 1% significance, t-values are in brackets.

Tab. 5: Linear form of model (depended variable: number of jobs applicants – U)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Const	38,805.3***	36,373.2***	−816.34	12,161.2***	−1,945.5	32,046.5*	36,586***	−2,804.6	−2,502.4	15,781.9
	(108.6)	(39.64)	(−0.166)	(3.178)	(−0.462)	(1.69)	(37.76)	(−0.555)	(−0.581)	(0.991)
V	−1.2024***	−1.3752***	−1.1458***	−1.313***			−1.398***	−1.142***		−1.677***
	(−16.82)	(−22.36)	(−16.43)	(−18.25)			(−22.39)	(−16.09)		(−14.11)
A		0.2172***	−0.2447***		0.3477***	0.206	0.205***	−0.251***	0.344***	−0.778***
		(4.829)	(−3.268)		(2.869)	(0.729)	(4.364)	(−3.243)	(2.771)	(−3.183)
Y			−0.0854***					−0.103***		
			(−2.779)					(−3.26)		
P			0.1268***	0.0517***	0.1359***	0.175***		0.135***	0.141***	0.1503***
			(8.174)	(4.236)	(9.937)	(5.19)		(8.471)	(10.07)	(5.358)
Y_o				0.0875***	−0.3105***	−0.454***			−0.326***	−0.065
				(4.463)	(−8.330)	(−5.361)			(−8.516)	(−0.813)
O_h						−229.3				−67.9931
						(−1.475)				(−483)
S						−909.5				−986.19
						(−1.041)				(−1.397)
M							0.4398	0.135	−0.634	−0.029
							(1.457)	(0.407)	(−1.568)	(−0.068)
Within R^2	0.2319	0.3865	0.4318	0.3348	0.1453	0.2165	0.3935	0.4414	0.1589	0.5687
AIC	19,344.8	16,765.8	14,420.1	16,887.3	14,715.3	6,730.6	16,354.5	14,010.7	14,298	6,139.7

Note: All variables are at origin units except for Yo, which denotes GDP per capita; *, **, *** symbolizes 10%, 5% and 1% significance, t-values are in brackets.

Tab. 6: Semi-logarithm form of model (depended variable: number of jobs applicants – U)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Const	−475,407***	−646,958***	−0.00***	−264,352***	−632,026***	−643,407***	−455,630***	−626,385***	−705,719***	−0.00***
	(−8.432)	(−9.815)	(−8.525)	(−4.405)	(−7.360)	(−9.75)	(−7.872)	(−7.151)	(−10.67)	(−7.206)
$\ln Y$				3,461.6***						
				(2.888)						
$\ln Y_o$					−31,734***	−3,139.1		−33,046***	−6,948.2**	−13,255***
					(−9.341)	(−1.079)		(−9.441)	(−2.327)	(−2.614)
$\ln V$	−7,824.4***	−8,450.8***				−8,273.4***	−8,441.6***		−8,555.3***	−9,317.3***
	(−19.82)	(−25.31)				(−4.198)	(−20.57)		(−22.36)	(−15.19)
$\ln P$	44,758.5***	67,956.5***			70,929.9***	68,591.8***	43,535***	71,385.1***	116,468***	167,633***
	(10.13)	(11.86)			(9.462)	(11.91)	(9.612)	(9.317)	(11.58)	(8.716)
$\ln A$		−12,156***	−3,691.4***		11,669.0***	−9,909.7***		12,056.7***	−10,151***	−14,924***
		(−10.93)	(−3.186)		(4.167)	(−4.198)		(4.205)	(−4.281)	(−15.19)
$\ln O_s$			115,529***							
			(8.692)							
$\ln O_h$				52,777***					−101,116***	−151,126***
				(4.06)					(−5.466)	(−4.757)
S										−1,025.1
										(−1.595)
$\ln M$							370.325***	−170.397**	143.688**	147.26
							(5.017)	(−2.114)	(2.272)	(0.467)
Within R^2	0.3675	0.5199	0.0902	0.0458	0.1871	0.5207	0.3941	0.2038	0.5544	0.6399
AIC	16,842.9	14,295.4	15,928.1	18,190.1	14,678.8	14,296.3	16,025	14,259.2	13,852.9	6,084.45

Note: All variables are at origin units except for Yo, which denotes GDP per capita; *, **, *** symbolizes 10%, 5% and 1% significance, t-values are in brackets.

Tab. 7: Logarithm form of model (depended variable: number of jobs applicants in logarithm form – $\ln U$)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Const	−3.029*	−2.818	−3.211**	−3.252	−3.362**	−3.552**	−2.309	−4.429***	−4.484***	−4.199
	(−1.897)	(−1.137)	(−2.014)	(−1.237)	(−2.072)	(−2.193)	(−0.92)	(−2.76)	(−2.795)	(−1.453)
$\ln Y_o$		−0.826***	0.161**			0.165**	−0.833***		0.094***	0.0593
		(−8.422)	(2.29)			(2.281)	(−8.298)		(1.297)	(0.569)
$\ln V$	−0.276***		−0.285***		−0.284***	−0.294***		−0.286***	−0.292***	−0.303***
	(−34.16)		(−31.75)		(−33.5)	(−31.13)		(−34.39)	(−31.43)	(−23.99)
$\ln P$	1.334***	1.382***	1.302***	1.138***	1.379***	1.346***	1.348***	2.3999***	2.33***	2.2905***
	(9.606)	(6.389)	(9.35)	(4.979)	(9.761)	(9.503)	(6.137)	(10.08)	(9.547)	(5.793)
$\ln A$	−0.154***	0.476***	−0.269***	−0.102**	−0.173***	−0.29***	0.479***	−0.216***	−0.281***	−0.3421***
	(−5.696)	(5.889)	(−4.711)	(−2.247)	(−6.178)	(−4.96)	(5.829)	(−7.546)	(−4.881)	(−3.840)
$\ln O_h$								−2.320***	−2.204***	−2.0204***
								(−5.271)	(−4.911)	(−3.093)
S										−0.006
										(−0.447)
$\ln M$				−0.011***	0.0037**	0.004**	−0.009***	0.003	0.003*	0.0217***
				(−4.596)	(2.379)	(2.409)	(−3.776)	(1.633)	(1.684)	(3.352)
Within R^2	0.6374	0.1292	0.6401	0.0706	0.6465	0.6491	0.155	0.6602	0.661	0.7343
AIC	−1,178.8	−540.86	−1,182.1	−465.8	−1,147.2	−1,150.5	−531.14	−1,173.2	−1,172.9	−520.4

Note: All variables are at origin units except for Yo, which denotes GDP per capita; *, **, *** symbolizes 10%, 5% and 1% significance, t-values are in brackets.

5 DISCUSSION AND CONCLUSIONS

Our final model was constructed in logarithm form and we used WLS. Model of regional unemployment includes GDP per capita, which growth lowers unemployment. As we expected average salaries also have a negative effect on rate of unemployment. This influence can be seen with one quarter delay. On the other hand higher values of workforce cause growth of unemployment. The last variable included into model is investment incentives. The aim of this article was to assess its influence on unemployment. We find significant relationship between all variables connected to incentives and rate of unemployment. The higher values of incentives are the lower level of unemployment will be.

Investment incentives seem to be proper instrument of economy policy and it is one of the key factors which decrease unemployment and improve regional productivity. We consider Investment incentives important for development of Czech economy.

As a problematic aspect of incentives we consider granting process which is overcomplicated. Since income taxes are related to performance of company, which can be influenced by business cycle while wage costs are constant, we suggest some form of discount of total wage costs as suitable form of investment incentives. It enables firms to employ job applicants even in depressions.

We also think that incentives should be designed not just for large companies, but for small and medium businesses too. It should lead to lowering of bureaucracy costs as well.

Based on positive relationship between incentives and employment we assume that volume of successful investments outbalances unsuccessful ones. We recommend focusing on investments with high added value. These investments reduce unemployment and also contribute to competitiveness of Czech economy.

Moreover we suggest creating independent report about system of investment incentives which should include detailed analyse and which should assess influence of incentives on Czech economy.

Our findings are consistent with Karaalp (2014) or Schalk and Untiedt (2000). Most of authors who claim that there is no relationship deal with foreign direct investment instead of incentives. The results also depend on which econometric technique is used. We were not able to find significant relationship using GLS for example. The truth is that some negative aspects of incentives can be seen in long run only. We are not able to find long run relationship between incentives and unemployment in the Czech Republic yet.

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SOUND SYSTEM AND NOISE AS ESSENTIAL ELEMENTS OF VISUAL MERCHANDISING IN SELECTED RETAIL CHAINS IN THE SLOVAK REPUBLIC

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ABSTRACT

Music is an inherent element of visual merchandising tools. It can affect not only the amount of time spent on shopping, but also the overall satisfaction of customers at the point of sale. Nevertheless, it is essential to find the right compromise between the combination of music genres and basic factors of store sound systems, because everyone perceives music and sound with varying sensitivity. Properly chosen music and sound system factors provide numerous advantages to retail stores, including the more relaxed and friendly-behaving staff as well as the encouraged customers spending more time inside the store. From the customer perspective, the music influences him when determining which store to choose. Last but not least, music can help the customer to overcome stressful situations such as waiting at the cash registers. We assessed the sound system and noise levels in retail stores operating in the Slovak food market through a questionnaire survey with the managers of these stores as well as by measuring the noise intensity in the particular sales departments. The survey sample included 182 store managers. The research was carried out in stores located mainly in western Slovakia and included Slovak retail chains but also companies with transnational capital ties. The questionnaire survey results showed that the store sound distribution depends on the size of the sales format and not on the ownership of particular retail chains operating in the Slovak Republic. Through measuring the level of noise a different approach of these companies can be assumed when creating cultural and pleasant shopping environment.

KEY WORDS

visual merchandising, music, food retail chains, shopping behavior

JEL CODES

M31, L81

BERČÍK, Jakub, and HORSKÁ, Elena. 2015. Sound System and Noise as Essential Elements of Visual Merchandising in Selected Retail Chains in the Slovak Republic. *European Journal of Business Science and Technology,* 1 (1): 15–23. ISSN 2336-6494.

1 INTRODUCTION

The consumer perceives the store environment by all five sensory organs. Solomon, Marshall and Stuart (2006) describe this perception as the process in which people collect, organize and interpret information from the outside world. It follows that in store shopping behavior is influenced by a variety of factors such as lighting, sound/noise, smell, air quality and merchandising). The resulting effect of this impact should be the customers feeling comfortable in the store. Otherwise, it is possible that the customer would be discouraged from buying goods that he would be interested in in a different situation.

Pradhan (2010) defines merchandising as the process of planning, development and presentation of product lines for identified target markets in terms of price, style, selection and timing. It can also be defined as a set of activities carried out in stores in order to improve the general visuality of products on the shelves and secondary exposures and thereby influence the final decisions of consumers to purchase and thus increase sales of the products, state Horská, Nagyová, Rovný et al. (2010). The task of visual merchandising is to create an environment and atmosphere in the store that will allow the identification of the customer with the business image of the company, notes Morgan (2011). Bell and Ternus (2006) say that a visual merchandiser should think based on the SCAMPER model, which is an aid for conceiving unusual solutions and is an acronym for Substitute + Combine + Adapt + Modify (minify, magnify) + Purpose or put to other use + Eliminate + Reverse or rearrange. It is mainly a tool for achieving target sales in the sales area and a mechanism to communicate with customers and influence their buying decision, note Bhalla and Anuraag (2010). Visual merchandising is an independent component of communication that informs customers about what the store can offer.

Music is an inherent element of visual merchandising tools. According to Franěk (2007), unsuitably chosen background music might send a signal to the customer that he found himself in a place where he does not belong. Music can affect not only the amount of time spent on shopping but also customer satisfaction. If the store has a properly chosen store sound system (intensity, frequency, music genre, tempo and quality) the customer perceives less stress in different stress situations related to shopping, such as when waiting in queues at the cash registers or finding specific goods items. In this context, Boček, Jesenský and Krofiánová (2009) highlight that the faster the music, the faster the customers move through the store, while also the type (genre, origin) of music can greatly influence the product selection.

2 METHODOLOGY AND DATA

In order to obtain information about the state of the sound system and the level of noise in the retail chains operating in Slovakia, we conducted a questionnaire survey with the managers of particular stores. The original sample consisted of 188 store managers, while six questionnaires had to be excluded due to incorrect entries, which means that the survey sample was reduced to 182 respondents. The research was conducted in stores located mainly in western Slovakia and included Slovak chains (COOP Jednota, CBA, Nitrazdroj and other retailers) but also companies with transnational capital ties (Tesco, Kaufland, Lidl, Billa, Hypernova). In terms of the size of the sales format, the survey was carried out mainly in grocery stores (almost 50% of the sample), supermarkets (nearly 33%) and hypermarkets (nearly 12%), but also discount stores (about 4%) and wholesale outlets (less than 1%) were represented.

Subsequently, the level of noise was measured in the particular stores by a certified digital Sound Meter Velleman DMV 1326.

Primary data processing was carried out using descriptive statistics (frequency, quantiles, averages and standard deviations) as well as inductive statistics (chi-squared test). This test is used to determine whether the difference between the observed and expected frequencies is only random (independent variables, due to sampling variation) or is too significant to be merely incidental (there is a relationship between variables), see Rimarčík (2015).

The assumptions in this test were defined as follows:

- H_0: Variables are independent.
- H_1: Variables are dependent.

Computing the test statistic was based on a contingency table (Tab. 1), where

$$n_{i.} = \sum_{j=1}^{s} n_{ij}, \quad n_{.j} = \sum_{i=1}^{r} n_{ij}.$$

The value of the test statistic was computed using the equation (1):

$$G = \sum_{i=1}^{r} \sum_{j=1}^{s} \frac{\left(n_{ij} - n'_{ij}\right)^2}{n'_{ij}} \tag{1}$$

The rejection of the null hypothesis was based on the chi-squared distribution. The null hypothesis is rejected if

$$G > \chi^2_{1-\alpha}\big[(k-1)(m-1)\big]. \tag{2}$$

The chi-squared test for independence was computed using the RapidMiner software and MS Excel. The degree of association was assessed by Cramer's V correlation coefficient and measure of association, giving a value between 0 and +1 (inclusive).

The measured values of noise levels have been grouped into clearly arranged tables and graphs that allowed us to compare the different environments in grocery stores.

3 RESULTS

Regarding the most relevant finding, the aim was to determine whether store managers consider music and the store sound system an important marketing tool. 74% of respondents answered yes to this question, which tells us that the music and sound are essential parts of the factors in the shopping environment. Only less than 26% of managers do not consider these elements as tools which have the potential to influence customers, which might be a result of the unwillingness of store managers to participate in the questionnaire survey, lack of information and ultimately an aversion to any kind of music.

Store managers who expressed the opinion that music and sound in the store are essential for success were asked for which types of goods or parts of the store is music of utmost importance, according to them. The results are shown in Fig. 1, where it can be seen that nearly 117 store managers considered music to be important for the entire sales area. The importance of music and sound in the particular departments separately was not considered that significant.

One of the objectives of primary research was also to find out what equipment is available in the particular stores in terms of the sound system and whether it is within the responsibility of store managers to affect the various attributes of music at the point of sale. 38% of stores are not provided with any sound system, but in this case it might be assumed that these answers were recorded mostly in smaller sales formats located in rural areas. On the contrary, 30% of larger sales formats use integrated audio system. Many shops operating in the Slovak food market are equipped only with an ordinary radio, which was also confirmed by 28% of store managers asked in the survey.

In the case when the store was equipped with just an ordinary radio, we asked what radio station most often is tuned in in the particular stores. Tab. 4 shows that Radio Expres was the most listened to in Slovak retails, followed by Európa 2 and Funradio.

Tab. 1: Contingency table

	Variable 1 (1st category)	**Variable 1 (2nd category)**	...	**Total**
Variable 2 (1st category)	observed frequencies	observed frequencies	...	$n_{1.}$
Variable 2 (2nd category)	observed frequencies	observed frequencies	...	$n_{2.}$
Variable 2 (3rd category)	observed frequencies	observed frequencies	...	$n_{3.}$
⋮	⋮	⋮	⋮	$n_{j.}$
Total	$n_{.1}$	$n_{.2}$	$n_{.j}$	n

Source: Paralič (2003)

Tab. 2: Answers to the question whether store managers consider store sound system together with music as an important marketing tool

Answer	**Absolute frequency**	**Relative frequency**
Yes	135	74.18%
No	47	25.82%
Total	**182**	**100.00%**

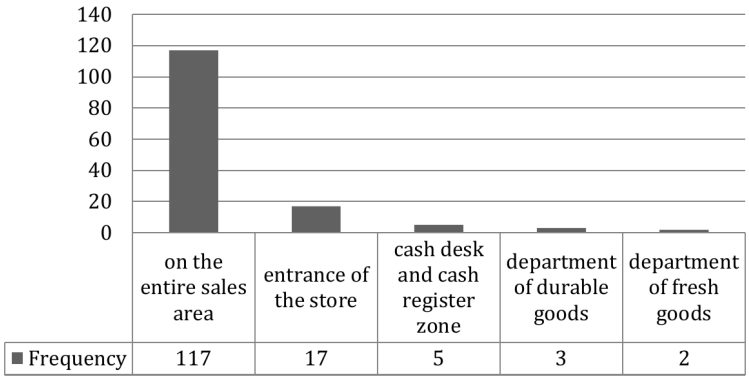


Fig. 1: The importance of music and sound system in particular store departments based on the evaluation of store managers

Tab. 3: Audiotechnical equipment of grocery stores

Equipment	**Absolute frequency**	**Relative frequency**
Without audio or music	70	38.46%
Only an ordinary radio	50	27.47%
Integrated audio system	55	30.22%
Other	7	3.85%
Total	**182**	**100.00%**

Tab. 4: Radio stations tuned in grocery stores

Radio	Absolute frequency
Anténa Rock	1
Beta rádio	2
Európa 2	7
Funrádio	5
Jemné melódie	2
Rádio Expres	19
Rádio Lumen	2
Rádio FM	2
Rádio WOW	2
Rádio Yes	1
RTVS	1
Viva	1

Tab. 5: The possibility to influence the intensity of the sound system at the point of sale

Answer	Absolute frequency	Relative frequency
Yes	100	54.95%
No	82	45.05%
Total	**182**	**100.00%**

Tab. 6: Perception of the sound system of the store by managers of particular stores

Perception	Absolute frequency	Relative frequency
Very positive (1)	29	15.93%
Positive (2)	100	54.95%
Rather negative (3)	29	15.93%
Negative (4)	24	13.19%
Total	**182**	**100.00%**

Tab. 7: The distribution of music factors according to importance by store managers

Distribution	Sound frequency	Intensity of the sound system	Music genre	Quality
25% quantile	3	2	1	2
Median	3	2	2	2
75% quantile	4	3	3	3
Order of the factors	**4**	**2–3**	**1**	**2–3**

Another important aspect was the possibility to influence the various attributes of the store sound system. In more than half of the stores (almost 55%) that participated in the questionnaire survey, store managers have the opportunity to set the intensity (volume) of music in sales areas and departments.

