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Measuring national economic resilience through industrial portfolios

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Abstract. Even though the importance of economic resilience has increased as economic shocks have become more frequent in the world, there is still a knowledge gap on how to measure it. In search for effective ways to measure national resilience, this article identifies and mathematically proves the existence of direct correlation between resilience and competitiveness through time-specific global correlation rate. This research proposes an economic performance evaluation method that measures the competitiveness of countries facing economic shocks and recovering from them. A quantified method for identification of global economic shocks through industrial portfolio is proposed as well. The holistic approach internalises most externalities and a nation's

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resilience is pared down to its ability to compete in the international trade, linking the main determinants of resilience to the basics of human behaviour. The proposed methodology can be used effectively for national and global economic performance estimations. It also opens a range of new possibilities for economic resilience studies.

Keywords: economic turbulence, economic shock, resilience, industrial portfolio, Inter-Country Input-Output tables, National Accounts

JEL Classification: D62, E01, E21, F4, F52, G01, O4

1. INTRODUCTION

Modern economic history is also a history of shock-induced disturbances and recessions (Hundt & Grün, 2022). Resilience has become a popular word in economics, especially since the 2007 economic shock (Martini, 2020). The onset of COVID-19 has sparked renewed attention to the relevance of developing tools and frameworks that would inform coordinated policymaking across different countries (Mascaretti et al., 2022). Economic resilience is highly complex and multifaceted issue (Martin, 2012; Martin & Sunley, 2014). Martini (2020) noted that it is shock-dependent: a region resilient during one period could be non-resilient during the next. There is a growing body of literature on this concept, yet there is no consensus on an appropriate methodology for measuring it (Martin & Gardiner, 2019).

Geographically, resilience studies usually cover the regional level. Martin (2012) and Martin and Gardiner (2019) have studied British cities and regions, and many other researchers (Di Pietro et al., 2020; Martini, 2020; Oprea et al., 2020; Hundt & Grün, 2022) have investigated the resilience of regions at the NUTS2 level (nomenclature of territorial units; EUROSTAT, 2021). Economies in Europe are still characterised by unequal economic resilience (Cuadrado-Roura & Maroto, 2016), and researchers have paid little attention to Eastern European countries so far (Oprea et al., 2020).

Economic resilience is often quantified using two main properties: resistance and recovery/recoverability (Martin & Gardiner, 2019; Martini, 2020; Oprea et al., 2020; Hundt & Grün, 2022). Changes in GDP per capita (Picek & Schröder, 2018; Oprea et al., 2020; Hundt & Grün, 2022) or output at basic prices (Martin, 2012; Martin & Gardiner, 2019) are used as proxies for these properties. Employment statistics are taken into account as well, mainly when researchers attempt to find correlations between resistance or recoverability and industrial specialisation (Martin & Gardiner, 2019; Hundt & Grün, 2022), although there are debates regarding the reliability of using employment statistics in this way (Gregg & Wadsworth, 2010; Martin & Gardiner, 2019; Oprea et al., 2020).

Recent studies have employed the Organisation for Economic Co-operation and Development (OECD)'s Input-output tables (IOTs), which describe the sale and purchase relationships between producers and consumers within an economy, or Inter-Country IOTs (ICIOTs; OECD, 2023), which capture the effects of distinct industries on national economies through the demand side of economic performance (Picek & Schröder, 2018; Pamucar et al., 2023). Lewis et al. (2021) used the ICIO Tables for a comparison of growth between aggregate values of goods and services worldwide.

The applicability of measuring economic resilience at the national level through industrial portfolios for large and small economies of the European Union (EU) was highlighted in Montrimas et al. (2023). Accordingly, this study addresses the lack of a unified resilience measuring methodology and proposes an effective way to evaluate resilience at the national level for any country in the global economy. The national accounts (NAs) of a sample of 77 economies worldwide are analysed (Eurostat, 2023). The sample countries' economic performance information is harmonised in the ICIOTs for the period between 1995 and 2020.

Resistance and recoverability, the two main components of resilience, are calculated following the methodology of Martin and Gardiner (2019) by lifting them to the national level, as proposed by Montrimas et al. (2023). In this research, national competitiveness denotes a country's aggregated gains or losses in the value of intermediate consumption (IC) during the defined period. The term IC refers to the goods and services consumed as inputs by the production process (Eurostat, 2013). Thus, IC can be viewed as the aggregate value of completed trading actions within industries in the context of the general economic equilibrium, because it consists of nation's goods and services that are either transformed or used up by the production process (Leontief, 1936). IC may reflect the decreased availability of certain resources for consumers in periods of increased scarcity, caused by disrupted production chains. Or the opposite. IC may also reveal the decreased demand for some products. Gains in the value of IC in one industry can cover the losses in another industry within a country, or internationally. In this study, competitiveness between countries herein includes minor and major changes within industrial portfolios. Hundt and Grün (2022) refer to the major ones as structural shifts.

The holistic approach of this research includes employment shifts, political initiatives and many other interconnected elements (Dicken, 2003) in determining the economic performance of a single global market. Undesired external economic disturbances of regional economies (Di Pietro et al., 2020; Ženka et al., 2021), deriving from any other regions of interaction (Martin, 2012), are included in the evaluation, along with the other regions of interaction, as the internal components of the global economy.

In its search for effective ways to measure national resilience, the research compares two methods for measuring national economic performance in the context of the global economic performance – resilience and competitiveness. A direct correlation between the results of the two methods through a time-specific global correlation rate is statistically identified and mathematically proven. Both calculation methods are capable of providing similar inter-country comparison results, although the competitiveness is identified as a more practical and convenient method.

Martin and Gardiner (2019) proposed the concept of 'relative resilience', denoting the economic performance of cities and regions, benchmarked to their national (macro-aggregate) economic performance, during the observed periods of the national recessionary shocks and recoveries. This research suggests a quantified way to identify periods of shocks and recoveries at the global (macro-aggregate) level to benchmark countries and compare their resilience. The level of detail in the data panel allows for a comparison of resilience and competitiveness, iterated to the national industry level. Industrial resilience and competitiveness results, viewed from a global perspective, enable the identification of disrupted economies in various regions of the world. as well as the disrupted global production chains throughout the observed time frame. Periods of global recessionary disruptions can be identified through the quantification of the data in the ICIOTs, and the results correspond to global economic recessionary events, as highlighted in the literature.

The findings of this research create a range of new possibilities for future resilience studies by exploiting the statistics of competitiveness. The proposed method enables the decision-making bodies anywhere in the world to adapt their economic performance measuring practices effectively and conveniently for national or even global economic performance estimations.

The rest of this paper is structured as follows. Section 2 provides an overview of the relevant literature. Section 3 describes the steps taken to obtain the results. Section 4 consolidates the results, proves the identified direct correlation, explains the applicability of the competitiveness method, details the significance and relevance of this research to science and outlines the potential for the research to be extended in future economic resilience studies. Section 5 concludes the research with essential findings and possibilities for future elaborations on the topic.

2. LITERATURE REVIEW

The world has been facing economic security issues for decades as globalisation has evolved (Kahler, 2004). Scientific literature on 'resilience' has highlighted the different ways in which various regions have tried to deal with these challenges. In the literature, term 'resilience' denotes a dynamic and multifaceted process with constantly changing characteristics of a regional or local economy (Martin & Sunley, 2014), although there is no consensus on the definition of resilience (Di Pietro et al., 2020; Oprea et al., 2020). Briguglio et al. (2009) described 'resilience' as a set of actions of socio-economic systems to help a region to recover from a negative shock or to help benefit from a positive shock. Regional resilience is usually seen as a highly complex concept that consists of many variables. Martin (2012) identified 'resistance', 'recovery', 're-orientation' and 'renewal' as the four properties of regional resilience that are most frequently used for economic interpretation (Martin & Sunley, 2014; Martin et al., 2016; Di Pietro et al., 2020; Oprea et al., 2020). Later works elaborated on additional properties of resilience, defining regions' sensitivity, robustness, responsiveness, and adaptiveness to different types of recessionary shocks (Martin & Sunley, 2014; Martin et al., 2016; Giannakis & Bruggeman, 2017; Athief et al., 2024; Hidayati et al., 2024). In practice, regional resilience is analysed mainly through two main elements – resistance and recovery (Martin & Gardiner, 2019; Oprea et al., 2020; Di Pietro et al., 2020; Alhanatleh et al., 2024). Most of the resilience measuring attempts in the literature have concentrated on particular regions by considering the time periods encompassing the occurrence of two or more shocks (Navarro-Espigares et al., 2012; Martini, 2020; Oprea et al., 2020).

Ženka et al. (2021) defined an economic shock as an unplanned change, an event or a phenomenon affecting the conditions of the economic, political, social and/or natural environment of national and/or regional economies and/or the international economy, which, if it is not addressed or if the current developmental strategy is not maintained, will have a sudden and serious harmful and/or beneficial impact on the regional economic development.

Resilience is usually considered as the ability to recover from a shock or to reach the pre-shock level. Martin and Gardiner (2019) highlighted the hysteretic behaviour of economies in the general literature, with this behaviour acting as the counterpart of resilience. While resilience refers to an the economy's bounce-back to its pre-shock level, hysteretic models allow for the possibility that a recession or similar disturbance can have permanent effects on the growth path and growth rate of an economy (Hamilton, 1989; Martin & Gardiner, 2019; Mishchuk et al., 2023; Tjahjanto et al., 2023).

