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National resilience to shocks: A configurational analysis of the impact of COVID-19 on the goods exports of European Union countries

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Abstract

This study explores the impact of the COVID-19 health crisis and other geopolitical events on the goods exports of European Union (EU) countries, as well as the possible long-term effects on the development and growth of these countries. The study focuses on parameters related to economic growth, including public deficit, debt-to-GDP ratio, gross fixed capital formation, competitiveness, productivity, and trade openness. Drawing on the academic literature, a model is proposed and tested using fuzzy-set qualitative comparative analysis (fsQCA). The case approach enables analysis of combinations of factors that help countries become more resilient to major global shocks. The results suggest that certain preconditions such as a solid institutional framework and a diversified export structure shape essential profiles and are necessary for countries to ensure subsequent periods of economic growth. Specifically, the empirical analysis reveals two profiles of EU countries with strong resilience and three profiles of EU countries with weak resilience. The findings have relevant implications for policymakers. They highlight the importance of developing resilience to prepare for unpredictable and complex global events. A novel feature of this study is the application of a case study methodology. The study is also novel in that it identifies macroeconomic resilience profiles that are robust to unexpected external shocks. This exploratory study contributes to the academic literature on economic development and goods export resilience in open economies. It also offers scholars promising opportunities for future studies.

Keywords: *COVID-19, economic shocks, exports, economic development, resilience, fsQCA*

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1 INTRODUCTION

The economies of many countries have faced major challenges in recent years. The COVID-19 health crisis has tested the resistance, resilience, and future growth potential of many countries and their economies as never before. This crisis has been compounded by other events such as the invasion of Ukraine by the Russian army, especially in terms of energy supply and raw material prices in Europe. Situations such as food crises and the geopolitical consequences of the conflict in the Red Sea and the Horn of Africa caused by the war in Gaza have also affected the ordinary course of trade between Southeast Asia and Europe.

Events of such magnitude can have unforeseeable consequences for countries' short- and long-term development and growth by causing changes in the balance between blocs, as well as structural changes, potentially caused by the supply side. The COVID-19 outbreak seriously affected global economic activity. It showed that many families, companies, and countries needed more resources or an essential economic base to withstand the impact of this crisis over a short period. In sum, because of globalization, such events mean that all countries must

analyze which aspects and resources most affect their economies' resilience to problems and their ability to continue to grow and develop.

The negative effect of COVID-19 on international trade can be traced to factors affecting goods imports and exports. A decrease in imports on the aggregate demand side, a reduction in people's income, and the inability to reach points of sale led to a slump in purchase flows. Conversely, the lack of mobility of the human factor caused a major crisis in the supply of goods. This crisis triggered a chain effect in all types of industries due to a lack of supply of intermediate goods and services. Products became less price elastic, leading to substantially higher inflation and unemployment rates globally.

In the COVID-19 crisis, world gross domestic product (GDP) declined by 3.1%. In the most developed countries, it shrank by 4.5% (IMF, 2022). This crisis is considered to have sparked one of the worst cases of economic turbulence since World War II (Zhao et al., 2021). However, the impact of COVID-19 on international trade was even greater. In 2020, export and import volumes decreased by 9.4% and 9%, respectively (IMF, 2021). This parameter plays a vital role in all countries' competitive position within the world economy (Cengiz et al., 2022).

In another of the major geopolitical events of recent years, the shock to the world economy caused by Russia's invasion of Ukraine was due to several factors. For instance, the economies of these countries are large. Moreover, they are responsible for a high percentage of several essential goods such as wheat (25% of the world total), corn and other coarse grains (20% of the world total), and sunflower oil (80% of the world total). In addition, Russia is one of the world's largest oil producers and energy exporters. The conflict also led to the blocking of financial flows with Russian companies, government, and individuals. This situation created great uncertainty in the markets and caused an upward trend in all prices, consequently increasing inflation (Desalegn et al., 2022). In terms of the effects on the world economy, one year after its onset, the conflict caused a 2 percentage point reduction in the international trade growth forecasts of the World Trade Organization (WTO, 2023) and a 1.5 percentage point reduction in the outlook for world GDP growth for 2022, according to the International Monetary Fund (IMF, 2023).

The academic literature displays a broad consensus regarding the factors that most affect the growth of countries. Such factors include trade openness (Polanyi, 2018), trade relationships with certain countries (Kolk et al., 2008), the per capita income of trade partner countries (Bougette et al., 2019), the size of the country's economy (Alesina & Spolaore, 2003), the public deficit (Jackson et al., 2020), accumulated public debt (Teles & Cesar Mussolini, 2014), competitiveness (Blockmans & Russack, 2020), and gross fixed capital formation (Pavelescu, 2008a). In this case, fuzzy-set qualitative comparative analysis (fsQCA) is useful for understanding the causal configurations that help improve resilience to macroeconomic shocks caused by an external event such as COVID-19.

This exploratory study answers the following research question: What combination of factors is optimal for a European Union (EU) country to increase its external resilience (goods exports and imports) to major global shocks such as COVID-19 and the Russia–Ukraine conflict and thereby improve its growth and development prospects? The analyzed factors are government deficit, debt to GDP, gross fixed capital formation, competitiveness, productivity, trade openness, and level of dependence or concentration of foreign trade. The analysis focuses on the performance of these parameters in each of the EU-27 countries.

Resilience can be evaluated in terms of the impact of an external crisis between the moment when the shock occurs and the immediately preceding period. It can also be assessed as a comparison of differences between the moment of overcoming the crisis and the moment before its occurrence. The research approach and scope of the targeted research question inform the

methodological design in this study(Gallardo et al,2024). It involves evaluating the goods export resilience of the EU countries in the first phase of the crisis as a difference in goods exports between the initial impact of the COVID-19 outbreak in 2020 and the pre-COVID-19 period in 2019.