The store managers also had the opportunity to comment on whether they perceive the sound system of a particular store positively or negatively (on a scale from 1 to 4). From the values observed, we calculated the mean value with standard deviation (2.26 ± 0.88) and median (2). Based on these figures, we can state that the managers perceive the sound of their stores positively with fluctuations towards more negative feelings.

In order to verify knowledge regarding music and the store sound system as an important factor of visual merchandising in the sale of food, store managers were asked to arrange particular factors of the sound system according to their importance on a scale from 1 to 4 (1 as the most important factor and 4 as the least important one). The results of arranging the factors based on their importance are shown in Tab. 7.

According to managers, the most important factor was the music genre, while as the least important factor the frequency (height) of the sound was listed. This fact, however, is controversial because this is the factor that contributes significantly to the overall perception of music (low versus high tones), notes Žiaran (2013). Incorrectly chosen music genre, intensity and frequency of sound can have fatal consequences and ultimately discourage customers from purchasing, says Franěk (2007).

In addition to the assessment of the state, we also focused on hypotheses testing and analysis.

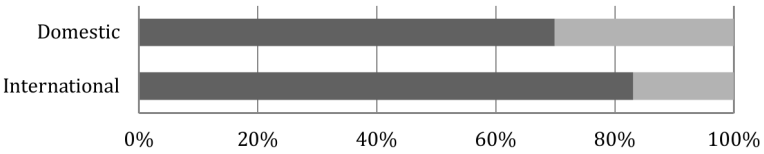
In the first hypothesis we assumed that there is a correlation between the size of the chain (large international versus small domestic) and the perception of music and sound as an important marketing tool. The summary of the respondents' answers regarding the importance of these elements in international and domestic chains is shown graphically in Fig. 2.

This dependence was verified using the chi-squared test of independence at a significance level of 0.05, while the hypothesis about the dependence of the mentioned attributes was not supported.

We also wanted to verify if the size of the sales format is related to the perception of music and sound system in the store. In this case, the hypothesis tested using the chi-squared test of independence was supported. The value of Cramer's correlation coefficient (0.24) indicates relatively weak dependence, which means that larger sales formats consider music and properly chosen sound as an important marketing tool. An exception in this case is the wholesale, which might be associated with an unwillingness to participate in the questionnaire survey (response "no" even if the store has sound system in the sales area).

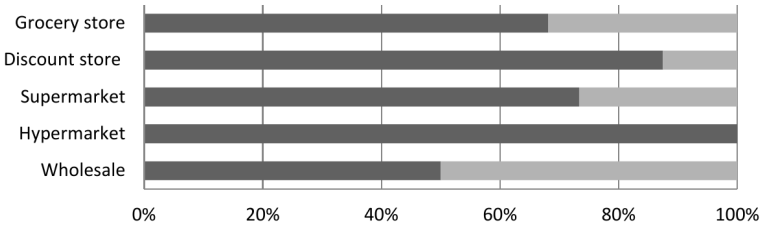
Given that consumers do not perceive only sounds which are pleasant (harmonious) but also other sounds, which are often distractive (non-harmonic), it is necessary to point at the influence of the ambient noise at the point of sale, as the human brain perceives it during the purchase, although the consumers are not always fully aware of it. The fact is that higher exceeding of noise limits affects the physical condition of humans, while smaller exceeding influences more the psychological state, on which the overall emotional state of humans depends. About 10 to 20% of the population might be identified as highly sensitive, while this part of the population reacts sensitively even to a noise of mild intensity. About the same number, from 10 to 20% is a tolerant population that does not mind even loud noise. For the remaining 60 to 80% of the population the reaction approximately equals to the quality of the incentive. For this reason we have focused on measuring noise intensity in the particular chains in selected departments of the sale of food. We measured the intensity of noise, average noise value and noise ceiling.

Fig. 4 presents the comparison of all the departments of various surveyed stores, where the highest values were measured in COOP Jednota. Significant differences in noise levels between departments were monitored only in



	International	Domestic
Yes	49	86
No	10	37

Fig. 2: Perception of music and sound system in the store according to the ownership of the chain



	Wholesale	Hypermarket	Supermarket	Discount store	Grocery store
Yes	1	21	44	7	62
No	1	0	16	1	29

Fig. 3: Perception of music and sound system in the store according to the sales format

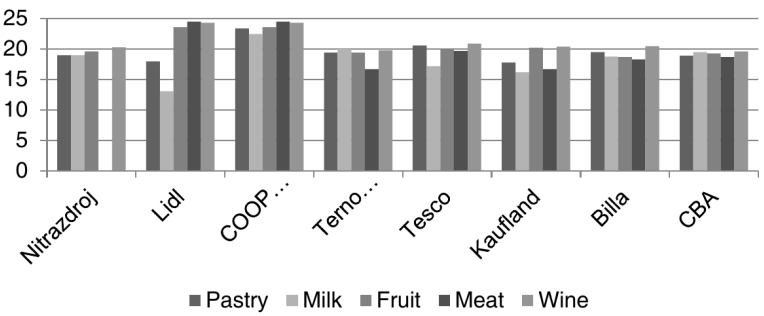


Fig. 4: Comparison of the intensity of noise in selected sales departments of particular stores

the case of Tesco, Kaufland, Lidl and Terno Slovakia. The assumption of higher noise levels in the fresh food departments compared to the ones offering durable goods has been demonstrated only in the case of Terno Slovakia and CBA. In the majority of cases in these departments of grocery stores a normal natural environment for people was present, with noise levels up to 30 dB. Natural noise (above 30 dB) might cause negative psychological aspects (loss of concentration, irritability, stress) in some individuals, depending on their sensitivity, while also in the longer term the noise level should not exceed 40 dB, as it might have an adverse effect on the overall human health, note Kuzmová et al. (2013).

4 DISCUSSION AND CONCLUSIONS

The measured values of noise and sound system intensity differ in both domestic and international stores, which reflects different approaches and strategies of these companies used when creating a pleasant and cultural shopping environment. Technical equipment and personnel maturity of particular stores depends on the sales format and area, but not on the ownership of these chains. These differences create a platform for a competitive struggle when not only the optimal price-quality ratio is important for the customer, but the shopping environment and experience with the visual appearance of the shop is also crucial. Creating a pleasant atmosphere within the store requires to determine the optimal accompanying musical elements (genre, tempo and reproduction), which are consistent with the nature of the goods sold and the sales strategy of the company. For the stores, which lack basic sound system we recommend an investment that will bring to the company not only satisfied customers, but also revenues from commercial playback of advertising messages within the sales area.

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IMPACT OF SOCIAL MEDIA ON THE STOCK MARKET: EVIDENCE FROM TWEETS

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ABSTRACT

The paper deals with the impact of the economic agent sentiment on the return for Apple and Microsoft stocks. We employed text mining procedures to analyze Twitter messages with either negative or positive sentiment towards the chosen stock titles. Those sentiments were identified by developed algorithms which are capable of identifying sentiment towards companies and also counting the numbers of tweets in the same group. This resulted in counts of tweets with positive and negative sentiment. Then we ran analysis in order to find causality between sentiment levels and the stock price of companies. To identify causal effects we applied Granger causality tests. We found bilateral causality between the risk premium and the amount of news distributed by Twitter messages.

KEY WORDS

stock returns, Granger causality, text mining, sentiment analysis, CAPM

JEL CODES

C1, C12, G17, G12

1 INTRODUCTION

The objective of this paper is to identify causal links and their directions between the stock returns and the economic agent sentiment. The main focus will be placed on the social networks, especially messages sent via Twitter. We hypothesize that those messages – tweets, provide quantifiable information about the sentiment. Therefore we apply text mining algorithms to identify positive and negative tweets relating to the analysed companies (Apple and Microsoft).

This paper continues the work of predecessors in this field, mainly Bollen, Mao and Zeng (2011). They have shown that there is a causal link between sentiment on Twitter and the stock market and therefore they were able to predict movements of the Dow Jones index (DJIA) with

FIALA, Vojtěch, KAPOUNEK, Svatopluk, and VESELÝ, Ondřej. 2015. Impact of Social Media on the Stock Market: Evidence from Tweets. *European Journal of Business Science and Technology,* 1 (1): 24–35. ISSN 2336-6494.

87.6% accuracy. Kuleshov (2011) was, on the other hand, not able to reproduce their results with the same procedure and thus questioned the research. No researcher has been able to archive similar results even with different methods, neither with the whole market nor with specific stock titles.

Apart from the majority of its predecessors this paper does not deal with causal links between sentiment and the whole market, which was represented by e.g. the Dow Jones index (Bollen, Mao and Zeng, 2011). It tries to find causality between sentiment and the price of specific stock titles. In order to accomplish that, it employs special algorithms which were not needed in previous research. The purpose of those is on one hand to identify tweets which are in some relationship with the chosen companies and on the other hand, to evaluate the level of sentiment of those tweets and to count them. Algorithms were created to be able to operate with tweets so they also respect some specifics of colloquial language. One of the most important parts is the analysis of causal links. There we employed Granger causality like Bollen, Mao and Zeng (2011).

2 THEORETICAL BACKGROUND

There is a large and rapidly growing literature examining the impact of investors' sentiment on financial markets, especially the predictive power of internet message postings. The empirical studies commonly employ distinct classifier machine learning algorithms to extract sentiment proxies from the huge quantity of text messages published in the news, in social media or on internet message boards (Antweiler and Frank, 2004; Arias, Arratia and Xuriguera, 2013 or Kim and Kim, 2014). These sentiment proxies are associated with specific words or expressions identified by rules or lexicons.

According to the efficient market hypothesis (EFM), the prices of securities are close to fundamental values (Fama, 1970; 1991). Markets are efficient because investors are rational and there are no limits on conducting arbitrage. Any dislocations in asset prices are quickly eliminated by rational investors (Friedman, 1953; Fama 1965), who understand Bayes' law and process all available information when forming expectations. However, empirical observations of capital markets contradict the EFM because the existence of anomalies and excess volatility cannot be explained by changes in fundamentals (LeRoy and Porter, 1981; Shiller, 1981; 2003).

This work is based on the fact that, according to Dolan (2002), human emotions have a large influence on decision making in general and also, as Gilbert (2010) states, on decision making and behaviour on financial markets. It is expected that with a better or more positive overall mood of investors they will be more prone to buying rather than selling in expectation of following growth of the price and vice versa. Those influences of public mood are then able to explain changes of asset prices which are unexplainable by fundaments. Gilbert and Karahalios (2010) showed that it is possible to abstract those sentiment (emotion) levels from social media. Those levels have aggregate character and expresses public mood. Based on that we suppose that if the sentiment influences decisions on the financial markets it also influences stock prices, which is the same assumption as used by similar research by Bollen, Mao and Zeng (2011), Kuleshov (2011) or Chung and Liu (2011). We also suppose that if this aggregate or general mood influences stock prices in general, mood towards one company influences stock prices of that company, as used by Chung and Liu (2011).

Different social media were used in past research in order to identify both overall sentiment levels and sentiment levels in relationship with one object (e.g. company). The social network Twitter was used with success by Bollen, Mao and Zeng (2011), Zhang, Fuehres and Gloor (2011), especially for its consistency and information value. The desired information is captured in tweets – unique authors' messages which are collectible via Twitter API.

3 METHODOLOGICAL BACKGROUND

In the beginning we had to choose companies with which to run analysis. We chose Microsoft Corporation and Apple Inc., mainly because of two elements. Stocks needed to be publicly traded, so we could run analysis and companies had to be popular. This popularity is for the purpose of research expressed by the combination of elements of market capitalization, average volume of stared stocks, business to consumer character of product and overall popularity of companies. We assumed that popular companies or their products will be mentioned more on Twitter than less popular ones and thus it will boost the importance of sentiment on Twitter in explaining changes in stock price.

The empirical strategy combines text mining algorithms and econometric modelling. First, we used Twitter streaming API in order to extract tweets from Twitter. We extracted tweets during the period from 1.3.2014 to 18.5.2014. We applied a filter to obtain tweets in the English language and keywords filter, which identified tweets with some relationship with the chosen companies. Those words were selected by analysis of companies and their products and with Google Trends which shows the popularity of words in google searches. Words were divided into two groups which identified Apple (M_{A}) and Microsoft (M_{M}).

After we created algorithms which were able to identify towards which company tweet carries sentiment, the level of sentiment itself and which also respects some features of colloquial English language. Those algorithms consisted of groups of words with different functions. In order to be counted as negative or positive, a tweet had to contain none or at least one word from each group in the algorithm. Which words the tweet must and must not contain is described by logical math connectors (conjunction $\wedge$, disjunction $\vee$ and negation $\neg$). Formula 1 represents the algorithm for identification of the number of tweets carrying positive sentiment towards Apple, formula 2 negative sentiment towards Apple, formula 3 positive sentiment towards Microsoft and formula 4 negative sentiment towards Microsoft:

$$M_{\mathrm{A}} \wedge S^{+} \neg V_{\mathrm{A}}, \quad V_{\mathrm{all}}, \quad M_{\mathrm{M}}, \tag{1}$$

$$M_{\mathrm{A}} \wedge S^{-} \neg V_{\mathrm{A}}, \quad M_{\mathrm{M}}, \tag{2}$$

$$M_{\mathrm{M}} \wedge S^{+} \neg V_{\mathrm{A}}, \quad V_{\mathrm{all}}, \quad M_{\mathrm{A}}, \tag{3}$$

$$M_{\mathrm{M}} \wedge S^{-} \neg V_{\mathrm{A}}, \quad M_{\mathrm{A}}, \tag{4}$$

where M_{A} and M_{M} are groups of words identifying Apple and Microsoft, S^{+} and S^{-} are groups of words identifying positive and negative segment, V_{A} and V_{M} are groups of words which prevent misinterpretation of M_{A} and M_{M}. V_{all} is a group of words which prevents misinterpretation of both M_{A} and M_{M}. Groups of words S^{+} and S^{-} were created from dictionaries and similar sources. The final groups of words were selected on the basis of usage with Google Trends and Google Ngram tools. Groups of words V_{A} and V_{M} were selected after thorough analysis of fundamental aspects of companies, products and especially competitive environment. Words in group V_{all} were selected in order to enable algorithms to identify specifics of colloquial English.

After we established algorithms we standardized data from Twitter. The process of standardization consisted of deletion of tweets of artificial origin (e.g. made by bots or applications) and limiting the number of tweets at 200,000 per day. Then we applied algorithms 5 to 8 which resulted in counts of both positive and negative tweets in relationship to either Apple or Microsoft by days.

With the counts of tweets needed, we applied Arbitrage Pricing Theory (APT) to obtain a basic model describing the relation between the stock returns and other factors (Ross, 1976). To explain stock returns we started with the simple Capital Asset Pricing Model (CAPM):

$$\mathrm{ER}_i = \mathrm{RF} + \beta\,(\mathrm{ER}_m - \mathrm{RF}), \tag{5}$$

where ER_i is the expected return of the specific capital asset i, RF is the risk-free interest rate on the market (usually government bonds), ER_m is the expected return of the market and β_i is the sensitivity of the expected excess of

the specific asset return to the expected excess market returns calculated as

$$\beta_i = \frac{\mathrm{Cov}\,(R_i, R_m)}{\mathrm{Var}\,(R_m)}.$$

The formula (5) is extended to the multifactor model as the special case of the APT:

$$R_i - \mathrm{RF} = \delta + \beta_i\,(R_m - \mathrm{RF}) + \gamma_i S_i + \epsilon_i, \quad (6)$$

where R_i and R_m are returns calculated from historical data as a rate of return over a single period on a daily basis, S_i represents sentiment, δ is intercept and ϵ_i is the idiosyncratic component of the stock's return which is minimized by the process of arbitrage. The vector autoregressive model of the order k, VAR(k), can be rewritten in matrix form:

$$\begin{aligned} Y_t &= \delta + B_1 Y_1 + \ldots + B_k Y_k + \epsilon_t = \\ &= \delta + \sum_{j=1}^{k} B_j Y_{t-j} + \epsilon_t, \end{aligned} \quad (7)$$

where all variables have the same lag length of order k. We applied Akaike and Bayesian information criteria to determine the minimal appropriate number of required lags.

To identify the causal relation between the news and the stock returns we applied Granger causality tests (Granger, 1969 and Sims, 1972). The causality is inferred when the lagged values of a variable X_t have explanatory power in a regression of a variable Y_t on lagged values Y_t and X_t. If lagged values of a variable X_t have no explanatory power of any of the variables in a system, then we would view X as weakly exogenous to the system. With respect to the direction of causality we can distinguish two cases: (1) unidirectional causality when X_t is caused Y_t but Y_t does not cause X_t and (2) bilateral causality when variables X_t and Y_t are jointly determined. This causality can be identified using the Granger test (1969) based on the premise that the future cannot cause the present or the past, utilising the concept of the VAR approach. In our analysis we assume a VAR(k) model with three variables X_t, Y_t and Z_t:

$$\begin{aligned} Y_t &= \delta_1 + \sum_{j=1}^{k} \alpha_{1j} X_{t-j} + \sum_{j=1}^{k} \beta_{1j} Y_{t-j} + \\ &\quad + \sum_{j=1}^{k} \gamma_{1j} Z_{t-j} + \epsilon_{1t}, \\ X_t &= \delta_2 + \sum_{j=1}^{k} \alpha_{2j} X_{t-j} + \sum_{j=1}^{k} \beta_{2j} Y_{t-j} + \\ &\quad + \sum_{j=1}^{k} \gamma_{2j} Z_{t-j} + \epsilon_{2t}, \\ Z_t &= \delta_3 + \sum_{j=1}^{k} \alpha_{3j} X_{t-j} + \sum_{j=1}^{k} \beta_{3j} Y_{t-j} + \\ &\quad + \sum_{j=1}^{k} \gamma_{3j} Z_{t-j} + \epsilon_{3t}, \end{aligned} \quad (8)$$

where X_t represents risk premium of the specific stock ($R_i - \mathrm{RF}$), Y_t is risk premium of the specific market ($R_m - \mathrm{RF}$) and Z_t represents sentiment (number of bad and/or good news sent by Twitter on a daily basis). To test causality in the formula (8) we used the Wald test with the defined W statistic (Wald, 1943):

$$\begin{aligned} W &= \frac{(\mathrm{RSS}_r - \mathrm{RSS}_u)/k}{\mathrm{RSS}_u/(n-2k-1)} \\ &\sim F(k, n-2k-1), \end{aligned} \quad (9)$$

and Lagrange multiplier with the defined LM statistic (Aitchison and Silvey, 1958; Silvey, 1959):

$$\begin{aligned} LM &= \frac{(\mathrm{RSS}_r - \mathrm{RSS}_u)/k}{\mathrm{RSS}_r/(n-2k-1)} \\ &\sim F(k, n-2k-1), \end{aligned} \quad (10)$$

where RSS_u is the sum of squared residuals from the unrestricted equation and RSS_r is the sum of squared residuals from the equation under the assumption that a set of variables is redundant (restricted).

