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ECONOMIC DISASTERS – WHAT DO WE REALLY KNOW?

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After recent global financial and economic crisis interest in potential effects of especially large economic crisis, called economic disasters has been increased. This study analyzes determinants of size and recovery phase of economic disasters from 1960 up to 2014 among 214 countries. The results reveal differences between scale and duration of economic disasters. Some possible factors shaping these patterns are explored indicating the importance of institutions and investments for scale of disasters, and human capital and financial sectors for duration phase.

Keywords: *economic disasters, institutions, investment, human capital.*

1. Introduction

Recent global financial and economic crisis has raised interest in economic crisis, especially rare extreme economic events with significant and devastating economic effects, called economic disasters.

The data set constructed by Barro and Ursúa's (2008, 2012) and recent devastating crisis have been motivation for large number of papers addressing the link between economic disasters and large number of economic phenomena (e.g. Barro 2009; Barro and Ursúa 2012; Gourio 2012, 2013; Pindyck and Wang 2013; Aizenman and Noy 2015; Barro and Jin 2016; Farhi and Gabaix 2016; Ćorić 2017; Fernández-Villaverde and Levintal 2018; Rebelo, Wang, and Yang 2018).

However, the dataset constructed by Barro and Ursúa's (2008, 2012) also offered some limitations recognized and bypassed in the new data sets constructed by Coric (2019).

In first place, the new data sets offered more profound empirical tool to analyze not only the existence, but also different perspectives of these rare and extreme economics shocks for longer time and among larger number of the countries.

On theoretical side, shocks have recently become a prominent subject of enquiry and interest has been expressively utilized under the term resilience (e.g. Bristow, 2010; Simmie and Martin, 2010; Martin, 2012; Martin and Sunley, 2015, Bristow and Healy, 2015; Martin and Gardiner, 2019).

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Resilience, as a way of conceptualizing and analyzing how economies react to and recover from disturbances and disruptions (Martin and Gardiner, 2019) represents proper framework for understanding specific perspective of economic disasters.

Several questions could arise from such a perspective. Do economies actually differ in their resilience to size of shocks, especially in their duration of such disruptions? What causes such differences? (Martin and Gardiner, 2019)

Considering, up to the knowledge of author, that there is no empirical research analyzing different elements of economic disasters, this paper deals not only with the economic determinants important for the size of economic disasters, but also with the factors important for the relative duration of economic disasters.

The paper is organized as follows. Literature review has been presented in section 2. Section 3 describes the used data set and methodology and results of empirical analysis. Concluding remarks are described in section 4.

2. Literature review

Recent economic shocks on global level offered reminder that shocks are frequent and regular part of the economic development and growth process (Cook et al, 2013).

Economic theory offered evidence for positive effects of shocks indicating that shocks can provide stimulus for firms to innovate and become more competitive. As a consequence, although the analysis of shocks as a part of business cycles and related fluctuations theoretical framework has long been a topic of theoretical and econometric enquiry (e.g. Lucas, 1977; Long and Plosser, 1983; Hansen, 1985; Cooley, 1995; Romer, 2011), shocks have not represented a major concern for the mainstream economic researches.

However, recent global economic turmoil prompts us that shocks can produce immediate agonizing effects for the places and people implicated, and, as consequence, it should be in epicenter of the economic policy concerns.

Shocks can take various forms, in terms of origin, nature, scale, duration and scope. The goal of this paper is to examine more closely the especially large economic shocks, called economic disasters.

The term economic disaster has been presented by Barro (2006) to identify especially large economic crises, later defined as a cumulative decline in output over one or more years of at least 10 percent.

To deal with the effects of newly introduced phenomena Barro and Ursúa's (2008, 2012) constructed data set based on historical output data for 42 OECD and non OECD countries.

On this basis, the literature addressed the effects of the economic disasters on asset-pricing puzzles (Barro and Ursúa 2012; Gabaix 2012; Gourio 2012, 2013; Tsai and Wachter 2015; Barro and Jin, 2016; Fernández-Villaverde and Levintal, 2018), but also on saving, investment, debt intolerance of developing economies, exchange rate, long-run output growth and welfare (Barro, 2009; Gourio, 2012, 2013; Pindyck and Wang, 2013; Aizenman and Noy 2015; Farhi and Gabaix, 2016, Ćorić, 2017; Rebelo, Wang, and Yang 2018).