Despite the lack of consensus on a unified methodology for measuring resilience, Martin and Gardiner (2019) note that it is generally agreed that some critical components, such as a counterfactual reference or an expected economic performance position, are necessary for calculating regional resistance and recoverability. Regional resilience is usually evaluated through the gross domestic product (GDP) per capita within a region (Martin & Sunley, 2014; Oprea et al., 2020; Hundt & Grün, 2022). Regional output and employment fluctuations are considered to better reflect market reactions to shocks (Martin & Sunley, 2014; Martin et al., 2016; Kudej et al., 2021). Others follow Martin et al. (2016) in using employment data to quantify resilience (Martini, 2020).

The relative resilience measuring methodology of Martin and Gardiner (2019) for cities (regions) uses annual output data in constant prices by benchmarking them to the economy of Great Britain. Montrimas et al. (2023) adapted this methodology to the national level of the Southern and Eastern European Union (EU) countries. Martin and Gardiner (2019) used resistance and recoverability (recovery) variables for measuring relative resilience by employing output data, while Montrimas et al. (2023) used the annual results of IC from the ICIOTs.

Mascaretti et al. (2022) underlined the OECD's IOTs as powerful instruments for representing and analysing the production structure of an economy, performing impact analyses or estimating the effect of

various shocks at different geographic levels. Pamucar et al. (2023) employed the IOTs to model the industrial interdependencies through the product inputs. IC consists of a country's goods and services that are either consumed or transformed during the production process (Eurostat, 2013). Within the data sets of NAs, IC can thus be considered as the annual aggregate value of completed trading actions within each industry in the context of the general economic equilibrium (Leontief, 1936). The ICIOTs were effectively applied in the research of Picek and Schröder (2018) to capture the effects of Germany's final demand spillovers on Southern European countries through the consumption perspective and in the research of Lewis et al. (2021) to capture the global expenditure shift from goods to services.

In periods of increased scarcity, caused by disrupted production chains, IC may reflect the decreased availability of certain resources for consumers or the decreased demand for certain products (Montrimas et al., 2023). Minor changes within national industrial portfolio are captured within IC changes (Montrimas et al., 2023), while the major changes – structural shifts (Hundt & Grün, 2022) – are captured during the processes of reorientation (Martin, 2012).

The industrial portfolio (or industrial structure) of an economy is one of the main determinants of resilience at both the theoretical and empirical levels (Delgado-Bello et al., 2023). The studies of Martini (2020), Oprea et al. (2020), Hundt and Grün (2022) and Delgado-Bello et al. (2023) focused on identifying the most or least resilient industries, but this research produced mixed results. Conroy (1975) and Martin (2012) noted that a regional industrial mix (or portfolio) acts as one input to resilience. However, in scientific discussions on economic resilience context-dependency dominates, producing mixed results and no unified opinion (Montrimas et al., 2023). Industrial specialisation (Krugman index) is widely used across regional resilience modelling (Martin et al., 2016; Martin & Gardiner, 2019; Martini, 2020; Hundt & Grün, 2022), but it is evaluated using employment data, which may be subject to data availability constraints (Martin & Gardiner, 2019). Oprea et al. (2020) also noted that unemployment statistics depend on GDP, which may distort the findings.

Scientists have extensively discussed human behavioural issues, related to securing the commodities and natural resources, is extensively discussed among scientists (Ross, 2004; Ron, 2005; Dunne & Tian, 2015; Musayev, 2016). Gat (2006) highlighted the possession and protection of scarce resources as the main objective of civil or international conflicts. An economy is a system of interconnected elements, consisting of interactions between the economies of all regional and local entities within globalising processes (Dicken, 2003). Adam Smith defined a nation's wealth as its per capita national product for any given mix of natural resources that the country might possess, with the self-interested actions of individuals (invisible hand theory) managing to somehow maintain a functioning social order within an economy (Manis, 2005; Butler, 2011). Productive population and the availability of natural resources in the economy are therefore the two essential elements of an economy (Milgrom, 2017). The research of Montrimas et al. (2023) showed an increase in structural shifts within industries across countries during recovery periods, implying that countries strive to explore their own advantages in distinct industries to compensate for the losses in production chains that are disrupted by shocks. This suggests that there is a link between economic resilience of a country and its ability to compete against the other countries.

These insights from the scientific literature indicate that the competitiveness of industrial sectors within countries, stemming from behavioural trends, is the determinant of national resistance during the shocks and the driver of the recovery of national economies as countries adapt, compensate, and otherwise explore their comparative advantages in the international market within specific industries.

3. STATISTICAL SOURCES AND METHODOLOGY

The harmonised data of the ICIOTs include the annual statistics of 45 industries per country, retrieved from the NAs of 76 countries (38 OECD and 38 non-OECD economies; OECD, 2023) of the world (referred to as the 'Countries' hereafter) during the analysed period between 1995 and 2020. The shortest period is one year in ICIOTs; consequently, the dynamics of variable changes in the data panel are captured in one-year iterations. Following the data format of the ICIOTs, the rest of the world (ROW) inputs are included in this research as well in the form of a separate (the 77-th) country.

In this research, IC is an aggregate input value of domestic and foreign products within an industry in the ICIOTs (OECD, 2023). 'Intermediate' denotes the relationships in the IOTs that emerge from the inter-industry input matrix, where row entries represent outputs from an industry and column entries represent inputs to an industry (Mascaretti et al., 2022). A set of inputs of all industries represents the industrial portfolio of a country as defined by Martin (2012). The values of IC, retrieved from the ICIOTs, are adjusted to a basic price level of 1994, as described in Montrimas et al. (2023). Montrimas et al. (2023) also provided a justification for examining IC rather than national output.

Two methods are applied to identify the economic behaviour of the Countries when they face turbulent periods in terms of global economic development. The goal is to identify the volatility of national industrial portfolios in the world market that suggest the presence of significant recessionary events in the global economy. This notion is consistent with the concept of an 'economic shock' (Ženka et al., 2021) highlighting any sudden and serious negative or positive impact on regional or macro-aggregate economic development.

3.1. Relative resilience calculation method

The first method follows the 'relative resilience' concept of Martin and Gardiner (2019). The expectation is that the economies within a region should react in the same way as the macro-aggregate economy, given that a shock is considered to be an economy-wide event. In this research, regions are denoted by Countries, and the global economy is considered the macro-aggregate level. Two approaches are possible:

- National resilience, measured through the two main components – resistance and recoverability. Both components are calculated in the same way by evaluating the derivation of a region's performance from the macro-aggregate economic development (Martin & Gardiner, 2019). Resistance is measured during the periods of economy-wide recessionary shocks, while recoverability is measured during the periods of recovery from shocks:

$$R_c^{t,t-x} = \frac{(\Delta IC_c^{t,t-x} - \Delta E(IC_c^{t,t-x})}{|\Delta E(IC_c^{t,t-x})|}, \qquad (1)$$

where:

$R_C^{t,t-x}$ is either the resistance of Country c during the period between the beginning of a shock ($t-x$) and the end of the shock t, or the recoverability of Country c during the period between the beginning of a recovery ($t-x$) and the end of the recovery t.

$\Delta IC_c^{t,t-x}$ (or $IC_c^{t,} - IC_c^{t-x}$) denotes the change in the IC value of Country c during the period between ($t-x$) and t.

$\Delta E(IC_c^{t,t-x})$ is the 'expected' change (Martin & Gardiner, 2019) in the IC value of Country c during the period between ($t-x$) and t, obtained by applying the following calculation:

$$\Delta E(IC_c^{t,t-x}) = \left(\frac{IC_w^t - IC_w^{t-x}}{IC_w^{t-x}}\right) * IC_c^{t-x}, \qquad (2)$$

where:

IC_w^t and IC_w^{t-x} are the macro-aggregate *IC* values of the world *w* during the period that starts in year $(t - x)$ and ends in year *t*. Equation (1) can be simplified, keeping in mind that the values of IC_w^{t-x} and IC_c^{t-x} are always positive in the data panel:

$$R_c^{t,t-x} = \frac{(\Delta IC_c^{t,t-x} - \left(\frac{IC_w^t - IC_w^{t-x}}{IC_w^{t-x}}\right) * IC_c^{t-x})}{|\left(\frac{IC_w^t - IC_w^{t-x}}{IC_w^{t-x}}\right) * IC_c^{t-x}|}$$

$$R_c^{t,t-x} = \frac{\frac{(IC_c^t - IC_c^{t-x}) * IC_w^{t-x} - (IC_w^t - IC_w^{t-x}) * IC_c^{t-x}}{IC_w^{t-x}}}{\frac{|IC_w^t - IC_w^{t-x}| * IC_c^{t-x}}{IC_w^{t-x}}}$$

$$R_c^{t,t-x} = \frac{IC_c^t * IC_w^{t-x} - IC_c^{t-x} * IC_w^{t-x} - IC_w^t * IC_c^{t-x} + IC_w^{t-x} * IC_c^{t-x}}{|IC_w^t - IC_w^{t-x}| * IC_c^{t-x}}$$

$$R_c^{t,t-x} = \frac{IC_c^t * IC_w^{t-x} - IC_w^t * IC_c^{t-x}}{|IC_w^t - IC_w^{t-x}| * IC_c^{t-x}}, \qquad (3)$$

- Industrial resilience in terms of the extent to which the industries of a Country lost or gained their comparative advantages during shocks or recovery periods. The calculation is similar to the above, except national industrial portfolios are iterated to the industry level:

$$R_{ci}^{t,t-x} = \frac{(\Delta IC_{ci}^{t,t-x} - \Delta E(IC_{ci}^{t,t-x})}{|\Delta E(IC_{ci}^{t,t-x})|}, \qquad (4)$$

where:

$R_{ci}^{t,t-x}$ is the resistance or recoverability of industry *i* in Country *c* during the period between $(t - x)$ and *t*.

