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MACROECONOMIC IMPLICATION OF THE FLOODS – A CASE STUDY FOR THE REGIONS OF THE CZECH REPUBLIC

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Abstract

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Floods are natural events with extensive impact on property and life of affected people. They significantly came in 1997 into the life of Czech society and since then has caused damage almost 172 billion CZK. The paper focuses on the assessment of impact of floods from 1997 to 2010 on economic level of each region. The impact is assessed on basis of development of the basic macroeconomic indicators such as GDP and economic level of regions, change in fixed capital formation, sales of industrial products and unemployment. The basic idea is to show how much floods have influenced region's economy and if it depends more on the amount of flood damages or nature of damage (structure within infrastructure). 13 regions of the Czech Republic except Prague were chosen for the analysis. Prague was excluded from the analysis because of its specific status (capital city and the region) and economic conditions among regions in the Czech Republic (higher GDP per capita than the national average).

natural disaster, floods, macroeconomic impact, regions, damage

Natural disasters are nothing else but extreme environmental events that influence human activities. According to database EM-DAT (2012) of the Centre for Research on the Epidemiology of Disaster, natural disaster is defined as situation or event, which overwhelms local capacity necessitating a request to national or international level for external assistance. The database is major source of data about natural disaster for recent research. It classifies the natural disasters in accordance with certain criteria, e.g. number of kills, affected area, and publishes regular reports on this issue. According to EM-DAT (2011), at the end of the last decade, natural disasters occurred six times more than in 1975. Floods are the most common natural disaster accounting for 40 percent of all natural disasters between 1985 and 2009 (Cuñado and Ferreira, 2011).

Usually after every natural disaster, the reports about losses caused by this event are published by media and other research institution. The most of this reports are only limited to the estimation of costs to restore damaged property and do not deal with the systematic impact of disasters on regional or national economy (Fomby *et al.*, 2009).

Economic research in this field of the impact of natural disasters on economic development after disaster is still in an early phase of development. The first studies dealing with this issue are created in the 90th. Albala-Bertrand (1993) found that natural disasters have a neutral or positive short-run effect on economic growth. Current research begin to use for analyse of macroeconomics impact on economic development the econometric methods. This analysis demonstrate that short-run and long-run impact of natural disaster on the economy of affected country or region may depend on economic, social, and institutional conditions, as well as on the type of natural disaster and sector of the economy (Fomby *et al.*, 2009).

Skidmore and Toya (2002) argue that climatic events have a positive influence and geological events have a negative or neutral impact on long-run economic development of effected area. Contrary,

Raddatz (2009) find that climatic natural disasters have a negative impact and geological events do not play a significant role in economic development of this region. Hochrainer (2009) finds the negative short-run impact of natural disaster on economic development. Ma (2011) argues that natural disasters indirectly cause lower growth in the short-run through reducing productivity and total output. The lack of productivity depends on the relative development of the country. Cavallo *et al.* (2010) do not demonstrate a significant economic impact of natural disaster.

To determine the economic impact of natural events on the affected area is important to distinguish the type of natural disasters. Fomby *et al.* (2009) find that droughts have a negative effect on economic growth. In, contrast, floods tend to have a positive effect. This effect is stronger in developing countries and is present in the agricultural and non-agricultural sectors. However research indicates that this effect comes only from moderate floods. Severe floods produce negative responses of all economics sectors. Cuňado and Ferreira (2011) build on previous research and confirm the positive impact of floods on economic development of developing countries. In fact, developed countries do not experience a positive impact of floods on overall growth. The positive impact on agricultural growth in developed countries does not seem to spill over to the manufacturing and service sector.

Floods are together one of the most important categories of natural disasters in Europe and in the Czech Republic too (Berga *et al.*, 2010). Since 1997 floods have caused damage over 172 billion CZK in the Czech Republic. Already each region was affected by floods at least once. Experience from extreme floods in the Czech Republic between 1997 and 2010 has shown the necessity for a systematic approach to flood protection. This process is carried out in accordance with Directive of the European Parliament and Council 2007/60/ES of 23rd October 2007 on the assessment and management of flood risks. The purpose of this directive is to establish a framework for management of flood risk in order to reduce the negative impact on human health, the environment, cultural heritage and economic development in European Union (Řezáč *et al.*, 2011). Already in 2000 the Czech government approve The Strategy for Flood Protection in the Czech Republic. It is document containing the main principles of flood protection in the Czech Republic.