The analysis is based on fsQCA. This qualitative methodology allows theory advancement from a deep knowledge of the studied cases (Rihoux, 2017). In this study, the sample comprises the EU-27 countries. The data reflect the indices in 2019 (the year before the focal events occurred) for public deficit, public debt to GDP, gross fixed capital formation, competitiveness, income generated per hour of work, and concentration of goods exports.

The paper is organized as follows. In Section 2, the theoretical background is presented. This background guides the subsequent analysis and conclusions. A causal model is then proposed to explain the phenomenon of interest. In Section 3, the data sources are described, along with the methodology used to test the model. In Sections 4 and 5, the results are presented and discussed. Finally, Section 6 outlines the conclusions and future research lines.

2 THEORETICAL BACKGROUND

A multitude of factors directly and indirectly affect the growth of any economy. In this study, the analysis focuses on specific parameters of economic growth to measure a country's degree of resilience. These parameters are EU countries' public deficit, debt-to-GDP ratio, gross fixed capital formation, competitiveness, productivity, trade openness, and trade dependence or concentration.

Numerous studies have confirmed the relationship between trade among countries and economic growth (Chauhan, 2020). High levels of public debt affect private consumption, for example. Berben and Brosens (2007) found that OECD countries with high public debt experience a decrease in private consumption of households and businesses. In contrast, private consumption is not sensitive to variations in public debt in OECD countries with low public debt. Private consumption by households and firms is the fundamental demand factor for a country's imports and thus for another country's exports. Kusairi et al. (2019) reported that income, capital accumulation, government spending, the real interest rate, and inflation directly affect countries' private consumption and thus their imports. Similarly, the more productive a country is, the more competitive it is. Therefore, its ability to sell abroad increases, its trade relations with other countries become more diversified, and it becomes less exposed to demand and supply shocks in those countries.

Given the exploratory nature of this research, causal conditions that could affect the resilience of the exports of EU countries are investigated. The study focuses on evaluating resilience in the first phase of a shock. In this study, resilience is measured as a difference in goods exports between 2020 during the first wave of COVID-19, taking 2019 as a benchmark before the spread of the pandemic throughout Europe.

2.1 Public Deficit and Public Debt

The role of the public deficit, its financing and debt management, and its impact on future generations have been of great concern to economists for centuries (Ricardo, 1817; Pigou, 1932). The Keynesian approach introduced a new perspective, giving rise to a lively debate on the nature of fiscal pressure. Since the last major financial crisis in 2007, the EU has established a policy of austerity and fiscal consolidation, which forces its member states to reduce their fiscal imbalances (Mavodyo, 2020). This policy is enshrined in the Stability and Growth Pact

(SGP). It has been heavily criticized for its lack of flexibility and counterproductive effects on short- and long-term economic growth (Morawieck, 2023).

Expansionary fiscal policies increase a country's debt. While effective in the short run, they may reduce long-term growth, partially or fully offsetting the positive effects of fiscal stimulus. Public debt can have a larger negative impact on economic performance if it affects the productivity of public spending (Teles & Cesar Mussolini, 2014), increases uncertainty, or generates expectations of future financial repression (Cochrane, 2011). Such a situation can result in higher real interest rates and lower private investment (Konzelman, 2014). It is widely accepted that even if expansionary fiscal policy leads to debt accumulation, it increases a country's economic activity and can avoid prolonged recessions. It thereby exerts a short- and long-term positive impact on growth (DeLong & Summers, 2012).

The theoretical arguments predicting the adverse effects of high public debt on GDP growth are aligned with a growing body of empirical literature showing a non-linear negative correlation between public debt and economic growth in advanced and emerging market economies (Salmon, 2021). However, that correlation does not necessarily imply causation. The relationship between public debt and economic growth could be because low economic growth leads to high debt (Reinhart et al., 2012). Measuring debt as a share of GDP automatically creates a negative correlation between debt and growth, which automatic stabilizers or counter-cyclical discretionary fiscal policies can amplify. Alternatively, the observed correlation between debt and growth could be due to a third factor that affects both variables simultaneously, such as a banking crisis, a pandemic, or an armed conflict (Reinhart & Rogoff, 2011). Establishing a causal link between debt and growth requires finding an instrumental variable that directly affects debt. Still, it has no direct effect (or indirect effect, except through debt) on economic growth. This correlation has not been confirmed (Panizza & Presbitero, 2014).

Some authors, such as Heimberger (2023), have reported a lack of systematic evidence of the negative effect of increasing public debt on GDP and growth. The main implication for economic policy is the need for caution when applying one-size-fits-all fiscal policies to deal with high levels of public debt. Other authors, such as Fan (2024), have reported that if the debt-to-GDP ratio falls below a certain threshold, the public economy positively contributes to economic growth.

The outbreak of COVID-19 triggered an economic contraction across the EU. Business closures, travel restrictions, and disruptions in supply chains particularly affected sectors such as tourism, hospitality, and retail, which contributed to negative growth rates (Mavodyo, 2020). Recovery was conditioned by the economic structure of each country, with those heavily dependent on tourism being the most affected. Disparity in economic growth during the COVID-19 pandemic was evident across the EU. Whereas some northern European countries experienced steady initial growth, others, especially in southern Europe, recovered more slowly. In addition, some countries faced structural economic challenges such as high unemployment and disparities in economic development, which led to the implementation of significant fiscal stimulus packages and increased public spending. Public spending increased debt across the EU, raising doubts about debt sustainability in some EU member states (Jackson et al., 2020). In response, central banks and international financial institutions supported debt sustainability and economic stability, investing in digitalization, green technologies, and other long-term growth areas (Espinosa et al., 2021). Some authors, such as Forte (2011), have explored the relationship between the size of government and economic growth in EU countries, concluding that actual public spending often exceeds the level that maximizes GDP growth.

