3. Resilience of Poland's economy to external shocks: A comparative study of tourist arrivals in relation to Lithuania, Spain, and Portugal

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Abstract

Purpose: The chapter explores the resilience of Poland's economy to external shocks, focusing on the tourism sector. It aims to compare the impact of various crises, such as the financial crisis, sovereign debt crisis, COVID-19 pandemic, and the war in Ukraine, on tourist arrivals in Poland, Lithuania, Spain, and Portugal.

Design/methodology/approach: Employing a Vector Autoregression (VAR) model and Impulse Response Functions (IRFs), the study analyses the effects of these crises on Gross Domestic Product (GDP) and foreign tourist arrivals (ARR). Data from the Eurostat Dissemination Database, spanning from Q1 2006 to Q4 2022, is used, with adjustments for seasonality and crisis-specific dummy variables.

Findings: The research reveals notable differences in how these economies, with varying tourism dependencies, respond to external shocks. Tourism-dependent countries like Spain and Portugal exhibited greater sensitivity in their GDP and ARR to these shocks compared to less reliant countries like Poland and Lithuania.

Research limitations/implications: The study's scope is limited to four European countries and specific crises, suggesting the potential for broader future research.

Practical implications: The findings offer valuable insights for policymakers and tourism industry stakeholders, aiding in the development of strategies for crisis mitigation.

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Social implications: The chapter underscores the importance of resilient economic structures and policies in mitigating the broader social and economic impacts of crises.

Originality and value: This chapter provides unique insights into economic resilience in the tourism sector during crises. Its comparative analysis across different European countries offers valuable perspectives for economists, policymakers, and researchers in understanding the dynamics of economic resilience and crisis management in tourism-dependent economies.

Keywords: external shocks' economy resilience, COVID, war in Ukraine, VAR.

Introduction

The concept of economic resilience, particularly in the face of external shocks, has gained significant attention in recent years as the number, the frequency and the importance of exogenous shocks and following crises increased (Keller, 2021). The COVID-19 crisis has had a profound impact on global tourism, an industry reliant on the movement and gathering of people. The pandemic, first identified in late 2019, spread rapidly worldwide, prompting countries to implement drastic measures such as border closures, quarantines, and lockdowns to contain the virus. These measures, although necessary for public health, brought tourism to a near standstill. Before the SARS-CoV-2-19 pandemic the international tourism growth was considered somehow robust (resilient) from the occasional exogenous shocks. However, the pandemic questions this in situation when tourists cannot travel if governments close the tourism system.

This paper aims to examine the resilience of the economies of Poland, Lithuania, Spain, and Portugal to various crises, including the financial crisis, the sovereign debt crisis, the COVID-19 pandemic, and the war in Ukraine, based on vulnerability of tourism arrivals to external shocks. Using Vector Autoregression (VAR) models and Impulse Response Functions (IRFs), the paper analyses the impact of these shocks on Gross Domestic Product (GDP) and foreign tourist arrivals (ARR), two key indicators of economic health and openness. The paper builds on the work of Briguglio et al. (2009), Blake et al. (2003), and Martin et al. (2018), among others, to provide a nuanced understanding of economic resilience and its determinants.

Subsequent sections of this paper are structured as follows: an exploration of the theoretical underpinnings of economic resilience, a detailed exposition of the empirical methodology employed, a presentation of the findings from the VAR analysis, and a discussion section that contextualizes the results within the broader framework of economic resilience. The final section of the paper encapsulates the conclusions drawn from the study, highlighting their implications for policy and future research trajectories.

3.1. Literature review

3.1.1. Tourism's vulnerability, economic resilience and its determinants

Economic resilience, defined as an economy's ability to withstand or recover from shocks, has been a focal point in economic literature. Briguglio et al. (2009) provide a comprehensive framework for understanding economic resilience, arguing that it is not merely a function of economic structure but also of policies and institutions that enable adaptation and recovery. They further posit that the resilience of small economies, in particular, is influenced by their openness, concentration, and the extent of their shock-absorbing potential.

The role of tourism in economic resilience has been explored extensively. Tourism is often seen as a double-edged sword; while it can contribute significantly to economic growth, it can also make economies vulnerable to external shocks (Blake et al., 2003). This vulnerability stems from the fact that tourism demand is highly sensitive to changes in economic conditions, natural disasters, and geopolitical events. However, the sector's ability to adapt to changing circumstances and the diversification of tourism markets can contribute to economic resilience (Alegre & Sard, 2015).

In the context of financial crises, research has shown that tourism-dependent economies tend to recover faster than non-tourism-dependent economies. This resilience is attributed to the adaptive capacity of the tourism sector and the diversification of tourism markets (Alegre & Sard, 2015). However, the authors caution that the long-term sustainability of this resilience may be compromised if the underlying structural vulnerabilities are not addressed.

The impact of pandemics on economies, particularly through the lens of tourism, has gained attention in recent years. Gössling et al. (2020) discuss the profound impacts of the COVID-19 pandemic on global tourism, highlighting the need for resilience and adaptation in the face of such unprecedented shocks. They argue that the pandemic has exposed the vulnerability of the tourism sector and underscored the need for more sustainable and resilient tourism practices.

Several factors can contribute to an economy's resilience. These include the diversity and complexity of the economy, the flexibility of its institutions and markets, the strength of its social networks and communities, and the effectiveness of its policy responses. Economies that are more diverse and complex tend to be more resilient because they are less dependent on any single sector or industry. If one sector is hit by a shock, other sectors can continue to function and support the overall economy. Flexible institutions and markets can help an economy to adapt to shocks. For example, flexible labor markets can help to mitigate unemployment during economic downturns by facilitating the movement of workers from declining sectors to growing ones. Strong social networks and communities can provide a form of social insurance that helps to buffer individuals and households against economic shocks. For example, during times of economic hardship, families and communities often provide support to their members in the form of shared resources, mutual aid, and emotional support. Effective policy responses can play a crucial role in enhancing economic resilience. Martin et al. (2018) argue that this includes both proactive policies that aim to reduce the risk and impact of shocks, and reactive policies that aim to facilitate recovery after shocks have occurred. They further suggest that resilience-building policies should be context-specific, taking into account the unique characteristics and vulnerabilities of each economy.

During the COVID-19 pandemic period, various government responses were undertaken in different countries to support tourism system as the most severely affected sector. The government interventions took different forms that can be divided in three groups: fiscal, monetary and jobs and skills (Vanhove, 2022). The response of governments to the economic consequences of SARS-CoV-2 was, e.g., the subject of the AIEST report (Airey et al., 2020), that includes both cross-cutting and tourism-specific measures.