Current Czech research in area of natural disasters is mainly oriented on flood protection in accordance with European Directive and The Strategy for Flood Protection. The studies deal with determination of flood hazards and risks (e.g. Dráb and Říha, 2010), to identify appropriate methods for the determination of damage in hazardous areas (e.g. Korytárová and Hromádka, 2010), the economic efficiency flood control measures. The discussion also leads to the financing system of flood prevention (Šelešovský and Bakoš, 2010), the efficiency of public expenditure on flooding in the Czech Republic (Čamrová and Jílková, 2006).

The paper wants to open discussion about impact of floods on economic development of the Czech Republic. The aim of the paper is to analyse the economic impact of the flood on the regions and to discuss the relationship between floods and economic development.

Economic impact is assessed on the basis of the basic economic indicators of regions – GDP, economic level, gross fixed capital formation, sales of industrial products and unemployment.

MATERIALS AND METHODS

Method used in this paper is the method of induction and correlation analysis. The amount of flood damage has been chosen as an exogenous variable. First, flood damage by region was detected. In spite of the different sizes of regions were the absolute indicators recalculated per capita (relative indicator). Subsequently the damage was compared with macroeconomic indicators using correlation analysis.

As basic macroeconomic indicators for correlation were selected:

- Gross domestic product (GDP),
- Gross fixed capital formation (GFCF),
- Industry sales and
- Unemployment.

All these indicators were identified by region and that as absolute and relative indicators. Correlation analysis was performed for both absolute and relative indicators (per capita). In addition, both nominal and real values of these variables were identified and their change too (growth and character).

The time series from the first catastrophic flood in 1997 to 2010 was selected to analyse. The data on the damage were obtained from reports on the floods issued by the Povodí, State Enterprise and from reports on estimates of damages caused by floods that affected regions have to create and send to the Ministry of Finance of the Czech Republic. Moreover it is only an estimate of damages which is provided by trained staff of municipal offices and the Povodí, State Enterprise. In foreign scientific literature dealing with natural disasters and their impact on affected area, the ECLAC methodology (European Commission for Latin America and the Caribbean) is used to identifying and analyzing damage. This methodology distinguishes direct and indirect damages and secondary effects. In the Czech Republic this is not use. Only direct damages are recorded – damage to tangible and intangible property of households, companies, regions, state and its companies; capital and inventories of finished and semi-finished products, raw materials and spare parts (Pelling *et al.*, 2002).

Thus, the hypothesis H is: The floods have conclusively negative impact on long-run economic development of effected area.

RESULTS AND DISCUSSION

A. Flood damages

As already mentioned above, the Czech Republic was affected by seven large floods in the years 1997 to 2010. They caused damage over 172 billon CZK.

In July 1997 the most tragic floods hit the Czech Republic. In just a few days, over half the usual annual rainfall fell in the Morava and Odra river basins. 60 people died, flood hit 28 districts, i.e. 536 municipalities in 12 regions. Damage amounted to 62 billion CZK. In July 1998 and March 2000, the Czech Republic was affected by smaller flood events in comparison with the preceding and following periods. In 1998 Hradec Králové Region was only affected, specifically the area of town Rychnov nad Kněžnou. Flood caused damages in the amount of 1.8 billion CZK. In 2000, Hradec Králové Region, Pardubice Region, Central Region and Liberec Region were affected. Two people died and damage amounted to 3 billion CZK.

The second extreme flood hit the Czech Republic in 2002. Nine regions, including Prague were affected. Highest damages – 26 billion CZK – were recorded in Prague. The main reason is considerable accumulation of social wealth and property in the capital city. The total damage amounted to about 70 billion CZK.

In March and April 2006, the melting of snow and intense rain caused next flood. It threatened about 800 municipalities in ten regions. Total damage exceeded 6 billion CZK. Nine people died.

In June and July 2009 series of flood events, caused mainly by heavy rainfall, threatened the area of republic, 15 people died. Floods affected 451 municipalities, all regions except Prague. Total damages were estimated about 8.4 billion CZK. Finally, in 2010 flood hit our republic twice. In May and June, Zlín Region, South Moravian Region, Olomouc Region a Moravian-Silesian Region were affected. Damage amounted to about 5 billion CZK. The second flood wave came in August. Liberec Region and the Ústí Region were affected. Total damages were estimated at 9.5 billion CZK, of which more than 80% Liberec Region reported. In 2010, floods caused total damages in the amount of 14.7 billion CZK and 11 people died.

Tab. I and II show the amount of flood damage in the regions from 1997 to 2010. For comparison are shown nominal (Tab. I) and real (Tab. II) values of flood damage.