In summary, the COVID-19 pandemic shaped EU fiscal policies, with deficits rising to mitigate the economic impact. Recovery paths have varied, influenced by other factors such as vaccination rates, policy responses, and economic structure. The actions of continued monitoring and adaptation of fiscal policies are essential for EU member states to address the complex challenges arising from the COVID-19 pandemic and to move toward sustainable economic recovery. The severity of the health crisis has affected deficits and economic growth, the national economic structure, and the effectiveness of policy responses. Each country's situation has been unique, reflecting a combination of preexisting economic conditions and pandemic-specific challenges.

2.2 Gross Fixed Capital Formation

The interaction between gross fixed capital formation and GDP plays a key role in the economic growth of EU countries because a greater propensity to invest is a crucial driver (Pavelescu, 2008b). This relationship is particularly important in the EU, especially for new member states, where the contribution of gross fixed capital formation to GDP and domestic demand is more relevant (Pavelescu, 2008b). The strong correlation between economic growth and gross fixed capital formation has been observed in Romania, Bulgaria, the Czech Republic, and Poland (Gibescu, 2010). However, the level of relative specialization of investment in EU regions is influenced by various factors, such as market and regional size, unemployment rate, and economic liberalization (Stirboeck, 2002). In this regard, Hajamini and Palaci (2018) observed the asymmetric effect of a government's final consumption expenditure and gross fixed capital formation relative to GDP, especially when they are above or below the optimal level. The optimal values of GDP and gross fixed capital formation were estimated at 16.63% and 2.31%, respectively. In policy terms, governments in developed countries must be aware of the possibility of misallocating public expenditure beyond the optimal size.

This relationship, along with other indicators such as labor force participation rate and personal remittances, has been severely affected by the 2008 financial crisis and the COVID-19 crisis (Soava, 2020). The correlation between gross fixed capital formation and GDP has been a key issue in assessing the contribution of gross fixed capital formation to economic growth (Pavelescu, 2008b). Following the outbreak of the COVID-19 pandemic, the euro area experienced an unprecedented recession that led to a sharp fall in gross fixed capital formation in the first and second quarters of 2020 (Soava et al., 2020). Although the contraction was more pronounced than at the height of the global financial crisis, it was short lived. A strong rebound was observed in the third quarter of 2020. The risk-taking response at both the national and EU levels lessened the impact of COVID-19 and boosted recovery.

2.3 Competitiveness

The competitiveness of the national economy and its business environment is crucial for a country's economic, political, and social development. Competitiveness can be analyzed using many single and multi-factor indicators to quantify its internal and external determinants (Ruzekova et al., 2020).

The crucial role of competitiveness is as a fundamental link between knowledge and public policy (Lodar et al.,2024), driven by various factors such as institutions, policies, and technology. Investment in improving human capital and skilled labor is vital, enabling a breadth of knowledge associated with a steady improvement in innovation and productivity (Rice, 2018). However, research on the relationship between competitiveness and economic growth has provided mixed results. Whereas Zagoršeková (2018) found no significant positive relationship in the EU, Cazacu (2015) and Korez-Vide (2016) identified a positive impact of competitiveness on GDP growth.

In terms of competitiveness in sectors such as banking (Melchor, 2005), growth stems mainly from improvements in production possibilities. Studies have emphasized the importance of firm- and country-specific factors and the need for market reforms and innovation to boost productivity and growth in the EU. Increasing convergence in output per worker has been observed among EU countries (Färe et al., 2006).

The COVID-19 pandemic has had a major impact on the competitiveness of the EU. In the initial stages, EU member states focused on individual crisis management, each prioritizing its own response to the emergency (Blockmans & Russack, 2020). At the same time, the severity of the crisis led to changes in attitudes toward economic solidarity. However, the EU's response was hampered by its continued engagement with the United States, as noted by Alcaro (2021).

The crisis has also led to changes in competition policy and antitrust measures, as highlighted by Meunier and Mickus (2020) and Šmejkal (2020). Pressures to adapt intensified, especially in response to Chinese state-backed enterprises and the global dominance of online platforms (Šmejkal, 2020). The banking system's connection to the macroeconomy has become clearer, with performance fluctuations and a major adverse impact on profitability (Juhász, 2022).

Some authors (Ivanová & Čepel, 2018) have claimed that international comparison requires the identification of complex factors. These factors affect the success of some EU countries' economies (Plaza-Casado et al.,2024). Their effects influence countries' social labor productivity and create a comparative international competitive advantage. Research has concluded that a key factor in the growing competitiveness of countries before and after COVID-19 is business innovation. Similarly, Dobrovic et al. (2018) studied the competitiveness framework set out in the Europe 2020 Strategy, claiming that it is projected through innovative business processes reflected in the innovation performance of the economy.

Some authors have analyzed how the pandemic has affected different facets of competitiveness. Examples include the immersion of the digital economy in all areas, greater reverse globalization, and the expansion of digital markets, requiring adjustments in competition policy (Radukić & Popović, 2021). Authors have also highlighted the need to improve cross-border cooperation, leading to some policy integration in the health and financial sectors (Duić & Sudar, 2021).

2.4 Productivity

Research on productivity and growth in EU countries has identified several factors that improve productivity performance. According to Dall'Olio (2013), firm-specific characteristics play a more crucial role in productivity growth in older EU member countries. In contrast, in countries that joined more recently, factors such as country characteristics, foreign direct investment, and credit availability are more relevant. In a study of Poland, Kolasa (2005) found that technology transfer, domestic innovation, and market reforms are critical drivers of productivity growth. Other authors, such as O'Mahony et al. (2010), have highlighted the importance of addressing constraints in product and labor markets, especially in the services sector, to improve productivity in the EU and thus influence long-term growth.

