Grażyna **BORYS**

A SURVEY OF EMPIRICAL RESEARCH ON THE FISCAL IMPLICATIONS OF NATURAL DISASTERS

Grażyna **Borys** (ORCID: 0000-0003-4969-5483) – *University of Zielona Góra*

Correspondence address:
Wołkowa Street 30, 58-500 Jelenia Góra, Poland
e-mail: g.borys@wez.uz.zgora

ABSTRACT: While the costs related to population ageing are seen as major drivers of fiscal pressure in developed countries, including the EU, concerns about climate-related public spending and natural disasters have received relatively little attention in ensuring long-term fiscal sustainability in these countries. This paper aims to contribute to a better understanding of the budgetary dimensions of natural disasters by empirically assessing their impact on the sustainability of public budgets and sustainable public debts. The so-called second-round effects resulting from governments' increasing efforts aimed at greenhouse gas reduction and adaptation are likely to further increase fiscal costs.

KEYWORDS: natural disasters, fiscal implications, empirical research

Introduction

In everyday language, the term "disaster" is used to describe a set of immediate, tragic and large-scale consequences of a sudden, relatively short-lived event. In accordance with the definition provided by the United Nations Office for Disaster Risk Reduction (2009), a disaster is 'A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources'. Two groups of disasters are commonly distinguished – natural and technological.

Natural disaster disturbances/threats can be: 1) meteorological (e.g. storms, heat, drought); 2) hydrologic (e.g. flooding, including but not limited to storm surge or flash flooding, tsunamis); 3) geological/geomorphological (e.g. volcanic activity, seismic activity, earth mass movements); 4) astrophysical (e.g. meteorite impact, space weather); or 5) biological (e.g. epidemics, pandemics and even endemics, attacks by wild or frightened animals, extinction of certain plant and animal species, pest activity).

Natural disasters caused by biological disturbances/threats, in particular epidemics and pandemics, differ significantly from disasters caused by the other disturbances/threats mentioned above. They are multi-period events, usually of a regional or even global scope, and their consequences persist for a long time, although the frequency of their occurrence is relatively low (Ludvigson et al., 2020). Therefore, they are subject to separate analyses.

There is no doubt that natural disasters are an exogenous shock with potential economic consequences, causing direct and indirect economic losses and generating extra costs and expenses. As a result, at the end of the last century, they gained an economic dimension. They became the subject of research – first in macroeconomics and a little later in the field of public finances. From the macroeconomic point of view, a natural disaster can be defined as a natural event that causes a perturbation to the functioning of the economic system, with a significant negative impact on assets, production factors, output, employment, or consumption' (Hallegatte & Przyluski, 2010). This study focuses on empirical research on the fiscal consequences of natural disasters. Following Osberghaus and Reif (2010) as well as Mochizuki et al. (2018), the term "fiscal implications" of natural disasters was adopted to suggest their "budgetary impact" – i.e. empirically confirmed changes in the figures of income, expenditure, budgetary deficits, and especially in the amount of public debt of countries affected by them in the past. The study is a starting point for a broader discussion on the issue of public budget stability and sustainable public debts in the situation of climate change, which contributes to the increased frequency of extreme weather conditions, which are defined as events belonging to the "edges of the complete range of weather experienced in the past" (UK Met Office, 2024). These include extreme values of certain meteorological variables, such as high temperatures (e.g. heat waves), high wind speeds (e.g. cyclones), or intense precipitation (e.g. torrential rains). However, for this discussion to develop, there must be consolidated expert and social awareness of the scale of challenges to public finances in the coming decades in the context of a drastic increase in the destructive impact of natural disasters. The aim of the study is to build and expand this awareness.

The discussion is divided into three parts. The first section contains a short review of the results of the discussion on the impact of natural disasters on economic growth and on the stability of the financial sector, justified by the fact that the basis for budget projections and long-term financial plans of the state is the current and expected macroeconomic situation, and this – as demonstrated by the most recent global financial crisis – depends on the condition of the financial system. The second part is devoted to a review of existing empirical research on the fiscal consequences of natural disasters, highlighting the evolution of research lines brought about by an influx of evidence confirming the relationship between extreme weather and climate change. The third and final part presents several conclusions and future research suggestions.