From the tables it is apparent that the highest flood damage was in 1997 and 2002. Moreover, in 1997, nominal total damage amounted to about 62 billion CZK. But our analysis only includes nominal damages in the amount of about 25.5 billion CZK for this year. The rest of the damage was caused on the state property and there is no sorting by districts (*).

Overall, Prague was the most affected. Nevertheless Prague was excluded from the analysis because of its specific status (capital city and the region) and economic conditions among regions in the Czech Republic (higher GDP per capita than the national average).

The other three most affected regions are Moravian-Silesian Region, Central Region and South Bohemian Region. Moravian-Silesian Region has been the most hit in 1997 while the South Bohemian Region and the Central Region were most affected in 2002. Because regions have a different size, it was not possible to use absolute value for the correlation analysis. It was necessary to choose

I: *The amount of flood damage in the regions of the Czech Republic (CZK million)*

	1997(*)	1998	2000	2002	2006	2009	2010	Sum	Rank
Prague	0.0	0.0	0.0	26914.4	65.4	0.0	0.0	26 979.8	
Central Region	1.7	0.0	872.0	14283.0	1 200.0	28.8	0.0	**16 385.5**	**3**
Hradec Králové Region	492.2	1 880.0	1 577.4	0.0	0.2	31.5	0.0	3 981.3	8
Karlovy Vary Region	0.0	0.0	0.0	77.0	0.0	0.0	0.0	77.0	13
Liberec Region	30.1	0.0	537.4	5.0	0.0	9.4	8 212.5	8 794.4	6
Moravian-Silesian Region	12 188.5	0.0	0.0	0.0	0.0	3 152.3	4 145.0	**19 485.8**	**1**
Olomouc Region	6 169.2	0.0	0.0	0.0	861.6	3 670.0	1.0	10 701.8	5
Pardubice Region	850.0	0.0	68.9	0.0	0.4	1.2	0.0	920.5	11
Pilsen Region	0.0	0.0	0.0	3851.3	0.0	6.1	0.0	3 857.4	9
South Bohemian Region	17.4	0.0	0.0	15152.5	752.4	787.8	0.0	**16 710.1**	**2**
South Moravian Region	656.3	0.0	0.0	475.7	1 077.6	15.7	317.0	2 542.3	10
Ústí Region	0.0	0.0	0.0	11295.2	904.8	574.2	1 925.7	14 699.9	4
Vysočina Region	182.3	0.0	0.0	187.0	125.7	41.6	0.0	536.6	12
Zlín Region	4 902.6	0.0	0.0	0.0	1 212.0	115.5	411.8	6 641.9	7
Sum	25 490.3	1 880.0	3 055.7	72 240.9	6 200.1	8 434.1	15 013.0		
Number of deaths	60		2		9	15	11		

Source: Data from the reports on the floods issued by the Povodí, State Enterprise and from reports on estimates of damages caused by floods created by affected regions, adjusted by authors

II: *The real amount of flood damage in the regions of the Czech Republic (CZK million)*

	1997(*)	1998	2000	2002	2006	2009	2010	Sum	Rank
Prague	0.0	0.0	0.0	26 438.5	63.8	0.0	0.0	26 502.3	
Central Region	**1.6**	**0.0**	**839.3**	**14 030.5**	**1 170.7**	**28.5**	**0.0**	**16 070.5**	**3**
Hradec Králové Region	453.6	1 698.3	1 518.2	0.0	0.2	31.2	0.0	3 701.5	9
Karlovy Vary Region	0.0	0.0	0.0	75.6	0.0	0.0	0.0	75.6	13
Liberec Region	27.7	0.0	517.2	4.9	0.0	9.3	8 091.1	8 650.3	6
Moravian-Silesian Region	**11 233.6**	**0.0**	**0.0**	**0.0**	**0.0**	**3 121.1**	**4 083.7**	**18 438.5**	**1**
Olomouc Region	5 685.9	0.0	0.0	0.0	840.6	3 633.7	1.0	10 161.2	5
Pardubice Region	783.4	0.0	66.3	0.0	0.4	1.2	0.0	851.3	11
Pilsen Region	0.0	0.0	0.0	3 783.2	0.0	6.0	0.0	3 789.2	8
South Bohemian Region	**16.0**	**0.0**	**0.0**	**14 884.6**	**734.0**	**780.0**	**0.0**	**16 414.7**	**2**
South Moravian Region	604.9	0.0	0.0	467.3	1 051.3	15.5	312.3	2 451.4	10
Ústí Region	0.0	0.0	0.0	11 095.5	882.7	568.5	1 897.2	14 444.0	4
Vysočina Region	168.0	0.0	0.0	183.7	122.6	41.2	0.0	515.5	12
Zlín Region	4 518.5	0.0	0.0	0.0	1 182.4	114.4	405.7	6 221.0	7
Sum	**23 493.4**	1 698.3	2 941.0	**70 963.6**	6 048.9	8 350.6	**14 791.2**		