However, the dataset constructed by Barro and Ursúa's (2008, 2012) also offered limitations recognized by Coric (2019). The author created the new data sets covering larger number of countries for longer time. In addition, by providing more details on each economic disaster it opened new horizons for a variety of empirical researches on economic disasters. In first place, the new data sets offered more profound empirical tool to analyze not only the existence, but also different perspectives of these rare extreme economic events.

As the notion of resilience has spread across various social sciences in recent years, it offered appropriate theoretical framework for utilizing possibilities offered by new data set.

Although resilience acquired a variety of interpretations and specifications (Martin and Sunley, 2015; Modica and Reggiani, 2015; Martin, 2018), paper follows definition offered by Walker (2004) defining resilience as "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks". Although previously mentioned definition offers space for different approaches, the focus in this paper will be so-called 'engineering resilience' – how quickly a system, once disturbed, returns to its pre-shock state. This essentially 'bounce back' definition or type of resilience resonates most closely with the conventional view of shocks (including recessions) in the economics literature. (Martin and Gardiner, 2019)

To deal with this perspective, two dimensions of the economic disasters are especially important: size and duration of economic disaster (e.g. Bordo et al., 2001). Size of economic disaster represent the measure of intensity of destroying economy's productive base. Duration captures the fact that time is crucial. More precisely, keeping in mind growing mobility of essential growth and development factors, time for considerable change of the economy that will be in position to retain and attract key development factors will be crucial criteria that will make difference between successful and unsuccessful economies, especially in interaction with the size of the disaster.

3. Data and Methodology

In first data set on economic disasters Barro and Ursúa (2008, 2012) defined economic disaster as macroeconomic contraction (cumulative declines of output over one or more years of at least 10 percent) and they identified 183 economic disasters over the last two centuries in 42 OECD and non-OECD countries available up to 2009 while country starting dates vary.

Also, the data set offers evidence for lower frequency of economic disasters after post-World War two (WWII) and significant difference between more developed countries (OECD countries) and less developed countries.

This discrepancy between OECD and non-OECD countries suggests that increasing the number of countries under investigation might provide valuable additional information on economic disasters and this has been recognized by Coric (2019). The author created the new data sets based on data offered by Maddison Project Database version 2018 (MPD) and Penn World Table (PWT) database described in Feenstra, Inklaar, and Timmer (2015). The first data set covers 169 countries up to 2016 (and for 77 countries data are available prior 1950) and second offers a broader coverage of countries after the WWII as compared to the MPD,

by providing annual data for 212 countries from 1950 to 2014. Both datasets by providing not only data on the country, but also on starting and ending year, size, duration, time of recovery, size of population and level of development open new horizons for a variety of empirical researches on economic disasters.

In this paper it is decided to use data set based on PWT due to several reasons. It offers a larger coverage of countries in the post-WWII period, but also by providing GDP in constant national prices (compared to MPD in which GDP is provided in constant US dollars), offers a control for the possible effect of the used exchange rate on real GDP and real GDP p.c.

As indicate previously, special focus is on size and duration of the economic disaster. Correlation matrix (*Table 1*) indicates weak and negative correlation between the size and duration of economic disasters. In addition, we find important to consider (and introduce in *Table 1*) relative duration, ratio between size and duration, as a measure of the intensity of economic declining during economic disaster. The new measure (relative duration) is not correlate with the size and duration and therefore it represents economic phenomena that should be analysed.

In addition, relative duration by considering size and duration simultaneously could provide more information on these dimensions of economic disasters.

Table 1 Correlation matrix between size, duration and relative duration of economic disasters

	size	duration	R_duration
size	1.0000		
duration	-0.4081	1.0000	
R_duration	-0.3674	-0.4138	1.0000

For empirical defining determinants of the size and relative duration of economic disasters the paper follows complementary literature. More precisely, it follows approaches of the authors analyzing determinants of financial and economic crisis (e.g. Park and Lee, 2001; Desai and Mitra, 2004; Bordo and Haubrich, 2011; Reinhart and Rogoff, 2014; Dao, 2017).