DOI: 10.34659/eis.2024.91.4.884

Basic research categories – An overview of the subject literature

So far, specialists in macroeconomics have been at the forefront of research on the consequences of natural disasters for national economies. The first research in this area was conducted by Albala-Bertrand (1993), who studied the macroeconomic consequences of the disasters of the 1960-70 period for 26 countries, using the *before-after* statistical analysis. The author proved that although GDP falls immediately after the disaster, once the reconstruction begins, GDP per capita returns to the long-term growth path. The obtained result was questioned by many scientists who highlighted its sensitivity to the type of disasters taken into account, to the selected sample of countries and to the research method used. Skidmore and Toya (2007) drew attention to the procedure for calculating GDP, which assumes that what is destroyed is most often excluded from GDP calculations, while activities related to reconstruction and modernisation are taken into account.

Nearly a decade after Albal-Bertrand's (1993) research, studies on the macroeconomic effects of disasters were resumed, but this time they have been focused on the medium- and long-term effects (cf. Skidmore & Toya, 2007; Rasmussen, 2004; Noy, 2009; Raddatz, 2007; Cuaresma et al., 2008; Cavallo et al., 2022; Noy & Nualsri, 2007; Loayza et al., 2012; Hsiang & Jina, 2014; von Peter et al., 2012; Klomp & Valckx, 2014; Kukułka, 2015; Batten, 2018; Canova & Pappa, 2021). Analysis of the subject literature shows that there is a consensus that a natural disaster has, on average, a negative, short-term impact on economic growth because the loss of production capacity reduces production immediately after a major disaster. In the medium and long term, disasters may have an impact on economic growth, but the vector of this impact is unclear. There are three competing hypotheses in the subject literature:

1) Schumpeter's "creative destruction" hypothesis assumes that a disaster may be followed by a period of accelerated growth, which will put the economy on a path towards a GDP higher than before the event. This may be due to a) an increase in demand for goods and services as lost capital is getting replaced, (b) international aid to support post-disaster economic growth, and (c) innovation stimulated by environmental disruptions,
2) The "return to trend" hypothesis states that after a slowdown in economic growth following a natural disaster, the income should eventually return to pre-disaster levels during a catch-up period of faster-than-average growth. This rebound should occur because the marginal product of capital will increase as capital and labour become relatively scarce after a disaster (due to destruction and mortality), causing a reallocation of resources to devastated places,
3) The "no recovery" hypothesis posits that natural disasters slow down economic growth by directly destroying productive capital or by destroying consumer goods (e.g., homes) that are replaced by funds that would otherwise go to productive investment. In such a case, there is no rebound because the reallocation of resources does not compensate for the negative effect. Although post-disaster production may continue to increase in the long term, it remains persistently lower than before (Batten, 2018).

In recent years, research has also been undertaken on the impact of natural disasters on the stability of the financial system and the behaviour of banks (cf. Albuquerque & Rajhi, 2019; Chang & Zhang, 2020; Horvath, 2021; Gramlich et al., 2023). Also, with these studies, the results so far have turned out to be ambiguous. On the one hand, they indicate that developed financial markets can serve as an insurance mechanism enabling both the government and the private sector to mitigate the immediate effects of disasters, and, in the medium and long term, they can generate an impulse to reinvest in damaged technical and social infrastructure. On the other hand, natural disasters may threaten the functioning of the financial sector, especially in a situation of initially low levels of financial development, weak institutions and limited economic activity. Following a disaster, financial intermediaries may limit access to financial resources due to increased uncertainty about the economic outlook and concerns about their own financial stability. Governments may increase spending after disasters in the form of repayable public aid (loans), which may push out bank loans, thus destabilising banks.

The ambiguity of the results of current research on the impact of natural disasters on economic growth and on the development of the financial sector, often affected by imperfect statistical data banks, is a kind of incentive to improve on them in order to be able to increase the resilience of national economies and financial sectors in the face of these disasters.