Recent research on productivity and growth in EU countries before and after the COVID-19 pandemic has provided inconsistent results. Dimelis (2002) reported that total factor productivity (TFP) is the main contributor to growth in the EU. In contrast, Dobrzanski (2021) observed a doubling of productivity change, with only a few countries experiencing an increase in 2020. Similarly, de Vries et al. (2021) noted negative productivity growth in French and UK industry, despite growth in aggregate output per hour. Finally, Halmai (2021) highlighted the possible long-term impact of the COVID-19 crisis on productivity and growth, emphasizing the need for structural reforms to increase growth potential. These studies suggest that, although

TFP has historically driven growth in the EU, the pandemic has significantly affected productivity, resulting in declines in some countries.

2.5 Openness to Foreign Trade

The academic literature widely concurs that a country's trade openness positively impacts its growth (Polanyi, 2018). A standard view is that, with increasing economic integration between countries, a nation's performance abroad significantly influences its economic performance. The relationship between exports and a country's GDP has always been complex, but it is often seen as an instrument of economic growth (Chauhan, 2020). However, the long-term impact of exports on non-exported GDP can be harmful, with notable variations across countries (Dreger & Herzer, 2012). Imports also play a crucial role in GDP because international trade is an essential and growing component of the economy (Wolla, 2018). This background indicates that a country's trade openness significantly affects the growth of its economy.

Research has also analyzed the impact of service exports on GDP and productivity growth within the EU (Bacovic, 2021). The findings suggest that, although both goods and services exports have a positive impact, goods exports have a more substantial effect. This conclusion is supported by the findings of Pietrzak (2015), who observed a positive correlation between the GDP of EU member states and their volume of exports and imports. Similarly, Anghel (2017) observed the importance of international trade in the EU (Prados-Castillo et al.,2024), focusing on the correlation between trade and economic growth.

Interestingly, Singh and Mitchell (2007) reported that it is desirable to trade with less developed countries to stimulate growth. Some models suggest that trade with less developed nations positively affects growth by encouraging specialization in relatively advanced sectors. Spilimbergo (2000) noted that this conclusion depends on specific assumptions, arguing that, in practice, net impact on a country's growth due to trade with less developed nations is an empirical question. Its direction is negative if the relative income effect is dominant and positive if the relative growth effect is dominant.

In this context, economic policy strategies at the national and European levels are crucial. Understanding the relationships between economic indicators is essential for formulating optimal development plans, guiding government decision making, and designing effective economic policies (Sterpu et al., 2023).

2.6 Dependence on External Trade Relations

European countries depend heavily on their trading partners because trade is a crucial component of their economies (Kolk et al., 2008). The EU is one of the world's largest trading blocs, with a considerable share of global trade. For EU member states, international trade is essential for economic growth and development (Ferreira-Pereira & Smith, 2021). The importance of exports for economic growth is undeniable, and there is a bidirectional relationship between imports and GDP. This relationship indicates the major influence of imports on economic growth. Therefore, EU countries depend on their trading partners to export and import, which is crucial to their economic development (Dellink et al., 2017). Analyzing the relationships between economic indicators is essential to create effective development plans and inform government decisions. European countries must maintain strong trade relations with their partners to ensure continued economic growth and successful development (Meunier & Nicolaïdis, 2005).

In recent years, a critical discussion about trade and economic dependence between countries has arisen because of advanced trade liberalization, as in the case of the EU. According to Kali and Reyes (2007), once other determinants of growth have been accounted for, the relative

income level and growth rate of trading partners can encourage a country's economic development. This conclusion suggests that developing countries experience trade benefits from interacting with industrialized nations with relatively high income levels. Moreover, the number of trading partners positively correlates with growth in all countries, although this phenomenon is more noticeable in more prosperous nations (Kali & Reyes, 2007).

The COVID-19 pandemic entailed a major supply shortage of labor and transportation systems (sea, air, and land), as well as an increase in unmet demand for many essential products, such as medical supplies. The blockage of supply chains has affected the economic recovery process, unbalanced the productive sector, and fueled inflation. During this period, the EU has depended on imports, with the pandemic greatly amplifying this dependence. In response, the EU has set the core objective of increasing autonomy by optimizing the resilience of its supply chains through policies that encourage supplier diversification, internal capacity building, support for a multilateral business environment based on clear rules, and strong cooperation with the United States (Enache, 2022).

The global shock of the COVID-19 outbreak disrupted international trade between European countries to varying degrees (Uğurlu, 2022). The most relevant effects include repercussions for cooperation between companies and universities in Europe (Rõigas, 2014). The intensification of the banking system's links to the macroeconomy has generated fluctuations in performance and has had a major adverse effect on profitability (Juhász & Felföldi-Szűcs, 2022). There have also been adjustments in the international open innovation strategies of certain peripheral countries (Lopes, 2022). In conclusion, the pandemic has altered the dynamics of trade partnerships among European countries, affecting different nations unevenly.

A major dependence has also been observed from the point of view of energy trade and environmental and economic sustainability. Therefore, policies have started to address the efficient use of energy, the reduction of reliance on fossil fuels, and the management of CO2 emissions as key elements of a sustainable economy (Cucchiella et al., 2019). Competitiveness in energy use also reduces oil and gas imports, boosts GDP, and creates employment in the renewable energy and energy efficiency sectors.

3 RESEARCH OBJECTIVE, METHODOLOGY, AND DATA

The research objective of this exploratory study was to identify the necessary and sufficient conditions to ensure the goods export resilience of EU countries in response to the economic shock caused by COVID-19. This issue, which greatly interests scholars and policymakers, has yet to be studied in the academic literature. Given the study's novelty, an exploratory approach was followed to understand the causal relationships between conditions and the outcome of interest. Analyzing the conditions discussed in the theoretical background section can provide an understanding of the elements that explain the resilience of countries' goods exports to an external shock during the first phase of impact on their economies.