$\Delta IC_{ci}^{t,t-x}$ denotes the change in the *IC* value of industry *i* in Country *c* during the period between $(t - x)$ and *t*.

$\Delta E(IC_{ci}^{t,t-x})$ is the 'expected' change in the *IC* value of industry *i* in Country *c* during the period between $(t - x)$ and *t*, obtained by applying the following calculation:

$$\Delta E(IC_{ci}^{t,t-x}) = \left(\frac{IC_{wi}^t - IC_{wi}^{t-x}}{IC_{wi}^{t-x}}\right) * IC_{ci}^{t-x}, \qquad (5)$$

where:

IC_{wi}^t and IC_{wi}^{t-x} are the the macro-aggregate *IC* values of industry *i* in the world *w* during the period that starts in year $(t - x)$ and ends in year *t*.

This formula can be simplified like the national resilience formula (Equation 3), keeping in mind that the values of IC_{wi}^{t-x} and IC_{ci}^{t-x} are always positive in the data panel:

$$R_{ci}^{t,t-x} = \frac{IC_{ci}^{t} * IC_{wi}^{t-x} - IC_{wi}^{t} * IC_{ci}^{t-x}}{|IC_{wi}^{t} - IC_{wi}^{t-x}| * IC_{ci}^{t-x}}, \qquad (6)$$

When one examines resistance or recoverability in relation to macro-aggregate economy trends, it is necessary to consider several important properties of national industrial portfolios, as explained in Montrimas et al. (2023). First, a country may be viewed as resistant to shocks or able to rapidly recover from them if significant losses in the IC values of its disrupted industries are compensated by similar or higher gains in the IC values of the remaining industries. Second, significant IC value losses or gains across countries are identifiable within the industries associated with specific economic shocks at the macro-aggregate level. Thus, industrial resistance from a Country's perspective (Equation 7) and from a macro-aggregate industry perspective (Equation 8) can be considered as follows:

$$RI_{c}^{t,t-x} = \sum_{i=1}^{45} \left(R_{ci}^{t,t-x}\right), \qquad (7)$$

$$RI_{i}^{t,t-x} = \sum_{c=1}^{77} \left(R_{ci}^{t,t-x}\right), \qquad (8)$$

where:

$RI_{c}^{t,t-x}$- denotes the resistance or recoverability of the industrial portfolio of Country *c* in the period between year *(t-x)* and *t*,

$RI_{i}^{t,t-x}$ - denotes the resistance or recoverability of the global industry *i* in the period between year *(t-x)* and *t*,

$R_{ci}^{t,t-x}$ denotes the resistance or recoverability of industry *i* in Country *c* in the period between year *(t-x)* and *t*.

3.2. COMPETITIVENESS CALCULATION METHOD

The second method allows the periods of volatility in industrial portfolios across Countries to be quantified by measuring the proportions of industry losses or gains within countries, independently from market fluctuations at macro-aggregate level. As stipulated in Montrimas et al. (2023), a decreased annual IC value in a national industry marks a country's lost market position in the international trade, while an increased IC value indicates a country's gains in the international market. Following this logic, a country's losses or gains in IC values within industries reflect the country's ability to compete in the industries internationally. Thus, 'competitiveness' denotes the proportion of annual IC value gains or losses of every industry in each Country throughout the analysed period. Two approaches are applicable:

- National competitiveness, measured by the level of changes in the IC values of industries, including every industry's level of contribution to the national industrial portfolios:

$$COMP_{c}^{t,t-x} = \sum_{i=1}^{45} \left(\frac{\Delta IC_{ci}^{t,t-x}}{IC_{ci}^{t-x}} * S_{ci}^{t-x}\right), \qquad (9)$$

where:

$COMP_{c}^{t,t-x}$ denotes the competitiveness of Country *c* during the period between *(t – x)* and *t*.

IC_{ci}^{t-x} denotes the IC value of industry *i* in Country *c* in year *(t – x)*.

$\Delta IC_{ci}^{t,t-x}$ denotes the change in the IC value of industry *i* in Country *c* during the period between *(t – x)* and *t*.

S_{ci}^{t-x} denotes the share of the IC value of industry *i* in the industrial portfolio of Country *c* ($IC_{ci}^{t-x}/IC_{c}^{t-x}$) at the beginning of the observed period (*t–x)*.

Equation (9) can be simplified as follows:

$$COMP_c^{t,t-x} = \sum_{i=1}^{45} \left(\frac{\Delta IC_{ci}^{t,t-x}}{IC_{ci}^{t-x}} * \frac{IC_{ci}^{t-x}}{IC_c^{t-x}} \right)$$

$$COMP_c^{t,t-x} = \sum_{i=1}^{45} \left(\frac{\Delta IC_{ci}^{t,t-x}}{IC_c^{t-x}} \right)$$

$$COMP_c^{t,t-x} = \frac{\sum_{i=1}^{45} (\Delta IC_{ci}^{t,t-x})}{IC_c^{t-x}}$$

National competitiveness includes the performance of the full industrial portfolio. Changes in the IC values of all industries in a Country are expressed as $\sum_{i=1}^{45} (\Delta IC_{ci}^{t,t-x})$, which is equal to $\Delta IC_c^{t,t-x}$. Consequently, national competitiveness does not depend on the performance of individual industries and can be expressed as:

$$COMP_c^{t,t-x} = \frac{\Delta IC_{ci}^{t,t-x}}{IC_c^{t-x}}, \qquad (10)$$

• Industrial competitiveness, measured from a Country (Equation 11) and from an industry perspective (Equation 12) at the macro-aggregate level. This approach does not include industries' level of contribution to the national industrial portfolio:

$$COMPI_c^{t,t-x} = \sum_{i=1}^{45} \left(\frac{\Delta IC_{ci}^{t,t-x}}{IC_{ci}^{t-x}} \right), \qquad (11)$$

$$COMPI_i^{t,t-x} = \sum_{c=1}^{77} \left(\frac{\Delta IC_{ci}^{t,t-x}}{IC_{ci}^{t-x}} \right), \qquad (12)$$

where:

$COMPI_c^{t,t-x}$ denotes the industrial competitiveness of Country *c* during the period between *(t – x)* and *t*.

$COMPI_i^{t,t-x}$ denotes the industrial competitiveness of the global industry *i* during the period between *(t – x)* and *t*.

Other variables are the same as in Equation (9).

4. RESULTS AND DISCUSSION

4.1. Correlation between national resilience and competitiveness

National resilience results, obtained by applying Equation (3) are shown in Figure 1 (in the Annex), and national competitiveness results, obtained by Equation (10), are shown in Figure 2 (in the Annex).

Despite the different methods used, empirical evidence suggests that Figures 1 and 2 both highlight the most volatile economic performances of Countries every year throughout the observed period. Besides the empirical evidence, several different methods of analysis confirm the interrelatedness of national resilience and competitiveness.

Table 1

RC correlation factors for each year during the observed period.

Year						
	RC factor	Intercept		Year	RC factor	Intercept
1996	78.53463	1.001385		2009	9.800069	1.000000
1997	37.93098	1.000000		2010	12.49728	-1.000000
1998	32.12798	1.000000		2011	8.620326	-1.000000
1999	32.12399	-1.000000		2012	142.6010	-1.000000
2000	31.91616	-1.000000		2013	119.3116	-1.000000
2001	26.99438	1.000000		2014	61.96660	-1.000000
2002	198.2384	-1.000000		2015	16.71819	1.000000
2003	8.908966	-0.999999		2016	36.51744	1.000000
2004	8.280913	-1.000000		2017	29.70208	-1.000000
2005	12.71500	-0,999851		2018	16.70872	-0.999987
2006	13.49531	-1.000000		2019	107.7009	1.000000
2007	8.861319	-1.000000		2020	29.82958	1.000000
2008	14.60194	-1.000000				

Source: Authors' results.

The variables denoting national resilience ($R_c^{t,t-x}$) and national competitiveness ($COMP_c^{t,t-x}$) initially appear to be independent from one another, especially when looking at their constructs. $R_c^{t,t-x}$ includes global economic performance variables (Equation 3), while $COMP_c^{t,t-x}$ uses the variables at the national level only (Equation 10). However, a linear regression exercise reveals that the national resilience and national competitiveness are directly correlated (Cambridge Dictionary) through a year-specific Resilience-Competitiveness (RC) factor. RC factor values are listed in Table 1, and the distribution of the resilience and competitiveness correlation results from a Country and a time perspective is shown respectively in Figures 9 and 10 respectively.