DOI: 10.34659/eis.2024.91.4.884

Research on the impact of natural disasters on public finances is somewhat complementary to research on the impact of the same on economic growth and the development of the financial sector.

Research results

Although authors of textbooks on public finance maintain that public finance has solely three functions: allocation, redistribution and stabilisation, governments feel that helping victims of natural disasters is their moral obligation. Moreover, it is also in the interest of politicians to respond decisively because politicians and governments are held accountable by voters for their response to disasters (Cavallo & Noy, 2010; Koetsier, 2017). In the face of disasters, public authorities must first and foremost provide the resources necessary for crisis response and humanitarian assistance to those affected. Next, funds are needed to mitigate the socio-economic effects of disasters – social transfers and payments of compensation and benefits under catastrophe insurance covered by state guarantees – which leads to the "scissors effect", as production disruptions resulting from disasters result in a decline in tax revenues. At the same time, public authorities must make an investment effort related to the reconstruction of schools, hospitals, transport infrastructure, etc., which takes time and translates into an increase in public debt in the medium and long term. Deryugina (2017) presented estimates of the direct fiscal costs (related to emergency aid at the time of the disaster) and indirect costs (costs of social transfers and investment outlays) of weather phenomena in the USA, which show that the indirect fiscal costs significantly exceed the direct ones and are significant for many years after an extreme weather episode.

The development of empirical experience-based literature on the fiscal implications of natural disasters – their impact on fiscal stability and public debt – is ongoing. The most prominent ones seem to be six extensive studies, the objectives of which are presented in Table 1.

Table 1. Objective of empirical research on the fiscal implications of natural disasters

Authors	Research objective
Heipertz and Nickel (2008)	Assessing the impact of extreme weather events on public revenues.
Lis and Nickel (2010)	Assessing the impact of extreme weather episodes on changes in nominal budget balance of the national and local governments as a percentage of GDP.
Melecky and Raddatz (2011)	Estimating the impact of natural disasters on fiscal sustainability (budget revenues and expenditures) and on the governments' ability to borrow.
Koetsier (2017)	Assessment of the average and median impact of natural disasters on the short, medium and long-term debt of the national and local governments of the countries affected.
Klomp (2017)	Discovering whether large-scale natural disasters increase the likelihood of government debt default.
Gagliard et al.(2022)	Capturing the serious physical risks associated with one-off extreme weather events in the medium term, in the form of factors decreasing debt sustainability at the country level.

Heipertz and Nickel's (2008) research covered the fiscal consequences of six extreme weather incidents that occurred in the US and the EU in 1990, 1992, 1999, 2002, 2003 and 2005, respectively. At the initial stage of research, they estimated the economic damage caused by disasters, assuming two sources of such damage. The first one was the production lost immediately after the disaster expressed as a percentage of GDP. The other source of damage information used by the authors were the estimates provided to them by the reinsurance company Munich Re, based on verified catastrophic losses of the insured. In step two, they used measures of the fiscal elasticity of budget indicators to changes in the macroeconomic situation as measured by GDP. Research has shown that extreme weather incidents caused a relatively small decline in the budget revenues of the countries affected, ranging from 0.3% to 1.1% in relation to GDP.

DOI: 10.34659/eis.2024.91.4.884

Lis and Nickel (2010) assessed the impact of extreme weather incidents on the change in the nominal budget balance of the national and local governments as a percentage of GDP. Their research used the panel analysis method using an extended fixed effects model. When identifying extreme phenomena, they used three criteria: 1) the number of people affected was not less than 100.000; 2) the estimated costs of damage caused were not less than USD 1 billion in constant prices and exceeded 2% of GDP; and 3) the number of people killed was not less than 1,000. The authors' research covered 138 countries, regardless of their level of economic development, which were affected by extreme weather incidents in the years 1985-2007. The number of observations was 1,631. The study found an impact of extreme weather events on the general government budget balance of between 0.23% and 1.1% of GDP, depending on the group of countries analysed. The negative effects were relatively higher in developing countries located near the equator and in the so-called "young democracies" with underdeveloped public institutions. The impact of extreme weather phenomena on the budgetary situation of developed countries (OECD and EU) was relatively low, but this was related, among others, to the fact that extreme weather incidents occur there less frequently due to their geographical location, which does not necessarily mean that the situation will be the same in the future.

