Large-scale natural disaster analysis in European transition countries

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Abstract

The first aim of this study is to identify possible natural disasters and catastrophes and to summarize the state of economic literature in the domain. Further are analyzed the methodologies used for estimating the economic impacts of disasters and catastrophes.

The second aim is to compare disasters and catastrophes from several transition countries (Bulgaria, Czech Republic, Hungary, Republic of Moldova, Poland, Romania and Ukraine) in the 1900-2014 time period, underlining their negative impact on the economy.

Keywords: disasters, catastrophes, transition countries,

Introduction

The primary question that this study wants to answer to is: *How much the economy of a transition country is affected by disasters?*, having in mind that every disaster costs money and may overwhelm the local economy. Also, many such events cost human lives, destroys infrastructure and crops, displace population. Another problem after a disaster is the loss of jobs for the population.

Most of the theories predict that natural disasters usually lower GDP per capita, but there are some studies that have found a positive correlation between disaster occurrences and economic growth (Albala-Bertrand, 1993; Skidmore and Toya, 2002). In the study of (Albala-Bertrand, 1993), a mild positive effect is found, but only in the short run, but in the study of (Skidmore and Toya, 2002) positive effects are found also on long-run growth. Also, even if the impacts of natural disasters are negative the stimulatory impulse of reconstruction activity may dominate (Loayza et al., 2009).

Related work

Although disaster analysis, from an economical point of view, seems to be an interesting subject, browsing the related work is rather difficult. According to (Cavallo & Noy, 2010) the economic research on natural disasters and their consequences is fairly limited.

(Cavallo et. al., 2010) examines the impact of natural disasters on GDP per capita (on the short- and long-run) and provides new evidence that natural disasters do not have any significant effect on subsequent economic growth, except the truly large natural disasters that are followed by an important decline in GDP per capita and where the natural disaster are followed by radical political revolution, which severely affected the institutional organization of society.

(Noy, 2007) describes the macroeconomic dynamics of natural disasters. The research shows that natural disasters have a statistically observable adverse impact on the macro-economy in the short-run. Developing countries and smaller economies face much larger output declines following a disaster of similar relative magnitude than do developed countries or bigger economies. Countries with a higher literacy rate, better institutions, higher per capita income, higher degree of openness to trade, and higher levels of government spending are better able to withstand the initial disaster shock and prevent further spillovers into the macro-economy. These all suggest an increased ability to mobilize resources for reconstruction. Financial conditions also seem to be of importance; countries with more foreign exchange reserves, and higher levels of domestic

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credit, but with less-open capital accounts appear more robust and better able to endure natural disasters, with less adverse spillover into domestic production.

(Rasmussen, 2004) provides in his paper a cross-country comparison of the incidence of natural disasters in the Caribbean proving that the relative costs tend to be far higher in developing countries than in advanced economies.

Disasters make both direct and indirect damages to an economy. The direct damages are on fixed assets and capital, raw materials or natural resources and on human capital. The indirect damages are on the production of goods and services. These distinguishes between types of damages are treated in (Pelling et al., 2002) and (ECLAC, 2003).

Econometric methods in the literature

In the existing literature, there are many different approaches when analyzing disasters and their impact to the economy. Just a few of them will be brought in attention in this section.

(Raddatz, 2009) uses a panel vector autoregression and provides estimates of the average impact on GDP of several types of disasters at various frequencies. The study concludes that disasters have modest but economically meaningful output consequences, resulting on a decline in output per capita.

(Okuyama, 2003) uses a Solow model in order to analyze the long-term recovery problems. The study shows that the introduction of new technology would lead to a slightly slower recovery and a new, higher, stable equilibrium.

(Benson & Clay, 2003) base their study on the endogenous Schumpeterian model of growth (having a positive impact theory).

(Skidmore and Toya, 2002) found a positive correlation between disaster occurrences and economic growth using a cross-sectional ordinary least squares technique.