Both test statistics are distributed as χ^2 under the null hypothesis with the same degrees of freedom (same number of restrictions). Berndt and Savin (1977) showed that the both tests are first-order equivalent and asymptotically optimal but they differ in second-order properties, when the null hypothesis is false, but erroneously fails to be rejected.

In order to proceed we obtained daily close stock prices abstracted from splits and dividends and daily Dow Jones Index close prices from Yahoo! Finance. Risk free interest rate is represented by daily treasury real yield curve rates of 5-year bonds provided by U.S. Department of the Treasury. The dataset contains data in the period March 3, 2014 to May 18, 2014.

4 RESULTS

Firstly, we calculated beta from the sample period using the formula

$$\beta_i = \frac{\mathrm{Cov}\,(R_i, R_m)}{\mathrm{Var}\,(R_m)}.$$

The parameter β is 0.6025 for Apple and 1.3721 for Microsoft. Using the adjusted closing price, the parameter β is 0.6093 for Apple and 1.3712 for Microsoft. The results showed that the Microsoft stock returns are much more sensitive to market movements as opposed to idiosyncratic factors. However, the key question is if the CAPM provides appropriate results and estimations of the asset prices and risks. Therefore we apply the simple version of the CAPM (formula 1) to calculate different betas referring to actual stock returns. The identified relations between the systematic risk (beta) and stock returns are presented in Fig. 1.

Obviously, there are too many situations when stocks do not lie on the SML (Security Market Line). Moreover, the results confirmed limitation of the simple CAPM without other idiosyncratic factors.

Regarding the results provided by the simple CAPM we included sentiment of the economic agents. Thus, we assume that economic agents incorporate and reflect all relevant information, including all idiosyncratic factors related to the specific stock returns. We assume that this information is contained in all news related to the companies and its typical products sent by Twitter as well. The results of the Granger causality tests are presented in Tab. 1 to 4. Tab. 1–2 present Wald statistics of variables within the identified VAR(k) models. In the case of Apple (AAPL) we estimated VAR models with k in the range 1–3. The lag was higher in the models of Microsoft stock (MSFT). The maximal lag of the estimated VAR model with significant relationship between the risk premium and news was 8 days.

However, the identified unilateral causality confirmed that risk premium of the specific stocks is affected only by market premium at the 1% and 5% significance level. We also found that the news sent via Twitter is affected by both risk premium of the specific stocks and risk premium of the market. Thus, the news reacts to the capital market movements, capital markets do not react to the news sent via Twitter. Especially in the case of Apple, we identified causal effects of risk premium of the stock and market on the bad news sent via Twitter at 1% significance level and lag of 2 days. On the contrary, changes in risk premium of the stocks and market affect the good news related to the company Microsoft and its products with the lag of 3 days. The only identified causality effect with direction from news to capital markets was identified in the case of Apple stock and the news which combines the names of both analysed companies and their products. This causality was identified in the model VAR(3) at 10% significance level.

Adjusted closing prices of the stocks showed similar results (Table 2). The employed Wald test identified causality only in the direction from capital market to the news sent by Twitter. Especially bad news related to both companies Apple and Microsoft and its products, and bad news related to Apple and its products, react to the changes of the stock and market returns. The causality was identified at 1% significance level and lag of 2 days. On the contrary, good news related to the company Microsoft and its products are sent 3 days after the changes of the appropriate stock returns or market returns.

Bilateral causality between the news and capital markets, as well as the unilateral causality in direction from capital markets to news

Tab. 1: Granger causality statistics, Wald test

Bad News			
VAR(3)	**Risk Premium (AAPL)**	**Market Premium**	**Bad News (AAPL + MSFT)**
Risk Premium (AAPL)	0.0098	4.0895**	2.7522*
Market Premium	0.0064	4.2297**	2.1409
Bad News (AAPL + MSFT)	1.0075	1.1103	0.4162
VAR(2)	**Risk Premium (AAPL)**	**Market Premium**	**Bad News (AAPL)**
Risk Premium (AAPL)	0.0600	3.9487**	0.2640
Market Premium	0.0039	4.2858**	0.0595
Bad News (AAPL)	15.6588***	14.9487***	0.0714
VAR(8)	**Risk Premium (MSFT)**	**Market Premium**	**Bad News (AAPL + MSFT)**
Risk Premium (MSFT)	2.2677	4.7571**	0.5777
Market Premium	2.8260*	5.6873**	0.6698
Bad News (AAPL + MSFT)	3.3559*	3.1535*	2.1429
VAR(3), const.	**Risk Premium (MSFT)**	**Market Premium**	**Bad News (MSFT)**
Risk Premium (MSFT)	0.9478	2.8848*	1.3400
Market Premium	0.6537	2.2899	1.1574
Bad News (MSFT)	0.1198	0.1044	3.7565*
Good News			
VAR(1)	**Risk Premium (AAPL)**	**Market Premium**	**Good News (AAPL + MSFT)**
Risk Premium (AAPL)	0.1581	13.0362***	0.0786
Market Premium	0.3362	15.5776***	0.0584
Good News (AAPL + MSFT)	2.6802	2.7528*	6.8571***
VAR(1)	**Risk Premium (AAPL)**	**Market Premium**	**Good News (AAPL)**
Risk Premium (AAPL)	0.0694	9.2360***	0.0713
Market Premium	0.1605	11.1707***	0.0914
Good News (AAPL)	0.9593	1.0611	9.4526***
VAR(1), const.	**Risk Premium (MSFT)**	**Market Premium**	**Good News (AAPL + MSFT)**
Risk Premium (MSFT)	0.7724	2.1210	0.0744
Market Premium	0.7899	2.1437	0.0422
Good News (AAPL + MSFT)	3.3267*	3.1550*	7.0371***
VAR(3)	**Risk Premium (MSFT)**	**Market Premium**	**Good News (MSFT)**
Risk Premium (MSFT)	0.0019	0.5253	0.0501
Market Premium	0.0090	0.3240	0.0052
Good News (MSFT)	6.3132**	6.0871**	6.2187**

Notes: *, ** and *** denote significance at the 10, 5 and 1% level.

Tab. 2: Granger causality statistics, Wald test, adjusted closing price

Bad News			
VAR(2)	**Risk Premium (AAPL)**	**Market Premium**	**Bad News (AAPL + MSFT)**
Risk Premium (AAPL)	0.0297	4.1425**	0.0262
Market Premium	0.0002	4.4257**	0.0009
Bad News (AAPL + MSFT)	13.3267***	12.7574***	0.3279
VAR(2)	**Risk Premium (AAPL)**	**Market Premium**	**Bad News (AAPL)**
Risk Premium (AAPL)	0.0374	4.0832**	0.2167
Market Premium	0.0007	4.4039**	0.0586
Bad News (AAPL)	15.0801***	14.3688***	0.0824
VAR(8), const.	**Risk Premium (MSFT)**	**Market Premium**	**Bad News (AAPL + MSFT)**
Risk Premium (MSFT)	3.6371*	6.1297**	0.4437
Market Premium	4.4618**	7.2933***	0.5599
Bad News (AAPL + MSFT)	3.1972*	3.0871*	2.2757
VAR(8), const.	**Risk Premium (MSFT)**	**Market Premium**	**Bad News (MSFT)**
Risk Premium (MSFT)	3.5802*	6.0588**	0.0033
Market Premium	4.4049	7.2325***	0.0096
Bad News (MSFT)	1.3975	1.3723	0.7956
Good News			
VAR(1)	**Risk Premium (AAPL)**	**Market Premium**	**Good News (AAPL + MSFT)**
Risk Premium (AAPL)	0.3044	14.4829***	0.0770
Market Premium	0.5023	17.3489***	0.0563
Good News (AAPL + MSFT)	2.7703*	2.8362*	6.8545***
VAR(1)	**Risk Premium (AAPL)**	**Market Premium**	**Good News (AAPL)**
Risk Premium (AAPL)	0.1625	10.2406***	0.0540
Market Premium	0.2588	12.1758***	0.0792
Good News (AAPL)	0.9844	1.0847	9.3627
VAR(1)	**Risk Premium (MSFT)**	**Market Premium**	**Good News (AAPL + MSFT)**
Risk Premium (MSFT)	0.6016	1.9716	0.0531
Market Premium	0.6163	1.9877	0.0217
Good News (AAPL + MSFT)	4.0486**	3.9813**	6.9760***
VAR(3), const.	**Risk Premium (MSFT)**	**Market Premium**	**Good News (MSFT)**
Risk Premium (MSFT)	0.0145	0.5865	0.2118
Market Premium	0.0003	0.3770	0.0759
Good News (MSFT)	6.7689***	6.7192***	7.1182***

Notes: *, ** and *** denote significance at the 10, 5 and 1% level.

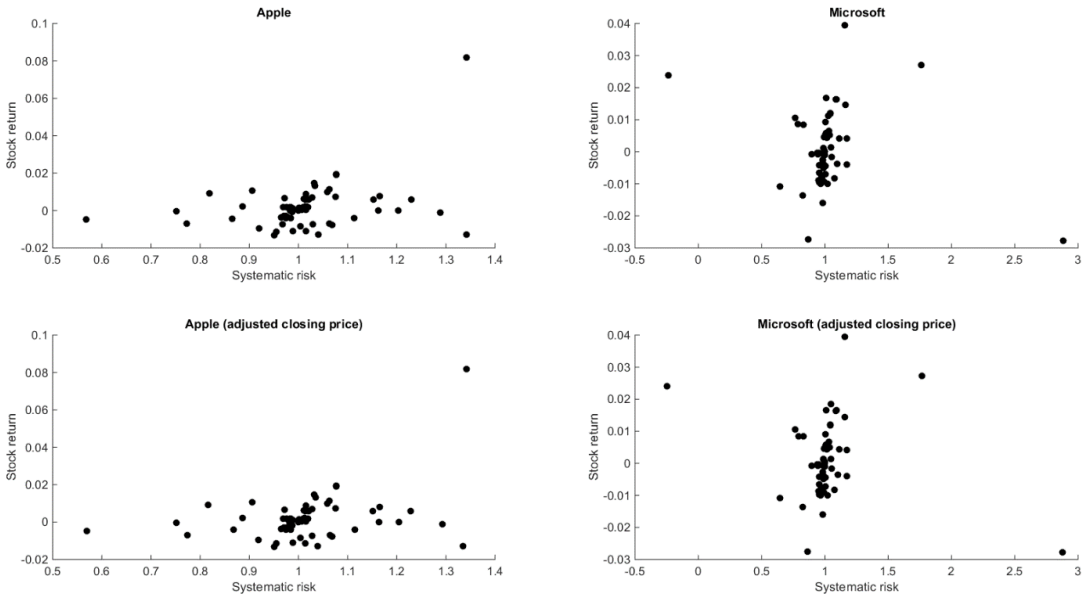

Fig. 1: Relation between the risk and the stock returns

was identified by the Lagrange multiplier test (Tab. 3–4). The results presented in Tab. 3 confirmed that market risk affect stocks in all the identified models at 1% significance level. The effects of the news on the stocks were confirmed only in the model of Microsoft stocks and good news at 1% significance level, and in the case of the other 4 models at 5% significance level and in two models at 10% significance level. The reverse causal effects in direction from the markets to the news was identified in the case of bad and good news related to the company Apple and it products, and in the case of good news related to the company Microsoft and its products. Bilateral causality was identified in the case of good and bad news related to Apple and good news related to both the analysed companies.

Obviously, the results are totally different in comparison with the Wald test. The reason is not only the possible error of the second-order mentioned in the methodological part of this paper but also different VAR models selected for the Granger causality tests. The resulted models, especially the lags, were selected according to the number of significant causal relations (under the assumption of the condition for the minimal required lag given by Akaike and Bayesian information criteria). Summarily, we can assume that the results in Tab. 1–2 may be biased by the error of the second-order. This means that the results may fail to reject a false null hypothesis, thus the results may fail to detect the effects of the news on the capital markets that are present.

Tab. 4 provides results where stock prices are adjusted by any distributions and corporate actions that occurred at any time prior to the next day's opening. These results better record the historical performance and confirmed the effect of the news on the capital markets. However, we can identify much fewer links in comparison with the results presented in Tab. 3. There is significant causal effect of the good news related to the company Microsoft and its products on the stock returns at 1% significance level with the lag of 1 day. In the same model we identified also effects of this news on the market risk premium. The causal effect in the direction from the news to capital markets at 5% significance level was identified in the case of Microsoft stocks and bad news related to both companies.

Tab. 3: Granger causality statistics, Lagrange multiplier test

Bad News			
VAR(2)	**Risk Premium (AAPL)**	**Market Premium**	**Bad News (AAPL + MSFT)**
Risk Premium (AAPL)	0.6424	9.3083***	0.6597
Market Premium	0.1095	4.9957**	0.0174
Bad News (AAPL + MSFT)	4.6557**	4.6879**	0.3100
VAR(2)	**Risk Premium (AAPL)**	**Market Premium**	**Bad News (AAPL)**
Risk Premium (AAPL)	0.7648	10.2927***	3.4243*
Market Premium	0.1902	5.1863*	1.4651
Bad News (AAPL)	4.7451**	4.8231**	0.0856
VAR(1)	**Risk Premium (MSFT)**	**Market Premium**	**Bad News (AAPL + MSFT)**
Risk Premium (MSFT)	20.8970***	22.9681***	5.2281**
Market Premium	21.9700***	23.4493***	9.1056***
Bad News (AAPL + MSFT)	0.8068	0.7084	6.7864***
VAR(3)	**Risk Premium (MSFT)**	**Market Premium**	**Bad News (MSFT)**
Risk Premium (MSFT)	0.0442	27.3144***	6.5107**
Market Premium	6.4669**	11.3334***	16.7450***
Bad News (MSFT)	1.0849	0.9640	0.0617
Good News			
VAR(1), const.	**Risk Premium (AAPL)**	**Market Premium**	**Good News (AAPL + MSFT)**
Risk Premium (AAPL)	2.3030	14.5587***	2.9538*
Market Premium	0.5477	7.1206***	5.4576**
Good News (AAPL + MSFT)	2.4542	2.3648	9.8139***
VAR(2)	**Risk Premium (AAPL)**	**Market Premium**	**Good News (AAPL)**
Risk Premium (AAPL)	1.0349	29.4166***	4.2049**
Market Premium	1.3066	21.6315***	7.1053***
Good News (AAPL)	5.8221**	5.9787**	12.7513***
VAR(1), const.	**Risk Premium (MSFT)**	**Market Premium**	**Good News (AAPL + MSFT)**
Risk Premium (MSFT)	20.6646***	24.3159***	4.4195**
Market Premium	24.0339***	25.8299***	1.9896
Good News (AAPL + MSFT)	4.4557**	4.2404**	8.6625***
VAR(1)	**Risk Premium (MSFT)**	**Market Premium**	**Good News (MSFT)**
Risk Premium (MSFT)	18.9652***	22.7299***	21.0364***
Market Premium	21.5313***	23.5420***	10.4915***
Good News (MSFT)	0.0065	0.0149	2.5686

Notes: *, ** and *** denote significance at the 10, 5 and 1% level.

Tab. 4: Granger causality statistics, Lagrange multiplier test, adjusted closing price

Bad News			
VAR(1)	**Risk Premium (AAPL)**	**Market Premium**	**Bad News (AAPL + MSFT)**
Risk Premium (AAPL)	8.5346***	12.4047***	1.8510
Market Premium	2.7211*	9.7663***	7.0824***
Bad News (AAPL + MSFT)	0.5500	0.6024	9.3682
VAR(1)	**Risk Premium (AAPL)**	**Market Premium**	**Bad News (AAPL)**
Risk Premium (AAPL)	8.4035***	11.0118***	2.7150*
Market Premium	1.9990	8.1766	7.8238***
Bad News (AAPL)	0.3145	0.0000	7.3322***
VAR(1)	**Risk Premium (MSFT)**	**Market Premium**	**Bad News (AAPL + MSFT)**
Risk Premium (MSFT)	22.6093***	25.3058***	5.8036**
Market Premium	22.8656***	25.1621***	9.5345***
Bad News (AAPL + MSFT)	0.7169	0.6215	6.8462***
VAR(1)	**Risk Premium (MSFT)**	**Market Premium**	**Bad News (MSFT)**
Risk Premium (MSFT)	18.6683***	24.0590***	0.2101
Market Premium	23.1452***	26.1626***	0.2435
Bad News (MSFT)	1.4336	1.2405	10.2091***
Good News			
VAR(1), const.	**Risk Premium (AAPL)**	**Market Premium**	**Good News (AAPL + MSFT)**
Risk Premium (AAPL)	4.5873**	15.0571***	2.8407*
Market Premium	0.6713	7.4638***	5.1118**
Good News (AAPL + MSFT)	2.6622	2.5635	9.8050***
VAR(1)	**Risk Premium (AAPL)**	**Market Premium**	**Good News (AAPL)**
Risk Premium (AAPL)	4.8234**	30.0526***	1.9303
Market Premium	2.6874	23.8666***	3.6264*
Good News (AAPL)	6.2321**	6.8226***	12.4235***
VAR(1)	**Risk Premium (MSFT)**	**Market Premium**	**Good News (AAPL + MSFT)**
Risk Premium (MSFT)	19.2966***	23.9271***	2.7963*
Market Premium	22.6996***	25.3400***	0.9935
Good News (AAPL + MSFT)	4.5975**	4.6390**	8.4946***
VAR(1)	**Risk Premium (MSFT)**	**Market Premium**	**Good News (MSFT)**
Risk Premium (MSFT)	19.4082***	24.1781***	20.3466***
Market Premium	21.7214***	24.6692***	10.2522***
Good News (MSFT)	0.0024	0.0082	2.5621

Notes: *, ** and *** denote significance at the 10, 5 and 1% level.

On the contrary, capital markets affected news sent via Twitter in the four models. Three of these four models are VAR(2). Thus, the effects of the news on the capital markets may be slightly faster in several cases than the effects in the direction from the capital markets to the news sent via Twitter.

The section should contain an evaluation and exact description of the achieved results. If the nature of a paper allows it, also state the statistical significance of the results.