Source: Data from the reports on the floods issued by the Povodí, State Enterprise and from reports on estimates of damages caused by floods created by affected regions, adjusted by authors

III: *The real amount of flood damage per capita in the regions of the Czech Republic (CZK)*[1]

	1997(*)	1998	2000	2002	2006	2009	2010	Sum	Rank
Central Region	1.4	0.0	752.7	12 430.9	996.2	22.9	0.0	14 204.0	6
Hradec Králové Region	820.5	3 073.9	2 756.4	0.0	0.4	56.3	0.0	6 707.5	9
Karlovy Vary Region	0.0	0.0	0.0	248.6	0.0	0.0	0.0	248.6	13
Liberec Region	**64.7**	**0.0**	**1 205.3**	**11.5**	**0.0**	**21.2**	**18 391.4**	**19 694.1**	**2**
Moravian-Silesian Region	8 735.8	0.0	0.0	0.0	0.0	2 502.1	3 284.8	14 522.7	5
Olomouc Region	8 815.5	0.0	0.0	0.0	1 315.1	5 658.7	1.6	15 790.9	4
Pardubice Region	1 537.2	0.0	130.4	0.0	0.8	2.3	0.0	1 670.7	11
Pilsen Region	0.0	0.0	0.0	6 886.4	0.0	10.6	0.0	6 896.9	8
South Bohemian Region	**25.6**	**0.0**	**0.0**	**23 811.6**	**1 165.1**	**1 223.3**	**0.0**	**26 225.6**	**1**
South Moravian Region	531.2	0.0	0.0	416.6	928.3	13.5	270.5	2 160.0	10
Ústí Region	**0.0**	**0.0**	**0.0**	**13 535.8**	**1 072.2**	**679.9**	**2 269.3**	**17 557.2**	**3**
Vysočina Region	321.5	0.0	0.0	354.9	239.7	80.0	0.0	996.0	12
Zlín Region	7 538.0	0.0	0.0	0.0	2 004.7	193.5	687.2	10 423.4	7
Sum	**28 391.4**	3 073.9	4 844.8	**57 696.3**	7 722.5	10 464.1	**24 904.8**		

Source: Data from the reports on the floods issued by the Povodí, State Enterprise, from reports on estimates of damages caused by floods created by affected regions and from Czech Statistical Office, adjusted by authors

and use the relative values of damage per capita. Another option was to use the indicator of damage to area of region. But this relative indicator was not suitable for analyzing the impact of the flood on the economy of regions. Following Tab. III shows the real damage per capita.

If we compare Tabs. II and III, it is evident that the highest damage was in 2002 and in the years 1997 and 2010. Regarding the affected regions, then in terms of damage per capita, the South Bohemian Region, Liberec Region and Ústí Region are among the most affected regions. The greatest shift in rankings is possible to see in the case of Liberec Region which was the sixth most affected region in terms of absolute damage, while in the case per capita Liberec Region is the second most affected region. Great shift is also at the Moravian-Silesian Region which was the most affected region in absolute terms, whereas in the case per capita it is only the fifth most affected region.

1 Prague is not in the table already. Prague was excluded from the analysis because of its specific status and economic conditions among regions in the Czech Republic (see above).

B. Correlation analysis

The dependence listed in Tab. IV was detected in the correlation analysis.

From Table IV ambiguous dependence is obvious. However, this also results from the comparison of absolute indicators. Therefore, correlation analysis was performed for relative indicator in relation to capita, see Tab. V.

From Tab. V it is clear, that except sales industry, correlation coefficients clearly show the direct or indirect dependence – for GDP and GFCF indirect and for unemployment direct dependence. However, from the results it is evident that for further analysis only data on GDP or GFCF give information about the relative impact of the floods on the economy of the region. Therefore, for the other analysis those indicators were only selected. However, it is necessary to draw attention to the fact that the determination of the dependence of the correlation coefficient is very weak in these indicators, which the significance level also proves.

If we focus on the most affected regions, which Liberec Region, South Bohemian Region and Ústí Region are in accordance with Tab. III, then we could see that they are not among the regions which have the strongest dependence between amount of flood damage and economic indicators according to the correlation coefficients, especially in GDP. In the case of GFCF dependence is evident in South Bohemian Region. In the case of indicator of unemployment, then even two of the most affected regions (Liberec Region and Ústí Region) by the correlation coefficient have stronger linear relationship. In the case of the sales industry, Ústí Region exhibits stronger dependence.