Resilience can be viewed from two main perspectives: static and dynamic. Static resilience refers to the ability of an economy to withstand a shock without changing its structure or behavior, while dynamic resilience refers to the ability of an economy to adapt and evolve in response to shocks, potentially leading to a new equilibrium state that may be more efficient or desirable than the original state.

Static resilience, which refers to the ability of an economy to withstand a shock without changing its structure or behavior, can be associated with the VAR model. The VAR model, by capturing the interdependencies among multiple time series, can help in understanding how a shock to one variable (e.g., an external shock to the economy) affects other variables in the system (like GDP or unemployment rate) at the same point in time. This can provide insights into the immediate or static response of an economy to shocks.

On the other hand, dynamic resilience, which refers to the ability of an economy to adapt and evolve in response to shocks, can be associated with IRFs. IRFs, derived from the VAR model, trace out the response of variables in the system to shocks over time. This can provide insights into the dynamic response of an economy to shocks, including how quickly and effectively it recovers from them.

Therefore, the VAR model and IRFs can be valuable tools for analysing both static and dynamic resilience of economies. They allow for a nuanced understanding of how economies respond to shocks both immediately and over time, which is crucial for designing effective policies to enhance economic resilience.

3.1.2. Crises in 2006—2022

3.1.2.1. Financial crisis

The financial crisis of 2007–2008 had a significant impact on European economies, with the effects of the crisis unfolding over several quarters. While the crisis originated in the United States due to the subprime mortgage market's collapse, its consequences quickly spread to Europe and other parts of the world.

It is challenging to pinpoint the exact quarters when the financial shock occurred in Europe, as the effects of the crisis varied across countries and financial institutions. However, some key events and periods can help provide a general timeline for the financial shock's duration in Europe:

- The beginning of the crisis in Europe is often associated with the troubles faced by German banks in mid-2007, particularly IKB Deutsche Industriebank, which experienced severe losses due to its exposure to U.S. subprime mortgage-backed securities. This marks the start of the crisis in Europe around Q3 2007.
- The crisis intensified in 2008, with multiple European banks facing liquidity issues, solvency concerns, and government interventions. Notable events include the nationalization of Northern Rock in the UK (Q1 2008), the collapse of Lehman Brothers (Q3 2008), and several European governments announcing bank rescue packages (Q4 2008).
- Throughout 2009, the crisis continued to affect European economies, with many countries experiencing deep recessions, rising unemployment, and worsening fiscal positions. This period marked the transition from a financial crisis to a broader economic crisis and eventually led to the European sovereign debt crisis.

While the financial shock's most acute effects occurred between Q3 2007 and Q4 2008, the crisis's aftermath continued to impact European economies in the following years. The European sovereign debt crisis, which began in late 2009 and continued into the early 2010s, was a direct consequence of the 2007–2008 financial crisis and its effects on European governments' fiscal positions.

3.1.2.2. Sovereign debt crisis

The Sovereign Debt Crisis, also often referred to as the European Debt Crisis, was a financial calamity that struck several European nations in the aftermath of the 2008 global financial crisis, and it spanned roughly from 2009 to 2012.

The crisis had its roots in the significant fiscal imbalances that had built up in the years leading up to 2008. Many European nations had accumulated substantial government debt, fueled by low-interest rates and robust economic growth in the early 2000s, coupled with the perceived guarantee of Eurozone membership.

However, when the global financial crisis hit in late 2008, it exposed these fiscal imbalances, leading to a sharp rise in borrowing costs for affected countries. By late 2009, Greece had revealed that it had been understating its deficit figures, and by early 2010, the country was shut out from borrowing in the financial markets, marking the beginning of the sovereign debt crisis.

In May 2010, the European Financial Stability Facility (EFSF) was established to tackle the growing crisis, and it granted loans to Ireland, Portugal, and Greece over the next two years. Despite this, borrowing costs for these and other countries remained high, and economic conditions worsened. Many countries were forced to implement strict austerity measures, which led to widespread social and political unrest.

By 2012, the European Central Bank (ECB) announced its Outright Monetary Transactions (OMT) program, which helped to assuage markets by providing a backstop for Eurozone countries. This announcement was a significant turning point, and it brought some relief to the crisis-stricken nations.

3.1.2.3. COVID-19 crisis

The outbreak of the SARS-CoV-2 pandemic started in China on the end of 2019 and its rapid spread across the globalized world in early 2020, showing a strong global economic impact. The United Nations World Tourism Organization (UNWTO) reported a drop of 74% in international tourist arrivals in 2020 compared to 2019, the worst year in tourism history. Destinations reliant on international tourism, particularly those in developing countries, were hit hardest. The aviation, hospitality, and event sectors also suffered substantial losses. Travel restrictions, health concerns, and economic uncertainty discouraged travel, even when restrictions were temporarily eased. Tourism businesses, many of them small and medium-sized enterprises, faced severe financial strain, and millions of jobs within the sector were at risk.

The crisis has also accelerated the shift towards more sustainable and resilient tourism. There has been a renewed focus on local tourism, outdoor activities, and digitalization. The crisis has underscored the need for greater cooperation and coordination within the industry, more flexible business models, and stronger policies to support the sector (Laesser et al., 2021).

Despite the rollout of vaccines, recovery remains uncertain due to factors such as uneven vaccine distribution, emergence of new virus variants, and changing travel restrictions. The COVID-19 crisis has reshaped tourism, with long-lasting impacts that are still unfolding (Butler, 2021).

3.1.2.4. War in Ukraine crisis

The conflict in Ukraine has had significant impacts on tourism in Poland. Geographically located near the conflict zone, Poland has seen a decrease in tourist arrivals due to concerns over personal safety. For example, in 2023, the number of tourists visiting Poland decreased by 25% in the early part of the year. This decrease was mainly due to the conflict in Ukraine, which raised safety concerns among potential visitors. Moreover, it was observed that the decrease in tourism was sharper in regions of Poland closer to Ukraine, suggesting a direct impact of the conflict on tourist behavior.

Despite the unfortunate circumstances, there has been a gradual recovery in the tourism sector. By the second quarter of 2023, Poland saw an uptick in the number of visitors. The conflict in Ukraine and its impact on tourism in Poland exemplify how geopolitical events can significantly influence tourism trends.

3.2. Data sources and data description

The empirical analysis in this study relies on a rich dataset retrieved from the Eurostat Dissemination Database, an official data portal of the European Union. This dataset offers a comprehensive range of social and economic statistical data that covers all EU member states. For the purpose of this study, we focus on two pairs of countries: an Eastern European pair consisting of Poland and Lithuania (located on the border with countries of armed conflict, with low importance of tourism in GDP), and a westernmost European pair consisting of Spain and Portugal (located far from countries of armed conflict, with high importance of tourism in GDP).