5 DISCUSSION AND CONCLUSIONS

In this paper we employed Granger causality to identify causal links between users' content on the social network Twitter – tweets and price of stocks of Apple Inc. and Microsoft Corporation on the New York Stock Exchange. The Wald test which was used proved causality from the direction of the market to the sentiment on Twitter. LM statistics on the other hand showed the existence of both one directional and two directional causal links. The causality of stock markets on the sentiment of tweets was proven mostly in models with positive sentiment tweets, which is a similar result as in the research of Chung and Liu (2011). In both tests causality of sentiment on the premium of Apple and Microsoft was proven, which may for example indicate that some Twitter users are owners of the stocks in question and opinion leaders such as news agencies are informing about the performance of markets. There were also identified causal links from the direction of the whole market (in this case the DJIA) to Twitter.

This research has also proven that simple CAMP is not enough to describe stock price creation and that the factor of feelings and emotions plays its role as is described by behavioural economics.

Possible limitations of our results originate in two causes. It is possible that the methodology of finding the causality between Twitter and specific stocks was creating limitations and research of causality between Twitter and whole market would resulted in proving even more significant causality (e.g. in all the models) as happened in the case of Bollen, Mao and Zeng (2011). The second limitation comes from identifying the sentiment of the tweets. The algorithms that we used were more complex than in previous research, which means that we were able to recognize sentiment and companies with more precision. On the other hand, specifics of colloquial language are far more complicated than the algorithms used could capture.

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FIRST EVIDENCE ON CROWD INVESTING IN GERMANY

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ABSTRACT

Crowd investing has recently become an interesting possibility for young entrepreneurs to finance the start-up of new firms. This paper analyses the impact of education and gender of young entrepreneurs who finance their start-ups using a crowd investing platform. We analyse the crowd investing projects financed through the Companisto and Seedmatch platforms, which are the main crowd investing platforms in Germany. The study confirms that the majority of founders of crowd investing start-ups completed a university education. However, we find a surprisingly low-rate of female founders in crowd investing, although the gender structure do not influence the amount of crowd investing. Thus, the crowd investing does not facilitate the access to finance for new groups of entrepreneurs, but it rather facilitates the financing conditions for founders, who could also obtain a credit from the bank.

KEY WORDS

crowdfunding, entrepreneurial nance, donations, venture capital

JEL CODES

G23, G24

1 INTRODUCTION

Start-ups companies have several alternatives how to finance their projects (Hahn, 2014). The access to external finance is crucial due to the fact that a lot of start-up enterprises fail because of undercapitalization (Fueglistaller, Müller, Müller and Volery, 2008). One possibility is the cooperation with the so-called business angels in order to receive sufficient financial resources. Moreover, they also bring know-how in the management of new projects (Kaiser and Busack, 2006). Another opportunity is to attract funding by venture investors but there is only a bare likelihood to receive the needed capital (Warmer and Weber, 2015).

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This type of funding is summarized as private equity (Haasis, Fischer and Simmert, 2007). Finally, capital resources or funds from friends or relatives are another possible method to collect the start-up capital (Stahlmann, 2013).

Contests for founders open a chance to obtain the necessary starting capital stock (Stahlmann, 2013). The most traditional way is to apply for credit from a bank (Hilse, 2010). By contrast, crowd funding provides a new source of capital to finance new innovative projects. In general, crowd funding is available for all types of projects (Orthwein, 2014). Crowd investing represents a form of crowd funding and it provides capital to start-up companies without a future participation in the projects in a direct or indirect way. Selected platforms offer start-ups the chance to present their business projects to potential private investors, who are generally referred to as the crowd. Usually, private persons invest relatively small amounts in different projects, which often attract them by other non-financial reasons (e.g. to support development in areas neglected by standard banks and institutional investors including environmental protection and non-profit activities). The collected capital is available for the company. If the business is successful, the invested money will be paid back with an interest (Waider, 2013). Actually, the mutual investment founding is not the main innovation of crowd funding (Sixt, 2014), it is rather the interactive approach fully integrated into online social networks which represents a major innovation in the context of company funding. Crowd investing is highly interesting for investors, especially in current periods which are characterized by low interest rates offered to households for standard saving forms (Heintze, 2015).

The most important German platforms for possible funding of start-ups are Companisto and Seedmatch. The dominance of these two platforms could be explained by high rates of successfully founded companies (Inci, 2014). Correspondingly, many start-ups are interested in presenting their projects on these platforms in order to increase the probability to receive sufficient funding. However, this creates also a pressure for the operators of the platforms to select the most promising start-ups, which may result in selection bias of presented projects. This can then explain the high percentage of successful funding following the principle "quality will prevail" (Piwinger and Zerfaß, 2007). Moreover, the platforms themselves are also interested in achieving high rates of completed investments because they receive fees from successfully funded projects (Kletzsch, 2013).

While public attention concentrates often on the description of crowd-funded projects, the founders of start-ups receive much less attention in this area. By contrast, the characteristics of traditional entrepreneurs and founders attract the interest of scholars for a long time (Blum and Leibbrand, 2001). Therefore, this paper focuses on the education and gender structure of the founders who present their projects at crowd funding platforms. Actually, female founders are underrepresented in the start-up area (Startups eV, Ripsas and Tröger, 2014). Furthermore, founders of start-up enterprises own a higher degree of education than the average founders (Startups eV, Ripsas and Tröger, 2014). This contribution is investigating whether this holds true also in the field of crowd investing. If one looks at the start-up developments, it strikes to see how few women are active in this area (Kampmann, Keller, Knippelmeyer et al., 2013). Despite of this, we do not confirm any difference in the investment amounts made available for start-up projects for male or female founders. Thus, it seems that either the self-selection by the founders or the selection by the investment platforms may cause low shares for female entrepreneurship.

Our paper is structured as follows. The next section describes our unique data sets, which was collected manually from the crowd investing platforms between 2013 and 2015. We describe the structure of projects in Section 3 and complete this description by a statistical analysis in Section 4. The last section concludes and presents policy discussion.

2 DATA DESCRIPTION

We collect data about crowd investing companies from two main platforms, Seedmatch and Companisto. These two platforms were selected because they are the biggest in Germany, thus most of the crowd investing companies were founded with their assistance (Carstens and Schramm, 2014). All firms funded by these platforms were collected as a part of this project. The research gives a closer look on the gender of founders and the educational background. In addition, the companies were analysed in order to understand which roles female founders played in these enterprises, and which responsibilities they had while in the group of founders. It is also interesting to take a closer look into their educational background. In addition, the website "Xing" is used to collect information which were not provided from the crowd investing websites. Further research categories are the branch, the product of the enterprise, the needed capital and the collected capital. This is relevant because more criterions could clarify the founding behaviour of women; especially the branch of the company. Altogether, 101 enterprises were investigated. This serves the purpose of supporting the results statistically to improve the quality of the research which should provide a general view on the status quo of crowd investing in Germany.

3 STRUCTURE OF FIRM FOUNDERS IN CROWD INVESTING

According to our data set of 101 start-ups with altogether 218 founders, only 18 female founders are represented in 13 founding teams. Thus, the share of start-ups with female founders is surprisingly low: 8.3% of all founders and of 12.8% of start-ups. Interestingly, the percentage of female founders is lower than the percentage of start-ups with female founders in their team (13.0%). It shows that female founders are strongly concentrated in few projects. Actually, Tab. 1 confirms that the share of female founders is above a half in the average for those projects with female participation. It is also interesting to note (see Tab. 1) that an average size of a founder with female participation is slightly larger (2.5 persons, and 2.6 persons in start-ups dealing with female topics) than the number of founders on average (2.3 persons).

Moreover, some start-ups – especially dealing with women specific topics – are nearly founded by women. Thus, eight enterprises were funded solely by women and four out of them deal with themes connected to women:

- Erdbeerlounge: `http://www.deutsche-startups.de/verzeichnisse/startups-a-z/erdbeerlounge/`;
- Tampons for U: `https://www.seedmatch.de/startups/tampons-for-you`;
- Sugarshape: `https://www.seedmatch.de/startups/sugarshape`;
- Edition F: `https://www.companisto.com/de/startups/edition-f-startup-39/overview`.

Without these start-ups the percentage of women in the crowd investing scene would be much lower.

The low share is not an uncommon figure for this scene. Earlier studies1 often document about a share of around 13%. Despite the difference of the figures the weak founding activities of females were reconfirmed with the empirical data.

Previous literature identifies several factors. Women are often less encouraged by their environment, resulting that they do not start new risky business projects. Moreover, women are less integrated into networks with other founders who could help them build their own company. Women rarely hold an executive position early in their career. This could result from the fact that women often work in the communication section of a start-up rather than in the technical fields. Furthermore, the arrangement of family and work duties is still difficult (Warda, 2007). The sectors where women found their companies are problem-oriented this means that with their enterprise want to solve a specific issue. Also female founders integrate a company in a field where they have particular expertise. Correspondingly, it is not surprising that female founders are focusing on female-specific areas and health and food.

4 STATISTICAL ANALYSIS

In the next step we examine the statistical characteristics of the start-up funding in crowd investing-platforms. We take the following factors into account. The size of the funding team (number of founders), the education level (share of team members with higher education), their expertise and the participation of female founders. Finally, we analyse the investment value collected by the crowd, which is selected as the most important indicator.

Tab. 2 presents the tests whether start-ups with particular characteristics receive more or less funding from the crow. In particular, we define sub-samples e.g. for small and big founding teams, with and without female member in the crowding team, or teams with members without university education. Then we perform the t-test of mean invested amount for the sub-samples.

On average the start-ups include two founding members. Only a few teams are constituted of four members and two teams consist of five members. The most interesting exception from this is a group of students from the University of Berlin, who collectively funded a start-up company offering printouts of passport photos. In this single case, the exact number of founders is not reported. Therefore, we exclude this company from further statistical analysis. Smaller teams get more money than bigger teams but the difference is not statistically significant.

Education level plays an important role in the field of crowd investing. Only seven start-ups have founders without a university degree. These start-ups consist of small teams with only one or two founders. They are mainly located in the field of online shopping. On average, 85% of founders own a university degree. Surprisingly, the statistical analysis shows that start-ups with a lower education level receive more capital, and this gap is even statistically significant. The difference in the collected capital is due to two very big start-ups with exceptionally high investments (a hotel and an IT-company). If we remove the two start-ups, the founded capital – as it was expected – will be higher for highly-educated founders. However, the discrepancy is not statistically significant.

As an extension of the classical statistical analysis we estimate a multivariate regression which includes all main factors and some control variables. The results for the presented variables remain unchanged. These outcomes confirm the earlier results (Barasinska and Schäfer, 2014), which concluded that the low participation of female founders in the field of crowd investing cannot be explained by gender-based discrimination.

Tab. 1: Gender Structure of Start-Ups Financed by Crowd Investing

	Number of start-ups	Total number of founders	Average number of founders	Total number of female founders	Aver. number of female founders	Share of female founders
Female topics & children	5	13	2.60	10	2.00	76.92
Health & food	5	11	2.20	5	1.00	45.45
Other	3	8	2.67	3	1.00	37.50
Total of start-ups with fem	13	32	2.46	18	1.38	56.25
All start-ups	101	218	2.33	18	1.33	8.26

Tab. 2: Descriptive Statistics for Crowd Funding Volume

Variable and tested threshold	Less than the threshold	More than the threshold	*t*-test
Number of member (more than 2)	433,284.7	338,521.9	0.5334
University education (above 85%)	657,191.7	313,636.1	1.8472**
University education (above 85%), outliers excluded	266,124.4	313,636.1	−0.6895
Female participation (above 1 person)	423,419.5	266,043.1	0.6391

5 CONCLUSIONS

The internet and especially crowd investing fuelled expectations that the technological revolution will create a virtual world where race, religion and gender are no longer important for business success. Yet, the experience of the first decade demonstrates that a lot of human behaviour follows the same behavioural pattern also in this virtual world in the internet. The female participation in start-ups remains low. In the area of crowd investing women only represent 13% of the founders. Moreover, the share of companies with female founders is even lower because female founders are concentrated in only few areas and start-up projects. By contrast, a statistical analysis does not prove any differences in the behaviour of the investors meaning that self-selection or selection of presented platforms by the dominating internet platforms might be important.

Beyond that, other factors like education have a minimal impact for the decision of the crowd. This can provide an interesting hint on the quality of the crowd-based decisions. In particular, it seems that the crowd-investors act more or less blind and perhaps the crowd-intelligence has been overemphasized so far. Crowd investing improves the situation for young well-educated men, who also have a good access to bank loans.

In other words, the data collected as a part of this research show an interesting pattern. Often women do not have the confidence to prevail in a men-dominated area like start-ups. This could be also related with the missing role models for female founders and the fact that they are not sufficiently integrated into expertise networks (Voigt, 2013). This issue can be observed in the acquisition of loan capital.

Female founders are mainly located in areas like public relations, marketing and personal department. Hence, they do not gain the experience of leading a company. As a consequence, they do not gain the confidence to build up their own company in a new and risky area. High risk aversion plays an important as well as the skills in communication areas (Kampmann et al., 2013). Moreover the arrangement of career and family is still fraught with problems. This could ensure that women restrain from leading positions in a company. The low percentage of women in executive positions can be also observed in the board of the DAX companies (Peters and von Garrel, 2013). The fact that women are seldom represented in the top management could also be associated with the

competitive situation for such jobs because women avoid such competition more than men (Bierach, 2011).

The hypotheses that women found mainly companies in specific areas can be confirmed also by our data. We show that firms with female founders often solve problems and in the field of their expertise. Examples like Sugarshape or Tampons for U verify this because they deal with female-specific issues.

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DOES ACCESS TO EXTERNAL FINANCE AFFECT DEVELOPMENT OF SMALL AND MEDIUM ENTERPRISES AND ECONOMIC GROWTH?

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ABSTRACT

Small and medium-sized enterprises (SMEs) have become increasingly important in nowadays society as providers of employment opportunities and key players for the well-being of local and regional communities. Access to external funding is one of the largest problem facing SMEs in European Union (EU). Entrepreneurs face difficulties implementing their development plans while creating new businesses, adopting innovation, etc. Scientists also argue that without external funding business cannot achieve good financial performance results. The European Commission (EC) is implementing a number of programs specifically designed to improve the financial environment for SMEs in Europe. Since the financial markets have failed to provide SMEs with the finance they need, the EC has developed and funded various financial instruments. According to the scientists, creating the appropriate conditions for the development of SMEs in each country would possibly reduce the unemployment rate, accelerate country's economic growth, help to overcome social problems, and create competitive environment. Given the current economic situation in the EU countries, the subject's relevance is obvious underlying the importance to assess whether a better access to external funding sources would provide benefits to the countries at micro and macro levels.

The main empirical findings of this study confirm the results of early empirical studies that a better access to external funding is an important growth factor for SMEs as well as for the whole economy. The panel regression analysis results suggest that a better access to banks' funding has a positive and statistically significant effect on country's economic growth as well as on SMEs development, however, a better access to equity finance (venture capital, business angels' investment) has no statistically significant effect. While SMEs represent over 99% of businesses in the EU so it is crucial to support their growth and innovation as well as improve the financing environment for small businesses in Europe.

KEY WORDS

small and medium-sized enterprises, access to finance, economic growth, the European Union

JEL CODES

L11, G32, O4, O52

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1 INTRODUCTION

While the largest share of gross domestic product (GDP) is created by SMEs, many economists agree that SMEs are the main drivers of economy. In 2014 the number of SMEs in the EU countries has increased significantly up to 21.52 millions and accounted 99.8 percent of all European enterprises, while the number of SMEs employees has reached 88.98 millions (about 66.9% of private-sector jobs and more than 80% of employment in some industrial sectors such as the manufacture of metal products, construction and furniture). The value added of the SMEs increased almost 108 percent during recent years and accounted 58 percent of total EU GDP in 2014. The development of small and medium-sized business has major implications for the economy considering the growing share of GDP created by SMEs along with the economic and social problems solved by SMEs. Šivickas, Simanavičius and Pukis (2010) note that despite the growing importance of SMEs in shaping and maintaining competition in the market, being small and having limited financial resources, SMEs cannot compete with the largest business companies, so policymakers have to create more favorable conditions for competition in the market for SMEs. Scientists note that in different stages of business development companies need different funding sources. The analysis of scientific literature reveals that the availability of external funding sources improves the competitiveness of SMEs in the long term, whereas this effect is not observed at the early stage of business development. However, most researchers investigating the effect of access to external funding on businesses focus on micro level, while research dealing with these issues at macro level is still lacking. In 2007, EC introduced the Small and Medium-sized Enterprises Access to Finance (SMAF) index which allows to monitor developments in SMEs access to financial resources, analyze differences between EU member states, and comprehensively assess the issue in question. However, a number of empirical studies investigating the impact of SMEs access to financial resources at EU level is relatively low.

Due to the growing business needs the volume of various external funding sources is increasing every year as well as amount of alternative funding sources. Alternative funding sources such as venture capital, peer-to-peer lending, crowdfunding are becoming more important these days. According to Jurevičienė and Martinkutė (2013) these alternative funding sources had been created because of growing needs for alternative funding sources in EU countries. The survey by the European Central Bank reveals that the demand for financial funding increased by 18% in 2013. Scientists agree that the supply and demand of external funding sources is growing every year, however, SMEs are facing a numerous challenges in order to get external funding. Railienė and Ivaškevičiūtė (2013) note that information asymmetry, risk uncertainty, transaction and monitoring costs, insufficient collateral are the main factors affecting the access of SMEs to external funding. According to Adomavičiūtė (2006), Paliulytė (2009), the choice of optimal funding structure under competitive market conditions is becoming very relevant issue for most of firms. Therefore, chief executive officers as well as chief financial officers are facing the dilemma of optimal funding structure in order to maximize financial results and profitably ratios. Adomavičiūtė (2006), Paliulytė (2009), Beržinskienė, Cibulskienė and Būdvytytė-Gudienė, (2012), Ivanovienė and Karalevičienė (2011) argue that companies using mixed funding structure increase profitability almost 50 percent comparing to companies using only equity. The empirical results show that at the early stage of business development SMEs are facing a shortage of financial funding, whereas external funding could be a solution in this situation.

The main purpose of this study is to investigate the effect of an access to external finance on development of SMEs and economic growth. The article is structured as follow. Section 2 reviews the literature on the financial constraints of SMEs and economic growth. Section

3 presents our data and research methodology. Section 4 contains our results, which we discuss in the following section (5) before concluding with a set of final comments on the contribution of the article.

2 LITERATURE REVIEW

The scientific literature provides some empirical studies related to access to external funding and economy. Scientists Carpenter (2001), Becchetti and Trovato (2002), Vos, Jia-Yuh Yeh, Carter and Tagg (2007), Mina, Lahr and Hughes (2013), Alvarez and Lopez (2014), El-Said, Al-Said and Zaki (2015) had investigated the impact of the access to external finance on economy. However, there are only a few studies (Krishan, Nandy and Puri, 2015; Lee, Sameen and Cowling, 2015) analyzing the effect of external funding on the development of SMEs at the EU level.