The results shown in Table 1 suggest the existence of a mathematical equality between $R_c^{t,t-x}$ and $COMP_c^{t,t-x}$ through a time-specific RC factor, which can be expressed as follows:

$$R_c^{t,t-x} = Intercept^{t,t-x} + RCfactor^{t,t-x} * COMP_c^{t,t-x}, \qquad (13)$$

The regression results in Table 1 show that *Intercept* in this formula is either 1, or −1. It minimally derives from the unitary value due to rounding errors in the calculations. A positive *Intercept* value corresponds to a negative change in the global IC value during the considered period ($(IC_w^t - IC_w^{t-x}) < 0$), while a negative value of *Intercept* corresponds to a positive change in the global IC value ($IC_w^t - IC_w^{t-x}) > 0$). The insertion of the Equations (3) and (10) in the places of $R_c^{t,t-x}$ and $COMP_c^{t,t-x}$ into Equation (13)

allows for a mathematical calculation of the RC factor results, as shown in Table 1, for every period under consideration (in this case, annual periods).

When Intercept = −1:

$$RCfactor^{t,t-x} * COMP_c^{t,t-x} = R_c^{t,t-x} - (Intercept^{t,t-x})$$

$$RCfactor^{t,t-x} = \frac{R_c^{t,t-x}-(-1)}{COMP_c^{t,t-x}}$$

After inserting Equations (3) and (10):

$$RCfactor^{t,t-x} = \left(\frac{IC_c^t * IC_w^{t-x} - IC_w^t * IC_c^{t-x}}{|IC_w^t - IC_w^{t-x}| * IC_c^{t-x}} + 1\right) \Big/ \left(\frac{IC_c^t - IC_c^{t-x}}{IC_c^{t-x}}\right)$$

$$RCfactor^{t,t-x} = \left(\frac{IC_c^t * IC_w^{t-x} - IC_w^t * IC_c^{t-x} + |IC_w^t - IC_w^{t-x}| * IC_c^{t-x}}{|IC_w^t - IC_w^{t-x}| * IC_c^{t-x}}\right) \cdot \left(\frac{IC_c^{t-x}}{IC_c^t - IC_c^{t-x}}\right)$$

$$\begin{cases} RCfactor^{t,t-x} = \frac{IC_c^t * IC_w^{t-x} - IC_w^t * IC_c^{t-x} + |IC_w^t - IC_w^{t-x}| * IC_c^{t-x}}{|IC_w^t - IC_w^{t-x}| * (IC_c^t - IC_c^{t-x})} \\ IC_w^t - IC_w^{t-x} < 0 \end{cases}, \qquad (14)$$

Alternatively, when *Intercept* = 1:

$$RCfactor^{t,t-x} = \frac{R_c^{t,t-x}-(1)}{COMP_c^{t,t-x}}$$

$$\begin{cases} RCfactor^{t,t-x} = \frac{IC_c^t * IC_w^{t-x} - IC_w^t * IC_c^{t-x} - |IC_w^t - IC_w^{t-x}| * IC_c^{t-x}}{|IC_w^t - IC_w^{t-x}| * (IC_c^t - IC_c^{t-x})} \\ IC_w^t - IC_w^{t-x} > 0 \end{cases}, \qquad (15)$$

The same RC factor values (with insignificant rounding errors in the calculations) are obtained for one-year periods by applying Equations (14) and (15), as those shown in Table 1. The distribution of thsese values is plotted in Figures 9 and 10 in the Annex.

The presence of a direct correlation between the two methods at the national level, when accounting for time-specifics, enables the national resilience to be measured in an easier way: it can be measured by calculating the competitiveness of a Country's industrial portfolio, independently from the macro-aggregate economic performance intervention.

Empirical insights suggest that the most volatile economies overwhelm the accumulated Country results at the global level, making this approach limited in effect when identifying global economic turbulence.

4.2. Identification of shock and recovery periods

The industrial resilience approach, accumulated at the Country level (Figure 3 in the Annex), produces more significant volatility results than in the national resilience approach (Figure 1 in the Annex). However, the industrial resilience approach reduces the importance of the most volatile economies at the global level by balancing them out. National competitiveness results (Figure 2 in the Annex) are not suitable for aggregation to measure global economic performance, because they include Country-specific industrial contribution factors that distort the results at the macro-aggregate level. The periods of global economic shocks and recoveries from them can thus be identified by iterating the industrial portfolio performances of all the contributing Countries and balancing the industry performance statistics at the international level.

Relative resilience, measured through industrial portfolio elements (industrial performance, as denoted before), enables the global economic performance results to be analysed from both a Country (using Equation (7) – Figure 3 in the Annex) and an industry perspective (using Equation (8) – Figure 4 in the Annex).

The application of the competitiveness calculation method enables the industrial portfolio volatility to be measured from two perspectives as well. Competitiveness results from a Country perspective, obtained using Equation (11), are shown in Figure 5 (in the Annex). The results from a global industry perspective, obtained using Equation (12) are shown in Figure 6 (in the Annex).

Despite their differences, both calculation methods indicate the same periods of economic downturns in the global economy. Periods, with the negative total values in Figures 3 and 5 (in the Annex) indicate economic downturns (or troughs), as denoted by Martin and Gardiner (2019). The last years with positive total values in these figures could be denoted as the onsets of the shocks worldwide (Figure 7 in the Annex).

The industrial performance and industrial competitiveness data allows the accumulation of results into a global industry perspective as well (Figures 4 and 6), producing total yearly values that are identical to those of the Country perspective (Figures 3 and 5). The negative total values in these figures correspond to some large-scale global economic recessionary events that are identified and described in the literature as follows:

- The Asian financial crisis of 1997 (Haggard, 2000).
- The NASDAQ crash following the dot-com bubble burst in March 2000 (Tseng, 2004).
- The Global financial crisis in September 2008 (Kok et al., 2022).
- The Euro area sovereign debt crisis from May 2010 to the second half of 2013 (Kok et al., 2022).

Figures 3 and 5 show the most significant negative results for economic performance in Europe in 2012, revealing a regional recessionary shock in Europe. However, most industries worldwide can be identified as having negative results in 2012 in Figures 4 and 6. A number of economies on continents other than Europe (India, Pakistan, Brazil, Indonesia, Hong Kong, South Africa) are identified as having significant negative results in 2012 as well. China, Vietnam, Laos, Ukraine, Peru, and Nigeria were among the gainers of IC value in 2012 and thus compensated for the losses of the others in terms of global economic performance during this period. This case is somewhat misleading as it shows a small number of countries being compensating for the losses of the others, resulting in positive global aggregate economic growth (see year 2012 in Figure 7 in the Annex). Figures 4 and 6 indicate disruptions in the performance of nearly all industries along the production chain in 2012, and the aggregate results suggest that the economic turbulence in 2012 was as significant as during the other shocks in the analysed period.

- The energy market crisis and the Ukraine crisis of 2014 (Van de Graaf & Colgan, 2017) as well as to the European migrant crisis 2015-2016 (Scipioni, 2018). Figures 3 and 5 show that the majority of economies recorded a negative performance in 2015.
- The COVID-19 pandemic from 2020 onwards (Kok et al., 2022).

In the literature, recovery from a shock is considered in literature as completed when an economy reaches its pre-shock performance level, although in cases of hysteretic recessions, the growth path and growth rate may be different after recovery (Martin, 2012; Martin & Gardiner, 2019). In line with this notion, Figure 8 shows the observed peak-to-peak performance (Martin & Gardiner, 2019) of the global aggregate IC value throughout the observed period, indicating the changes in the growth path and growth rate of the global economy. As the onsets and troughs of the shocks remain as in Figure 7, the recoveries can be considered completed empirically as soon as the IC value returns to the pre-shock level (years 2000 and 2017 in Figure 8) or exceeds it (years 2003, 2011, and 2014).

Steep growth in the global economy occurred from 2003 through 2008, between the two turbulent periods (Figure 8 in the Annex). The positive IC value development statistics of the industries along the production chain, as shown in Figures 4 and 6, indicate that there is no need to include this period in further analyses of economic resilience.

4.3. Applicability of the competitiveness method

The identified shock and recovery periods allow for the conventional evaluation of resistance and recoverability (the evaluation approach used by Martin (2012), Martin and Gardiner (2019) and Hundt and Grün (2022)) – the two main components of national resilience – when the recessionary events and recoveries from them last one or more years in the global economy. This approach can be applied in two ways:

1. When the national resilience calculation method is used, resistance and recoverability values for each Country are obtained from Equation (3). This method requires data on IC value fluctuations at the Country level of detail. However, the data panel has to be sufficient to represent the IC value fluctuations at the global level as well, so the volatility in each Country's IC values can be benchmarked against the global IC value fluctuations during either a shock or a recovery period.
2. When the competitiveness calculation method is used (Equation 10), it is sufficient to have data on IC values at the Country level. The calculations can be completed even if one has the data panel of just one Country, independently from the global IC value fluctuation dynamics. For inter-country comparisons, several Countries of interest could be included in the analysis independently from their locations. The values of a Country's resilience components can be obtained by using Equations (14) and (15) to produce the national competitiveness results along with the global RC factor value for the respective period (Table 2).