As a result, two models were constructed. Firstly, for defining the determinants of the size of economic disasters:

$$Size_i = \alpha_i + \beta_1 Human\ capital_i + \beta_2 Institutions_i + \beta_3 Investment_i + \gamma_i Globalization + \eta_i Fin.sector + \tau_i + \varepsilon_{(i,t)}$$

Where **Size** denotes the cumulative loss of output in a particular disaster (as % of GDP);

Human capital stands for Compulsory education duration (years) in particular country *i*;

Institutions represent Cost of business start-up procedures (% of GNI per capita);

Investment stands for Gross capital formation (% of GDP);

Globalization represent KOI index of globalization;

Fin.sector denotes Domestic credit provided by financial sector (% of GDP)

τ captures time controls; ε denotes the error term; i and t represent the country and time, respectively; while α , β and γ are the respective coefficients.

Secondly, for defining the determinants of the relative duration (defined as ratio between duration (in years) and the size (as % of GDP) of economic disasters:

$$R.duration_i = \alpha_i + \beta_1 Human\ capital_i + \beta_2 Institutions_i + \beta Investment_i + \gamma_i Globalization + \eta_i Fin.sector + \tau_t + \varepsilon_{(i,t)}$$

Where **R. duration** denotes as ratio between duration of economic disaster (in years) and the size of economic disaster (as %of GDP);

Human capital stands for Compulsory education duration (years) in particular country i ;

Institutions represent Cost of business start-up procedures (% of GNI per capita);

Investment stands for Gross capital formation (% of GDP);

Globalization represent KOI index of globalization;

Financial sector denotes Domestic credit provided by financial sector (% of GDP)

τ captures time controls; ε denotes the error term; i and t represent the country and time, respectively; while α , β and γ are the respective coefficients.

4. Empirical findings and concluding remarks

The results of the static linear regression analysis using are presented in *Table 2* (column 1 for the overall size of economic disaster and column 2 for relative duration of the economic disaster).

Results in column 1 indicate significant importance of institutions and investment. More precisely, higher quality of institutions decreases the size of economic disasters, while higher investment increases the size of economic disasters. These results can indicate that higher quality of institutions can provide stimulus for firms to innovate and become more competitive even after the extreme shocks. Higher level of investments at the beginning of the economic disaster can indicate not only lower efficiency and productivity of present and previous investments, but also lower capacity for investments necessary for firms to become more competitive and decline the size of economic disaster.

For relative duration of the crisis two determinants shown significance. Human capital decreases relative duration of economic disaster indicating that human capital can stimulate faster positive changes after economic disaster happens. However, higher level of domestic credit provided by financial sector has negative effects on relative duration indicating that in periods of uncertainty in financial markets and rising risk aversion among investors, the negative effects of extracting funds and place them in other countries will be higher among countries with higher level of domestic credit provided by financial sector.

Table 2 Results of linear regression models

	(1) size	(2) R_duration
Human capital	-1.344 (-1.72)	1.332* (2.19)
Institutions	-0.180*** (-3.56)	0.0251 (0.64)
Fin.sector	0.0326 (1.43)	-0.0339* (-1.90)
Investment	0.454* (2.16)	-0.200 (-1.22)
Globalization	-0.236 (-1.57)	0.116 (0.99)
2004.start	0 (.)	0 (.)
2007.start	24.90* (3.30)	-5.309 (-0.90)
2008.start	27.80** (4.04)	-1.025 (-0.19)
2009.start	28.53** (4.51)	-0.0682 (-0.01)
2011.start	34.47** (4.03)	-2.085 (-0.31)
2012.start	20.20 (2.19)	3.112 (0.43)
2013.start	32.84** (4.39)	3.701 (0.63)
_cons	-27.30 (-2.08)	-4.557 (-0.45)

t statistics in parentheses

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

These results could provide valuable recommendations for policy makers. In first place the countries with the higher probability for economic disaster (less developed countries) have additional reasons to implement a measures that will increase the quality of institutions and human capital. Simultaneously, the efficiency and effectiveness of the investments and level of domestic credits provided by financial sector should be in focus of key national actors.