The time series data utilised in this research spans from the first quarter of 2006 to the fourth quarter of 2022, providing a detailed longitudinal view of key economic and social indicators in these countries. The variables that we have incorporated into our analysis include:

- Arrivals at Tourist Accommodation Establishments: This variable reflects the tourism activity in each country, which is an important contributor to their respective economies.
- Gross Domestic Product (GDP): GDP (mln EUR) is used as a comprehensive measure of overall economic activity within the countries.

- Final Consumption Aggregates: This measure provides insight into the total spending of households, non-profit institutions serving households, and general government final consumption expenditure.
- Harmonized Unemployment Rates: This variable provides a measure of the unemployment situation in the countries under study.
- Crises Dummy: A dummy variable is incorporated to account for any major economic or financial crises during the observed period.

In order to ensure that the data analysis is not affected by seasonal fluctuations, the data were seasonally adjusted using seasonal differences. This adjustment enables us to focus on the underlying trends and cycles in the data, providing a clearer picture of the key dynamics at play. The seasonal differences method is particularly useful for dealing with highly seasonal data. A seasonal difference is defined as a difference between a value and a value with lag that is a multiple of the seasonal period. This method of seasonal differencing removes the seasonal trend and can also get rid of a type of nonstationarity associated with a seasonal random walk.

The upper panel of Figure 3.1 shows the level of seasonality of our data, in case of tourist arrivals to Poland over the period 2006–2020. The lower panel of Figure 3.1 shows the data on tourist arrivals to Poland in 2006–2020 after adjusting for seasonality using the seasonal differences method.

Based on the data collected, the response of GDP to shocks in ARR for the four countries included in our study: Poland, Lithuania, Spain, and Portugal during various crises varies, as shown in the table below. The crises considered include the financial crisis, the sovereign debt crisis, the COVID-19 pandemic, and the war in Ukraine. The response is measured in terms of standard deviations, with the shock to foreign tourist arrivals (ARR) and the corresponding response of GDP presented for each country during each crisis.

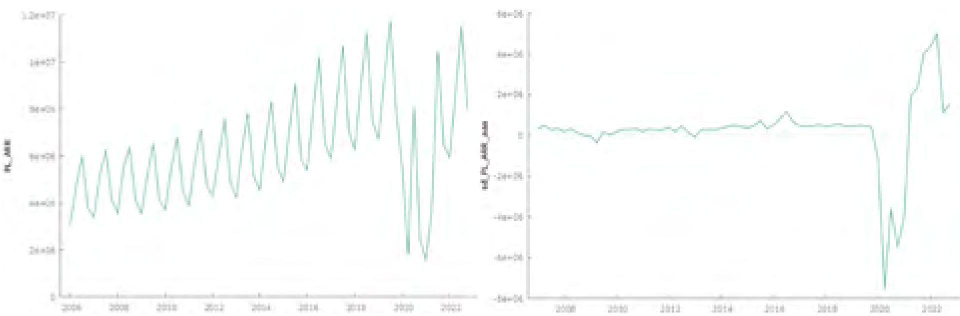

Figure 3.1. Seasonally unadjusted and adjusted data on tourist arrival to Poland in 2006–2020

Source: own work.

Table 3.1. Impact of various crises on Foreign Tourist Arrivals (ARR) and Gross Domestic Product (GDP) in Poland, Lithuania, Spain, and Portugal

Country	Crisis	Shock to ARR (in standard deviations)	Response of GDP (in standard deviations)
Poland	financial crisis	0.924	0.310
	sovereign debt crisis	1.049	0.366
	COVID-19	1.011	0.459
	war in Ukraine	0.225	0.457
Lithuania	financial crisis	0.800	0.289
	sovereign debt crisis	0.722	0.123
	COVID-19	0.992	0.515
	war in Ukraine	0.234	0.189
Spain	financial crisis	1.477	0.733
	sovereign debt crisis	1.436	0.867
	COVID-19	0.956	1.619
	war in Ukraine	0.453	0.778
Portugal	financial crisis	1.210	0.626
	sovereign debt crisis	1.288	0.545
	COVID-19	2.446	0.963
	war in Ukraine	0.506	0.146

Source: own work.

The magnitude of the foreign tourist arrivals (ARR) shock represents the severity of the impact on foreign tourist arrivals during the crisis, while the GDP response gives an indication of the overall economic reaction to this shock. Hence, the table allows for a comparative analysis of the resilience of the four economies during these crises, offering insights into the impact of external shocks on both the tourism industry (via ARR) and the broader economy (via GDP). The data reveals considerable variation across different crises and countries, illustrating the complex interplay between external shocks and national economic responses.

3.3. Method and model specification

This section outlines the methodological approach adopted in this study to analyse the impact of external shocks, such as the 2007–2008 financial crisis, sovereign debt crisis, the COVID-19 pandemic, and the war in Ukraine, on the tourism sector performance and GDP changes in Poland, Lithuania, Spain, and Portugal. The choice of external shocks is motivated by their potential to significantly influence tourism sector performance and GDP in the selected countries.

We employ the Vector Autoregression (VAR) method to compute the Impulse Response Functions (IRFs) for explaining the effects of these shocks on the endogenous variables: GDP, foreign arrivals, unemployment, and consumption. Seasonal differences are incorporated to reduce strong seasonality in the data. Crises are introduced as external variable dummies.

The VAR model is a multivariate time series econometric model that captures the linear interdependencies among multiple time series variables (Lütkepohl, 2005). It has been widely used in macroeconomics to analyse the dynamic interactions between economic variables, policy analysis, and forecasting (Sims, 1980; Stock & Watson, 2001). The VAR model is appropriate for this study due to its ability to capture the complex relationships among GDP, tourism sector performance, and external shocks (Enders, 2015).

The VAR model can be represented by the following equation:

$$\Delta Y_t = A_1\, \Delta Y_{\{t\text{-}1\}} + A_2\, \Delta Y_{\{t\text{-}2\}} + \ldots + A_p\, \Delta Y_{\{t\text{-}p\}} + B_1\, X_{\{1t\}} + B_2\, X_{\{2t\}} + B_3\, X_{\{3t\}} + \varepsilon_t$$

where ΔY_t is a vector of endogenous variables (seasonally differenced real GDP, and foreign arrivals), A_i ($i = 1, 2, \ldots, p$) are matrices of coefficients to be estimated, $X_{\{1t\}}$, $X_{\{2t\}}$, and $X_{\{3t\}}$ are the dummy variables representing the 2007–2008 financial crisis, COVID-19 pandemic, and war in Ukraine, respectively, B_i ($i = 1, 2, 3$) are coefficient vectors associated with the external shocks, and ε_t is a vector of error terms.