Table 2

RC factors during the identified shocks and recovery periods

		Global		Resilience
Period	RC factor	IC change*	Intercept**	component
1997 – 1998	17.646	-1.363	1	Resistance
1999 – 2000	15.764	1.440	-1	Recoverability
2001	26.994	-0.894	1	Resistance
2002 – 2003	8.485	2.739	-1	Recoverability
2009	9.800	-4.093	1	Resistance
2010 – 2011	4.871	7.394	-1	Recoverability
2012	142.601	0.304	-1	Resistance
2013 – 2014	40.561	1.078	-1	Recoverability
2015	16.718	-2.679	1	Resistance
2016 – 2018	15.260	2.760	-1	Recoverability
2020	29.830	-1.490	1	Resistance

Source: Authors' results.

* Global IC change, $ million, $(IC_w^t - IC_w^{t-x})$

** Intercept has the opposite sign to the global IC change value

Figures 3, 5 and 8 (in the Annex) indicate a positive economic performance of some Countries in the first year of a shock or recovery period and a negative economic performance in the second year, or vice versa. These differences in consecutive years produce unique RC factor values of two- or three-year resistance and recovery periods (in Table 2), which do not correspond to the sum of yearly RC factor values in the respective periods, as shown in Table 1.

The direct correlation between national resilience and competitiveness variables means that both calculation methods are capable of providing similar inter-country comparison results but at different scales of measurement. For example, when the goal is to compare the resilience of several countries, this research shows that it is sufficient to evaluate the countries' competitiveness by applying the Equation (10). This comparison is as effective as using the relative resilience calculation method by applying Equation (3), except the latter demands a significantly larger data panel that contains the global economic performance results to be used as benchmarks.

The difference in scales of measurement between the national resilience and competitiveness is captured in the RC factor value, which is time-specific, but the same for all the observed Countries. Depending on the period-specifics of the global economy, when the RC factors are applied, there is a direct correlation between the resistance and competitiveness of all Countries during the recessionary shocks, as well as between recoverability and competitiveness during the recoveries (Figure 10 in the Annex). Each period is associated with a different RC factor, which is calculated by applying Equations (14) or (15).

4.4. Discussion

Scientists face the challenge of studying the same global economic problems in different environments, beginning with the 'economic geography' of Krugman (1992) through to the regional resilience theory and models of Martin and Sunley (2014), Martin et al. (2016), Di Pietro et al. (2020) and Oprea et al. (2020). Scientific research has highlighted the uniqueness of economies as well as the varying development patterns in every region. When looking at the regional level, resilience is a highly complex multidimensional property of regional economic systems (Martini, 2020) that consists of many variables and is a dynamic and multifaceted process with constantly changing characteristics (Martin, 2012; Martin & Sunley, 2014). Di Pietro et al. (2020) and Ženka et al. (2021) defined resilience as the ability of economies to respond to undesired external disturbances. In the presence of externalities that significantly affect the development of regional economies, there is a tendency to focus on industrial specialisation rather than diversification (Martin et al., 2016; Picek & Schröder, 2018; Hundt & Grün, 2022), which offers limited possibilities to obtain robust results. Furthermore, the diverse industries of an economy can be linked to various networks of external relations, resulting in different degrees of resilience (Martin, 2012), which makes the resilience problem more difficult to solve.

This research invites one to look at the issue of resilience from a global perspective in which all the external economic relations become internal and all different industrial networks become internal, in line with the Lewis et al.'s (2021) idea of quantifying of the global economic performance. The data in the ICIOTs are sufficient to capture the economic environment and specifics of the majority of the world's economies and identify the global economic development trends. The chosen holistic approach considers the global economy to be a united system of interconnected elements, consisting of interactions between all economies (Dicken, 2003), assuming that most externalities are internalised into the variables within the data panel. According to Martin (2012), external disturbances of a regional economy come from the economic performances of other regions of common business relations. However, when all other regions are evaluated along within the global context, the empirical evidence of this research implies that all economic sectors (industries) within all economies are self-interested competitors for a better position in trade. This implication complies with the Adam Smith's invisible hand theory (Manis, 2005; Butler, 2011).

Conroy (1975) and Martin (2012) argued that a regional industrial mix (or portfolio) acts as one input to resilience. This research proves that there is a relationship between relative resilience, as defined by Martin and Gardiner (2019) and competitiveness, expressed through a Country's proportional losses or gains in IC

value, independently of the contents of it. Production portfolio contents may influence a Country's ability to compete in the international market, but this should be analysed in the future studies.

The findings of this study also show that all industries within the Countries contribute to the international market performance as their competitiveness helps in bypassing or redeveloping disrupted production chains faster and more effectively.

The relative resilience concept of Martin and Gardiner (2019) is designed to compare regions by their ability to resist to recessionary shocks or to recover from them. This research shows that a comparison of Countries' competitiveness reflects a comparison of their resilience (resistance and recoverability). Accordingly, the resilience of Countries can be compared through their competitiveness, without including the RC factor in the calculations. However, the RC factor may be an important target of future studies. When the periods of shocks are analysed, Figures 11 and 12 (in the Annex) highlight similar correlation rates (or RC factors) between national resilience and competitiveness during different shocks, except for the shock in 2012. Similar correlation rates imply similar behaviour of the contributors to the performance of the global economy. For the periods of recoveries, Figures 13 and 14 (in the Annex) show different correlation rates between national resilience and competitiveness, suggesting differing behaviour of the contributors to the global economy during most of the recovery periods, except for the recoveries of 1999 to 2000 and 2015 to 2018. The designation and applicability of these correlation rates (RC factors) could be investigated in further in-depth analyses, potentially leading to the quantification of recessionary period specifics.

This research employs linear regression analysis in parallel with the mathematical equation calculations to cross-check and confirm the reliability of the direct correlation results between national resilience and competitiveness through a period-specific RC factor.

5. CONCLUSION

This study's holistic approach internalises most externalities. In this respect, the resilience of a country becomes its ability to compete in the international market when the world faces increased resource scarcity. Consequently, the main determinants of resilience, are linked to the basics of human behaviour.

The proposed statistical methods of evaluating the resilience and competitiveness of a country are mathematically proved to be directly correlated through a global rate (the RC factor) that is applicable to all countries. Both calculation methods are capable of providing similar inter-country comparison results, yet the competitiveness evaluation (calculating a country's proportional losses or gains in IC value during a defined period) is more practical and convenient.

The production portfolio specifics of a country are not found to be a deciding factor, as long as the country is able to compensate for losses in IC values in some industries through gains in other ones. Future studies could consider the implication that production portfolio contents could influence a nation's ability to compete in the international market.

The RC factor is a period-specific global rate that links the results of the two national performance evaluation methods (resilience and competitiveness). This research highlights the more effective applicability of evaluating national economic performance, which produces the same inter-country comparison results as the resilience method. The RC factor could be the subject of further in-depth research as it could potentially lead to the quantification of specifics of periods of recessionary shocks and recoveries.

The results of industrial performance (relative resilience at the industry level) or industrial competitiveness (excluding national industrial portfolio contributions), accumulated to the global perspective, produce an aggregated view of global economic performance through two perspectives – country and industry. The country perspective allows for the identification of disruptions to economies in

different regions of the world, while the industry perspective provides insights into disruptions in global production chains on an annual basis. Both calculation methods identify the periods of global recessionary disruption in a quantified manner, and these periods correspond to global economic recessionary events highlighted in scientific literature. The results imply the applicability of both methods for the effective quantified identification of the global recessionary events, but the industrial competitiveness calculation is more practical.

The direct correlation between national resilience and competitiveness opens a range of new possibilities for future resilience studies in terms of national competitiveness. Furthermore, decision-making bodies anywhere in the world can effectively and to conveniently adapt these economic performance measuring methods, proposed in this study, to estimate national or even global economic performance.

The most recent statistical data available for this research is from the year 2020. The findings could be renewed and updated once the OECD publishes the updated version of the ICIOTs for 2021 and later periods.

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REFERENCES

Alhanatleh, H., Khaddam, A., Abudabaseh, F., Alghizzawi, M., & Alzghoul, A. (2024). Enhancing the public value of mobile fintech services through cybersecurity awareness antecedents: A novel framework in Jordan. *Investment Management and Financial Innovations, 21*(1), 417-430. https://doi.org/10.21511/imfi.21(1).2024.32

Athief, F.H.N., Zaky, R.A., Virgiawan, R., Fathoni, M.A., & Rofiqo, A. (2024). Capturing Islamic bank performance in Indonesia during the COVID-19 crisis: RGEC and SCNP approaches. *Banks and Bank Systems, 19*(2), 15-29. https://doi.org/10.21511/bbs.19(2).2024.02

Briguglio, L., Cordina, G., Farrugia, N., Vella, S. (2009). Economic vulnerability and resilience: Concepts and measurements. *Oxford Development Studies, 37*, 229–247. https://doi.org/10.1080/13600810903089893

Butler, E. (2011). The condensed wealth of nations and the incredibly condensed theory of moral sentiments. https://static1.squarespace.com/static/56eddde762cd9413e151ac92/t/56fbaba840261dc6fac3ceb6/1459334065124/Condensed_Wealth_of_ Nations_ASI.pdf.