Carpenter (2001) investigated the impact of funding structure on the development and growth of SMEs. The empirical results of this study show that most of companies use only a small share of external funding. The results of regression analysis suggest that the growth of companies that do not use external funding is strongly related to the size of company's equity. These empirical results also indicate that the growth of SMEs is limited due to the size of equity and low financial leverage. Becchetti and Trovato (2002) observed the impact of the determinants of growth: company's size, age, number of employees on the development of Italian SMEs. The empirical results suggest that the hypothesis of independence of company's growth from the initial size and other factors is not rejected for large companies, while it does not hold for SMEs under financial constraints in a Vbank-oriented financial system in which access to external funding is difficult. Jia-Yuh Yeh (2007) examined the financial behavior of the American and British private firms. The empirical results suggest that only minority of American private firms view a lack of capital other than working capital as a major financial problem. The results contradicting the conventional financial lifecycle paradigm suggest that financial performance indicators such as sales growth, return-on-assets, and net profit margin are insignificant determinants of small business finance. Vos, Jia-Yuh Yeh, Carter and Tagg (2007) argue that "younger and less educated private-firm owners more actively use external finance even though more education reduces the fear of bank loan denial, whereas, older and wiser small business owners with better education are less likely to tap into external finance". Overall, these empirical results do not support the agency lifecycle prediction that the vast majority of private firms suffer from severe financial constraints or financing gaps. Vos, Jia-Yuh Yeh, Carter and Tagg (2007) suggest to rethink about the conventional wisdom that private firms cannot grow as fast as their public counterparts due to a lack of reasonable access to external capital. Mina et al. (2013) analyzed how firm-level innovation affects the likelihood of seeking external finance. They find that overall the probability of seeking external finance is significantly affected by the human capital-intensity of the business and by the profitability of the firm but is not affected by research and development (R&D) intensity or innovation outputs. Alvarez and Lopez (2014) examined whether access to finance increases the probability of exporting of Chilean manufacturing plants. The results show that real exchange rate depreciations increase the probability of exporting for firms with access to banking funding and especially for firms in industries with higher financial needs. These results are robust to controlling for other firm characteristics affecting the probability of exporting and also for time varying industry-specific shocks that may affect export performance and banking finance. El-Said et al. (2015) tried to examine the impact of access to finance on export performance of SMEs. The results suggest that limited resources and barriers to entry are critically higher for SMEs

than for large companies that can be explained by their limited access to financial services. They found a significant and positive impact of dealing with banks and having banking facilities on the probability of exporting and that of exporting to more than one destination.

Krishan, Nandy and Puri (2015) conducted an empirical study focusing on the access to external funding and productivity at the micro level. The empirical results confirmed that a better access to funding allowed to implement productive projects, which normally would have to give up. Krishan, Nandy and Puri (2015) also show that an external financial support is important at the early stage of business development as well as later. The empirical results suggest that a better access to financing allows financially constrained SMEs to invest in productive projects and increase SMEs' productivity. Lee, Sameen and Cowling (2015) considered the differential effect of the 2008 financial crisis on access to finance for innovative SMEs. They found that innovative SMEs are more likely to be turned down for finance than other firms, and this worsened significantly in the crisis. However, regressions results show that the worsening in general credit conditions has been more pronounced for non-innovative firms with the exception of absolute credit rationing which still remains more severe for innovative firms. The results of this empirical study suggest that there is a structural problem which restricts access to finance for innovative firms and the financial crisis has impacted relatively more severely on non-innovative firms.

Beck and Demirguc-Kunt (2006) summarized some empirical research which shows "that access to finance is an important growth constraint for SMEs that financial and legal institutions play an important role in relaxing this constraint, and that innovative financing instruments can help facilitate SMEs' access to finance even in the absence of well-developed institutions". The summarized research suggests "that a competitive business environment, of which access to finance is an important component, facilitates entry, exit and growth of firms and is therefore essential for the development process. A focus on improving the business environment for all firms is more important than simply trying to promote a large SME sector which might be characterized by a large number of small but stagnant firms". The literature suggests that a focus on improving the institutions and the overall business environment is probably the most effective way of relaxing the growth constraints SMEs face and facilitate theirs to contribution to economic growth. However, institution building is a long term process and in the interim innovative lending technologies hold promise, providing market-friendly ways of relaxing the constraints SMEs face.

According to Beck and Demirguc-Kunt (2006), while cross-country research sheds doubt on a causal link between SMEs and economic development, there is substantial evidence that small firms face larger growth constraints and have less access to formal sources of external finance, potentially explaining the lack of SMEs' contribution to growth. Financial and institutional development helps alleviate SMEs' growth constraints and increase their access to external finance and thus levels the playing field between firms of different sizes. Together, these results suggest that it is important to have a competitive business environment that allows for the entry of new and innovative entrepreneurs resulting in the Schumpeterian process of "creative destruction" rather than simply having a large SME sector, which might be characterized by a large number of small enterprises that are neither able to grow nor to exit. Indeed, a large, but stagnant SME sector may be a by-product of a poor business environment itself. Furthermore, the existing evidence suggests that access to finance plays a very important role in the overall business environment, potentially constraining both firm entry and growth.

3 METHODOLOGY AND DATA

There are various methods that were used during different researches: cross-correlation function (CCF), cross-covariance function (CCVF), Granger causality, etc. It's hard to use them when analyzing short period, because it gives very inaccurate results.

Panel data (also known as longitudinal or cross-sectional time-series data) is a dataset in which the behaviors of entities are observed across time. These entities could be states, companies, individuals, countries, etc. Panel data allows controlling for variables that cannot observe or measure like cultural factors or difference in business practices across companies; or variables that change over time but not across entities (i.e. national policies, federal regulations, international agreements, etc.). Panel regression method is used to analyze either short or long period of data. The mostly used techniques to analyze panel data: fixed effects and random effects. Fixed effects technique (FE) is better to use in this situation, because we are only interested in analyzing the impact of variable that vary over time. FE explores the relationship between predictor and outcome variables within an entity. Each entity has its own individual characteristics that may or may not influence the predictor variables. Simple equation for the fixed effects model is:

$$Y_{it} = \beta_1 X_{it} + a_i + u_{it}, \tag{1}$$

where a_i is the unknown intercept for each entity (n entity-specific intercepts); Y_{it} is the dependent variable (DV) where i = entity and t = time; X_{it} represents one independent variable (IV); β_1 is the coefficient for that IV; u_{it} is the error term.

There are various ways how to modify the model for FE technique: use binary variables, add time effects to the entity effects model to have a time and entity fixed effects regression model (Torres-Reyna, 2007).

We employ the following regression specification to investigate whether a better access to external finance affects development of SMEs and economic growth:

$$Y_{it} = \alpha + X'_{it}\beta_{it} + \delta_i + \gamma_t + \epsilon_{it}, \tag{2}$$

where Y_{it} dependent variable characterizing economic growth (real GDP change – ΔRGDP) and development of SMEs[1] (change of number of SMEs – ΔNSME, change of number of persons employed in SMEs – ΔNPESME, and

[1]Companies classified as small and medium-sized enterprises (SMEs) are defined officially by the EU as those with fewer than 250 employees and which are independent from larger companies. Furthermore, their annual turnover may not exceed €50 million, or their annual balance sheet exceed €43 million. SMEs may be divided into three categories according to their size: micro-enterprises have fewer than 10 employees, small enterprises have between 10 and 49 employees, and medium-sized enterprises have between 50 and 249 employees.

[2]The SMAF index provides an indication of the changing conditions of SMEs' access to finance over time for the EU and its member states. The overall SMAF index and the individual sub-indices present scores for each country, and the EU and euro-zone averages. The SMAF index is calculated using a baseline of EU 2007 = 100, and so allows comparison between countries and across time. The base reference of 2007 deliberately provides a baseline before the onset of the financial downturn. The index comprises two main elements or sub-indices: access to debt finance and access to equity finance and is a weighted mean of the sub-indices. The sub-indices themselves are weighted means of the indicators that comprise them with the indicators normalized (nine indicators are included in the debt finance sub-index and five in the equity finance sub-index). Appropriate values for the weights are defined based on actual volumes, the nature of indicators and the coverage of indicators. In general the index largely reflects the importance of debt finance in the area of access to finance: the debt finance sub-index was set to represent 85% of the SMAF weighting. The equity finance sub-index was set to represent 15% of the SMAF weighting. In interpreting the scores, it is important to bear in mind the following: (a) the reference point in the index corresponds to the EU average in 2007 (100 = EU 2007); (b) low values in the overall index and individual sub-indices indicate poor performance against the access to finance indicators relative to the EU level in 2007, and vice versa for high values; (c) year-on-year increases indicate a relative improvement over time for that particular sub-index or the overall index. Sub-index on access to debt finance is comprised of indicators based on the take-up of different sources of debt finance, SME perceptions of loan finance and actual data on interest rates. The equity finance sub-index is calculated with data from the European Venture Capital Association and the European Business Angel Network reflecting investment volumes and numbers of deals/beneficiaries.

change of value-added at factor costs of SMEs – ΔVASME), X'_{it} is a k-vector of regressors (SMAF index – SMAF^2, debt finance sub-index – DFSI, equity finance sub-index – EFSI, unemployment rate – UR, harmonized indices of consumer prices – HICP), and ϵ_{it} are the error terms for $i = 1, 2, \ldots, M$ cross-sectional units observed for dated periods $t = 1, 2, \ldots, T$. The α parameter represents the overall constant in the model, while the δ_i and γ_t represent cross-section and period fixed effects.

4 RESULTS

The developments in SMEs access to financial resources and differences between EU member states are reflected by SMAF index dynamics. The value of SMAF for many EU countries has increased since 2008 when the EU average for SMAF hit its lowest point (see Fig. 1). For 24 out of 28 EU member states, the SMAF score has increased between 2007 and 2013. The key factor driving this seems to be the fall in interest rates for loans and overdrafts since 2009 for many EU countries, and so this has contributed to an improvement in the debt finance sub-index score for 25 EU member states between 2007 and 2013. Venture capital investment declined significantly between 2007 and 2009, and has remained relatively stable ever since. Business angel investment has slightly increased between 2007 and 2013, though for some countries there was a peak in 2009 before falling levels in the last years. As a result of these trends, the equity finance sub-index of 11 EU member states has slightly declined since 2007. The improvement in the debt finance sub-index has outweighed the decline in the equity finance sub-index.

Fig. 1 shows the SMAF index scores for each of the EU member states in 2007 and 2013. France, Austria and Finland are the highest performing countries in terms of access to finance for SMEs, all with an index value ranging between 122 and 126 (approx. 24 points higher than the EU overall in 2007), while Greece, Cyprus and Romania have the lowest scores (index values of 78, 82 and 85 respectively). The Fig. 1 shows the changes in the overall SMAF index for EU member states in the period 2007 to 2013. In total, 24 countries have shown improvements in their access to finance environments over the six year period to 2013. In particular significant improvements have been made by Latvia, Lithuania, Estonia, France and Ireland. Conversely 4 countries have experienced declines in their access to finance environments since 2007. EU member states having experienced a deterioration of their access to finance index score with respect to their original situation in 2007 are Cyprus, Greece, Romania and Sweden. The only countries to consistently have an index value of over 110 were Sweden, Germany, France and Austria. It is important to note that even if Sweden has experienced a deterioration of its index score, it is still one of the strongest EU member states in terms of access to finance, with scores above the EU-28 average during the whole period 2007 to 2013.

The EU index score for 2013 is 108, indicating an improvement of 8 points with respect to the score in 2007. Fig. 1 shows that the SMAF value for the EU-28 declined between 2007 and 2008. From this point the value increased again until 2010, before levelling off. The euro area average has performed consistently better than the EU-28 average although there was a marked decline between 2010 and 2011 in the euro area, which narrowed the gap with the EU. The data for 2013 shows a significant rise in values for both the EU-28 ad euro area – implying financial conditions for SMEs are better inside and outside the euro area.

Fig. 2 presents the sub-indices scores for each of the EU member states in 2013. The EU-28 debt sub-index value has increased by nine points since 2007. Across EU member states, 25 countries have seen their relative performance on this sub-index improve since 2007. Luxembourg, France and Austria represent the strongest performing countries, whereas

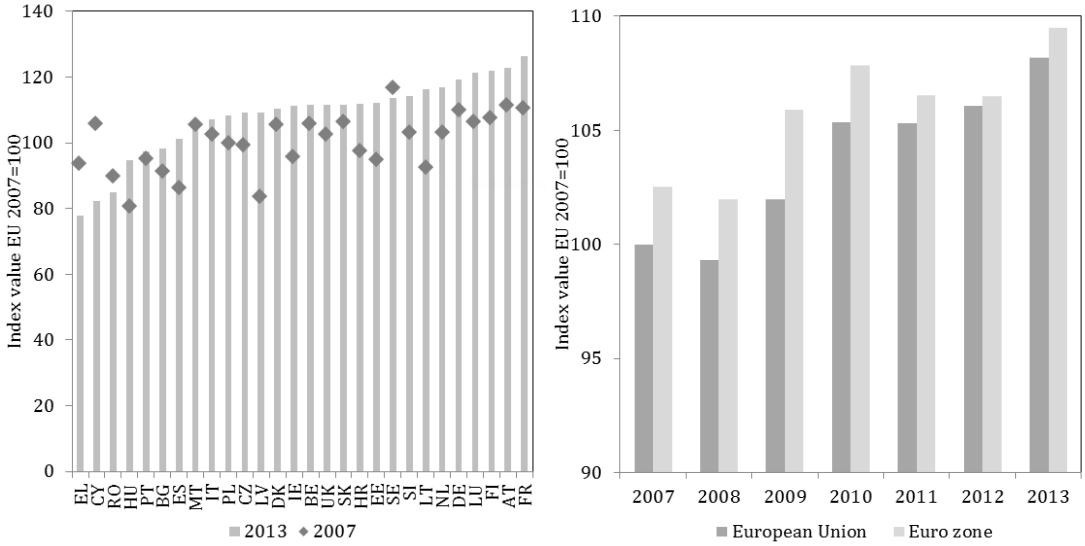

Fig. 1: SMAF index per country in 2007 and 2013 (left side) and SMAF index in EU and Euro area in 2007–2013 (right side)
Source: The European Comission

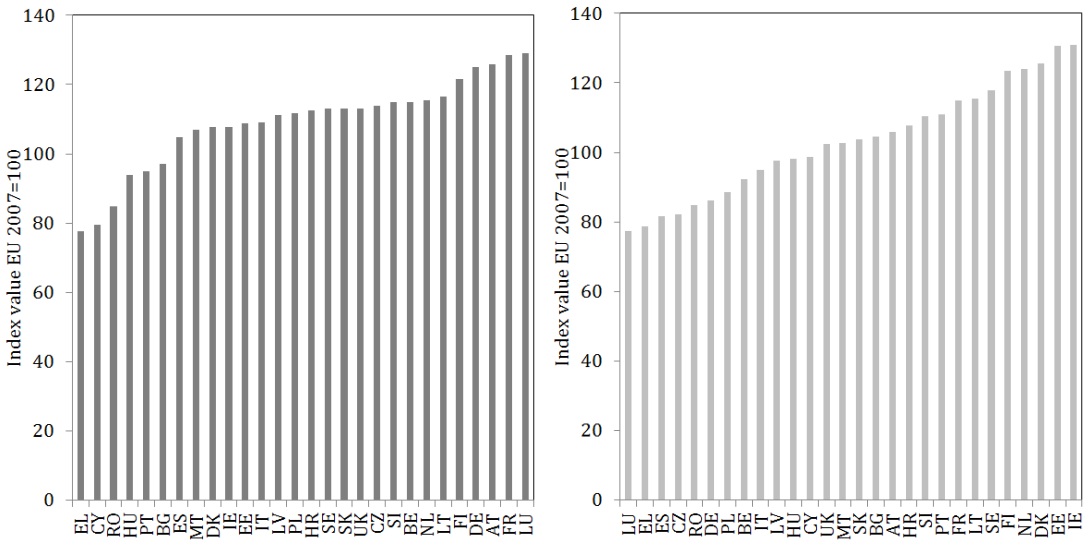

Fig. 2: Sub-index on access to debt finance per country in 2013 (left side) and sub-index on access to equity finance per country in 2013 (right side)
Source: The European Comission

Greece, Cyprus and Romania have the least favorable environment for debt finance. Ireland, Estonia, Denmark, Netherlands and Finland are the strongest performing countries, whereas Luxembourg Greece and Spain have the least favorable equity finance environments. The EU-28 sub-index value is 103, indicating a slight improvement since 2007. Sixteen countries have improved relative performance in the equity finance sub-index between 2007 and 2013.

The empirical results on the impact of an access to external finance on development of SMEs and economic growth using fixed-effects panel regression models are presented in Tab. 1–4. The empirical results suggest that a better access to external finance positively affects country's economic growth. Our tests highlight that a better access to debt finance has a positive and statistically significant effect on country's economic development while a better access to equity finance (venture capital, business angels' investment) has no effect on dependent variable. The main explanation for these findings is that in most of EU countries financial systems are bank-based and SMEs more often use banks' funding than alternative external funding sources.

The empirical results also suggest that unemployment rate has a negative impact on economy's growth while a positive impact of inflation on economy's growth was observed. An access to external funding source has no significant effect on some SMEs development indicators (e.g. change of number of SMEs) while a positive impact of access to external funding (including banks' funding) on change of number of persons employed in SMEs and change of value-added of SMEs was identified. When companies have that external funding option, it also has a way to expand. New employees, new places to grow, new opportunities opens right at that moment when business gets financial injection. Competition level in each country also grows, because of the better access to external funding sources.

5 DISCUSSION AND CONCLUSIONS

The main empirical findings of this study confirm the results of early empirical studies that a better access to external funding is an important growth factor for SMEs as well as for the whole economy. The empirical results of this study suggest that a better access to banks' funding has a positive and statistically significant effect on country's economic growth as well as on SMEs development while a better access to equity finance (venture capital, business angels' investment) has no statistically significant effect. The literature suggests that a focus on improving the institutions and the overall business environment is probably the most effective way of relaxing the growth constraints SMEs face and facilitate theirs to contribution to economic growth. Furthermore, the existing evidence suggests that access to finance plays a very important role in the overall business environment, potentially constraining both firm entry and growth.