The VAR model is estimated using the ordinary least squares (OLS) method. The optimal lag length for the VAR model is determined using information criteria such as Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) (Lütkepohl, 2005). Diagnostic tests, including serial correlation tests (Breusch-Godfrey test), heteroskedasticity tests (White test), and tests for normality of residuals (Jarque-Bera test), are conducted to ensure the model's validity and robustness (Enders, 2015).

After estimating the VAR model, we compute the Impulse Response Functions (IRFs) to analyse the dynamic responses of the endogenous variables (seasonally differenced real GDP, foreign arrivals, and number of nights spent) to one standard deviation shocks in the external dummy variables representing the 2007–2008 financial crisis, sovereign debt crisis, COVID-19 pandemic, and war in Ukraine. The IRFs provide insights into the magnitude, direction, and persistence of the impact of these shocks on the tourism sector performance and GDP changes in Poland, Lithuania, Spain, and Portugal.

To ensure the robustness of our findings, we perform several robustness checks. First, we experiment with alternative lag lengths for the VAR model. Second, we test the sensitivity of our results to different specifications of the external shock dummy variables. Lastly, we assess the stability of the VAR model by examining the roots of the characteristic polynomial, ensuring that they lie inside the unit circle (Lütkepohl, 2005).

The robustness of our findings was thoroughly scrutinised to ensure the validity and reliability of our results. We experimented with alternative lag lengths for the Vector Autoregressive (VAR) model, which allowed us to assess the sensitivity of the model to changes in the time frame considered for previous values. This procedure ensures that the chosen lag length provides the most accurate representation of the relationships within the data. Furthermore, we tested the sensitivity of our results to different specifications of the external shock dummy variables. This was crucial in understanding how changes in the measurement or coding of these variables could potentially alter the results of the analysis.

In addition to these checks, we assessed the stability of the VAR model by examining the roots of the characteristic polynomial. In a stable VAR system, all the roots of the characteristic polynomial should lie within the unit circle, which is a key condition for the model's applicability. In our analysis, all dots representing the roots were indeed within the unit circle, indicating that our model is stable and valid. The final results, visualised in Figure 3.2, show the roots of the characteristic polynomial for Poland, Lithuania, Portugal, and Spain from left to right. The dots within the unit circle in these diagrams represent the roots of the characteristic polynomial for each country's VAR model, thus illustrating the stability of these models.

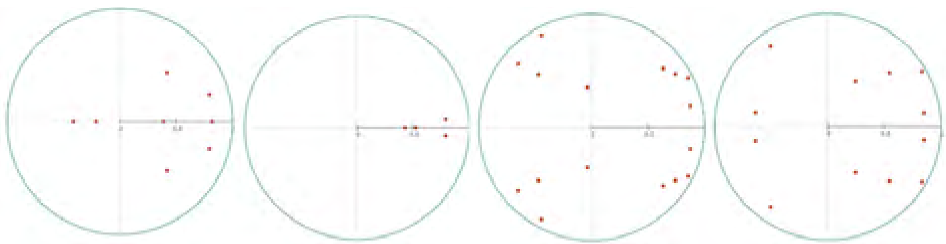

Figure 3.2. Stability of the VAR models: Roots of the characteristic polynomial for Poland, Lithuania, Portugal, and Spain

Source: own work.

3.4. Results

3.4.1. Poland

In case of Poland we built the following model taking GDP (mln EUR) as an endogenous variable (Table 2.2).

Table 3.2. VAR system, lag order: 1, equation: seasonal differences of GDP (Poland)

	Coefficient	Standard error	*t*-ratio	*p*-value
const	748.999	1083.25	0.6914	0.4921
sd_PL_ARR_1	0.00117179	0.000402833	2.909	0.0052 ***
sd_PL_GDP_1	0.984544	0.422756	2.329	0.0234 **
sd_PL_UNP_1	329.781	513.875	0.6418	0.5236
sd_PL_CONS_1	−0.446958	0.657178	−0.6801	0.4992
CRISIS	3702.36	1718.49	2.154	0.0354 **

Mean dependent variable	5925.416		S.D. dependent variable	8214.654
Sum squared residual	1.89e+09		S.E. of regression	5765.459
R-squared	0.547131		Adjusted *R*-squared	0.507406
F(5, 57)	13.77285		*p*-value(*F*)	8.07e-09
rho	0.142563		Durbin-Watson	1.684308

Source: own work.

The model, as a whole, appears to be statistically significant based on the F-statistic and the corresponding *p*-value. The *F*-statistic tests the overall significance of the model. In this case, *F*(5, 57) = 13.77285 with a very small *p*-value (8.07e-09), which is less than 0.05, indicating that the model as a whole is statistically significant at the 5% level. This means that the independent variables in the model jointly have a significant effect on the dependent variable, i.e. GDP („sd_PL_GDP”).

The variable tourist arrivals with lag 1 („sd_PL_ARR_1”) is statistically significant, the former with p-values less than 0.01 is significant at 1% level, while GDP with lag 1 („sd_PL_GDP_1”) and dummy variable crisis („CRISIS”) which have *p*-values less than 0.05, indicate that they are statistically significant at the 5% level. The other variables: unemployment with lag 1 („sd_PL_UNP_1”), and consumption with lag 1 („sd_PL_CONS_1") do not appear to be statistically significant, as their *p*-values are greater than 0.05.

The *R*-squared value of the model is 0.547131, which means that about 54.71% of the variation in the dependent variable, „sd_PL_GDP", is explained by the independent variables in the model. The adjusted *R*-squared value takes into account the number of predictors in the model and can be a more accurate measure when comparing models. In this case, it is 0.507406, which indicates that about 50.74% of the variation in „sd_PL_GDP" is explained by the model, taking into account the number of predictors.

The Durbin-Watson statistic is used to detect the presence of autocorrelation (a relationship between values separated from each other by a given time lag) in the residuals from a regression analysis. The Durbin-Watson statistic ranges from 0 to 4, with a value around 2 suggesting no autocorrelation. The statistic in this model is 1.684308, which suggests that there is a slight positive autocorrelation, but it is not strong.

Afterwards, we calculated IRF (Impulse Response Function) showing response of „sd_PL_GDP" to a shock in „PL_ARR" which was chosen as a GDP change to external shocks affecting tourist arrivals and the main measure of economies' resilience to shocks as stated earlier. The IRF is shown in Figure 3.3.