Based on the academic literature, a model was proposed to identify the conditions that facilitate (or inhibit) countries' goods export resilience to external shocks. Causal configurations were defined as combinations of conditions that provide strong resilience profiles (SRP) or weak resilience profiles (WRP). The proposed model to explain goods export resilience is defined as follows:

$$RES = f\,(SPB_{19}, GGD1_{9}, GFCF_{19}, CS_{19}, GDPE_{19}, EC^{T10}{}_{19})$$

Tab. 1 provides details of the outcome and causal conditions included in the model. The model was empirically tested using fsQCA based on data from Eurostat, the World Economic Forum, the International Labor Organization, and United Nations COMTRADE for 2019 and 2020.

Tab. 1 – Attributes, descriptions, and data sources

Attribute	Type	Description	Data source
RES	Outcome	ln ($exports_{20}$) – ln ($exports_{19}$)	United Nations COMTRADE
SPB_{19}	Condition	Strong public balance in 2019	Eurostat
GGD_{19}	Condition	General government debt in 2019	Eurostat
$GFCF_{19}$	Condition	Gross fixed capital formation in 2019	Eurostat
CS_{19}	Condition	Competitiveness score in 2019	World Economic Forum
$GDPE_{19}$	Condition	Gross domestic product per employee in 2019	International Labor Organization
$EC^{T10}{}_{19}$	Condition	Concentration of exports in the top 10 destination in 2019	United Nations COMTRADE

FsQCA is an important methodology in social science research for the systematic analysis of cases as combinations of specific attributes in order to uncover causal patterns (Fiss, 2011; Ragin, 1987, 2008). Unlike conventional statistical methods, fsQCA identifies asymmetric relationships among conditions that may be non-significant in traditional analyses (Woodside, 2013; Chen et al.,2023). FsQCA is particularly effective for finding causal relationships by examining cases in detail, thus enhancing the factual understanding of the phenomena of interest (Rihoux & Lobe, 2009; Thomann & Maggetti, 2020; Vargas-Zeledon,2024). Initially conceived for small data sets, fsQCA has proven effective with large samples without mathematical constraints. This feature has broadened its applicability across various fields, including entrepreneurship (Fiss, 2011; Kraus et al., 2018; Woodside, 2012; Yao&Jiahui,2023). FsQCA sheds light on necessity and sufficiency relationships between sets, moving beyond the constraints of statistical significance. The measures of consistency and coverage are employed for this purpose (Mendel & Korjani, 2012; Ragin, 2008; Schneider & Wagemann, 2012; Duarte et al.2024). In summary, fsQCA offers a nuanced and multifaceted approach to social science research. It requires a comprehensive understanding of the subject matter, meticulous data calibration, and careful analysis and interpretation of results. The method's strength lies in integrating qualitative depth with quantitative precision, making it an invaluable tool for exploring complex social phenomena.

As a process, fsQCA involves several key steps. The initial step is the calibration of conditions and outcomes. In this step, cases are categorized as fully inside, fully outside, or at a point of maximum ambiguity (Ragin, 2008; Ragin & Davey, 2014). This step is crucial for transforming raw data into fuzzy-set scores ranging from 0 to 1. These scores indicate the extent to which each case has membership in a set based on established cutoff points (Ragin, 2008; Schneider & Wagemann, 2012; Woodside, 2013; Fu et al.,2014). In the calibration stage, cases are categorized based on their relationship to a specific condition. This categorization involves assigning the values of complete membership (score above 0.95), complete non-membership (score below 0.05), or maximum ambiguity (score of 0.5) to cases (Ragin, 2008). These distinctions are essential for delineating clear boundaries within the fuzzy sets. Cases with a membership score of 0.50 are generally not considered in fsQCA. The ambiguity at this midpoint makes it challenging to ascertain the presence or absence of a condition that is necessary for the occurrence of the outcome of interest. In this study, the cutoff points of full membership at the 95th percentile and full non-membership at the 5th percentile were used. The point of maximum ambiguity was set at the 50th percentile for all conditions except for RES and SPB19. In these cases, a value of 0 was taken as the cutoff point. It was assumed that there was resilience of goods exports to the shock of COVID-19 (RES19) when the variation in goods exports was greater than 0. Similarly, strong public balance (SPB19) was assumed to exist pre-COVID-19 when it was greater than 0. Tab. 2 reports the cutoffs in the calibration, and the descriptive statistics for the outcome and conditions.

Tab. 2 – Calibration and descriptive statistics

Calibration				Descriptive statistics				
Conditions	**Full-in**	**Max amb.**	**Full-out**	**Max**	**Min**	**Average**	**SD**	**Median**
RES	0.04	0	-0.13	0.08	-0.38	-0.06	0.08	-0.05
SPB_{19}	2.15	0	-2.95	3.66	-4.29	-0.05	1.80	0.27
GGD_{19}	129.69	58.77	20.90	176.61	8.42	63.51	38.40	58.77
$GFCF_{19}$	12.60	8.65	4.47	13.04	4.26	8.16	2.62	8.65
CS_{19}	81.62	70.90	63.14	82.40	61.90	72.03	6.34	70.90
$GDPE_{19}$	160.30	66.10	29.41	235.00	19.40	78.36	49.16	66.10
$EC^{T10}{}_{19}$	0.76	0.67	0.59	0.84	0.51	39.52	52.18	10.12

Following calibration, the next key step is to construct a truth table. The truth table is a comprehensive list of all possible logical combinations of conditions in the proposed model (Schneider & Wagemann, 2012). A cutoff point of 0.80 is typically employed. This cutoff highlights configurations with sufficient explanatory power for the outcome of interest. In examining causal relationships in the resilience of countries' goods exports, two consistency thresholds of 0.886 (presence) and 0.902 (absence) were adopted. These thresholds thus surpassed the minimum requirements. High levels of proportional reduction inconsistency (PRI) were also considered (presence PRI = 0.757; absence PRI = 0.763). These levels were higher than those recommended by best practices in fsQCA (Pappas & Woodside, 2021).