The empirical results show not only the situation at this moment, but also a perspective in long term. The European Commission has changed its approach and decided to focus on SME development. Next incoming years will be targeted on SMEs development. It means that the positive connections between variables let us to predict positive situation in future researches. The research summarized in this study is only the first step on a long term research agenda. Much more analysis, particularly using microeconomic and macroeconomic data, country case studies, is needed to explore in more detail the policies and financing tools that can help SMEs overcome financing constraints and expand their access to external finance. In this context, it seems especially relevant to focus on institutions that are important for SMEs' access to finance. Going along with institution-building, however, the search has to be continued for financing tools that can work

Tab. 1: The empirical results of fixed-effects panel regression models (dependent variable – real GDP change, ΔRGDP)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
C	−13.5295**	−9.1818**	−12.0730**	−8.3722**	3.2968	4.4252
	(5.4645)	(4.4130)	(4.8258)	(4.0082)	(4.2613)	(2.9472)
SMAF	0.1529***	0.1237***				
	(0.0496)	(0.0377)				
DFSI			0.1389***	0.1153***		
			(0.0433)	(0.0337)		
EFSI					−0.0047	0.0048
					(0.0383)	(0.0259)
UR	−0.3160***	−0.3006***	−0.3216***	−0.2948***	−0.3225**	−0.4027**
	(0.1095)	(0.0883)	(0.1092)	(0.0882)	(0.1129)	(0.0854)
HICP	0.4137**	−0.1101	0.4034**	−0.1304	0.2570	−0.2275
	(0.1728)	(0.1370)	(0.1710)	(0.1347)	(0.1733)	(0.1421)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes
Observations	196	196	196	196	196	196
R^2	0.2549	0.7168	0.2582	0.7184	0.2121	0.6977
S.E.	3.8427	2.4132	3.8341	2.4064	3.9515	2.4932

Notes: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Tab. 2: The empirical results of fixed-effects panel regression models (dependent variable – change of number of SMEs, ΔNSME)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
C	4.7912	−103.8330	6.4947	−96.0468	20.7771	−3.6307
	(68.6563)	(88.2474)	(60.9518)	(80.7391)	(51.0570)	(55.4473)
SMAF	0.1508	0.9394				
	(0.6030)	(0.7334)				
DFSI			0.1349	0.8622		
			(0.5285)	(0.6594)		
EFSI					0.0057	0.0916
					(0.4443)	(0.4752)
UR	−1.1426	0.9090	−1.1526	0.9243	−1.1842	−0.0665
	(1.4640)	(1.8549)	(1.4595)	(1.8526)	(1.4714)	(1.6997)
HICP	−2.1764	0.2868	−2.1873	0.1316	−2.3345	−0.4716
	(2.0539)	(2.6133)	(2.0369)	(2.5803)	(1.9819)	(2.6305)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes
Observations	168	168	168	168	168	168
R^2	0.1740	0.2091	0.1740	0.2095	0.1736	0.1995
S.E.	42.8791	42.7452	42.8787	42.7341	42.8889	43.0039

Notes: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Tab. 3: The empirical results of fixed-effects panel regression models (dependent variable – change of number of persons employed in SMEs, ΔNPESME)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
C	−20.8376*	−33.6980**	−18.1076*	−30.4594**	−0.9458	−3.5497
	(11.0746)	(14.3732)	(9.8324)	(13.1552)	(8.3613)	(9.1775)
SMAF	0.2035**	0.3012**				
	(0.0973)	(0.1195)				
DFSI			0.1781**	0.2702**		
			(0.0853)	(0.1074)		
EFSI					0.0233	0.0475
					(0.0728)	(0.0787)
UR	0.1361	0.3726	0.1218	0.3700	0.0881	0.0677
	(0.2362)	(0.3021)	(0.2354)	(0.3018)	(0.2410)	(0.2813)
HICP	−0.8299**	−0.6816	−0.8490**	−0.7368*	−1.0306***	−0.8978**
	(0.3313)	(0.4256)	(0.3286)	(0.4204)	(0.3246)	(0.4354)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes
Observations	168	168	168	168	168	168
R^2	0.2914	0.3082	0.2913	0.3081	0.2693	0.2769
S.E.	6.9166	6.9621	6.9170	6.9629	7.0237	7.1179

Notes: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Tab. 4: The empirical results of fixed-effects panel regression models (dependent variable – change of value-added at factor costs of SMEs, ΔVASME)

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
C	−33.4181**	−41.5560***	−34.1180***	−40.6380***	15.7834	2.0864
	(12.9843)	(15.5461)	(11.4196)	(14.1632)	(9.8134)	(9.9861)
SMAF	0.3093***	0.3579***				
	(0.1140)	(0.1292)				
DFSI			0.3146***	0.3457***		
			(0.0990)	(0.1157)		
EFSI					−0.1403	−0.0152
					(0.0854)	(0.0856)
UR	0.7531***	0.8120**	0.7425***	0.8384**	0.5898**	0.4186
	(0.2769)	(0.3268)	(0.2734)	(0.3250)	(0.2828)	(0.3061)
HICP	−2.1101***	−1.1822**	−2.0898***	−1.2266***	−2.5584***	−1.5459**
	(0.3884)	(0.4604)	(0.3816)	(0.4526)	(0.3809)	(0.4738)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes	No	Yes
Observations	168	168	168	168	168	168
R^2	0.4934	0.5791	0.5028	0.5829	0.4765	0.5548
S.E.	8.1093	7.5302	8.0335	7.4964	8.2434	7.7450

Notes: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

around institutional deficiencies. While SMEs represent over 99% of businesses in the EU so it is crucial to support their growth and innovation as well as improve the financing environment for small businesses in Europe.

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THE INFLUENCE OF PACKAGE ATTRIBUTES ON CONSUMER PERCEPTION AMONG GENERATION Y

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ABSTRACT

The article focuses on how milk packaging is perceived by generation Y. The required data were obtained through eye-tracking using the SMI RED 250 device. Additionally an in-depth interview and a short questionnaire were included in the experiment to obtain complementary qualitative data. The research took place during November 2014 in the Eye Tracking Laboratory at Mendel University. In total 110 respondents representing generation Y participated in the experiment. The research analyzed the front of 12 types of milk packaging. The main objective was to determine which package attributes attract the most attention among consumers. The research shows that the most attention is given to the milk brand as well as claims with additional information, such as fat content and quantity. Additionally, the respondents were asked to rank the packaging samples from the best to the worst. Finally the respondents had to decide which of the products they would buy. The results provide valuable insights to create customized, eye-catching packaging for consumers.

KEY WORDS

consumer perception, package, milk products, eye tracking

JEL CODES

M31

1 INTRODUCTION

The way consumers make their in-store buying decisions continues to elude marketers. Which are the factors creating awareness, interest and ultimately the sale? A major product decision for marketers in this regard is according to Kotler and Armstrong (2011) to determine the label for a product. The most basic function of a label is to help consumers identifying the product according to, for instance, its brand name. However, the time labels served merely

SOUČEK, Martin, DREXLER, Denis, VAN WICHELEN, Steven, MOKRÝ, Stanislav, and DUFEK, Ondřej. 2015. The Influence of Package Attributes on Consumer Perception among Generation Y. *European Journal of Business Science and Technology,* 1 (1): 54–64. ISSN 2336-6494.

as an identification of products is long gone. The content of labels are these days much more complex, including for instance the origin of the product, its contents and various other elements. It is also important to mention that a label has a strong influence on branding and how consumers perceive the brand.

This article focuses on the general marketing effects of labels as a whole on consumer buying behavior, particularly for dairy food. We will however start by briefly describing the regulatory context of the act of labeling, which strongly influences the content of the label for various product categories. This will be complemented with a brief overview of methods and results of previous research regarding the effects of labels.

A label is component of the entire packaging design of a product. According to Cheverton (2004) the consumer's attention is impacted by effective packaging design and results in a longer time spent at the shelf and potentially results in a sale. According to Wang and Chou (2011) the visual elements of packaging can be divided between aesthetic design elements and functional design elements. Wang and Chou (2011, p. 2) list the aesthetic elements "Shape (form), color, illustration (lines, symbols, graphics, patterns, and pictures), logo and brand, typography (company name, product name), pattern design (lines, patterns, illustrations, photos), brand name and address, product facts and usage instructions, ingredients, volume (or weight) and decoration to form a layout." and the functional elements as "Structure design (protection, storage, transportation, opening and resealing functions), material design (emotional appeal and window presence value), and volume design (economic function)."

The importance of labels is not only a concern of individual enterprises in terms of how they facilitate the buying process: Europe scrutinizes the act of labelling thoroughly. Directive 2000/12/EC from The European Commission (2012) specifies the general rules to be applied on food labeling. The directive emphasizes the importance of readability and understandability of labels. From a regulatory point of view it is therefore important for enterprises to comply with these rules. However, depending on the product category, different rules apply. The Enterprise Europe Network (EEN – see Thomson, 2011) states that there exists confusion about the regulations applying on labels, particularly in terms of information requirements. Though the EEN mainly focuses on nutritional information, food contents, etc. and not so much on the marketing effects of labels, it is interesting to mention that according to the EEN (Thomson, 2011, p. 10) "the labelling, presentation and advertising of foodstuffs must not mislead the consumer as to the foodstuff's characteristics or effects; attribute to a foodstuff (except for natural mineral waters and foodstuffs intended for special diets, which are covered by specific Community provisions) properties for the prevention, treatment or cure of a human illness." In addition to the Directive on the labeling and presentation of foodstuffs, the EEN states that labeling of milk products, which is particular interest of this article, must state near the trade name the percentage of fat and the percentage of fat-free dried milk extract. The main reason for this concern for labeling worldwide results from a concern for health: as stated for instance by Food and Drug Administration (FDA) Commissioner Dr. Margaret Hamburg (Silverglade and Heller, 2010) "The public health importance of food labeling as an essential means for informing consumers about proper nutrition … has not been substantially addressed since the FDA implemented the Nutrition Labeling and Education Act, more than 16 years ago."

As a result quite a lot of research, both in Europe and beyond, focuses on the effect of nutritional information on labels. Colby, Johnson, Scheett and Hoverson (2010) concluded that nutrition marketing is mostly used on products with high saturated fat levels, sodium and/or sugar. Grunert and Wills (2007) claim that there is widespread interest among consumers regarding nutrition information on food packages. The results point out that consumers prefer simplified information. Additionally the research indicates that consumers have a different response when it comes to ease of use, the level of information provided and

the degree to which consumers feel pressured to change their consumer buying behavior. The work of Feunekes, Gortemaker, Willems, Lion and van der Kommer (2008) supports a need for simplicity. Their research points out a more simplified front-pack labeling need less time for evaluation. This in turn would make the buying behavior easier in shops where consumers tend to make quick decisions. Kim, Lopetcharat and Drake (2013) discovered that the brand as well as the fat or sugar level influence purchase intent. Krystallis and Chrysochou (2011) claim that a 'low fat claim' results in a higher loyalty and is therefore important as part of the communication.

In terms of research methods to evaluate the marketing effects of dairy products, Gelici-Zeko, Lutters, Klooster and Weijzen (2013) concluded that categorizing and perceptual mapping are useful, simple and user-friendly to uncover which packaging design cues have an impact on the perception of dairy products. An often-used method for evaluating packaging and labels is eye-tracking. Clement (2007, p. 1) concludes through this method "consumers exhibit a muddled search strategy where packaging design influences the decision process in several phases. Five phases were found in an in-store decision process, and the post-purchase phase seems to be essential for even low-level in-store decision processes. Further knowledge on packaging design elements is needed for a broader understanding of visual influence during in-store purchase decisions." A study by Graham and Jeffery (2011) across several types of food products showed 'meal' items generated more attention contrary to fruits, vegetables, snacks and deserts. Respondents also gave more attention to products, which they actually intended to buy. Finally the study showed few between-groups differences in terms of label viewing when it came to age, sex, race, etc. Additional research by Graham and Jeffery (2012) concluded showed that the self-reported awareness of nutritional information is higher than the awareness an eye-tracker was objectively able to measure. It also was concluded that more viewings were generated from label elements, which were placed at the top of the label as centrally placed labels. Another important factor which should be mentioned is lightning of package in shops (Horská and Berčík, 2014). These authors claim that the various types of lightning indeed change the rhythms of brain activity and probably on consumer behavior. Therefore it is important to focus on the presentation of packages in stores.

2 METHODOLOGY AND DATA

2.1 Participants

Participants were 110 students from a Faculty of Business and Economy at the Mendel University in Brno ranging in age from 19 to 25 years, with 75% of them female. Students with bad results in calibration were excluded from participation. Participants were chosen random. Time spend with one participant by research was 15 minutes. Our participants were chosen due to relatively easy availability and also they represent relevant example of the Y generation. The sample size of participant is comprehensive with respect to the used method. Typical sample size in similar researches is approximately 20 participants.

2.2 Procedure

For research were chosen 12 brands of milk packaging, which are available in typical Czech supermarkets. The first pages of packaging (part of labels visible firstly in shelves by shopping) were photographed in eye-tracking laboratory. All pictures were adjusted to correct size. All pictures were uploaded to the SMI Experiment Center software and printed concurrently. In experiment were used brands and types of milk which are on Fig. 1.

The required data were obtained through eye-tracking using the SMI RED 250 device. The RED has a sampling rate of 250 Hz. The distance between participants and eye-

Fig. 1: Overview of Packages

tracker with screen was 60 cm. First step with all participants were calibrated by 9 automatic calibration points and validated by 4 validation points. In some cases were done these steps repeatedly to taken better results. 36 participants with bad results by calibration and validation (more than $X = 1$ or $Y = 1$) were excluded.

After calibration and validation were participants answered to several important questions answers where were served for identification of participants.

Next these questions were screened pictures with labels of milk. Order of pictures was for each participant random. The task for participants was "Take a look at labels of milk". Each label was screened 10 s. Aim of this task was to discovered, which parts or stimuli of labels get the most of attention. After each label participants were answered to question "Do you like this label (ranging 1–5; 1 = I like it; 5 = I don't like it)" and "Do you buy this product?". Aims of this questions was to discovered, if there are some dependence between attention of participants and their attitude to brands of concretes milks.

In next step were participants answered to several questions served for discover they attitude to milk and buying milk.

After finished this part of experiment, were participants asked for looked at all labels in printed version and chosen three, which they like mostly and three which they don't like. Next task was to order these three labels in order from the best and another three from the worst. Part of this task was also described why they were chosen these labels or what their like or don't like on these labels.

All data were transformed to SMI BeGaze software. First step of analysis of data was classified all participants based on their identification and removed participants with bad results by calibration. Like key performance indicator were included to all stimuli areas of interest: "Brand", "Title name", "Fat", "Claims", "Weight", "Nutrition values". In next step all these data were exported from BeGaze to Stata software. Based on these information and information from questions was possible to evaluated attention and meaning participants about labels of milk.

Same like areas of interest there were made in BeGaze for illustration heat maps and focus maps analysis. Obtained data were analyzed using ANOVA analysis, analysis of frequency, average values of dwell time.

3 RESULTS

According to average Dwell Time (see Fig. 1) we can conclude that respondents from generation Y are mostly attracted by Title name of the milk. The most Dwell time was spent to milk number 1. This result can be affected by the fact that the Title name covers almost all front size of the examined package. But the importance of Title name for consumer's attention is proved with other results, where only in two occurrences (packages number 7 and 11) the Title name isn't the most important part of front side of milk package according to Dwell Time. In these cases Brand, Fat and Image gained more attention. Both packages (7 and 11) are retailer's private brands. Package number 11 is the one with the most Dwell Time spent for Fat information. This result is probably affected with fact that this information is emplaced in the top third part of the front size and is the biggest (in meaning of font size) from all the samples. Probably the high contrast (white font on blue background) takes it role as well. In other cases the average Dwell Time to Fat was between 500 and 1000 milliseconds so we can assume consumers from generation Y only check whether the main colour of package (excluding the white colour) refers to the right fat level (red = fat, blue = semi-fat, green = low-fat).

Only two examined samples have the Image average Dwell Time longer than 1,500 milliseconds. Sample number 5 obtained even more than 2,000 milliseconds of average Dwell Time.

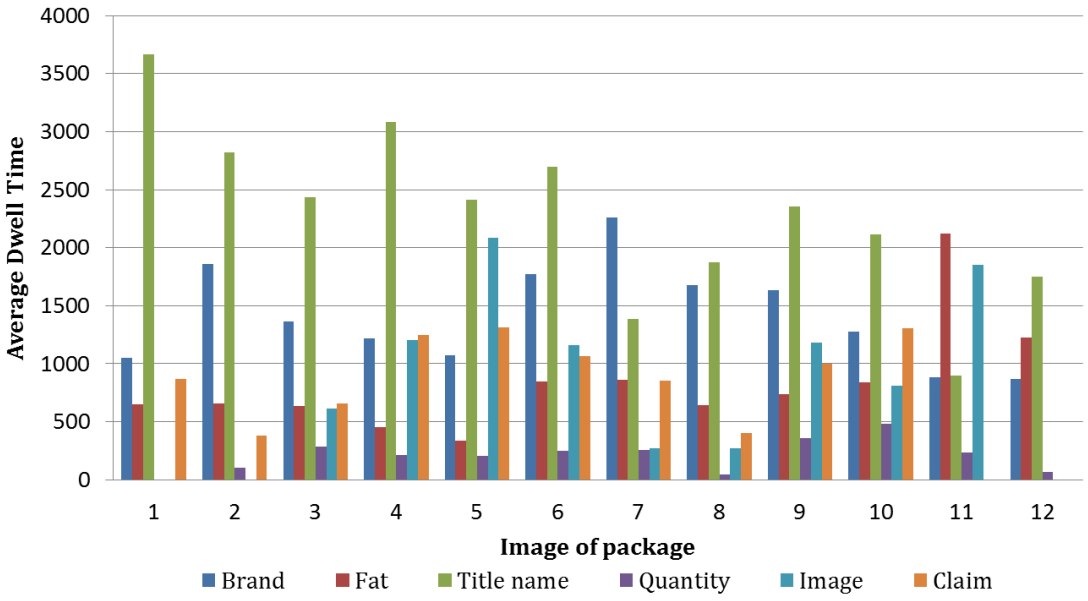

Fig. 2: Average Dwell Time of Package parts

The other sample is number 11. Both images are very simple and not presenting milk itself (compare with samples 3, 4, 6, 7, 8, 9, 12). They are more representing something connected to milk – cow (sample 11) or traditional farmhouse typical for South Bohemia region (sample 5). The shortest average Dwell Time spent respondents with Quantity. This is probably affected with the fact that all samples in this research have typical dimensions and shape for 1 litre of milk sold in the Czech Republic. Two basic types of milk packages were included in this research – tall-slim (samples 1, 2, 7, 8, 12) and short-wide (samples 3, 4, 5, 6, 9, 10, 11).

In Fig. 3 and 5 the most and the less attractive milk packages are shown. There is mostly no difference in gender, only packages number 5 and 2 are a little bit more attractive for men than women. And packages 7, 3 and 6 are less attractive for men. Women's most preferred package is number 1 and we can see some difference in package 3 between women and men. The less attractive packages for women are 10, 2 and 11 (all retails private brands with simple graphics). Overall the most attractive package is number 1 – analysis of this package's areas of interest is shown in Fig. 5.

Obtained data were analyzed using ANOVA analysis. The aim was to verify the assumption gender and package structure influence on consumer's attention. In the Tab. 1 ANOVA analysis results are presented. Overview of the ANOVA's results of all images is in Tab. 2.