Cambridge Dictionary. 'Direct correlation' - connection or relationship between two or more facts going in a straight line. https://dictionary.cambridge.org/example/english/direct-correlation

Conroy, M.E. (1975). The concept and measurement of regional industrial diversification. *Southern Economic Journal 41*, 492.

Cuadrado-Roura, J.R., & Maroto, A. (2016). Unbalanced regional resilience to the economic crisis in Spain: a tale of specialisation and productivity. *Cambridge Journal of Regions, Economy and Society, 9*, 153–178. https://doi.org/10.1093/cjres/rsv034

Delgado-Bello, C., Sachez, A.M., Ubeda, M.A. (2023). Resilience and economic structure: The case of the Chilean regions during the Asian crises and the great recession of 2008. *Papers in Regional Science 102*, 31–51. https://doi.org/10.1111/pirs.12719

Di Pietro, F., Lecca, P., Salotti, S. (2020). Regional economic resilience in the European Union: a numerical general equilibrium analysis. *Spatial Economic Analysis 0*, 1–26. https://doi.org/10.1080/17421772.2020.1846768

Dicken, P. (2003). Global shift: Reshaping the global economic map in the 21st century. *Sage.*

Dunne, J.P., & Tian, N. (2015). Military expenditure, economic growth and heterogeneity. *Defence and Peace Economics 26*, 15–31. https://doi.org/10.1080/10242694.2013.848575

Eurostat (2013). The European system of national and regional accounts (ESA 2010). European Commission https://doi.org/10.2785/16644

Eurostat (2021). The NUTS classification - Nomenclature of territorial units for statistics - is a hierarchical system for dividing up the economic territory of the EU and the UK. https://ec.europa.eu/eurostat/web/nuts/overview

Eurostat (2023). National Accounts (NAs) - sometimes called macroeconomic accounts are statistics focusing on the structure and evolution of economies. They describe and analyse, in an accessible and reliable way, the economic interactions (transactions) within an economy. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:National_accounts_(NA)

Gat, A. (2006). War in Human Civilization. *OUP E-Books, OUP Oxford.*

Giannakis, E. & Bruggeman, A. (2017). Economic crisis and regional resilience: Evidence from Greece. *Papers in Regional Science 96*, 451 – 476. https://doi.org/10.1111/pirs.12206

Gregg, P., Wadsworth, J., & 2010. Employment in the 2008–2009 recession. *Econ Lab Market Rev 4*, 37–43. https://doi.org/10.1057/elmr. 2010.111

Haggard, S. (2000). The political economy of the Asian financial crisis. *Peterson Institute.*

Hamilton, J.D. (1989). A new approach to the economic analysis of nonstationary time series and the business cycle. *Econometrica 57*, 357–384. http://www.jstor.org/stable/1912559

Hidayati, S., Marwa, T., Andaiyani, S., & Abukosim (2024). Reviewing the consequence of trade openness and financial openness on banking stability in developing countries. *Banks and Bank Systems, 19*(1), 112-125. https://doi.org/10.21511/bbs.19(1).2024.10

Hundt, C., & Grün, L. (2022). Resilience and specialization – how German regions weathered the great recession. *ZFW – Advances in Economic Geography 66*, 96–110. https://doi.org/10.1515/zfw-2021-0014

Kahler, M. (2004). Economic security in an era of globalization: definition and provision. *The Pacific Review 17,* 485–502. https://doi.org/10.1080/0951274042000326032

Kok, C., Mongelli, F.P., Hobelsberger, K. (2022). A tale of three crises: synergies between ECB tasks. *ECB Occasional Paper 2022/305*. https://dx.doi.org/10.2139/ssrn.4219400

Krugman, P. (1992). Geography and trade. *MIT press*

Kudej, M., Gavurova, B., & Rowland, Z. (2021). Evaluation of the selected economic parameters of Czech companies and their potential for overcoming global crises during the Covid-19 pandemic. *Journal of International Studies, 14*(1), 258-275. https://doi.org/10.14254/2071-8330.2021/14-1/18

Leontief, W.W. (1936). Quantitative input and output relations in the economic systems of the United States. *The Review of Economics and Statistics 18*, 105–125. http://www.jstor.org/stable/1927837

Lewis, L.T., Monarch, R., Sposi, M., Zhang, J. (2021). Structural Change and Global Trade. *Journal of the European Economic Association 20*, 476–512. https://doi.org/10.1093/jeea/jvab024

Manis, J. (2005). An inquiry into the nature and causes of the wealth of nations by Adam Smith. *An electronic classics series publication of Pennsylvania State University.* https://www.rrojasdatabank.info/Wealth-Nations.pdf

Martin, R. (2012). Regional economic resilience, hysteresis and recessionary shocks. *Journal of Economic Geography 12*, 1–32. https://doi.org/10.1093/jeg/lbr019

Martin, R., & Gardiner, B. (2019). The resilience of cities to economic shocks: A tale of four recessions (and the challenge of Brexit). *Papers in Regional Science 98*, 1801–1832. https://doi.org/10.1111/pirs.12430

Martin, R., & Sunley, P. (2014). On the notion of regional economic resilience: Conceptualization and explanation. *Journal of Economic Geography 15*, 1–42. https://doi.org/10.1093/jeg/lbu015

Martin, R., Sunley, P., Gardiner, B., Tyler, P. (2016). How regions react to recessions: Resilience and the role of economic structure. *Regional Studies 50*, 561–585. https://doi.org/10.1080/00343404.2015.1136410

Martini, B. (2020). Resilience and economic structure. are they related? *Structural Change and Economic Dynamics 54*, 62–91. https://econpapers.repec.org/article/eeestreco/v_3a54_3ay_3a2020_3ai_3ac_3ap_3a62-91.htm

Mascaretti, A., Dell'Agostino, L., Arena, M., Flori, A., Menafoglio, A., Vantini, S. (2022). Heterogeneity of technological structures between EU countries: An application of complex systems methods to input–output tables. *Expert Systems with Applications 206*, 117875. https://doi.org/10.1016/j.eswa.2022.117875

Milgrom, P. (2017). Discovering Prices: Auction Design in Markets with Complex Constraints. *Columbia University Press.*

Mishchuk, H., Czarkowski, J. J., Neverkovets, A., & Lukács, E. (2023). Ensuring Sustainable Development in Light of Pandemic "New Normal" Influence. *Sustainability*, *15*(18), 13979. https://doi.org/10.3390/su151813979

Montrimas, A., Bruneckiene, J., Giziene, V. (2023). Measuring economic resilience through industrial portfolio: The cases of new EU member states since 2004. *Engineering Economics 34*. https://doi.org/10.5755/j01.ee.34.5.35515

Musayev, V. (2016). Externalities in military spending and growth: The role of natural resources as a channel through conflict. *Defence and Peace Economics 27*, 378–391. https://doi.org/10.1080/10242694.2014.994833

Navarro-Espigares, J.L., Martin-Segura, J.A., Hernandez-Torres, E. (2012). The role of the service sector in regional economic resilience. *The Service Industries Journal 32,* 571–590. https://doi.org/10.1080/02642069.2011.596535

OECD (2023). OECD Inter-Country Input-Output database. http://oe.cd/icio

Oprea, F., Onofrei, M., Lupu, D., Vintila, G., Paraschiv, G. (2020). The determinants of economic resilience. the case of Eastern European regions. *Sustainability 12*. https://doi.org/10.3390/su12104228

Pamucar, D., Sarkar, B.D., Shardeo, V., Soni, T.K., Dwivedi, A. (2023). An integrated interval programming and input–output knowledge model for risk and resiliency management. *Decision Analytics Journal 9*, 100317. https://doi.org/10.1016/j.dajour.2023.100317

Picek, O., & Schröder, E. (2018). Spillover effects of Germany's final demand on Southern Europe. *The World Economy 41*, 2216– 2242. https://EconPapers.repec.org/RePEc:bla:worlde:v:41:y:2018:i:8:p:2216-2242

Ron, J. (2005). Paradigm in distress? Primary commodities and civil war. *The Journal of Conflict Resolution 49*, 443–450. http://www.jstor.org/stable/30045126

Ross, M.L. (2004). What do we know about natural resources and civil war? *Journal of Peace Research 41*, 337–356. http://www.jstor.org/stable/4149748

Scipioni, M. (2018). Failing forward in EU migration policy? EU integration after the 2015 asylum and migration crisis. *Journal of European Public Policy 25*, 1357–1375. https://doi.org/10.1080/13501763.2017.1325920

Tjahjanto, H., Tuhana, T., Mafruhah, I., Istiqomah, N., & Ismoyowati, D. (2023). High unemployment, disrupted economic growth and sustainable development goals: Analyzing unemployment reduction. *Economics and Sociology, 16*(1), 106-120. https://doi.org/10.14254/2071-789X.2023/16-1/7

Tseng, K. (2004). Panorama of NASDAQ stock bubbles and aftermath. *American Business Review 22*, 61.