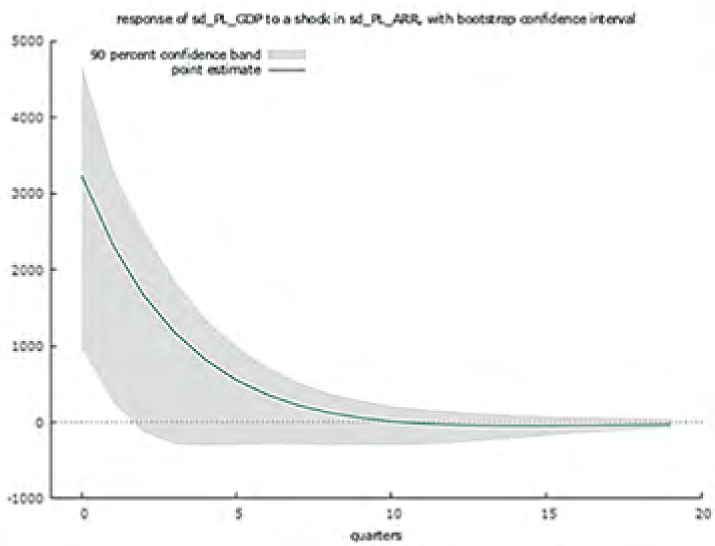

Figure 3.3. Response of GDP in mln EUR (seasonal differences) to a shock in Foreign Tourist Arrival (seasonal differences) for Poland
Source: own work.

The IRF for „sd_PL_GDP" in response to a shock in „PL_ARR" converges to 0 after 10 quarters from the upper side of the chart, what means that the effect of the shock in „PL_ARR" on „sd_PL_GDP" gradually diminishes and becomes insignificant after 10 quarters. This suggests that the impact of changes in „PL_ARR" on „sd_PL_GDP" is temporary and fades out over time, taking about 10 quarters to do so.

The IRF is essentially providing a dynamic view of the impact of a „PL_ARR" shock on „sd_PL_GDP", which is consistent with what the VAR model is suggesting. The VAR model shows that „sd_PL_ARR" has a significant positive impact on „sd_PL_GDP" in the next period. And the IRF shows how this impact evolves over time - it starts significant but gradually fades out and becomes insignificant after about 10 quarters. Therefore, both analyses are consistent with each other.

In addition, both the VAR model and the IRF show that „sd_PL_GDP" is influenced by „PL_ARR" (as per the VAR model) and that this impact fades over time (as per the IRF). This indicates that any policies or interventions targeting „PL_ARR" would have a temporary impact on „sd_PL_GDP".

This suggests that the Polish economy, as represented by „sd_PL_GDP", is able to absorb shocks in „PL_ARR" over time. The initial impact is positive but it gradually diminishes. So, we could interpret this as the economy being resilient to shocks in „PL_ARR" in the long run, as any changes in „PL_ARR" are not permanently affecting „sd_PL_GDP".

3.4.2. Lithuania

In case of Lithuania we built the following model taking GDP (mln EUR) as an endogenous variable (Table 3.3).

The model, as a whole, appears to be statistically significant based on the F-statistic and the corresponding *p*-value. The *F*-statistic tests the overall significance of the model. In this case, $F(9, 52) = 31.00030$ with a very small *p*-value (7.30e-18), which is less than 0.05, indicating that the model as a whole is statistically significant at the 5% level. This means that the independent variables in the model jointly have a significant effect on the dependent variable, „sd_LT_GDP".

The variables „sd_LT_GDP_1", „sd_LT_UNP_1", and „sd_LT_UNP_2" are statistically significant with *p*-values less than 0.01, indicating that they are statistically significant at the 1% level. The „CRISIS" variable has a *p*-value just slightly above 0.05, which suggests that it may be statistically significant at the 5% level, although this would typically be considered borderline. The other variables („sd_LT_ARR_1", „sd_LT_ARR_2", „sd_LT_GDP_2", „sd_LT_CONS_1", „sd_LT_CONS_2") do not appear to be statistically significant, as their *p*-values are greater than 0.05.

Table 3.3. VAR system, lag order: 2, equation: seasonal differences of GDP (Lithuania)

	Coefficient	Standard error	*t*-ratio	*p*-value
const	70.3763	71.9492	0.9781	0.3325
sd_LT_ARR_1	0.000161091	0.000658892	0.2445	0.8078
sd_LT_ARR_2	−0.0003327	0.00055338	−0.6013	0.5503
sd_LT_GDP_1	0.971198	0.244442	3.973	0.0002 ***
sd_LT_GDP_2	−0.321578	0.283523	−1.134	0.2619
sd_LT_UNP_1	−225.061	49.2443	−4.570	<0.0001 ***
sd_LT_UNP_2	185.893	50.4154	3.687	0.0005 ***
sd_LT_CONS_1	−0.421663	0.537257	−0.7848	0.4361
sd_LT_CONS_2	0.673413	0.477496	1.410	0.1644
CRISIS	300.973	150.740	1.997	0.0511 *

Mean dependent variable	653.2516		S.D. dependent variable	871.7541
Sum squared residual	7282654		S.E. of regression	374.2339
R-squared	0.842902		Adjusted *R*-squared	0.815711
F(9, 52)	31.00030		*p*-value(*F*)	7.30e-18
rho	−0.065786		Durbin-Watson	2.107672

Source: own work.

The *R*-squared value of the model is 0.842902, which means that about 84.29% of the variation in the dependent variable, „sd_LT_GDP", is explained by the independent variables in the model. The adjusted *R*-squared value takes into account the number of predictors in the model and can be a more accurate measure when comparing models. In this case, it is 0.815711, which indicates that about 81.57% of the variation in „sd_LT_GDP" is explained by the model, taking into account the number of predictors.

The Durbin-Watson statistic is used to detect the presence of autocorrelation in the residuals from a regression analysis. The Durbin-Watson statistic ranges from 0 to 4, with a value around 2 suggesting no autocorrelation. The statistic in this model is 2.107672, which suggests that there is minimal autocorrelation, indicating a good model fit.