(Loayza, 2009) applies a dynamic Generalized Method of Moments panel estimator to a 1961–2005 cross-country panel having three major conclusions. First and most important is that disasters not always affect economic growth negatively and that they affect economic growth differently across economic sectors. Second, the assumption that severe disasters can have a positive growth effect in some sectors is ruled out. Third, growth in developing countries is more sensitive to natural disasters—more sectors are affected and the magnitudes are non-trivial.

There are studies that analyze specific disaster incidents like (Horwich, 2000) and there are also studies that analyze more than one country/incident like (Raschky, 2008), where a multicountry framework is developed in order to show that countries with better institutions experience less victims and lower economic losses from natural disasters. As for the econometric method applied in (Raschky, 2008), a pooled time-series regression model is used to estimate the relationship between economic development, institutional vulnerability and disaster impacts.

Some of the variables used in these studies are annual GDP growth rate, per-capita real GDP growth, square of per capita GDP growth and the measure of disaster magnitude – number of people killed, number of people affected and damages caused –, lagged value of GDP growth, destruction of a country's capital stock.

Data

The data used in this study is gathered from the Emergency Events Database (EM-DAT) database at the University Catholique de Louvain in Brussels, Belgium and from the PreventionWeb database (both consulted on 20.12.2014).

In this study data for 1900-2014 time period was gathered and only disasters with economic damages bigger than 1 million US$ were considered.

Data on disasters can also be found on databases like: NatCat; Sigma; Disaster Database Project; Regional Databases.

Disasters in transition countries

Transition countries struggle for economic growth and a natural disaster may be a major setback for the economy. As stated in (Sharma, 2009), *disasters and their implications on development, therefore, need to be examined and analyzed in view of a nation's economic, social, institutional and political structure.*

From the data collected it can be seen that disasters hit the selected transition countries rather often and the most frequent type of disaster in European transition countries are floods. The least affected by major disasters is the Republic of Moldova.
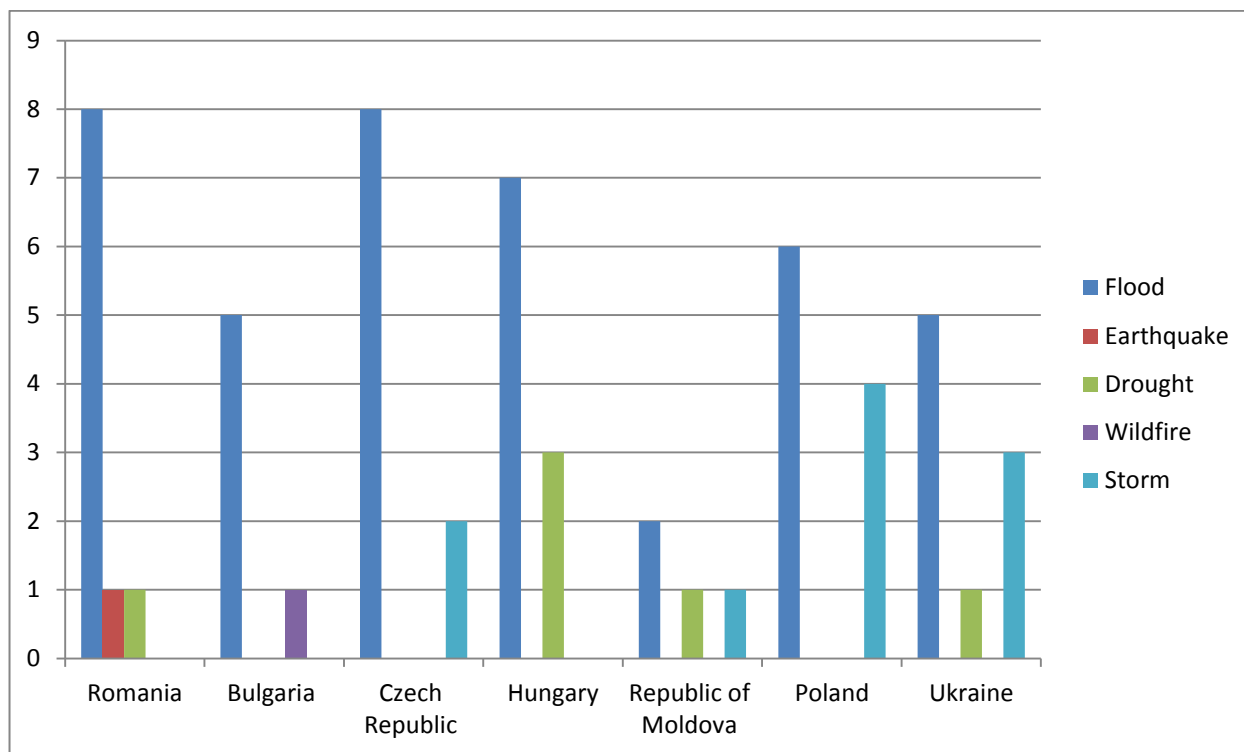
The occurrence of disasters:

Figure 1. Occurrence of disasters by type, grouped on countries.

The disaster type that has cost the most money in most of the analyzed countries is floods. Only in Ukraine drought produces more damage (in US$) than floods.

From figure 2 it can be seen that over the years disasters can cost a lot of money. The costs of the disasters (in 000 US$):
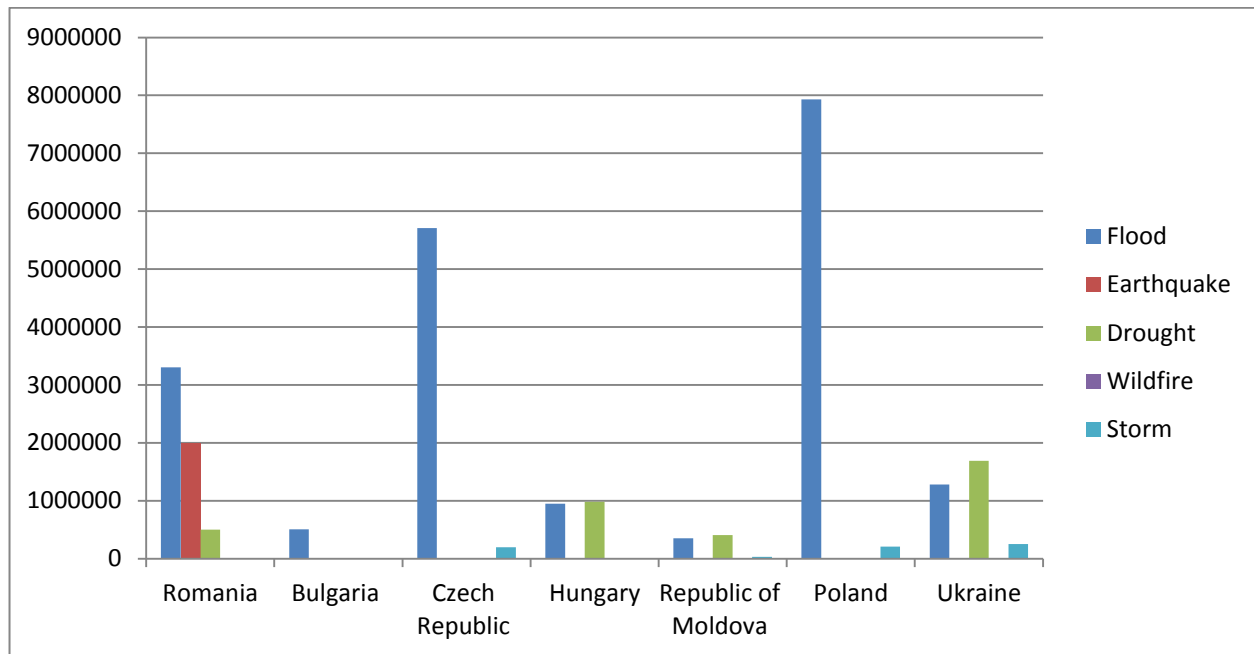
Figure 2. The combined costs of large natural disasters for 1900-2014 time period in the selected countries

Analyzing the natural disasters that occurred in Romania it can be stated that eight floods have a combined cost of 3304428 (in 000 US$) and that the most expensive flood was in 2010 with a damage of 1111428 (in 000 US$), meaning a 6.09% of the country's GDP in that year. The 1977 earthquake (the biggest natural disasters in economic terms) has made a damage of 2000000 (in 000 US$), meaning a 7.19% of the country's GDP in that year. In spite of this major event, Romania had an economic growth next year, reflected in its GDP.