The final phase in fsQCA involves providing a solution to the model. Three solutions are generated: complex, parsimonious, and intermediate. The intermediate solution is often chosen. It offers a balanced option by avoiding the elimination of necessary conditions that might be disregarded in the complex and parsimonious solutions (Ragin, 2008). The intermediate solution is particularly advantageous for analyzing and interpreting results. It offers a nuanced understanding aligned with the intricate nature of social science phenomena.

4 RESULTS

4.1 Necessary Condition Analysis

This study sought the combinations of factors that are most conducive to ensuring a country's resilience to a major global shock and improving its growth and development prospects in the aftermath. The first phase of analysis examined the necessary conditions that EU countries should have in order to be resilient and ensure subsequent periods of economic growth(.Casalegno et al,2023) The analysis assessed positive and negative cases following the method proposed by Ragin (2000). For a condition to be considered necessary, it must be consistently present when a specific outcome occurs (Ragin, 1987; Rihoux & Ragin, 2009). In fsQCA, a condition is considered necessary when the consistency score exceeds a value of 0.9 (Ragin, 2008). However, some authors suggest that a high consistency score does not necessarily imply that a condition is necessary (Schneider & Wagemann, 2012). Therefore, a causal condition is considered "almost always necessary" if the consistency score is higher than 0.90 (Schneider et al., 2010).

Research in the related literature suggests the need for a consistency score of 0.95, allowing up to 5% of counterexamples to be identified (Dul et al., 2010). In this study, this more stringent criterion was adopted. The analysis examined whether any of the four conditions (or absence of any of these four conditions) met the 0.95 consistency level recommended by Dul et al. (2010). The evidence in Tab. 3 shows that no condition was necessary to ensure EU countries' goods export resilience to an external shock. During the COVID-19 crisis, the countries that

showed resilience had a set of conditions, which were assessed in the sufficiency analysis (Tab. 4). Both the strong resilience profiles (SRP) and the weak resilience profiles (WRP) had consistency levels below 0.9 and coverage levels above 0.5 for all conditions.

Tab. 3 – Necessary condition analysis

	Strong resilience profiles		**Weak resilience profiles**	
Condition	**Consistency**	**Coverage**	**Consistency**	**Coverage**
SPB_{19}	0.628	0.605	0.623	0.653
~ SPB_{19}	0.640	0.609	0.623	0.646
GGD_{19}	0.486	0.517	0.661	0.765
~ GGD_{19}	0.780	0.679	0.583	0.552
$GFCF_{19}$	0.726	0.768	0.478	0.549
~$GFCF_{19}$	0.574	0.503	0.798	0.760
CS_{19}	0.574	0.537	0.676	0.689
~CS_{19}	0.667	0.654	0.546	0.582
$GDPE_{19}$	0.498	0.522	0.658	0.751
~$GDPE_{19}$	0.762	0.672	0.581	0.557
$EC^{T10}{}_{19}$	0.751	0.721	0.541	0.566
~ $EC^{T10}{}_{19}$	0.548	0.523	0.733	0.762

4.2 Sufficient Condition Analysis

Following the consistency analysis for the outcome of resilience, the results reveal a high level of consistency across several attributes. However, they do not meet the threshold for a condition to be considered necessary. The evidence in Tab. 4 indicates that the country profiles with solid or weak resilience have no necessary conditions.

Tab. 4 – Sufficient condition analysis

	Strong resilience profiles			**Weak resilience profiles**		
	SRP1	**SRP2**		**WRP1**	**WRP2**	**WRP3**
SPB_{19} ● ○	○	●		●		●
GGD_{19} ● ● ○	○	●			●	●
$GFCF_{19}$ ●	⬤	⬤		○	○	○
CS_{19} ● ● ○	○	○		●	●	○
$GDPE_{19}$ ●	○	○		●	●	○
$EC^{T10}{}_{19}$ ●	⬤	⬤		○	○	○
Solutions						
Raw coverage	0.367	0.217		0.282	0.382	0.237
Unique coverage	0.177	0.028		0.048	0.148	0.099
Consistency	0.886	0.924		0.950	0.971	0.902
Model						
PRI	0.757			0.763		
Frequency cutoff	1			1		
Consistency cutoff	0.886			0.902		
Assumptions	- - - - - -			- - - - - -		
Coverage	0.395			0.529		
Consistence	0.893			0.948		

Notes: Black circles denote the presence of conditions. White circles denote the absence of conditions. The absence of circles denotes irrelevant conditions. Large circles denote core conditions. Small circles denote peripheral conditions.

In the exploratory analysis, Model 1 shows the causal configurations for the profiles of countries with strong resilience to global economic shocks (SRP). Model 2 corresponds to the

profiles of countries with weak resilience to global economic shocks (WRP). These two models show the configurations that explain high or low resilience of EU countries to global shocks.

The sufficiency analysis has a high level of consistency that exceeds the threshold established by Ragin (2008). The coverage is also acceptable. This analysis shows that the SRP2, WRP1, and WRP2 strategies have a consistency score close to 1. The SRP1 and WRP3 strategies are acceptable. Setting benchmarks in advance is considered bad practice in fsQCA analysis (Schneider & Wagemann, 2012; Lee & Choi, 2024). In this case, the study of high-performing countries' resilience to an external shock used a consistency cutoff of 0.886. The analysis of low-performing strategies used a consistency cutoff of 0.948. Both exceeded the threshold of 0.75.