REFERENCES

1. Aizenman, J., Noy, I. (2015), "Saving and the long shadow of macroeconomic shocks," *Journal of Macroeconomics*, Vol. 46, No. C, pp. 147-59.
2. Barro, R., J. (2006), "Rare Disasters and Assets Markets in the Twentieth Century," *Quarterly Journal of Economics*, Vol. 121, No. 3, pp. 823-66.
3. Barro, R., J. (2009), "Rare Disasters, Asset Prices, and Welfare Costs," *American Economic Review*, Vol. 99, No. 1, pp. 243-64.
4. Barro, R., J., Ursúa, J., F. (2008), "Macroeconomic Crises since 1870, *Brooking Papers on Economic Activity*," Vol. 1, pp. 255-335.
5. Barro, R., J., Ursúa, J., F. (2012), "Rare Macroeconomic Disasters, *Annual Review of Economics*," Vol. 4, No. 1, pp. 83-109.
6. Barro, R., J., and Jin, T. (2016), "Rare Events and Long-run Risks," NBER Working Paper No. 21871 (Cambridge, Massachusetts, National Bureau of Economic Research)
7. Bordo, M. D., Eichengreen, B., Klingbiel, D., Martinez-Peria., M.S. (2001), "Is the crisis problem growing more severe?" *Economic Policy*, 32, 53-82.
8. Bordo, M. D., Joseph G. H. (2011), Deep recessions, fast recoveries and financial crises: Evidence from the American record. Unpublished paper, Rutgers University.
9. Bristow, G. (2010), *Resilient Regions: Re-plac-ing Regional Competitiveness*, *Cambridge Journal of Regions, Economy and Society*, 3, 1, pp. 153-167.
10. Bristow, G., Healy, A. (2015), *Crisis Response, Choice and Resilience: Insights from Complexity Thinking*, *Cambridge Journal of Regions, Economy and Society*, 8, 241-256.
11. Cook, J., Pringle, S., Bailey, D., Cammiss, S., Wilkinson, C., Amison, P. (2013), *Economic Shocks Research A report to the Department for Business, Innovation and Skills*
12. Cooley, T. F. (1995), *Frontiers of Business Cycle Research*. Princeton: Princeton University Press. ISBN 978-0-691-04323-4.
13. Ćorić, B. (2017), "The long-run effect of economic disasters," *Applied Economics Letters*, Vol. 25, No.5, pp. 296-99.
14. Desai, P., Mitra, P. (2004), *Why Do Some Countries Recover More Readily from Financial Crises?* IMF Working Paper.
15. Farhi, E., Gabaix, X. (2016), "Rare Disasters and Exchange Rates," *Quarterly Journal of Economics*, Vol. 131, No. 1, pp. 1-52.
16. Feenstra, R., C., Inklaar, R., Timmer, M., P. (2015), "The Next Generation of the Penn World Table," *American Economic Review*, Vol. 105, No. 10, pp. 3150-82.
17. Fernández-Villaverde, J., Levintal, O. (2018), "Solution methods for models with rare disasters," *Quantitative Economics*, Vol. 9, No. 2, pp. 903-44.
18. Gabaix, X. (2012), "Variable Rare Disasters: An Exactly Solved Framework for Ten Puzzles in Macro-Finance," *Quarterly Journal of Economics*, Vol. 127, No. 2, pp. 645–700.
19. Gourio, F. (2012), "Disaster Risk and Business Cycles," *American Economic Review*, Vol. 102, No. 6, pp. 2734-66.
20. Gourio, F. (2013), "Credit Risk and Disaster Risk," *American Economic Journal: Macroeconomics*, Vol. 5, No. 3, pp. 1-34.