Melecky and Raddatz (2011) estimated the impact of disasters (geological, meteorological and other (epidemics, insect plagues, etc.) on the budgetary stability of countries with medium (73 countries) and high (28 countries) GDP per capita. Major disasters were considered to be those that affected at least 0.5% of the country's population, caused damage to at least 0.5% of the national GDP or caused more than one fatality for every 10,000 inhabitants. The research period covered the years 1975-2008. The researchers used a panel vector autoregressive (PVAR) model that includes actual output, government spending, government revenue, and standard macroeconomic variables (inflation rates and interest rates). They analysed the data, comparing average macroeconomic performance in the years in which disasters occurred and those in which they did not occur. The study has demonstrated that in the affected countries, budget deficits increased by an average of 25% immediately after the disaster. Countries with developed financial markets increased their budget expenditure relatively more, so their budget deficits grew more in comparison with countries of an average level of development. At the same time, for countries with high penetration of the business insurance market, dealing with the effects of natural disasters did not cause major fiscal burdens.

The aim of the research conducted on a sample of 163 countries by Koetsier (2017) was to examine the average and median effect of the 100 largest natural disasters that occurred in 1971-2014 for national and local levels of debt. Various criteria were used to identify such disasters: the total number of people affected, the number of deaths, the amount of damage, and the severity of disasters as measured, for instance, by the Richter scale or wind speed. In the research, the author used a synthetic panel control method, which constructs an alternative scenario for the country affected by a natural disaster. The synthetic control group consists of unaffected countries that, in the pre-disaster period, closely resembled – macroeconomically, institutionally, geographically, and in other characteristics – the affected country. The effects of these disasters were observed up to 10 years after their occurrence. The researcher proved that in the research sample, the public debt increased by an average of 11.3% of GDP compared to the synthetic control group. The median impact on debt was 6.8% of GDP. Public debt levels peaked two to four years after the disaster. The author positively verified the hypothesis that the type of disaster affects the debt of the country in which it occurred: in the case of the deadliest disasters, an increase in debt by up to 24.4% of GDP was observed, and in the case of largest disasters in terms of area affected, the debt increased by 21.4%. Research has also demonstrated that disasters have different impacts on the fiscal situation of countries, depending on their characteristics. For example, this impact is relatively large in small island countries (following the disasters, their debt increased on average by 13.6% of GDP). Evidence has been found that high-income countries are more likely to increase their public debt immediately after a disaster. However, no clear pattern was found in the debt increase in the medium and long term perspective among the developed and developing countries.

Klomp (2017) set out to estimate, using a discrete choice model, the increase in the probability of public debt default due to a natural disaster. The research sample included 115 countries that suffered disasters in the years 1985-2010. The researcher's main findings suggest that one additional

DOI: 10.34659/eis.2024.91.4.884

large-scale natural disaster increases the likelihood of a public debt default by about three percentage points.

The aim of the study by Gagliardi et al. (2022) was to provide a medium-term projection of the severe physical damage associated with one-off weather incidents stressing debt sustainability at the national level. The projection covered 13 EU countries, including Poland, which were affected by extreme weather incidents related to climate change in the years 1980-2020. Stress tests showed significant fiscal impacts in the research sample, both in the 1.5°C and 2°C scenarios. Among the most vulnerable countries, including Spain, where the debt-to-GDP ratio will be higher, depending on the scenario, by 4.5 p.p. or 5.2 p.p. of the GDP, respectively. Also, due to its high level of existing debt. Similar results were obtained for the Czech Republic (4.0 pp and 4.7 pp of the GDP) and Hungary (3.1 and 3.7, respectively). The next positions are taken by Poland, Romania and Greece. Germany, Belgium and the Netherlands presented the lowest debt-to-GDP gap by the end of the projection under any global warming scenario.