As we can see in the Tab. 2, the models appear to be significant at the 0.00% level. Gender is not significant in any of the package and it does not effect on the length of the consumers' attention. Part of package has a significant influence on the length of consumer's attention.

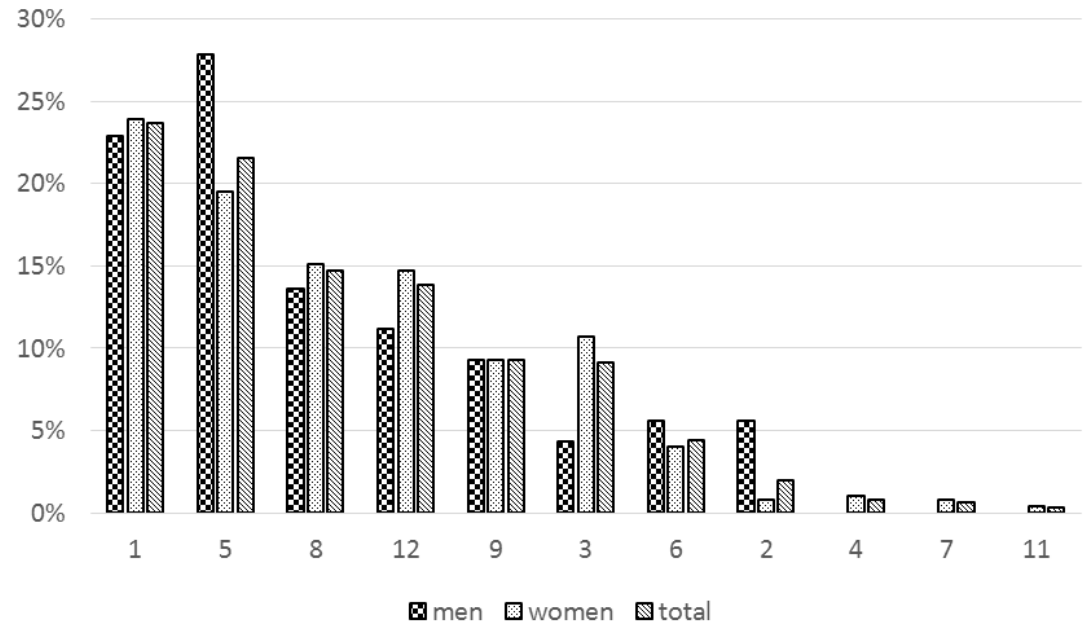

Fig. 3: Most attractive milk packages according to gender of respondents

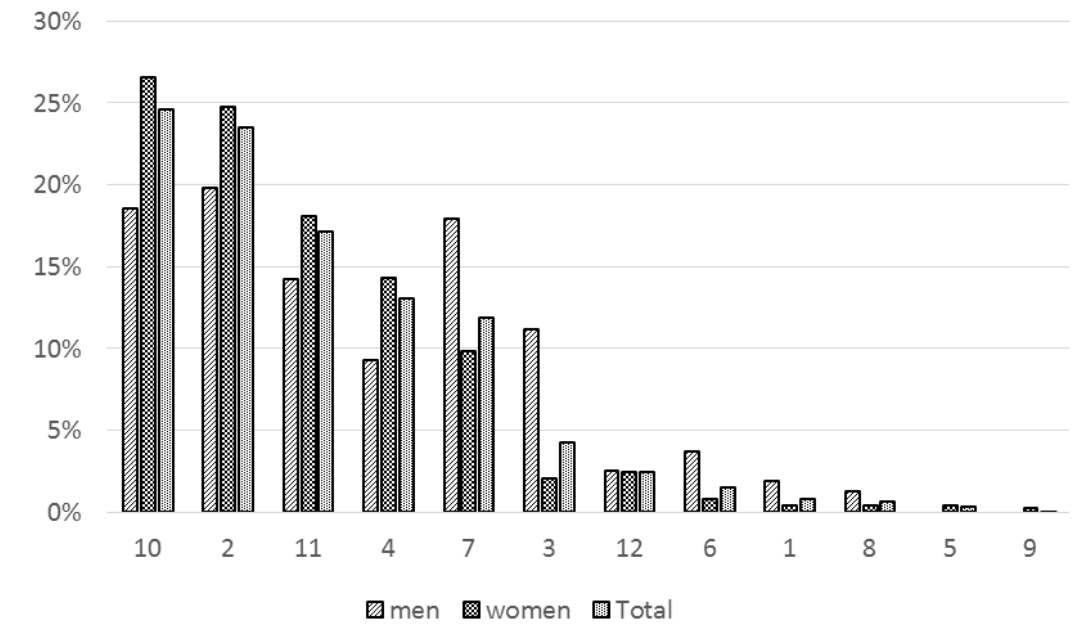

Fig. 4: Less attractive milk packages according to gender of respondents

Fig. 5: Areas of interest of the most attractive milk package overall

Tab. 1: ANOVA of 1st package

Number of obs = 518 R-squared = 0.7007
Root MSE = 758.355 Adj R-squared = 0.6930

Source	Partial SS	df	MS	F	Prob > F
Model	678571530	13	52197810	90.76	0.0000
gender	459256.974	1	459256.974	0.80	0.3719
part	580782461	6	96797076.8	168.31	0.0000
gender#part	875443.272	6	145907.212	0.25	0.9578
Residual	289851476	504	575102.135		
Total	968423006	517	1873158.62		

Tab. 2: Summary of ANOVA's results

		$p > F$		
Image	**Model**	**Gender**	**Part of package**	**Interaction**
1st	0.0000	0.3719	0.0000	0.9578
2nd	0.0000	0.1434	0.0000	0.5499
3rd	0.0000	0.9881	0.0000	0.6946
4th	0.0000	0.8438	0.0000	0.9194
5th	0.0000	0.6741	0.0000	0.4252
6th	0.0000	0.4895	0.0000	0.4131
7th	0.0000	0.9090	0.0000	0.0885
8th	0.0000	0.2275	0.0000	0.1166
9th	0.0000	0.5800	0.0000	0.5657
10th	0.0000	0.5840	0.0000	0.4372
11th	0.0000	0.8775	0.0000	0.8910
12th	0.0000	0.7771	0.0000	0.4954

4 DISCUSSION AND CONCLUSIONS

In this paper 12 milk packages were researched to show how gender and package structure influence on consumer's attention in generation Y. Finally we can say the variability of results is independent on gender in generation Y. But ANOVA's results proved that all package parts are influencing consumer's attention (see Cheverton, 2004). Results of this participants group suggest the name of the product is the most important part of package influencing consumer's attention followed by brand and image.

Our results did not proved influence of brand and other parts of package on buying intent as stated Kim, Lopetcharat and Drake (2013). Otherwise results are showing that for representatives of the Y generation the title name (milk) and the brand of the milk gained the highest attention. With the respect to the result it is possible to assume that this two parameters of the package could have influence on the consumer buying process.

The crucial nutrition parameter of a milk is a content of fat. The value of fat as well as the color of package refers to fat level of a milk in the Czech Republic (red – 3.5% of fat, blue – 1.5%, green – 0.5%). As Grunert and Wills (2007) stated consumers prefer simplified information regarding nutrition information on food packages and the milk is the typical example of simplified information. From results it is obvious that the attention to the fat level is also significant.

5 ACKNOWLEDGEMENTS

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INTEGRATED REPORTING: THE NEXT STEP AHEAD FOR A SUSTAINABLE SOCIETY

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ABSTRACT

The recent global developments have emphasized the limits of the actual corporate reporting system. Today's organizations experience a growing pressure exercised by various types of stakeholders as a result of the increasingly public concern regarding environmental and social issues. Hence, companies must assume their responsibility for the improvement of the environment and society within which they operate materialized through the disclosure of sustainability and corporate responsibility information. The main challenge is not to simply increase the amount of information provided inside the annual reports, but to increase their relevance through new, comprehensive and condensed reporting practices which combine and interconnect financial and nonfinancial data. Accordingly, the concept of integrated reporting is founded. Despite its necessity and adequacy, differences among countries regarding the adoption of integrated reporting exist. This paper aims to analyze the relation between the number of integrated reports issued by companies inside a country in relation with its economic, social and environmental performances. The results found that there is a higher commitment from companies, belonging to more developed countries, to make their contribution towards the development of integrated reporting concept and practice.

KEY WORDS

integrated reporting, sustainable development, sustainability

JEL CODES

M400, M410, Q010, Q560

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1 INTRODUCTION

Filling the gaps left by the actual financial reporting system in sustaining financial performance and risk management represents a real preoccupation. The main objective is not to simply increase the amount of information provided inside the annual report to cover the deficient areas, but to increase their relevance through new comprehensive and condensed reporting practices that respond to the diverse and continuous changing needs of different types of stakeholders. Consequently the concept of Integrated Reporting is founded having as main goal to clarify and harmonize the relationship between financial and nonfinancial data sustained by the newest technological possibilities (Devi, 2014).

In 2010, The International Integrated Reporting Council (IIRC) was created as a result of the collaboration between International Federation of Accountants IFAC (IFAC), Global Reporting Initiative (GRI), and the Prince's Accounting for Sustainability, having as main objective to develop a "globally acceptable framework for Accounting for Sustainability ... which brings together financial, environmental, social and governance information in a clear, consistent and comparable format – put briefly, in an 'integrated' format" (James, 2013, p. 22).

The IIRC encompasses specialists and leaders representing the academic environment, private industry, accounting firms, regulators or standard setters. Among the organizations represented, it may be mentioned: the International Accounting Standards Board (IASB), Financial Accounting Standards Board (FASB), United Nations Environmental Programme Finance Initiative, United Nations Global Compact, Carbon Disclosure Standards Board (CDSB), International Organization of Securities Commissions (IOSC), World Wide Fund for Nature (WWF) or the World Business Council for Sustainable Development (WBCSD) (James, 2013; Devi, 2014).

On the 9th of December 2013, IIRC released the first Integrated Reporting Framework "following extensive consultation and testing by businesses and investors in all regions of the world, including the 140 businesses and investors from 26 countries that participate in the IIRC Pilot Programme. The Consultation Draft, lunched on 16 April, 2013, had been developed based on the analysis of the responses to the 2011 Discussion Paper 'Towards Integrated Reporting – Communicating Value in the 21st Century', the publication of a draft outline in July 2012, and a Prototype Framework in November 2012" (International Integrated Reporting Council, 2013a).

In Eccles and Krzus's (2010, p. 10) view "one report means producing a single report that combines the financial and narrative information found in a company's annual report with the nonfinancial (such as environmental, social, and governance issues) and narrative information found in a company's 'Corporate Social Responsibility' or 'Sustainability' report. But the integration of financial and nonfinancial reporting is much more than simply issuing a combined paper document. It involves using the internet to provide integrated reporting in ways that cannot be done on paper, such as through analytical tools that enable the user to do his or her own analysis of financial and nonfinancial information. It also involves providing information that is of particular interest to different stakeholders."

The Extensible Business Reporting Language (XBRL) stands out when referring to new technology supporting the concept of integrated reporting. "XBRL allows the creation of reusable, authoritative definitions, called taxonomies that capture the meaning contained in all of the reporting terms used in a business report, as well as the relationships between all of the terms. Taxonomies are developed by regulators, accounting standards setters, government agencies and other groups that need to clearly define information that needs to be reported upon. XBRL doesn't limit what kind of information is defined: it's a language that can be used and extended as needed" (XBRL, 2014).

Emphasizing the connectivity of information represents a primary goal for an integrated report as value creation over time can only be achieved through the interaction between the organization and its external environment. XBRL makes possible to connect a piece of information to another or to its corresponding specialized literature through the use of "tags". Consequently information can be easily reused and exploited, thus representing a significant step ahead for reducing financial reports complexity. Among the features of software making use of XBRL tags it may be considered: sorting the information according to each user's needs, improving the ease of understanding the information or increasing comparability among companies (Eccles and Krzus, 2010; Monterio, 2010, 2014; Busco, Quattrone, Frigo and Riccaboni, 2013, 2014).

IRC Framework (International Integrated Reporting Council, 2013b) defines integrated reporting as "the process founded on integrated thinking that results in a periodic integrated report by an organization about value creation over time and related communications regarding aspects of value creation. An integrated report, as defined by the same source, represents a concise communication regarding the way in which an organization's strategy, governance, performance and prospects, in the context of its external environment, lead to the creation of value over the short, medium and long term".

Integrated reporting goes beyond disclosing information related to a company's strategy, governance and financial performance, by covering aspects related to a company's social, environmental and economic context (Healey, 2013). Hence, integrated reporting makes its contribution in evaluating and monitoring internal performance as well as supporting financial capital attraction (Druckman, 2014).

An integrated report should draw the features of a sustainable company as an integral part of a sustainable world, while emphasizing the entity's contributions to achieving sustainability as well as its unsustainable actions resulted from the interaction between the company and the social, environmental and economic context within which it operates (Thomson, 2014).

The IIRC Framework does not set a template for the format of an integrated report, but sets eight content elements that are fundamentally linked to each other and are not mutually exclusive, as presented in the following table (International Integrated Reporting Council, 2013b).

According to Eccles, Krzus and Ribot (2014) only 1% of the 46,000 listed companies all over the world issued a self-declared integrated report in 2012. As concerning sustainability reporting, 3,704 companies, as compared to just 11 companies for 1999, produced a sustainability report using GRI Guidelines in 2012. Additionally, the Corporate Sustainability Assessment, a study analyzing the annual reports for 2011 and 2012 of the 2000 world's largest companies, issued by RobecoSAM, the preparer of the Dow Jones Sustainability Indices (DJSI), shows that only 12% of the analyzed entities for 2012 (respectively 8% for 2011) had provided data regarding the measure in which environmental and social initiatives lead to cost saving or increased revenues (Eccles, Krzus and Ribot, 2014).

Consequently, these figures become more significant as a study published by Ernst & Young (2013), including employees from seventeen activity sectors, highlights the fact that about half of the respondents express their concerns about the probability that company's core business objectives will be affected by natural resource shortages in the next three to five years. Moreover, the study reveals the existence of a strong agreement among the respondents that company's sustainability performance would benefit if integrated reporting is adopted.

Tab. 1: Content elements of an integrated report

Content elements	Question to be answered
Organizational overview and external environment	What does the organization do and what are the circumstances under which it operates?
Governance	How does the organization's governance structure support its ability to create value in the short, medium and long term?
Business model	What is the organization's business model?
Risks and opportunities	What are the specific risks and opportunities that affect the organization's ability to create value over the short, medium and long term and how is the organization dealing with them?
Strategy and resource allocation	Where does the organization want to go and how does it intend to get there?
Performance	To what extent has the organization achieved its strategic objectives for the period and what are its outcomes in terms of effects on the capitals?
Outlook	What challenges and uncertainties is the organization likely to encounter in pursuing its strategy, and what are the potential implications for its business model and future performance?
Basis of preparation and presentation	How does the organization determine what matters to include in the integrated report and how are such matters quantified or evaluated?

Source: International Integrated Reporting Committee (2013, p. 5)

2 METHODOLOGY AND DATA

There are significant findings that companies belonging to different types of economies tend to react differently to similar changes or shocks (Hall and Soskice, 2001). Consequently, the present paper regards the analysis of the correlation between the numbers of integrated reports published by companies inside one country in relation with its social, environmental and economic performances.

Differences among countries regarding the adoption of integrated reporting were previously examined. Based on Matten and Moon (2008) framework explaining differences in Corporate Social Responsibility practices, determined by different institutional context, Jensen and Berg (2011) analyze the similarities and differences between companies using traditional sustainability reporting and those that publish integrated reports by reference to the political, financial, educational, labor, cultural and economic systems. Frías-Aceituno, Rodríguez-Ariza and García-Sánchez (2013) investigate the influence of one of the most significant institutional factors, the legal system, on the issuance of integrated reports.

The study is conducted by reference to two sets of data, the first one regards a worldwide analysis while the second one is concentrated on the European Union. The decision to divide the study resulted from the fact that at global level no such set of sustainability indicators are issued.

The study conducted at the European Union level aims to analyze the relationship between the number of integrated reports issued by each country and the European Union set of headlines sustainability indicators issued every two years by Eurostat, with the purpose of monitoring the EU Sustainable Development Strategy.

The list of sustainable indicators contains more than 130 indicators, out of which, ten have been identified as headline indicators. "They are intended to give an overall picture of whether the European Union has achieved progress towards sustainable development in terms of the objectives and targets defined in the strategy" (Eurostat, n.d). A short description of each headline indicator can be found in the annexe section.

Moreover, the results obtained are confronted with the ones resulting from the rank correlation analysis between the number of integrated reports attributed to each EU member and the ranking prepared by Bolcárová and Kološta (2014) based on the aggregate index of sustainable development developed based on the same set of headlines sustainability indicators.

Taking into consideration the lack of sustainability indicators at global level, the worldwide analysis is founded on Jensen and Berg (2011) model and examines the correlation between the number of integrated reports issued in relation with a country's cultural and economic system. Accordingly, a number of five indicators (The National Corporate Responsibility Index, The Environmental Performance Index, The Human Development Index, per-capita Gross National Income and The Economic Freedom Index) were embedded, covering the three pylons of sustainability development, namely social, environmental and economic development (Drexhage and Murphy, 2010).

"One important aspect of a country's culture consists in the extent to which companies are seen as responsibility bearing parts of society. Whereas in some countries corporate responsibility is primarily limited to financial wellbeing, in other countries corporate responsibility involves a broader set of environmental and social values" (Jensen and Berg, 2011, p. 304). As measure for a country's cultural system, The National Corporate Responsibility Index (NCRI) is used. NCRI is the world's first assessment of the state of corporate responsibility at a global level. The index assesses over 80 countries on criteria including corruption, civic freedom, corporate governance and environmental management to establish a global ranking. The NCRI takes values from 0 to 100, with 100 representing the highest development status (AccountAbility, 2005).

The inclusion of NCRI was decided even though it refers to a different year from the analyzed one, since it is considered "as one of the only available indices that attempts to capture variation in country regimes with respect to a broad range of social and environmental-related institutional factors" (Kolk and Perego 2008, p. 8) and no later publication of this indicator exists. Moreover, the indicator captures aspects related to a country's culture which are less probably to change rapidly over time.

For a deeper analysis concerning the cultural system, the environmental responsibility and social development of a country are taken into consideration. The environmental responsibility is measured by The Environmental Performance Index (EPI). EPI ranks how well countries perform on high-priority environmental issues in two broad policy areas: protection of human health from environmental harm and protection of ecosystems, taking values from 0 to 100. The higher the value of the indicator, the lowest the environmental impact and implicitly the higher development status (Jensen and Berg, 2011).