IV: *Correlation coefficient for the dependence of flood damage*

	GDP	GFCF	Unemployment	Sales industry
Central Region	–0.10028	–0.18490	**0.21089**	–0.34248
Hradec Králové Region	**–0.56411**	–0.15028	–0.29731	**–0.52013**
Karlovy Vary Region	–0.05120	0.04325	0.16421	**–0.38236**
Liberec Region	0.32182	–0.05134	**0.44703**	0.25334
Moravian-Silesian Region	–0.15308	–0.06609	–0.54349	0.46887
Olomouc Region	–0.14867	–0.11559	–0.26157	0.14083
Pardubice Region	**–0.47232**	**–0.31060**	–0.54540	**–0.57916**
Pilsen Region	–0.11433	–0.18550	0.14343	–0.34109
South Bohemian Region	–0.07946	**–0.41141**	0.12594	–0.31147
South Moravian Region	–0.00369	–0.11443	–0.18147	0.03882
Ústí Region	–0.03839	–0.10010	**0.31402**	–0.34547
Vysočina Region	–0.20690	–0.27000	–0.23752	–0.01743
Zlín Region	**–0.31451**	**–0.32654**	–0.53798	0.34306
Total	**0.06188**	**0.06841**	**0.03773**	**0.09262**

Source: adjusted by authors

V: *Correlation coefficient for the dependence of flood damage per capita*

	GDP per capita	GFCF per capita	Unemployment	Sales industry per capita
Central Region	–0.06453	–0.17466	**0.21174**	–0.33322
Hradec Králové Region	**–0.57058**	–0.15462	–0.29718	**–0.52429**
Karlovy Vary Region	–0.04339	0.04851	0.16421	–0.38016
Liberec Region	0.29544	–0.04714	**0.44663**	0.22984
Moravian-Silesian Region	–0.14520	–0.07900	–0.54259	0.47469
Olomouc Region	–0.15527	–0.12274	–0.26097	0.13552
Pardubice Region	**–0.47982**	**–0.31747**	–0.54540	**–0.58616**
Pilsen Region	–0.10340	–0.17783	0.14340	–0.34161
South Bohemian Region	–0.07363	**–0.40126**	0.12559	–0.31111
South Moravian Region	–0.00267	–0.11052	–0.18010	0.04053
Ústí Region	–0.03470	–0.09268	**0.31434**	**–0.34975**
Vysočina Region	–0.19917	–0.26193	–0.23574	–0.01241
Zlín Region	**–0.31321**	**–0.32875**	–0.53744	0.34493
Total	**–0.09804**	**–0.06326**	**0.02395**	**0.01429**

Source: adjusted by authors

C. Impact of floods on GDP and GFCF

In the following section, we only analyzed the impact of flood on GDP. Fig. 1 illustrates the change (increase, decrease) of real GDP (RGDP) per capita of the regions of the Czech Republic from 1995 to 2010.

Fig. 1 shows that especially strong flood in 1997 had an impact on GDP. For all regions GDP significantly decreased compared to the previous year.

Correlation analysis, however, did not confirm the influence of floods on GDP. In the case of more detailed analysis we find that data show the strongest impact of floods in Hradec Králové Region, Pardubice Region and Zlín Region. But these regions, except Zlín Region, however, were less affected by the floods, Pardubice Region even minimally. It is obvious that other factors had also effect on significant decline GDP in these regions.