21. Hansen, G. D. (1985), "Indivisible labor and the business cycle". *Journal of Monetary Economics*. 16 (3): 309–327. CiteSeerX 10.1.1.335.3000. doi:10.1016/0304-3932(85)90039-X.
22. Long, J. B., Jr., Plosser, C. (1983), "Real Business Cycles". *Journal of Political Economy*. 91 (1): 39–69. doi:10.1086/261128.
23. Lucas, R.E., Jr. (1977), "Understanding Business Cycles". *Carnegie-Rochester Conference Series on Public Policy*. 5: 7–29. doi:10.1016/0167-2231(77)90002-1.
24. Martin, R.L. (2012), *Regional Economic Resilience, Hysteresis and Recessionary Shocks*, *Journal of Economic Geography*, 12, 1-32.
25. Martin, R.L. (2018), *Shocking Aspects of Regional Development: Towards an Economic Geography of Resilience*, Ch. 45 in Clark, G.L., Feldman, M., Gertler, M. and Wojcik, D. (Eds) *The New Oxford Handbook of Economic Geography*, Oxford: Oxford University Press, 837-864
26. Martin, R.L., Sunley, P. (2015), *On the Notion of Regional Economic Resilience: Conceptualisation and Explanation*, *Journal of Economic Geography*, 14, 1-42.
27. Martin, R., Gardiner, B. (2019), *The resilience of cities to economic shocks: A tale of four recessions (and the challenge of Brexit)*. *Papers in Regional Science*.doi:10.1111/pirs.12430
28. Minh Quang, D. (2017), "Determinants of the global financial crisis recovery: an empirical assessment", *Journal of Economic Studies*, Vol. 44 Iss 1 pp. 36 – 46
29. Modica, M., Reggiani, A. (2015), *Spatial Economic Resilience: Overview and Perspectives*, *Networks and Spatial Economics*, 2, 211-233.
30. Park, Y., Lee, J. (2001), *Recovery and Sustainability in East Asia*. NBER, Working Paper 8373.
31. Pindyck R., S., Wang, N. (2013), "The Economic and Policy Consequences of Catastrophes," *American Economic Journal: Economic Policy*, Vol. 5, No. 4, pp. 306-39.
32. Rebelo, S., Wang, N., Yang, J. (2018), "Rare Disaster, Financial Development and Sovereign Debt," NBER Working Paper No. 25031 (Cambridge, Massachusetts, National Bureau of Economic Research)
33. Reinhart, C., Rogoff, K. (2014), *Recovery from Financial Crises: Evidence from 100 Episodes*. *American Economic Review* 104(5), 50-55.
34. Romer, D. (2011), "Real-Business-Cycle Theory". *Advanced Macroeconomics* (Fourth ed.). New York: McGraw-Hill. pp. 189–237. ISBN 978-0-07-351137-5.
35. Rose, A. Z. (2009), "Economic Resilience to Disasters", *Published Articles & Papers*. Paper 75. http://research.create.usc.edu/published_papers/75
36. Simmie, J., Martin, R.L. (2010), *The Economic Resilience of Regions; Towards an Evolutionary Approach*, *Cambridge Journal of Regions, Economy and Society*, 27-43.
37. Tsai J., Wachter, J., A. (2015), "Disaster Risk and Its Implications for Asset Pricing," *Annual Review of Financial Economics*, Vol 7, No. 1, pp. 219-52.
38. Walker, B., Holling, C.S., Carpenter, S., Kinzig, A. (2004), *Resilience, Adaptability and Transformability in Socio-Ecological Systems*, *Ecology and Society*, 9, 2.

Sažetak

EKONOMSKE KATASTROFE – ŠTO ZAISTA ZNAMO?

Nakon nedavne globalne financijske i ekonomske krize, interes za istraživanjem učinaka velikih ekonomskih kriza, nazvanih ekonomskim katastrofama, je porastao. Ovaj rad analizira odrednice veličine i faze oporavka uslijed ekonomskih katastrofa od 1960. do 2014. za 214 država svijeta. Rezultati otkrivaju značajne razlike između intenziteta i trajanja gospodarskih katastrofa, a koji ukazuju na važnost institucija i investicija za intenzitet, te ljudskog kapitala i financijskih sektora za fazu trajanja ekonomskih katastrofa.

Ključne riječi: ekonomske katastrofe, institucije, investicije, ljudski kapital.