The Human Development Index (HDI) issued by UNDP is used as a proxy for the social development of a country (Jensen and Berg, 2011). HDI is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living and represents the geometric mean of normalized indices for each of the three dimensions (United Nations Development Programme, 2013). The indicator ranges from 0 to 1, the values close to 1 denoting the highest status of human development.

The economic system of a country is measured by per-capita GNI based on purchasing power parity. For a more detailed analysis the level of state intervention in economic activities is considered, quantified by The Economic Freedom Index (EFI). EFI documents the positive relationship between economic freedom and a variety of positive social and economic goals. The ideals of economic freedom are strongly associated with healthier societies, cleaner environments, greater per capita wealth, human development, democracy, and poverty elimination (The Wall Street Journal and The Heritage Foundation, 2012). The Economic Freedom Index takes values between 0 and 100, the upper value corresponding to the highest degree of economic freedom (Jensen and Berg, 2011).

As regards the sample embedded, the actual number of integrated reports attributed to each country comes from two main sources, namely the self-declared integrated reports published in the GRI Sustainability Disclosure Database during the year 2013 and the integrated reports issued by the companies included in The International Integrated Reporting Council (IIRC) Pilot Program. According to Eccles, Krzus and Ribot (2014, p. 61) "Global Reporting Initiative's Sustainability Disclosure Database for the period 2010–2013 provides a useful indicator of the rise in the number of integrated reporting companies, based on self-declared integrated reports".

At an initial stage of the paper, I tried to conduct the analysis by dividing the total number of reports attributed to each country to the total number of registered companies or total population but the results obtained were inconclusive. A reason for this may be found in the reduced number of reports published as a consequence of the inexistence of legal requirements for the issuance of integrated reports, excepting the special case of South Africa. Also, the usage of year to year relative change for the total number of reports was not suitable and leaded to distorted results, for the same above-mentioned reason.

The variables embedded were obtained from various sources, for more accurate results the data used, if available, refers to the year 2012 which corresponds to the year of the analyzed annual integrated reports. In order to quantify the correlation between the indicators, two correlation coefficients are applied: Pearson correlation coefficient for the worldwide analysis and Spearman's rank correlation coefficient, concerning the study conducted at the European Union level. The software used for data processing was Microsoft Office Excel.

Pearson correlation coefficient, also called product-momentum coefficient, represents one of the most used measure of the linear correlation between two variables. Spearman correlation coefficient measures the association between two ranked variables and it is usually used when the sample embedded is small, usually under 30 observations. Both coefficients take values from -1 to 1, where -1 indicates a perfect negative linear relationship, while 1 indicates a perfect positive linear relationship. Moreover, in order to test for the significance of the obtained results the t test was computed (Opariuc, 2011).

3 RESULTS

Integrated reporting raised a great interest among the European Union members, seven of the first fifteen countries around the world as regards the number of integrated reports published are members of the European Union. Also, the number of reports published by these countries represents almost 30% of the total of top 15 and approximately 55% if we are excluding South Africa.

South Africa detains a special status as a result of the King III (The King Code of Governance Principles for South Africa 2009) report and its requirement that all South African listed companies on the country's stock exchange publish an integrated report starting with 2010 under the governance of "apply or explain" approach.

The highest number of integrated reports published inside the European Union is attributed to Finland (35, approx. 18% of total), followed by Netherlands (34, approx. 17% of total) and Spain (28, approx. 14% of total). Despite the overall interest showed by the European Union as a whole, integrated reporting does not represent an actual interest for all the state members, roughly 89% of the total reports being published by the first 10 performers. Therefore, companies from countries such as Czech Republic, Estonia, Ireland, Cyprus, Lithuania, Luxembourg, Malta, Romania or Slovakia have not published any integrated report during the analyzed year.

Tab. 2: Summary of analyzed indicators

Indicator	Issuer	Reference year
Cultural system		
NCRI	AccountAbility	2005
EPI	YCELP & CIESIN	2012
HDI	UNDP	2012
Economic system		
GNI per-capita	The World Bank	2012
EFI	The Wall Street Journal & The Heritage Foundation	2012
Sustainable development indicators	Eurostat	2012
Sustainable development index	Bolcárová and Kološta (2014)	2011

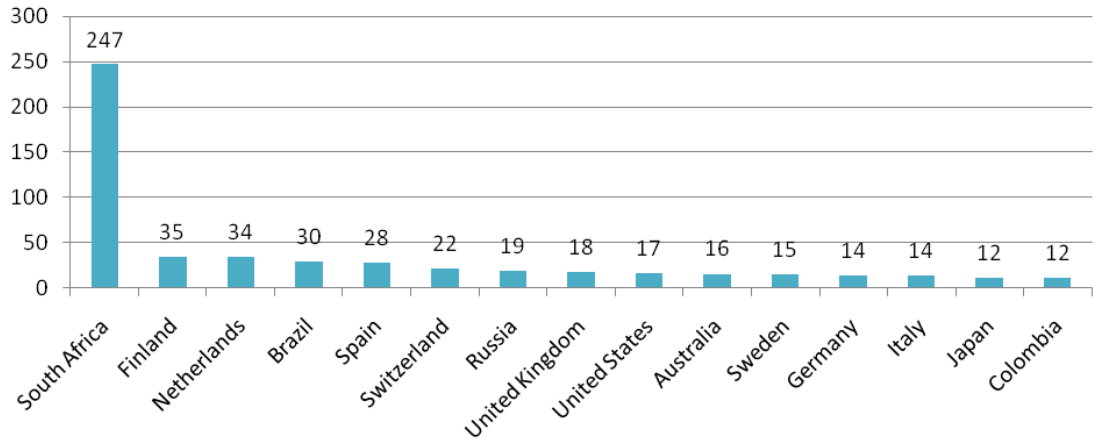

Fig. 1: Top 15 countries by the number of integrated reports issued

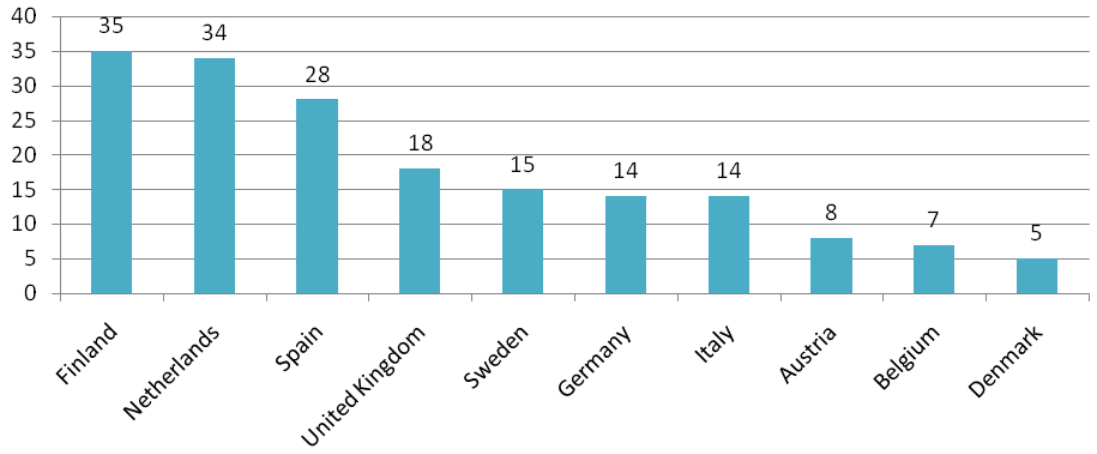

Fig. 2: Top 10 countries from European Union by number of integrated reports issued

Tab. 3: Correlation between the number of integrated reports issued and social, environmental and economic indicators

Indicator	**Pearson correlation coefficient** (r)	t **computed**	t **critic** ($\mathrm{df} = 40$, $\alpha = 0.05$)
EPI	0.38582	2.805*	1.684
HDI	0.38484	2.797*	1.684
NCRI	0.47526	3.583*	1.684
GNI	0.38154	2.738*	1.684
EFI	0.28374	1.984*	1.684

Note: * significance at 0.05 level

There is a positive correlation between the number of integrated reports issued and a country's social, environmental and economic development. The highest correlation level being registered by the National Corporate Responsibility Index (0.47) followed by Environmental Performance Index, Human Development Index and Gross National Income, indicators for which very close values were obtained, around 0.38.

More than 64% of the total number of integrated reports issued all over the world are published by companies from countries registering higher values than the average for the analyzed indicators. Going deeper, 73.89% of the total integrated reports are published from countries registering a Human development index over 0.8, 70.93% pertain to countries having an Environmental Performance Index higher than 63.97 and 70.44% are issued from countries with an Economic Freedom Index above 65.54.

The results obtained are consistent with the ones presented by Jensen and Berg (2011) who claim that companies from countries registering a higher level of national corporate responsibility and economic development are more likely to publish integrated reports.

Going further and exploring the results achieved on the European Union level, we can state that eight out of the ten analyzed indicators obtained the expected values, meaning significant correlation level for a significance level lower than 0.05 and correct positive or negative relationship. The two indicators for which insignificant results were registered are share of renewable energy in gross final energy consumption and energy consumption of transport relative to GDP.

The highest correlations levels were obtained between the number of integrated reports published attached to each country and the following sustainable development indicators: resource productivity (0.48), life expectancy at birth (0.47) and employment rate of older workers (0.42).

Out of the total number of integrated reports, almost 95% were published from countries with a life expectancy at birth for males higher than 76 years, around 77% were published from countries with a real GDP per capita superior to the European Union average and over 73% were issued inside countries with a resource productivity higher than the average. Also, 73.87% were published by companies from countries registering a lower proportion of people at risk of poverty or social exclusion.

Furthermore, over 60% of the integrated reports are issued by companies belonging to countries registering higher values than the average for each analyzed indicator, excepting the share of renewable energy in gross final energy consumption.

Going deeper and analyzing the results obtained for the rank correlation analysis based on Bolcárová and Kološta's (2014) study, it can be stated that they confirm the previous presented ones, accordingly the correlation between the number of integrated reports published inside one country and its sustainable development performances is a strong and positive one. The value of 0.60 obtained for the correlation coefficient indicates that the results are significant for a significance level lower than 0.05, supporting the idea according to which countries registering higher values for the sustainable development indicators are the ones that issue more integrated reports.

Tab. 4: The number of integrated reports issued by reference to a country's social, environmental and economic performances

Indicator	Average value	Number of reports published in countries which are above the average	Number of reports published in countries which are below the average
EPI	63.79	70.93%	29.07%
HDI	0.804	73.89%	26.11%
NCRI	58.63	64.75%	35.25%
GNI	27.243	69.62%	30.38%
EFI	65.54	70.44%	29.56%

Tab. 5: Correlation between the number of integrated reports issued and sustainable development indicators

Sustainable development indicator	Pearson correlation (r)	t computed	t critic (df = 26, $\alpha = 0.05$)
Real GDP per capita	0.36283	1.98*	1.706
Resource productivity	0.48708	2.84*	1.706
People at-risk-of-poverty or social exclusion	−0.37905	2.09*	1.706
Employment rate of older workers	0.41957	2.35*	1.706
Life expectancy at birth (males)	0.47113	2.72*	1.706
Greenhouse gas emissions relative to GDP	−0.36735	2.01*	1.706
Share of renewable energy in gross final energy consumption	0.12152	0.62	1.706
Primary energy consumption relative to GDP	−0.34324	1.86*	1.706
Energy consumption of transport relative to GDP	−0.23434	1.23	1.706
Official development assistance as share of gross national income	0.38810	2.15*	1.706

Note: * significance at 0.05 level

Tab. 6: The number of integrated reports issued by reference to the sustainable development indicators values

Indicator	Average value	Number of reports published in countries which are above the average	Number of reports published in countries which are below the average
Real GDP per capita	20.807	77.38%	23.76%
Resource productivity	1.40	73.86%	26.14%
People at-risk-of-poverty or social exclusion	25.59	26.13%	73.87%
Employment rate of older workers	47.5	61.30%	38.70%
Life expectancy at birth (males)	76.01	95.47%	4.53%
Greenhouse gas emissions relative to GDP	0.001516	2.01%	97.99%
Share of renewable energy in gross final energy consumption	16.87	35.67%	64.33%
Primary energy consumption relative to GDP	56.55	23.11%	76.89%
Energy consumption of transport relative to GDP	92.04	29.14%	70.86%
Official development assistance as share of gross national income	0.31	66.33%	33.67%

Tab. 7: Correlation between the number of integrated reports issued and sustainable development index

Indicator	Spearman's rank correlation coefficient (r_s)	t computed	t critic (df = 25, $\alpha = 0.0005$)
Sustainable development index	0.60747	3.823*	3.725

Note: significance at 0.05 level, * Croatia was not included in Bolcárová and Kološta's (2014) study

Tab. 8: The number of integrated reports issued by reference to the sustainable development index ranking

Indicator	Number of reports published by the first half of the ranking	Number of reports published by the second half of the ranking
Sustainable development index	90.90%	9.10%

Note: Croatia was not included in Bolcárová and Kološta's (2014) study

Out of the total integrated reports issued at the European Union's level, over 90% were published from countries placed in the first half of the ranking. Moreover, 86 out of the total 198 integrated reports issued for the financial year 2012 belong to the top five countries.

4 DISCUSSION AND CONCLUSIONS

As annual reports remains the most valuable source of information when making investment decisions (ACCA, 2013), integrated reporting may represent a viable solution for meeting the actual information demands through the use of a comprehensive and intuitive language in accordance with each user's needs.

Companies from different countries tend to react differently to the adoption of integrated reporting. The results obtained, which are consistent with the ones presented by Jensen and Berg (2011), indicate that companies attitude towards the adoption of integrated reporting is influenced by a country's sustainability performances.

Other significant country-level determinants influencing the adoption of integrated reporting, as presented by other relevant papers, may include investor protection, the degree of market coordination, ownership dispersion, private expenditure for tertiary education, trade union density (Jensen and Berg, 2011) or the legal system (Frías-Aceituno, Rodríguez-Ariza and García-Sánchez, 2013).

The present paper reveals a positive correlation between the number of integrated reports issued by companies inside one country and the values registered for the sustainable development indicators. Consequently, companies from countries registering a higher status of social, economic and environmental development, the three pillars of sustainability development, are the ones that publish more integrated reports.

It is sure that integrated reporting does not directly influence the macro indicators level but, as we have seen, there is a bigger commitment from companies, belonging to more developed countries, to make their contribution for the improvement and development of integrated reporting concept and practice.

Future research may attempt to investigate the relationship between a company's decision to publish an integrated report by reference to its financial, social and environmental performances.

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7 ANNEX

Tab. 9: Social, environmental and economic indicators description

Indicator (measurement unit)	Description
Environmental Performance Index (0–100)	The Environmental Performance Index (EPI) ranks how well countries perform on high-priority environmental issues in two broad policy areas: protection of human health from environmental harm and protection of ecosystems.
Human Development Index (0–100)	The Human Development Index is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions.
National Corporate Responsibility Index (0–100)	National Corporate Responsibility Index is the world's first assessment of the state of corporate responsibility internationally. The index assesses over 80 countries on criteria including corruption, civic freedom, corporate governance and environmental management to establish a global ranking.
Gross National Income per capita (USD per inhabitant)	GNI per capita based on purchasing power parity (PPP). PPP GNI is gross national income (GNI) converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GNI as a U.S. dollar has in the United States. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad.
Economic Freedom Index (0–100)	The Index of Economic Freedom documents the positive relationship between economic freedom and a variety of positive social and economic goals. The ideals of economic freedom are strongly associated with healthier societies, cleaner environments, greater per capita wealth, human development, democracy, and poverty elimination.

Source: AccountAbility (2005); The Wall Street Journal & The Heritage Foundation (2012); The World Bank (2012); UNDP (2012); YCELP & CIESIN (2012)

Tab. 10: Sustainable development indicators description

Sustainable development indicator (meas. unit)	Theme	Description
Real GDP per capita (EUR per inhabitant)	Socio-economic development	Real GDP per capita is calculated as the ratio of real GDP to the average population of a specific year. It is often used as an indicator of how well off a country is, since it is a measure of average real income in that country. However, it is not a complete measure of economic welfare. For example, GDP does not include most unpaid household work. Neither does GDP take account of negative effects of economic activity, like environmental degradation.
Resource productivity (EUR per kilogram, chain linked volumes, 2005)	Sustainable consumption and production	Resource productivity is gross domestic product (GDP) divided by domestic material consumption (DMC). DMC measures the total amount of materials directly used by an economy. It is defined as the annual quantity of raw materials extracted from the domestic territory of the focal economy, plus all physical imports minus all physical exports
People at-risk-of-poverty or social exclusion (percentage of total population)	Social inclusion	This indicator corresponds to the sum of persons who are: at risk of poverty or severely materially deprived or living in households with very low work intensity. Persons are only counted once even if they are present in several sub-indicators. At risk-of-poverty are persons with an equivalised disposable income below the risk-of-poverty threshold, which is set at 60% of the national median equivalised disposable income (after social transfers).
Employment rate of older workers (percentage of total population)	Demographic changes	The employment rate of older workers is calculated by dividing the number of persons in employment and aged 55 to 64 by the total population of the same age group.
Life expectancy at birth (males, years)	Public health	Life expectancy at birth is defined as the mean number of years still to be lived by a person at birth, if subjected throughout the rest of his or her life to the current mortality conditions.
Greenhouse gas emissions (total greenhouse gas emission in CO_2 equivalent, indexed to 1990)	Climate change and energy	It presents annual total emissions in relation to 1990 emissions and. The aggregated greenhouse gas emissions are expressed in units of CO_2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport.
Share of renewable energy in gross final energy consumption (% of gross final energy consumption)	Climate change and energy	Renewable energy sources cover solar thermal and photovoltaic energy, hydro (including tide, wave and ocean energy), wind, geothermal energy and biomass (including biological waste and liquid biofuels). The contribution of renewable energy from heat pumps is also covered for the Member States for which this information was available.
Primary energy consumption (million TOE (tons of oil equivalent)	Climate change and energy	"Primary Energy Consumption" is meant the Gross Inland Consumption excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). This quantity is relevant for measuring the true energy consumption and for comparing it to the Europe 2020 targets.
Energy consumption of transport relative to GDP (% of GDP, chain-linked volumes, at 2000 exchange rates)	Sustainable transport	This indicator is defined as the ratio between the energy consumption of transport and GDP (chain-linked volumes, at 2000 exchange rates). The energy consumed by all types of transport (road, rail, inland navigation and aviation) is covered, including commercial, individual and public transport, with the exception of maritime and pipeline transport.
Official development assistance as share of gross national income (% of gross national income)	Global partnership	Official development assistance (ODA) consists of grants or loans that are undertaken by the official sector with the objective of promoting economic development and welfare in recipient countries. Disbursements record the actual international transfer of financial resources, or of goods or services valued at the cost of the donor.

Source: Eurostat website (2014)

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