Van de Graaf, T., & Colgan, J.D. (2017). Russian gas games or well-oiled conflict? Energy security and the 2014 Ukraine crisis. *Energy Research & Social Science 24*, 59–64. https://doi.org/10.1016/j.erss.2016.12.018

Ženka, J., Chreneková, M., Kokešová, L., Svetlíková, V. (2021). Industrial structure and economic resilience of non-metropolitan regions: An empirical base for the smart specialization policies. *Land, 10(12),* 1335. https://doi.org/10.3390/land10121335

ANNEX

Region	Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	ARG	0,9	0,8	-0,5	-4,4	-1,8	-1,1	-95,0	0,9	0,5	0,5	0,4	0,4	1,0	-0,2	1,5	0,5	4,4	-1,1	-7,2	2,0	-4,1	1,9	-3,9	-11,8	-2,9
	BRA	-6,5	-0,5	-1,1	-11,0	5,9	-3,7	-26,5	-0,9	0,2	2,0	1,0	0,6	1,4	-0,3	1,5	0,0	-15,5	-8,8	-5,3	-4,3	-2,9	2,2	-1,8	-4,3	-6,1
	CHL	-2,8	0,8	-2,8	-2,3	0,7	-1,7	-10,7	1,0	2,2	1,8	2,7	0,0	-1,8	-0,1	2,0	0,0	-5,2	-3,1	-7,4	-1,9	-0,9	2,0	0,0	-8,3	-1,3
	COL	-11,1	-2,9	-7,2	-8,3	12,1	-1,5	-12,3	-1,7	0,4	1,0	0,1	0,7	1,1	0,0	1,9	0,5	7,2	-0,4	-1,9	-3,3	-3,4	-0,1	-0,3	-6,4	-4,7
Americas	PER	-4,4	0,0	-2,9	-4,3	-0,8	0,9	10,6	-0,5	0,1	0,9	1,4	0,2	0,6	0,4	1,6	0,5	4,0	-2,2	-4,9	-1,0	0,1	1,3	-0,1	-1,0	-3,6
	CRI	-10,5	-1,3	-0,6	-2,7	-3,8	-0,5	-15,1	-1,4	-1,3	-1,5	-1,0	-0,4	-0,7	0,1	0,2	-0,3	4,6	-3,2	-2,8	1,5	2,1	-0,7	-0,8	2,3	0,2
	MEX	-8,4	0,6	-2,5	-2,5	1,7	-0,4	-9,6	-1,6	-0,6	0,3	0,1	-0,6	-0,6	-1,6	0,8	-0,1	-3,2	-1,0	-2,7	-1,6	-2,3	0,2	-0,8	-0,6	-4,2
	CAN	4,6	1,9	-0,5	1,2	3,2	0,0	-5,5	0,2	0,1	0,4	0,1	-0,3	-0,2	-0,8	1,0	-0,2	-0,4	-0,7	-3,2	-1,6	-0,6	0,9	-0,5	0,3	-0,9
	USA	3,3	3,2	2,0	0,0	0,8	0,1	-6,4	-0,8	-0,5	-0,2	-0,6	-0,7	-1,0	-0,2	-0,1	-0,5	2,8	2,6	1,1	0,8	1,0	-0,1	-0,3	1,9	-0,9
	IRL	5,1	3,9	4,0	0,4	-2,5	1,9	13,2	1,4	0,0	-0,1	0,0	0,2	0,0	-0,1	-2,5	-1,7	14,3	9,3	0,5	1,7	2,7	0,8	2,2	-7,7	6,1
	ISL	5,1	-2,9	3,1	0,3	-1,4	-2,0	13,4	0,8	0,6	0,9	-0,9	1,3	-4,6	-2,5	-0,2	-0,2	-9,8	1,6	2,2	0,0	4,6	3,4	-0,3	-5,7	-3,7
	GBR	2,2	4,6	2,3	-1,0	-2,0	0,5	12,6	0,1	0,4	-1,0	0,3	-0,2	-2,1	-0,7	-1,1	-0,6	-4,0	0,2	2,9	-0,1	-1,5	-2,2	0,1	-2,6	-1,1
	NOR	6,9	0,0	-0,9	0,4	0,1	0,7	14,1	0,1	0,3	1,1	0,6	0,6	1,0	-1,1	-0,1	0,3	0,5	-1,6	-4,5	-3,2	-2,9	0,8	0,5	-8,3	-3,1
	SWE	6,1	-1,5	1,3	-0,7	-1,6	-1,7	7,7	0,8	0,4	-0,5	0,2	0,3	-0,3	-0,9	0,3	0,3	-7,4	3,0	-2,3	-1,5	1,0	0,3	-0,4	-7,1	1,3
	FIN	-0,5	-0,8	2,0	-1,0	-1,9	-0,3	8,4	0,8	0,4	-0,5	0,2	0,3	0,3	-0,8	-0,8	-0,2	-13,4	0,4	-1,7	-1,8	1,5	1,4	0,5	-3,7	0,5
	DNK	0,4	-2,9	0,8	-0,6	-2,8	1,4	7,6	0,5	0,1	0,5	0,1	0,4	0,6	-0,6	-1,4	-0,4	-9,0	1,1	-0,2	-1,5	1,6	1,0	0,2	-2,1	0,0
	DEU	-3,1	-3,1	1,6	-1,0	-3,5	0,6	6,3	0,9	0,1	-0,6	-0,2	0,3	0,3	-0,4	-0,8	0,0	-13,9	1,0	0,4	-1,5	1,7	0,6	0,1	-3,6	0,7
	AUT	-1,2	-2,7	2,0	-1,1	-3,1	1,0	13,0	1,0	0,2	-0,2	0,2	0,3	0,9	-0,2	-1,1	-0,1	-10,6	1,8	-1,9	-1,6	0,8	0,8	0,4	-3,0	-0,8
	BEL	-1,9	-2,3	1,8	-0,9	-3,7	0,6	5,0	0,6	0,3	-0,6	0,0	0,3	0,2	-0,4	-0,8	-0,1	-14,2	0,0	0,2	-1,8	1,5	0,0	0,0	-2,7	-0,5
	FRA	-1,0	-2,3	1,9	-0,6	-2,8	1,1	8,7	0,6	0,0	-0,6	-0,3	0,2	0,1	-0,3	-1,1	-0,3	-11,9	2,0	-0,6	-1,6	1,0	0,8	0,1	-3,8	-0,1
	LUX	-1,2	1,4	5,2	2,9	0,7	-0,1	6,7	1,0	0,7	0,1	1,4	0,1	0,6	0,0	0,2	-0,6	-7,9	10,8	7,5	0,6	0,4	1,4	-0,2	2,0	2,0
	NLD	1,2	-2,5	1,7	-1,0	-2,9	0,8	4,3	0,6	0,1	-0,4	-0,2	0,1	0,7	-0,1	-1,0	0,0	-11,1	0,0	-0,6	-1,5	1,2	1,0	0,5	-6,6	-0,3
	CHE	-1,5	-3,6	1,9	-1,6	-3,6	1,0	18,7	0,3	0,2	-0,8	-0,3	0,2	1,1	0,6	-0,1	0,6	-3,7	3,0	0,0	0,3	0,8	-0,1	0,0	0,9	1,9
	PRT	2,2	-1,8	1,5	-1,9	-3,4	0,4	5,2	0,6	0,1	-0,8	-0,7	0,2	0,4	-0,3	-1,3	-0,7	-22,1	0,9	-0,6	-1,5	1,4	1,6	0,4	-0,7	0,7
	ESP	3,4	-1,9	2,3	-0,3	-2,5	1,7	24,9	1,2	0,3	0,0	0,1	0,2	-0,7	-0,6	-2,0	-0,8	-18,8	-1,2	0,6	-1,4	1,1	0,8	0,5	-0,9	-1,1
Europe	ITA	5,4	-1,2	1,1	-1,4	-3,1	0,8	9,6	0,7	0,1	-0,7	-0,4	0,2	-0,2	-0,7	-1,1	-0,2	-19,2	-0,7	-1,0	-1,9	1,0	0,7	0,1	-3,5	-0,7
	CYP	1,1	-2,8	4,2	-1,2	-3,5	1,2	16,9	0,6	0,1	-0,5	0,0	0,6	0,3	0,8	-1,9	-0,7	-21,6	-4,8	-1,9	0,4	3,5	2,2	0,5	-4,2	0,3
	MLT	-4,3	-2,3	1,9	-1,0	0,0	-2,5	16,4	0,7	-0,8	-0,7	0,7	0,8	2,1	1,6	-1,1	-1,7	-2,2	7,6	4,9	1,1	5,7	2,1	1,0	6,0	0,2
	SVN	-5,9	-3,9	0,4	-3,1	-5,3	-0,7	8,2	0,6	0,2	-0,4	0,5	0,9	0,5	-0,7	-1,2	-0,5	-18,7	0,2	1,3	-1,2	1,9	2,2	0,8	-2,9	0,2