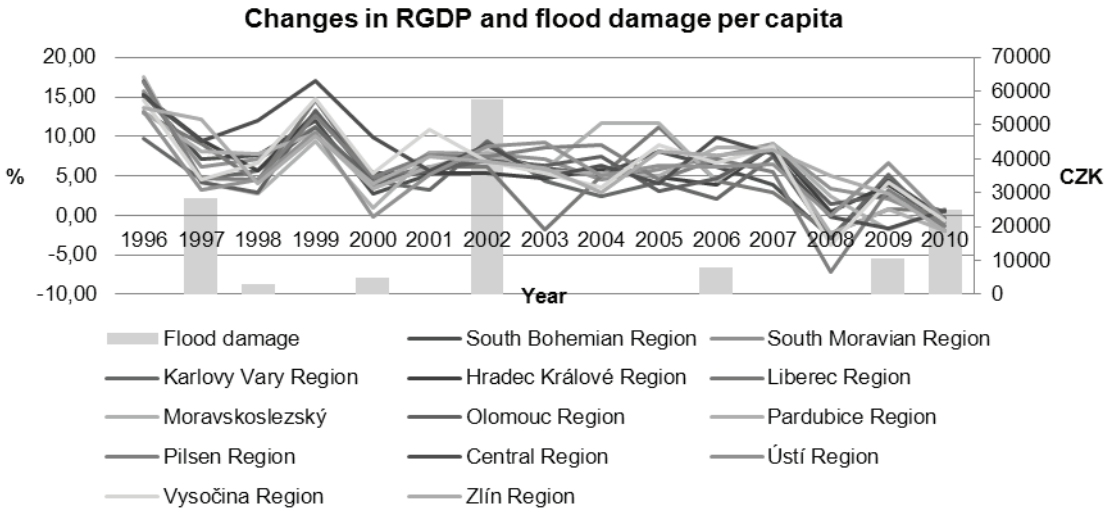
If we research the most affected regions, namely South Bohemian Region, Liberec Region and Ústí Region, see Fig. 2–4, and then also from these graphs unambiguous relationship between floods and changes in GDP are clear.

Clearly, we can disprove the hypothesis H_0 for the GDP that floods have a significant impact on long-term changes in the economic development of the region. The analysis shows that the relationship between the damage after floods and changes in GDP may exist, but only weak.

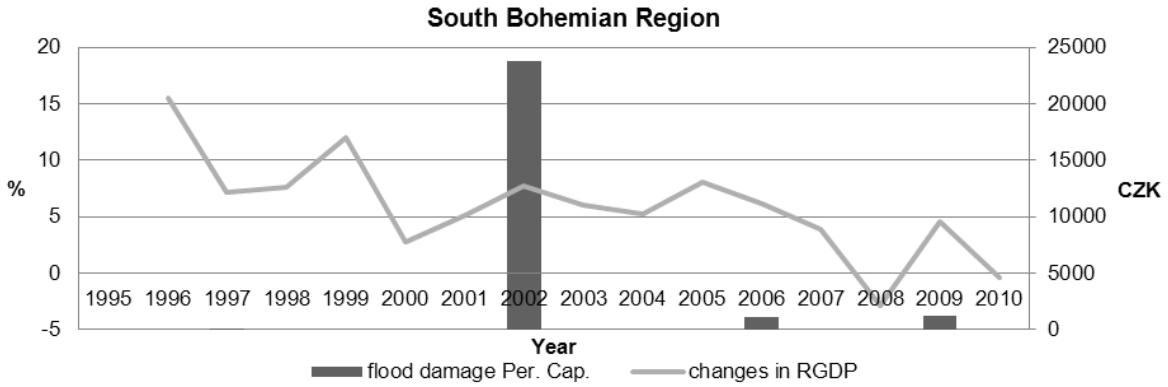
Then we tested another economic indicator that suggested dependence – GFCF. It gives different results than GDP, see Table VI.

If we consider the most affected regions, namely South Bohemian Region, Liberec Region and Ústí Region, only GFCF indicators of South Bohemian Region was clearly affected by floods. This is demonstrated by the following Fig. 5.

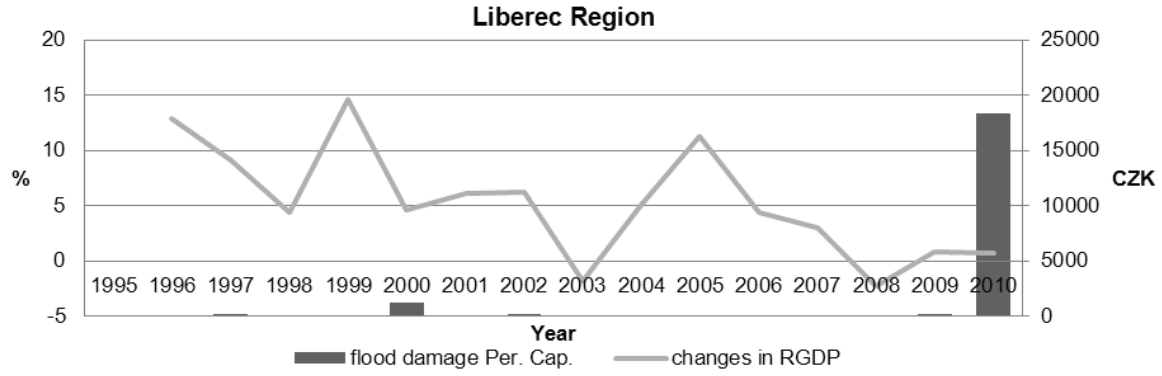
Thus, in the case of GFCF we can reject the hypothesis, that the floods have a conclusively negative impact on long-run economic development of effected area. Analysis of economic