According to studies based on equifinality theories (Fiss, 2011), different configurations may lead to the same outcome (Katz & Kahn, 1978). Differentiating between core and peripheral causal conditions leads to neutral permutations. It implies that, for the same outcome, there may be various combinations of interchangeable peripheral conditions lying around a core causal condition (Fiss, 2011).

Tab. 4 illustrates the implications of the theory of core and peripheral causal conditions (Fiss, 2011) in the present analysis. In the profiles of countries with strong resilience (Model 1), the conditions of gross fixed capital formation and the concentration of trade relations with other top 10 countries are core conditions. In the profiles of countries with low resilience (Model 2), no condition is classified as a core condition. Tab. 5 shows the countries with strong or low resilience, according to each configuration from the proposed model solutions.

Tab. 5 – Resilience profiles[(a)]

Configuration	Cases
SRP1: Cases with greater than 0.5 membership in term[(b)]	~fs_PB19*~fs_GGD19*fs_GFCF19*~fs_CS19*~fs_GDPE19*fs_EC19_T10: Latvia (0.609819)
SRP2: Cases with greater than 0.5 membership in term[(b)]	fs_PB19*fs_GGD19*fs_GFCF19*~fs_CS19*~fs_GDPE19*fs_EC19_T10: Croatia (0.546283)
WRP1: Cases with greater than 0.5 membership in term[(c)]	fs_PB19*~fs_GFCF19*fs_CS19*fs_GDPE19*~fs_EC19_T10: Germany (0.699966), Netherlands (0.528334)
WRP2: Cases with greater than 0.5 membership in term[(c)]	fs_GGD19*~fs_GFCF19*fs_CS19*fs_GDPE19*~fs_EC19_T10: France (0.714398), Spain (0.604336), Italy (0.541879), Germany (0.510458), Finland (0.506269)
WRP3: Cases with greater than 0.5 membership in term[(c)]	fs_PB19*fs_GGD19*~fs_GFCF19*~fs_CS19*~fs_GDPE19*~fs_EC19_T10: Cyprus (0.817025)

(a) More detailed results are available upon request.
(b) Cases with greater than 0.5 membership in term.
(c) Cases with lower than 0.5 membership in term.

The analysis of the country profiles reveals that Latvia (SRP1) has the three core conditions of high gross fixed capital formation (GFCF), low apparent labor productivity (GDPE), and a concentration of trade relations with top 10 countries (EC). The country profile (SRP2) represented by Croatia also contains these three core conditions, as well as other peripheral conditions. Surplus or a low deficit (SPB), low public debt to GDP (GGD), and a low competitiveness index (CS) score are peripheral in the SRP1 profile. The presence of surplus or low deficit (SPB), high public debt to GDP (GGD), and a low competitiveness index (CS) score are peripheral in the SRP2 profile.

Countries with low resilience (WRP) have three possible profiles. All have two core causal conditions: low gross fixed capital formation (GFCF) and low concentration of trade relations with other top 10 countries (EC). These cases include the WRP1 profile for Germany and the Netherlands, the WRP2 profile for France, Spain, Italy, Germany and Finland, and the WRP3 profile for Cyprus.

4.3 Sensitivity Checks

A sensitivity check was carried out for the initial calibrations to validate the internal reliability of the model. Following the approach of Skaaning (2011) and Schneider and Wagemann (2012), the percentiles selected to calibrate the variables were modified. Following Fiss (2011) and Stevens (2016), the stress test involved a 10% modification of the percentiles used to define the fully-in and fully-out thresholds. They were modified to the 80% and 20% percentiles, respectively. Analysis of the sensitivity test reveals acceptable levels of consistency and coverage, showing no relevant differences in the solutions to those for the proposed model.

5 Discussion

The findings of this study provide valuable insights into the pathways that contribute to economic resilience in terms of exports. These findings have both theoretical and managerial implications. These implications are crucial for advancing the current understanding of economic resilience. This section details these implications. It thus provides a foundation for future research and practical strategies in economic planning and policymaking.

All the analyzed factors have a direct impact on the resilience of economies. This exploratory study reveals some highly relevant implications that should be considered in the decision making of public administrations and business managers. For example, there is a basic need to legislate and increase resources allocated to growing gross capital formation. Likewise, there is a need to encourage trade relations with a select group of countries with high economic development. It is also positive that these countries form the same trade bloc. This combination would be the best recipe for governments and companies to achieve maximum resilience.

5.1 Theoretical Implications

The study shows that no single condition is universally necessary for resilience. It therefore confirms the complexity and multifaceted nature of resilience mechanisms. This finding challenges existing theories that often emphasize specific critical factors. It suggests that alternative mechanisms should be explored in future research (Di Pietro et al., 2021). The interdependencies among conditions underscore the importance of considering multiple factors simultaneously. This complexity shows the need to rethink theoretical models, which should account for interconnections between conditions rather than focusing on isolated variables.

Traditional economic indicators such as general government debt (GGD) and gross domestic product per employee (GDPE) were not found to be necessary for resilience. This finding challenges existing models. It suggests a need to reassess the role of these metrics in theoretical frameworks (Domańska & Serwa, 2013). The variability in country profiles indicates that multiple pathways can lead to resilience. This variability highlights the value of configurational approaches such as fsQCA. Theoretical frameworks should thus embrace this variability and avoid overreliance on a single model of resilience (Huang & Fan, 2021).

The inadequacy of traditional metrics in predicting resilience suggests that broader, more dynamic indicators should be considered instead. Hence, the way that resilience is theoretically conceptualized should be reevaluated to move beyond static metrics (Ruza Paz-Curbera et al., 2019). The configurational complexity observed in the results highlights the importance of set-theoretic approaches, which can better capture the multiple combinations of conditions that lead to resilience. This study supports the continued use and development of such methodologies in economic research. Contextual factors play a critical role in mediating the impact of various

conditions on resilience, indicating that theoretical models should be more context sensitive. Future research should explore these contextual influences further to refine the current understanding of resilience. Finally, the dynamic nature of resilience, reflected by the absence of necessary conditions, suggests that theoretical frameworks must be flexible and adaptive. This adaptability is crucial for capturing the evolving nature of resilience over time and across different contexts.