Afterwards, we calculated IRF (Impulse Response Function) showing response of „sd_LT_GDP" to a shock in „LT_ARR" which was chosen as a GDP

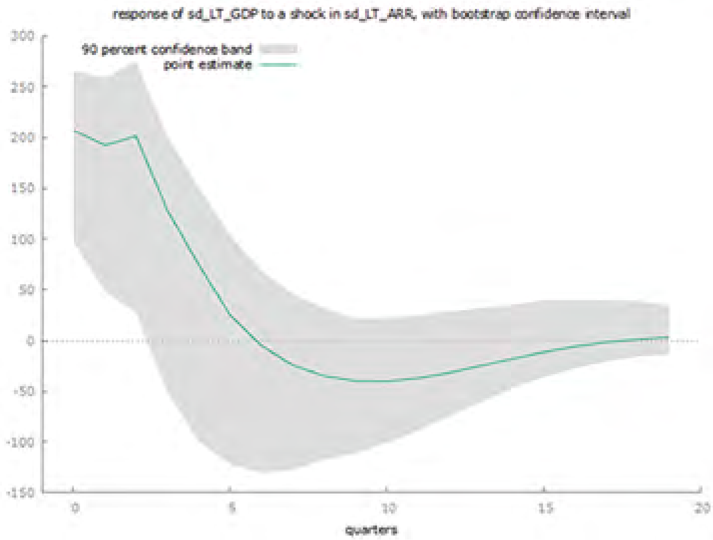

Figure 3.4. Response of GDP in mln EUR (seasonal differences) to a shock in Foreign Tourist Arrival (seasonal differences) for Lithuania
Source: own work.

change to external shocks affecting tourist arrivals and the main measure of economies" resilience to shocks as stated earlier. The IRF is shown in Figure 3.4.

The IRF suggests that a shock to „LT_ARR" initially leads to a positive effect on „sd_LT_GDP" which crosses to the negative side after 5 quarters and eventually becomes insignificant after about 20 quarters. This indicates that shocks to „LT_ARR" have a temporary and diminishing impact on „sd_LT_GDP", with the effects essentially disappearing after about 20 quarters. The model's coefficients for „sd_LT_ARR_1" and „sd_LT_ARR_2" are not statistically significant, suggesting that „LT_ARR" does not have a significant impact on „sd_LT_GDP" in the short term. The lack of significance in the model aligns with the IRF's finding of the temporary nature of the effect.

Based on the VAR model and the IRF, it appears that the Lithuanian economy shows some resilience to shocks in „ARR". Shocks to „ARR" have a temporary impact on „sd_LT_GDP" that fades out over time.

3.4.3. Spain

In case of Spain, we built the following model taking GDP (mln EUR) as an endogenous variable (Table 3.4).

Table 3.4. VAR system, lag order: 3, equation: seasonal differences of GDP (Spain)

	Coefficient	Standard error	*t*-ratio	*p*-value
const	979.056	2201.51	0.4447	0.6586
sd_SP_ARR_1	−0.00066874	0.000825627	−0.8100	0.4220
sd_SP_ARR_2	0.000411014	0.000791302	0.5194	0.6059
sd_SP_ARR_3	−0.00175075	0.000613299	−2.855	0.0064 ***
sd_SP_GDP_1	−0.490385	0.730647	−0.6712	0.5054
sd_SP_GDP_2	−0.238363	0.723632	−0.3294	0.7433
sd_SP_GDP_3	0.550329	0.620679	0.8867	0.3798
sd_SP_UNP_1	−5117.29	3348.70	−1.528	0.1332
sd_SP_UNP_2	4399.43	5676.50	0.7750	0.4422
sd_SP_UNP_3	−533.790	3117.25	−0.1712	0.8648
sd_SP_CONS_1	1.51070	0.940157	1.607	0.1148
sd_SP_CONS_2	0.287409	0.968817	0.2967	0.7680
sd_SP_CONS_3	0.120291	0.890260	0.1351	0.8931
CRISIS	−27.8930	4145.28	−0.006729	0.9947

Mean dependent variable	4440.803		S.D. dependent variable	16302.02
Sum squared residual	6.66e+09		S.E. of regression	11901.02
R-squared	0.582524		Adjusted *R*-squared	0.467051
F(13, 47)	5.044708		*p*-value(*F*)	0.000018
rho	−0.025781		Durbin-Watson	2.045900

Source: own work.

The VAR model for Spain's GDP („sd_SP_GDP") provides a comprehensive look at the influences on economic output. An overall *F*-statistic of 5.044708 and the corresponding *p*-value of 0.000018 strongly suggests the model as a whole is statistically significant at the 5% level. This indicates that the variables in the model jointly have a meaningful effect on the dependent variable, „sd_SP_GDP".

Examining individual coefficients, only „sd_SP_ARR_3" is statistically significant, as its p-value of 0.0064 is less than 0.01, making it significant at the 1% level. The rest of the coefficients including „CRISIS", all lags of „sd_SP_GDP", „sd_SP_UNP" and „sd_SP_CONS" are not statistically significant at the 5% level, as their *p*-values are all greater than 0.05.

The *R*-squared value of this model is 0.582524, suggesting that approximately 58.25% of the variation in „sd_SP_GDP" can be explained by the variables in the model. However, the adjusted *R*-squared, which takes into account the number of predictors in the model, is substantially lower at 0.467051, indicating that about 46.70% of the variation in „sd_SP_GDP" can be explained when considering the number of predictors.

The Durbin-Watson statistic, used to detect autocorrelation in the residuals, is 2.045900, which is close to 2, suggesting there is little autocorrelation. This implies that the model does a good job capturing the time-dependent structure of the data.

In terms of the *F*-tests of zero restrictions, only all lags of „sd_SP_ARR" are statistically significant at the 5% level, with a *p*-value of 0.03. This suggests that the changes in arrivals („sd_SP_ARR") at all lags are jointly significant in predicting „sd_SP_GDP". Other variable groups are not significant. The „CRISIS" variable is not statistically significant, which suggests that the „CRISIS" variable does not significantly affect Spain's GDP within this model.

As in case of previous countries, we calculated IRF showing response of SP_GDP to a shock in SP_ARR. However, unlike the previous cases the IRF oscillates around zero and doesn't converge to zero during twenty quarters after the shock (Figure 3.5).

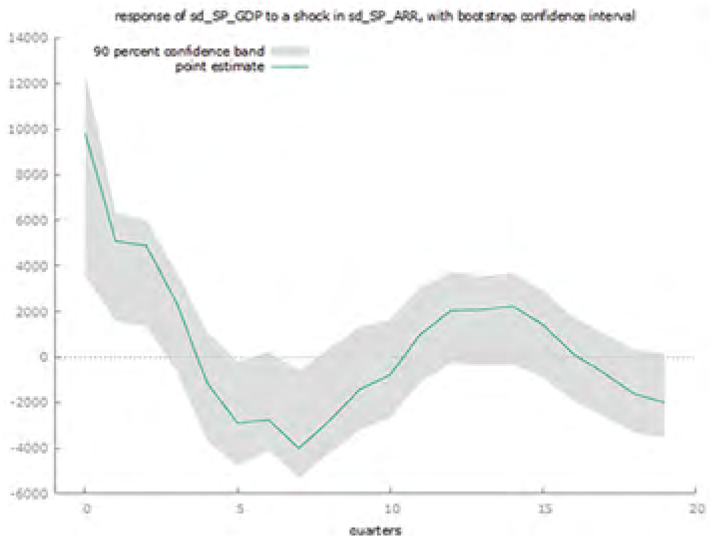

Figure 3.5. Response of GDP in mln EUR (seasonal differences) to a shock in Foreign Tourist Arrival (seasonal differences) for Spain
Source: own work.