Conclusions and future research

The selected results of empirical research presented above, obtained using various research methods, clearly indicate that natural disasters pose a physical risk to the stability of public budgets and sustainable public debts in the short and medium term. However, extrapolation based on historical data does not allow for the estimation of future physical risk with a high degree of probability. This is due to the situation of ongoing climate change under the influence of global warming, resulting in an increase in the frequency and severity of extreme weather incidents (Bindoff et al., 2013; Zhang et al., 2013; Stott, 2016). As emphasised by Carney (2015), 'Climate change is the Tragedy of the Horizon. We don't need an army of actuaries to tell us that the catastrophic impacts of climate change will be felt beyond the traditional horizons of most actors – imposing a cost on future generations that the current generation has no direct incentive to fix'. It is therefore necessary to conduct continuous research both on the course of climate change and on the fiscal effects of natural disasters, especially those caused by meteorological and hydrological factors. The latter line of research is particularly neglected in the Polish literature on public finance. It would be appropriate to support Owsiak's (2021) call for expanding the set of functions of public finances to include a rescue function. The function would, on the one hand, give due prominence to the need for emergency activity of the state using public finances in the face of deep crises caused by natural disasters and, on the other hand, would enforce the creation of a concept for a system for managing fiscal resilience in the event of such disasters.

Generally speaking, fiscal resilience is defined as the ability of the state and local governments to anticipate, absorb and respond to shocks that affect their finances over time.

It seems that such a concept should be based on three main pillars:

- a methodology for estimating contingent liabilities, especially the hidden liabilities that have not been clearly regulated but determine the responsibility of public authorities for assuming additional liabilities when a disaster occurs. Such commitments are usually accepted under the influence of political or social pressure,
- a strategy to ensure immediate financial liquidity of the state when a disaster occurs, without jeopardising the balance of public finances in conditions of their multi-level management,
- a strategy for reducing the fiscal sensitivity of the state/local governments to natural disasters, for example, by insuring public assets or the so-called resilience financing (i.e. incurring financial outlays on infrastructure facilities that limit losses and damage resulting from a disaster).

References

Albala-Bertrand, J. M. (1993). *Political economy of large natural disasters: with special reference to developing countries.* Oxford: Oxford University Press. https://doi.org/10.1093/oso/9780198287650.001.0001

Albuquerque, P. H., & Rajhi, W. (2019). Banking stability, natural disasters, and state fragility: Panel VAR evidence from developing countries. Research in International Business and Finance, 50, 430-443. https://doi.org/10.1016/j.ribaf.2019.06.001

DOI: 10.34659/eis.2024.91.4.884

Batten, S. (2018). *Climate change and the macro-economy: A critical review.* Bank of England. https://www.bankofengland.co.uk/working-paper/2018/climate-change-and-the-macro-economy-a-critical-review

Bindoff, N. L., Stott, P. A., Achuta Rao, K. M., Allen, M. R., Gillett, N., Gutzler, D., Hansingo, K., Hegerl, G., Hu, Y., Jain, S., Mokhov, I. I., Overland, J., Perlwitz, J., Sebbari, R., & Zhang, X. (2013). Detection and attribution of climate change: from global to regional. In T.F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex & P.M. Midgley (Eds.), *Climate change 2013: The physical science basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 867-952). Cambridge: Cambridge University Press.

Canova, F., & Pappa, E. (2021). *Costly disasters and the role of fiscal policy: Evidence from US states.* https://doi.org/10.2765/437788

Carney, M. (2015). *Breaking the tragedy of the horizon–climate change and financial stability.* Bank of England. https://www.bankofengland.co.uk/speech/2015/breaking-the-tragedy-of-the-horizon-climate-change-and-financial-stability

Cavallo, E., Becerra, O., & Acevedo, L. (2022). The impact of natural disasters on economic growth. In M. Skidmore (Ed.), *Handbook on the economics of disasters* (pp. 150-192). Edward Elgar Publishing.