5.2 Managerial Implications

For practitioners, the finding that no single condition is necessary for resilience implies that strategies should be diversified. Economic resilience can be enhanced through various pathways(Ramírez-Herrero et al.,2023). The approach of focusing on a single condition may need revisiting. Policymakers are encouraged to adopt a holistic approach to economic resilience, combining multiple conditions in their planning processes. Relying on isolated economic indicators may not capture the full complexity of resilience, and a comprehensive strategy is essential (Martinez et al., 2021). Tailored strategies that reflect the unique contexts of different countries are crucial. The results suggest that one-size-fits-all policies are unlikely to be effective. Countries should instead leverage their specific strengths and conditions.

Economic planning should be flexible and responsive to changing conditions. The dynamic view of resilience arising from the findings of this study indicates that, to remain effective, plans must be adaptable, with regular reassessment and updates. Context-specific solutions should be prioritized, particularly in light of the complex and multifaceted nature of resilience. Practitioners should consider their unique economic environment to develop strategies sensitive to these conditions. Maintaining a solid competitive position in global markets is critical for resilience. Regular evaluations and enhancements of competitive strategies are necessary to ensure sustained economic resilience (Gammoh et al., 2011).

Sociotechnical factors should also be included in decision-making processes because of their strong influence on economic resilience. A multi-disciplinary approach considering these factors would prove more effective for planning and policymaking. Risk management strategies should be dynamic and should cover diverse risk factors. This study suggests that static risk management approaches may need to be revised. Practitioners should adopt more flexible and responsive strategies. Investing in multiple areas simultaneously, such as public balance and capital formation, is advisable to enhance resilience (Guter-Sandu & Murau, 2022). This diversified approach reduces the risk of overreliance on any single factor and strengthens overall economic stability (Hein & Schubert, 2021). In conclusion, the findings highlight the theoretical and practical complexity and multifaceted nature of resilience. The absence of necessary conditions shows the need for a more nuanced and adaptable approach in both research and practice.

6 CONCLUSIONS

The shock of the COVID-19 pandemic has been felt worldwide (Chauhan, 2022). The interdependent environments and unpredictable, successive, and iterated shocks of the modern world make knowledge of the profiles that improve countries' resilience to systemic crises essential. The evidence suggests that, for an economy to be resilient to an economic shock such as the one caused by the COVID-19 pandemic, national gross fixed capital formation must play a relevant role. Investment in this area must be increased, especially in countries that joined the EU later, as noted by Pavelescu (2008a, 2008b).

Numerous studies have documented the relationships between trade among countries and economic growth (Chauhan, 2020). They are especially prominent within economic blocs such as the EU (Anghel, 2017; Pietrzak, 2015). These relationships have become so powerful that they are fundamental for EU member states, as indicated by Dellink et al. (2017), Ferreira-Pereira and Smith (2021), Kolk et al. (2008), and Meunier and Nicolaïdis (2005).

Extending this idea, Kali and Reyes (2007) reported that trade relations are more robust if a country's trading partners have higher income levels and that there is a positive correlation between the number of trading partners and economic growth in all countries. In this exploratory study, concentrating trade relations with a few trading partners is useful if these countries are in the global top 10. In contrast, some countries opt for strategies that diversify foreign trade with a larger and less concentrated number of countries. This finding emphasizes the importance of economic and monetary integration, which can strengthen economic interdependence and produce synergies of vertical specialization along supply chains.

Interestingly, the results also suggest that a country can be resilient to a major economic shock without a high level of productivity. Dobrzanski (2021) also raised this possibility, suggesting that, while productivity doubled in the EU, only a few countries showed economic growth in 2020. Erumban (2021) and de Vries et al. (2021) also reached similar conclusions, indicating that negative productivity growth in French and UK industry was compatible with growth in aggregate output per hour. The available empirical evidence contributes to guiding policymakers in building robust links based on production variability to promote and strengthen industrial and sector policy.

This exploratory study identifies profiles that can help countries enhance their goods export resilience to unexpected external shocks. The study's novelty lies in the choice of methodology, which is suitable for small samples and cases discussions. The findings contribute to the literature on international trade, economic crises, and resilience. The fsQCA method is ideal for developing a new theory using a multilevel approach. The study's implications for policymakers are articulated at the macro and meso levels. However, they can also contribute to the design and control of sector policies and specific public policies at the micro level. From a global value chain perspective, the underlying geostrategic risks for European countries due to their dependence on third countries, particularly in specific industries and technologies, are amplified by a new trend of regionalization of globalization. In a context where commercial strategy is being redefined by trends in the regionalization of the world economy, this study's findings contribute to understanding what form the European New Deal should take in order to improve the strategic autonomy and commercial independence of the region.

One limitation of this study is the sample. Given the research objectives, the data were limited to the EU-27 countries, and the analysis focused on the years 2020 and 2021. Future research should extend the analysis to other countries and crises to enable comparison of causal conditions that contribute to short- and long-term resilience. Future studies should help formulate and validate new economic integration and resilience theory supported by empirical evidence from analysis of differences between the entry and exit of external shocks. Studies should also examine different outcomes. Scholars could use GDP, GDP per capita, the GINI index, competitiveness, public debt, unemployment, and other variables of interest to expand knowledge about countries' resilience. Another promising line of research involves identifying differences in the resilience profiles of countries by type of economic crisis (i.e., supply or demand) and persistence and recurrence in the form of deep and long-lasting recessions. Future research should study the role of environmental, social, and governance (ESG) criteria in public policy and their impact on countries' competitiveness in crises and recessions.

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