The observed oscillatory behavior indicates that a shock to „SP_ARR" creates disturbances in „SP_GDP" that persist and fluctuate around zero rather than converging smoothly towards zero. This suggests that changes in „SP_ARR" have an ongoing, alternating impact on „SP_GDP" over the examined period of 20 quarters, instead of a gradual fading effect observed in the previous countries.

Comparing the IRF to the VAR model's results, the third lag of „SP_ARR" („sd_SP_ARR_3") is statistically significant in the model. This is consistent with the IRF's indication of ongoing effects, as this significant lagged effect might contribute to the persisting influence of „SP_ARR" shocks over multiple periods.

In terms of resilience to crises, the coefficient for „CRISIS" in the VAR model is not statistically significant, suggesting that within the model's structure and data, crises don't significantly impact „SP_GDP". However, it's worth noting that real-world resilience to crises is multifaceted and may not be fully captured by this model.

In terms of resilience to shocks in „ARR", the persistence of effects in the IRF suggests that Spain's economy shows some sensitivity to such shocks. Yet, the oscillatory response implies a pattern of adjustment and adaptation, possibly indicating some level of resilience in managing these shocks over time.

3.4.4. Portugal

In case of Portugal we built the following model taking GDP (mln EUR) as an endogenous variable (Table 3.5).

The Portuguese GDP model („sd_PT_GDP") shows a few notable statistical relationships, but most of the variables in the model are not statistically significant based on their respective *p*-values being greater than 0.05.

Starting with the overall model significance, the *F*-statistic of $F(17, 42) = 5.056726$ and its corresponding p-value of 9.50e-06 suggests that the model is statistically significant at the 1% level. This means that jointly, the independent variables significantly affect the dependent variable, „sd_PT_GDP".

Among the independent variables, only „sd_PT_GDP_1" has a *p*-value less than 0.05 (*p*-value = 0.0465), indicating it"s statistically significant at the 5% level. This implies that the first lag of the Portuguese GDP has a significant effect on the current period Portuguese GDP.

Most of the other variables including all lags of „sd_PT_ARR", „sd_PT_GDP" (except the first lag), „sd_PT_UNP", „sd_PT_CONS", and „CRISIS", are not statistically significant at the 5% level as their *p*-values are greater than 0.05.

The model's *R*-squared value is 0.671784, meaning that about 67.18% of the variation in the dependent variable, „sd_PT_GDP", can be explained by the independent variables in the model. The adjusted *R*-squared value is 0.538934,

Table 3.5. VAR system, lag order: 4, equation: seasonal differences of GDP (Portugal)

	Coefficient	Standard error	*t*-ratio	*p*-value
const	350.722	306.894	1.143	0.2596
sd_PT_ARR_1	−0.00064589	0.000561493	−1.150	0.2565
sd_PT_ARR_2	0.000848235	0.000603202	1.406	0.1670
sd_PT_ARR_3	−0.00046779	0.000666929	−0.7014	0.4869
sd_PT_ARR_4	−0.00015510	0.000546419	−0.2839	0.7779
sd_PT_GDP_1	1.08072	0.526730	2.052	0.0465 **
sd_PT_GDP_2	−0.815572	0.572311	−1.425	0.1615
sd_PT_GDP_3	0.00175079	0.563612	0.003106	0.9975
sd_PT_GDP_4	−0.0494147	0.531340	−0.09300	0.9263
sd_PT_UNP_1	−13.8409	682.697	−0.02027	0.9839
sd_PT_UNP_2	−974.455	1127.77	−0.8641	0.3925
sd_PT_UNP_3	1392.95	1063.23	1.310	0.1973
sd_PT_UNP_4	−807.179	554.721	−1.455	0.1531
sd_PT_CONS_1	−0.0590159	0.620232	−0.09515	0.9246
sd_PT_CONS_2	0.594476	0.588925	1.009	0.3186
sd_PT_CONS_3	0.0705422	0.585432	0.1205	0.9047
sd_PT_CONS_4	−0.244595	0.597262	−0.4095	0.6842
CRISIS	418.058	645.074	0.6481	0.5205

Mean dependent variable	1062.833		S.D. dependent variable	2556.241
Sum squared residual	1.27e+08		S.E. of regression	1735.735
R-squared	0.671784		Adjusted R-squared	0.538934
$F(17, 42)$	5.056726		p-value(F)	9.50e-06
rho	0.056040		Durbin-Watson	1.882748

Source: own work.

implying that after adjusting for the number of predictors in the model, about 53.89% of the variation in „sd_PT_GDP" can be explained. The Durbin-Watson statistic, used to detect autocorrelation in the residuals, is 1.882748, indicating that there may be some slight positive autocorrelation present, but it isn't strong.

To summarise, based on the VAR model for Portugal, the first lag of Portuguese GDP („sd_PT_GDP_1") significantly impacts the current GDP. The overall model is statistically significant, but most variables do not individually significantly affect Portuguese GDP. Furthermore, the Durbin-Watson statistic suggests that the residuals may have slight positive autocorrelation (Figure 3.6).

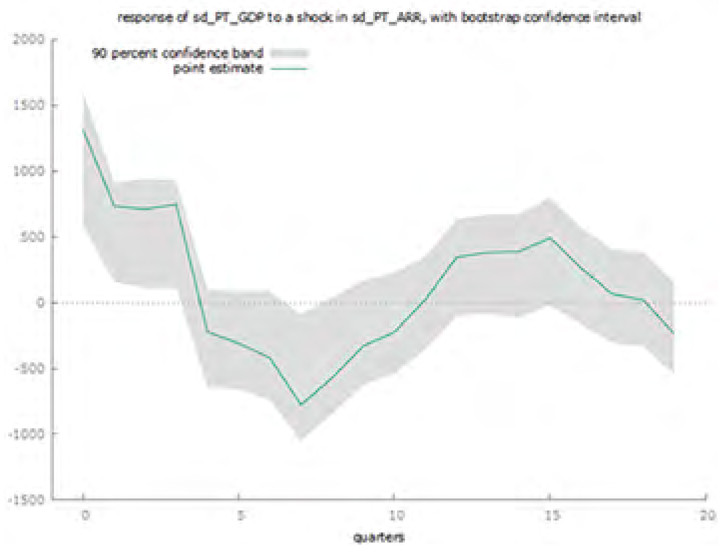

Figure 3.6. Response of GDP in mln EUR (seasonal differences) to a shock in Foreign Tourist Arrival (seasonal differences) for Portugal
Source: own work.