Cavallo, E., & Noy, I. (2010). The aftermath of natural disasters: beyond destruction. CESifoForum, 11, 2, pp. 25-35. https://www.econstor.eu/bitstream/10419/166389/1/cesifo-forum-v11-y2010-i2-p025-035.pdf.

Chang, C. P., & Zhang, L. W. (2020). Do natural disasters increase financial risks? An empirical analysis. Bulletin of Monetary Economics and Banking, 23, 61-81. https://doi.org/10.21098/bemp.v23i0.1258

Cuaresma, J. C., Hlouskova, J., & Obersteiner, M. (2008). Natural disasters as creative destruction? Evidence from developingcountries.EconomicInquiry,46(2),214-222.https://doi.org/10.1111/j.1465-7295.2007.00063.x

Deryugina, T. (2017). The fiscal cost of hurricanes: Disaster aid versus social insurance. American Economic Journal: Economic Policy, 9(3), 168-198. https://www.jstor.org/stable/26598165

Gagliardi, N., Arévalo, P., & Pamies-Sumner, S. (2022). *The fiscal impact of extreme weather and climate events: Evidence for EU countries*. https://doi.org/10.2765/867213

Gramlich, D., Walker, T., Zhao, Y., & Bitar, M. (2023). After the storm: Natural disasters and bank solvency. International Journal of Central Banking, 19(2), 199-249. https://www.ijcb.org/journal/ijcb23q2a4.pdf

Hallegatte, S., & Przyluski, V. (2010). *The economics of natural disasters: Concepts and methods.* http://dx.doi.org/10.1596/1813-9450-5507

Heipertz, M., & Nickel, C. (2008). Climate change brings stormy days: case studies on the impact of extreme weather events on public finances. SSRN, 613-630. http://dx.doi.org/10.2139/ssrn.1997256

Hochrainer, S. (2006). *Macroeconomic risk management against natural disasters. Analysis focussed on governments in developing countries.* Wiesbaden: GWV Fachverlage GmbH.

Horvath, R. (2021). Natural catastrophes and financial depth: An empirical analysis. Journal of Financial Stability, 53, 100829. https://doi.org/10.1016/j.jfs.2021.100842

Hsiang, S. M., & Iina, A. S. (2014). *The causal effect of environmental catastrophe on long-run economic growth: evidence from 6,700 cyclones*. http://doi.org/10.3386/w20352

Klomp, J. (2017). Flooded with debt. Journal of International Money and Finance, 73, 93-103. https://doi.org/10.1016/j.jimonfin.2017.01.006

Klomp, J., & Valckx, K. (2014). Natural disasters and economic growth: A meta-analysis. Global Environmental Change, 26, 183-195. https://doi.org/10.1016/j.gloenvcha.2014.02.006

Koetsier, I. (2017). *The fiscal impact of natural disasters.* https://www.uu.nl/sites/default/files/rebo_use_dp_2017_1717.pdf

Kukułka, A. (2015). Wzrost gospodarczy a katastrofy naturalne w Ameryce Łacińskiej i Azji Południowo-Wschodniej. Wiadomości Statystyczne, 60(2), 42-53. https://doi.org/10.59139/ws.2015.02.3 (in Polish).

Lis, E. M., & Nickel, C. (2010). The impact of extreme weather events on budget balances. International Tax and Public Finance, 17(4), 378-390. https://doi.org/10.1007/s10797-010-9144-x

Loayza, N. V., Olaberria, E., Rigolini, J., & Christiaensen, L. (2012). Natural disasters and growth: Going beyond the averages. World Development, 40(7), 1317-1336. https://doi.org/10.1016/j.worlddev.2012.03.002

Ludvigson, S. C., Sai, M., & Ng, S. (2020). COVID-19 and the macroeconomic effects of costly disasters. NBER Working Paper, 26987. https://doi.org/10.3386/w26987