Other natural disasters that made a lot of damage in US$ are two floods from Poland. The first one, in 1997, made a total damage of 3500000 (in 000 US$) and the second one, in 2010, made a total damage of 3080000 (in 000 US$). The disaster that happened in 2010 made total damages of nearly 0.8% of that year's GDP, and the one from 1997, 1.52%.

Conclusions

The review of the existing economic literature on disasters impacts shows that different researchers have come to different conclusions about the influence of a disaster over the economy. There are studies that underline the negative impact, others that suggest some positive impact in the economy and a third category of inconclusive research papers. Also, there are many different econometric methods used in the literature to analyze the impact of disasters over the economy.

Trying to draw conclusion only by looking at statistical data about the costs of natural disasters is not enough. By doing so, we can only see the damage in US$ of a disaster or a group of disasters and we can compare it to the GDP of that year. Even so, it can be stated that any economy is affected by unpredicted loss of money, no matter the cause. For better understanding of the damages done by a natural disaster, analyzing microeconomic indicators would be of interest.

As further research, an analysis whether a specific major natural disaster has slowed economic growth of a country is of interest. For example, Romania's GDP, would had been significantly bigger in the next years if the '77 disaster had not happened?

References

[1]   Albala-Bertrand, J.M., Political economy of large natural disasters: With special reference to developing countries. Oxford: Clarendon Press, 1993
[2]   Skidmore, M. & H. Toya,, Do natural disasters promote long-run growth? Economic Inquiry, 40, 664-87, 2002

[3]   Loayza, N.V., E. Olaberra, J. Rigolini & L. Christiansen, Natural disasters and growth: Going beyond the averages. World Bank Policy Research Working Paper 4980, 2009

[4]   E. Cavallo, I. Noy, The Economics of Natural Disasters, IDB Working Paper Series No. IDB-WP-124, Inter-American Development Bank, 2010.

[5]   Cavallo, E., Galiani, S., Noy, I., Pantano, J., Catastrophic Natural Disasters and Economic Growth, IDB Working Paper Series No. IDB-WP-183, Inter-American Development Bank, 2010.

[6]   Noy, I., The Macroeconomic Consequences of Disasters, Working Papers, University of Hawaii at Manoa, Department of Economics, 2007.

[7]   Rasmussen, T., Macroeconomic Implications of Natural Disasters in the Caribbean, IMF Working Paper, WP/04/224, 2004.

[8]   Pelling, M., A. Ozerdem and S. Barakat, (2002), The macro-economic of Disasters. Progress in Development Studies, 2-4, 2002.

[9]   ECLAC. Handbook for Estimating the Socio-economic and Environmental Effects of Disasters. United Nations Economic Commission for Latin America and the Caribbean, 2003

[10]   Raddatz, C., "The Wrath of God: Macroeconomic Costs of Natural Disasters" World Bank Policy Research Working Paper 5039, 2009

[11]   Okuyama, Y., Economics of natural disasters: A critical review. December 2003.

[12]   Benson, C. and Clay, E. (), Disasters, Vulnerability and the Global Economy, in Kreimer, A., Arnold, M., and Carlin, A., Building Safer Cities: The Future of Disaster Risk. Washington DC, The World Bank, 2003

[13]   Horwich, G., Economic Lessons of the Kobe Earthquake, in Economic Development and Cultural Change, Vol. 48, No. 3, pp. 521-542, 2000

[14]   Raschky, P., Institutions and the Losses from Natural Disasters. Natural Hazards and Earth System Sciences, 8, pp. 627-634, 2008

[15]   Loayza, N., Olaberría, E., Rigolini, J., and Christiaensen, L., "Natural Disasters and Growth: Going Beyond the Averages"World Bank Policy Research Working Paper 4980, 2009

[16]   Sharma, S., Review of Economic Literature on Implications of Disasters on Development, Singapore Economic Review Conference, 6-8 august 2009