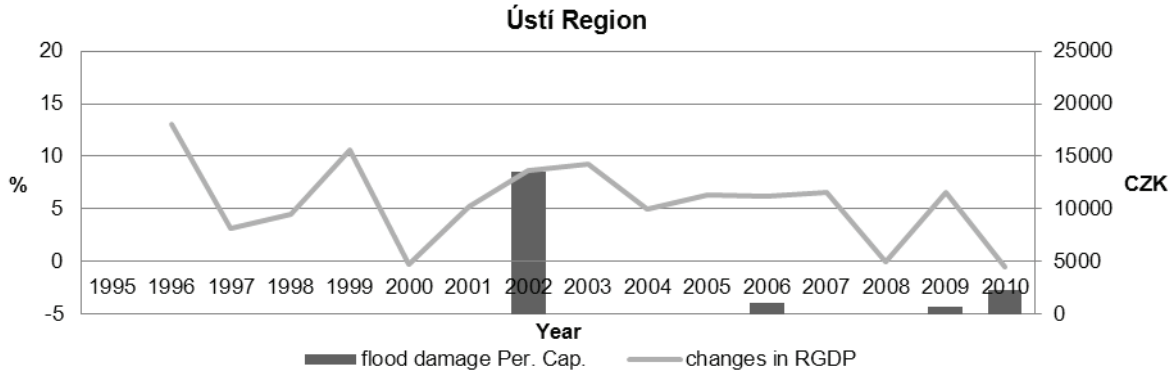
1: *Change in RGDP of the regions of the Czech Republic and flood damage per capita as the sum of damage of the regions*
Source: Data from the reports on the floods issued by the Povodí, State Enterprise, from reports on estimates of damages caused by floods created by affected regions and from Czech Statistical Office, adjusted by authors



2: *Change in RGDP and flood damage per capita of South Bohemian Region*
Source: Data from the reports on the floods issued by the Povodí, State Enterprise, from reports on estimates of damages caused by floods created by affected regions and from Czech Statistical Office, adjusted by authors



3: *Change in RGDP and flood damage per capita of Liberec Region*
Source: Data from the reports on the floods issued by the Povodí, State Enterprise, from reports on estimates of damages caused by floods created by affected regions and from Czech Statistical Office, adjusted by authors



4: *Change in RGDP and flood damage per capita of Ústí Region*
Source: Data from the reports on the floods issued by the Povodí, State Enterprise, from reports on estimates of damages caused by floods created by affected regions and from Czech Statistical Office, adjusted by authors

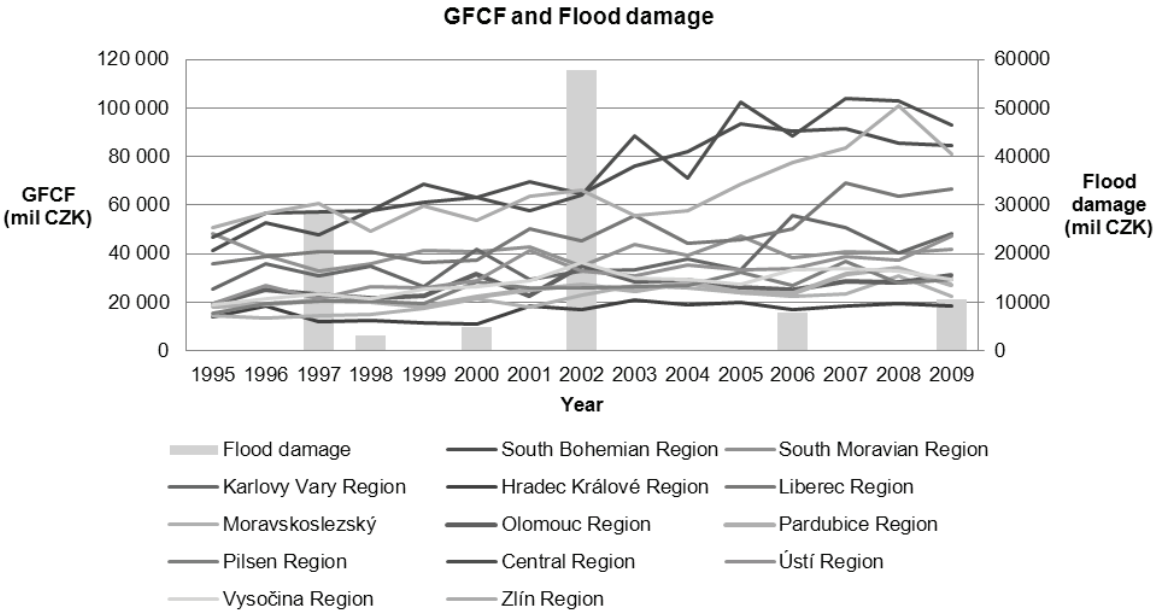
VI: *Correlation coefficient for the dependence of flood damage per capita and GDP per capita and GFCF per capita*