Melecky, M., & Raddatz, C. E. (2011). How do governments respond after catastrophes? Natural-disaster shocks and the fiscal stance. Policy Research Working Paper, 5564. https://hdl.handle.net/10986/3331

Mochizuki, J., Schinko, T., & Hochrainer-Stigler, S. (2018). Mainstreaming of climate extreme risk into fiscal and budgetary planning: Application of stochastic debt and disaster fund analysis in Austria. Regional Environmental Change, 18(7), 2161-2172. https://doi.org/10.1007/s10113-018-1300-3

Noy, I. (2009). The macroeconomic consequences of disasters. Journal of Development Economics, 88(2), 221-231. https://doi.org/10.1016/j.jdeveco.2008.02.005

Noy, I., & Nulasri, A. (2007). *What do exogenous shocks tell us about growth theories?* https://hdl.handle.net/10419/64100

Osberghaus, D., & Reif, C. (2010). *Total costs and budgetary effects of adaptation to climate change: An assessment for the European Union.* http://www.cesifo-group.de/DocDL/cesifo1_wp3143.pdf

Owsiak, S. (2021). O racjonalne wykorzystanie funkcji finansów publicznych w warunkach kryzysu. In M. Zioło (Ed.), *Finanse publiczne* (pp. 15-29). Warszawa: Polska Akademia Nauk. (in Polish).

Raddatz, C. (2007). Are external shocks responsible for the instability of output in low-income countries? Journal of Development Economics, 84(1), 155-181. https://doi.org/10.1016/j.jdeveco.2006.11.001

Rasmussen, T. Macroeconomic implications of natural disasters in the Caribbean. IMF Working Paper, 224, 1-24. https://ssrn.com/abstract=879049.

Skidmore, M., & Toya, H. (2007). Economic development and the impacts of natural disasters. Economics Letters, 94(1), 20-25. https://doi.org/10.1016/j.econlet.2006.06.020

Stott, P. (2016). How climate change affects extreme weather events. Science, 352(6293), 1517-1518. https://doi.org/10.1126/science.aaf7271

UK Met Office. (2024). https://www.metoffice.gov.uk

United Nations Office for Disaster Risk Reduction. (2009). *Terminology of disaster risk reduction.* http://www.unisdr.org/files/7817_UNISDRTerminologyEnglish.pdf

von Peter, G., von Dahlen, S., & Saxena, S. (2012). *Unmitigated disasters? New evidence on the macroeconomic cost of natural catastrophes.* https://www.bis.org/publ/work394.pdf

Zhang, X., Wan, H., Zwiers, F. W., Hegerl, G. C., & Min, G. C. (2013). Attributing intensification of precipitation extremes to human influence. Geophysical Research Letters, 40(19), 5252-5257. https://doi.org/10.1002/grl.51010

Grażyna BORYS

PRZEGLĄD BADAŃ EMPIRYCZNYCH NAD FISKALNYMI KONSEKWENCJAMI KATASTROF NATURALNYCH

STRESZCZENIE: Podczas gdy koszty związane ze starzeniem się społeczeństwa są postrzegane jako główne czynniki wywierające presję fiskalną w krajach rozwiniętych, w tym w UE, obawom związanym z wydatkami publicznymi związanymi z klimatem i katastrofami naturalnymi poświęca się stosunkowo mało uwagi w zapewnieniu długoterminowej stabilności fiskalnej w tych krajach. Niniejszy artykuł ma na celu przyczynienie się do lepszego zrozumienia budżetowego wymiaru katastrof naturalnych poprzez empiryczną ocenę ich wpływu na równowagę budżetów publicznych i zrównoważone długi publiczne. Nie wzięto pod uwagę tzw. efektów drugiej rundy, wynikających z rosnących wysiłków rządów w zakresie redukcji emisji gazów cieplarnianych i adaptacji, które najprawdopodobniej jeszcze bardziej zwiększą koszty fiskalne.

SŁOWA KLUCZOWE: katastrofy naturalne; konsekwencje fiskalne; badania empiryczne

DOI: 10.34659/eis.2024.91.4.884