Given the Impulse Response Function (IRF) analysis of „PT_GDP" to shocks in „PT_ARR", it is observed that the response does not stabilise over a period of twenty quarters. The oscillation around the zero-line without convergence suggests a persistent impact of shocks on Portuguese GDP, although the response is relatively low in magnitude, given the IRF oscillations close to zero.

Referring to the VAR model above, this finding is congruent with the statistical insignificance of „sd_PT_ARR" lags on „sd_PT_GDP". None of the lags for „sd_PT_ARR" has a *p*-value less than 0.05, indicating that they are not statistically significant at the 5% level. This suggests that changes in ARR do not have a significant immediate impact on GDP, aligning with the observed oscillations around zero in the IRF.

As for the resilience of the Portuguese economy to shocks in „CRISIS", the „CRISIS" variable is not statistically significant in the VAR model (*p*-value =

0.5205), which suggests that crises do not have a statistically significant impact on Portuguese GDP. Therefore, based on this analysis, the Portuguese economy may be seen as resilient to shocks in „CRISIS".

However, resilience to shocks in „ARR" is less clear. Given that the IRF of „PT_GDP" to shocks in „PT_ARR" oscillates without stabilising, it indicates that such shocks may have a continued effect on „PT_GDP". Although these shocks are not statistically significant in the VAR model, the IRF suggests that they may have a lingering effect on „PT_GDP". This suggests that while the Portuguese economy may be resilient to immediate shocks in „ARR", it may still feel the impact of such shocks over time.

3.5. Discussion

In the study examining the impact of crises on countries' economic growth, foreign tourist arrivals were used as a metric. This is because the international travel and tourism industry is more susceptible to exogenous shocks and crises compared to other industries, as noted by Keller (2021). This approach differs from other studies on the impact of external shocks on the Polish economy. Here, the response to the crisis impulse is much quicker, and the effect dissipates faster as well (within 10 quarters). In contrast, Sznajderska's (2021) study on the impact of demand-driven trade shocks on the Polish economy found that the growth of the effect (positive) lasts for a relatively short period (several years) and then diminishes over a much longer period (40 quarters). Furthermore, when comparing the results of this study with the negative effects of large-scale wars or pandemics from a historical perspective (Stefański, 2020), it appears that the negative impacts on the economy are immediate, while recovery spans years. However, this pattern is typical of large-scale crises, such as the "Black Death" or World War II, where it took decades to restore the labor force and capital.

In our study, we observed varying degrees of resilience to external shocks in economies, depending on their economic reliance on the tourism sector. Economies dependent on tourism are among the most affected by crises and take longer to recover compared to those less dependent on tourism. This is supported by studies focusing on specific crises, such as the pandemic (Behsudi, 2020; EFTA, 2022). It should also be noted, based on previous studies, that the pandemic revealed domestic tourism to be more robust or resilient to crises, even in the worst-case scenarios of supply shocks, particularly in emerging and developed countries (Keller, 2021). The extent to which domestic overnight stays have compensated for the loss of foreign ones (EFTA, 2022) is significant. The varying importance of domestic versus foreign tourism in the group of countries analysed in this chapter may also explain the differential GDP responses to the shock of a decline in foreign tourist arrivals. Moreover, Vanhove (2022) suggests that the recovery period will be highly unequal across different segments of the tourism sector. Additionally, Keller (2021) highlights potential differences in economic recovery depending on the type of external shock: demand or supply. Therefore, it is crucial to conduct further in-depth assessments of the impact of external shocks, in the form of various crisis phenomena, on the economic growth of individual countries and to identify the sources of their resilience to crises.

Conclusions

The paper presents a detailed analysis of the resilience of the economies of Poland, Lithuania, Spain, and Portugal to external shocks. Using VAR models and IRFs, the paper studies the response of GDP and ARR to various crises. The results show that the Polish and Lithuanian economies demonstrate remarkable resilience to these shocks, recovering more quickly than Spain and Portugal. The paper argues that this resilience can be attributed to a combination of factors, including economic diversity, institutional and market flexibility, and effective policy responses. The paper contributes to the literature on economic resilience by providing empirical evidence of the differential impacts of shocks on different economies and by highlighting the role of tourism in shaping these impacts. The findings have important implications for policymakers, suggesting that enhancing economic resilience requires a multifaceted approach that takes into account the unique characteristics and vulnerabilities of each economy.

Based on the Vector Autoregression (VAR) models and Impulse Response Functions (IRFs) calculated for Poland, Lithuania, Spain, and Portugal, our study offers several observations. Firstly, the analysis highlights a remarkable resilience of the Polish and Lithuanian economies to external shocks, notably stronger than those of Spain and Portugal. The data suggests that both the Polish and Lithuanian economies recover more quickly from shocks, indicated by lower standard deviations in their response to shocks. Secondly, the magnitude of both the financial and sovereign debt crises were more pronounced in Spain and Portugal, which is reflected in more fluctuating IRFs. It's plausible that the larger magnitudes of these crises necessitated a longer period for these economies to absorb the shock and stabilise.

However, the study also exposes limitations in the use of VAR models and IRFs for analysing crises, especially when dealing with overlapping crises like the financial and sovereign debt crises or the COVID-19 pandemic and the war in Ukraine. While these tools offer valuable insights, they may not capture the full complexity of these situations. To garner a more comprehensive understanding of economic dynamics during crises, it's beneficial to consider additional analytical methods. These can include stress tests, scenario analysis, and Structural Vector Autoregression (SVAR) modeling (see, e.g., Kilian & Lütkepohl, 2017).

Nevertheless, a critical caveat in employing SVAR models is the need for sufficiently long time series data. Particularly in the case of the war in Ukraine, there is a lack of extensive data which may hinder the construction of a meaningful Cholesky C matrix, a key component in SVAR models. Hence, while SVAR modeling is a promising approach, its applicability depends largely on the quality and quantity of available data.

To conclude, our analysis underscores the robustness of the Polish and Lithuanian economies in the face of external shocks compared to Spain and Portugal. However, these insights should be complemented with other robust analytical methods to fully understand the resilience of economies and their responses to crises.

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