	GDP per capita	Rank	GFCF per capita	Rank
Central Region	–0.06453	9	–0.17466	6
Hradec Králové Region	–0.57058	1	–0.15462	7
Karlovy Vary Region	–0.04339	10	0.04851	13
Liberec Region	**0.29544**	**13**	**–0.04714**	**12**
Moravian-Silesian Region	–0.14520	6	–0.07900	11
Olomouc Region	–0.15527	5	–0.12274	8
Pardubice Region	–0.47982	2	–0.31747	3
Pilsen Region	–0.10340	7	–0.17783	5
South Bohemian Region	**–0.07363**	**8**	**–0.40126**	**1**
South Moravian Region	–0.00267	12	–0.11052	9
Ústí Region	**–0.03470**	**11**	**–0.09268**	**10**
Vysočina Region	–0.19917	4	–0.26193	4
Zlín Region	–0.31321	3	–0.32875	2

Source: adjusted by authors

fundamentals in each region has not confirmed the clear impact of floods on these variables. Overall, we can define their influence as neutral. Results of testing hypotheses (Lehman and Promano, 2005) correspond to a normal distribution.

The analysis results confirm the conclusions of foreign studies dealing with the impact of natural disaster on economic growth. Already Albala – Bertrand said in 1993 that natural disaster have a neutral or positive short-run effect on economic growth. Similarly, Skidmore and Toya (2002)



5: *GFCF of the regions of the Czech Republic and Flood damage as the sum of damage of the regions*
Source: Data from the reports on the floods issued by the Povodí, State Enterprise, from reports on estimates of damages caused by floods created by affected regions and from Czech Statistical Office, flood damages are the sum of damages of regions of the Czech Republic adjusted by authors

concluded that geological events have negative or neutral impact on long-run economic development of effected area. Raddatz (2009) had another opinion. According to him, climatic natural disasters (among which we can include floods) have a negative impact on economic development, while geological events do not play a significant role in economic development.

Our results, however, disagree with the research Fomby *et al.* (2009) which demonstrated the positive effect of floods on economic growth as well Cuňado, Ferreira (2011), which confirm these results their research. However, both researches have assessed the impact of floods in the entire states, not regions and it could affect their results.

CONCLUSION

Many papers on the economics of natural disasters define severity of disaster as a function of the number of people killed or affected by floods. But in this paper is used flood damage as main indicator. We have used correlation analysis. As basic macroeconomic indicators for correlation analysis were selected: GDP, GFCF, industry sales and unemployment. All these indicators were identified by region and that as absolute and relative indicators.

Our results show that flood shocks tend to have slightly negative or neutral impacts these indicators. We would expect, these neutral impact are not experienced on the year of the flood. We expect the delay in one or more years.

Overall, it can be assumed that other extensive and intensive factors have a greater influence on economic growth. The question is, whether floods in the short and long-term period have an impact on domestic consumption, public budgets or debt service and thus affect aggregate demand and to what extent. It will be the subject matter of the future research priorities.

SUMMARY

The paper opens discussion about impact of floods on economic development of the Czech Republic. The aim of the paper is to analyse the economic impact of the floods on the regions in the Czech Republic and to discuss the relationship between floods and economic development. It is assessed on the basis of basic economic indicators of the region – GDP, gross fixed capital formation, industry sales, and unemployment. These variables are assessed as absolute and relative indicators, which are transferred per capita (with the exception of the unemployment rate). The paper uses data of GDP, GFCF, industry sales and unemployment from 13 regions of the Czech Republic between 1995 and 2010 to compute correlation of economic growth and flood events. Prague was excluded from the analysis because of its specific status (capital city and the region) and economic conditions among region in the Czech Republic. It was hypothesized: The floods have conclusively negative impact

on long-run economic development of effected area. This hypothesis was disproved based on the analysis, when the conclusion is that, the floods have a neutral impact on the economic growth of the regions of the Czech Republic.

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