	HRV	1,2	-0,8	-2,3	-5,0	-4,8	1,8	26,4	1,6	0,7	0,3	0,3	0,4	0,0	-0,8	-1,9	-0,6	-18,4	-5,2	-1,3	-1,3	2,1	0,5	1,2	1,4	0,2
	CZE	1,9	-3,4	0,1	-3,0	-2,6	2,8	31,2	1,3	0,6	0,3	1,5	0,8	1,3	-1,1	-0,7	0,3	-20,4	-3,6	-0,9	-1,2	1,8	1,6	0,9	-4,5	-2,2
	EST	-6,1	1,9	2,4	-2,5	-1,0	2,4	22,2	1,6	0,6	0,4	0,6	0,8	-0,6	-1,4	0,0	0,8	-9,0	6,1	0,7	-1,7	2,9	1,8	0,7	-0,4	-0,4
	LVA	-3,0	2,9	2,3	-1,3	3,6	1,1	14,3	1,0	0,5	0,6	2,0	1,2	-0,6	-1,8	-0,7	0,3	-5,6	6,6	-3,6	-2,1	-0,1	0,9	0,8	-3,9	0,2
	LTU	-1,2	-0,3	1,3	-4,4	1,6	2,6	30,0	1,9	1,0	1,2	0,9	0,7	1,8	-2,0	-0,3	0,4	-5,7	7,6	-0,3	-1,5	1,0	1,8	1,5	5,4	2,4
	SVK	1,1	0,1	-1,0	-6,9	-3,1	-0,6	23,8	1,3	-0,1	0,2	0,9	1,9	2,5	-0,6	-1,0	0,1	-11,1	0,4	1,3	-0,8	2,2	0,7	1,0	-7,0	-1,9
	POL	-6,4	-3,8	0,6	-4,2	-2,1	3,2	0,1	0,0	0,6	1,1	1,1	1,1	1,7	-1,5	0,1	-0,2	-13,7	3,3	0,1	-0,7	1,2	2,3	0,9	1,0	-0,6
	HUN	-12,4	-4,5	-2,1	-3,0	-4,1	1,9	27,9	0,7	0,1	0,4	-0,7	0,1	0,0	-1,2	-1,4	-0,1	-21,9	1,8	0,4	-1,3	2,9	1,1	0,4	-1,7	-2,5
	GRC	-2,3	-3,3	-1,0	-0,9	-4,2	1,0	19,8	0,7	0,6	-0,9	0,1	0,1	-0,2	0,0	-2,5	-1,4	-19,1	5,2	0,0	-2,2	-0,2	0,7	0,4	-4,4	-3,0
	BGR	-53,6	-33,2	0,6	-7,7	-3,5	1,4	13,6	1,5	1,3	0,3	0,5	0,8	-0,1	-0,4	-1,5	0,4	-13,1	-1,6	4,9	-1,0	0,2	2,3	0,6	-0,3	0,2
	ROU	-16,8	-23,5	-11,4	-13,0	-11,2	-4,2	-13,2	-0,1	0,3	0,5	1,2	1,4	1,3	-1,0	-0,4	0,0	-15,0	8,3	0,4	-1,5	1,1	0,8	0,5	0,8	-0,2
	UKR	-39,4	0,9	-7,2	-12,8	-7,0	3,4	17,5	0,7	1,5	0,0	-0,1	0,3	-0,9	-3,4	-0,2	0,0	12,5	-1,2	-22,7	-7,9	-2,6	-0,3	-0,2	10,5	1,1
	BLR	-32,8	-13,1	-11,5	-26,2	-22,4	-7,3	-55,2	-1,9	0,0	1,3	0,6	0,2	1,8	-2,2	0,8	-2,5	-49,1	-19,9	-11,8	-5,2	-7,1	3,0	0,0	-0,9	-3,3
	RUS	-14,1	-4,7	-15,3	-19,5	2,7	0,4	-14,9	0,0	0,8	0,9	1,3	0,7	0,8	-2,4	1,5	0,8	-2,2	-3,2	-10,9	-5,3	-3,1	5,5	-0,1	-2,3	-3,8
	TUR	-29,8	-15,0	-12,0	-14,7	-10,7	-12,0	-21,8	-0,6	0,5	0,7	-1,1	-0,2	-1,1	-1,1	0,1	-0,5	-1,5	0,9	-5,6	-1,8	-1,7	-2,6	-4,3	-14,5	-4,2
	KAZ	-26,0	-2,2	-3,7	-6,0	0,3	3,3	-9,5	0,3	2,2	2,4	2,4	-0,3	0,9	-1,9	22,3	0,5	-0,8	2,0	-8,6	-3,2	-11,3	7,9	-1,7	-8,5	-2,8
	CHN	6,0	3,9	4,4	1,9	2,9	1,8	4,5	0,6	0,8	2,1	2,2	1,4	1,6	1,7	0,2	0,9	20,7	12,4	4,9	2,2	-2,9	-0,8	0,3	1,5	1,2
	HKG	2,9	0,8	-1,2	0,0	0,6	-0,1	-0,1	-0,7	-0,4	0,0	-0,2	-0,4	-1,1	-0,2	0,3	-1,0	-9,7	-9,7	-2,9	0,7	0,8	-0,7	-0,9	2,0	0,3
	TWN	1,1	1,0	-2,9	1,3	1,4	-2,1	1,6	-0,9	-0,6	-0,3	1,4	-0,6	-1,5	-0,8	1,8	-0,3	-5,9	-1,6	-1,1	-0,9	-0,2	1,3	-0,7	-0,2	4,1
	KOR	3,1	-2,8	-8,3	5,9	2,8	-2,0	18,7	-0,2	0,2	1,1	0,7	0,0	-1,7	-0,3	1,5	0,1	0,3	3,2	1,4	-0,2	0,1	1,0	0,0	-4,8	0,3
	JPN	-8,2	-2,6	-2,9	2,7	2,4	-2,1	-9,9	-0,2	-0,1	-0,8	-1,1	-0,7	1,1	0,3	0,7	0,0	-0,5	-20,5	-5,9	-1,2	3,9	-0,6	-0,4	1,0	0,2
	LAO	-8,5	-8,5	-17,2	-17,1	-2,2	-1,4	-17,6	-1,1	-0,7	1,7	1,9	0,4	1,5	1,8	0,8	1,4	27,9	15,7	2,7	3,6	6,1	1,0	-0,5	4,0	0,2
	MMR	-1,2	-6,1	-17,7	-4,2	7,9	-0,3	-41,4	-3,9	-2,0	-1,4	-0,9	-0,9	2,6	4,7	1,6	2,1	4,7	-7,1	0,0	-1,2	1,4	-0,9	-0,5	-4,5	1,2
	BGD	2,9	1,3	-0,8	-2,1	-1,2	1,1	3,8	-0,7	-0,8	-0,3	-0,1	-0,5	-0,5	1,6	-0,6	-1,4	-1,6	14,2	4,3	2,7	3,9	1,4	0,3	7,5	0,5
	BRN	4,6	1,0	-7,2	5,5	13,1	-1,0	12,6	0,2	0,6	1,9	2,0	-0,9	2,6	-1,9	1,4	2,0	3,9	-7,7	-4,6	-4,4	-5,5	3,3	1,0	0,6	-3,3
	MYS	9,4	-0,4	-8,0	1,3	4,3	-0,8	11,2	-0,2	-0,1	0,6	-0,2	0,3	1,1	-0,3	1,1	-0,2	-2,8	-3,3	-6,3	0,8	1,1	-0,5	0,9	3,3	-0,7
Asia/Oceania	IDN	4,9	-2,1	-20,9	5,0	1,1	-2,7	10,8	0,1	-0,8	-1,1	0,7	-0,1	-0,2	1,2	2,0	0,0	-6,0	-11,1	-6,7	-0,7	1,9	0,4	-1,3	5,3	-0,6
	PHL	-0,6	-1,8	-7,5	2,5	-2,8	-1,8	12,6	-0,6	-0,4	0,4	1,4	0,6	0,0	0,4	0,8	-0,5	9,8	-2,2	-0,1	1,2	1,5	-1,1	-1,4	7,1	-0,3
	AUS	8,4	1,0	-2,5	1,9	-2,9	-0,6	18,4	1,2	0,6	0,3	-0,4	0,5	-0,3	0,7	1,5	0,4	0,3	-9,8	-5,7	-1,9	1,9	1,4	-0,7	-3,0	1,6
	NZL	6,3	0,8	-3,7	-1,0	-2,0	-0,3	10,5	1,0	0,8	0,4	-1,5	0,3	-1,1	-0,2	0,1	0,1	6,7	7,2	0,6	-0,8	1,0	1,0	-0,3	0,6	0,3
	SGP	9,0	1,5	-2,1	-1,8	1,3	1,2	11,6	-0,1	0,2	1,0	1,1	0,1	-1,4	1,2	1,3	-0,2	2,1	1,0	0,4	0,4	0,9	0,8	0,6	0,3	-0,9
	THA	4,0	-6,2	-7,5	1,0	0,7	-0,3	14,8	0,3	0,2	0,3	0,7	0,6	0,2	0,7	1,1	-0,9	4,5	1,0	-3,9	0,3	0,6	0,9	0,4	6,6	-0,6
	VNM	10,8	3,8	-0,5	0,1	2,9	4,0	10,7	0,1	1,2	0,4	0,3	-0,3	0,4	1,1	-1,7	-0,9	23,4	10,9	7,7	3,1	6,4	0,3	0,0	5,5	1,5
	KHM	-4,3	-0,5	-5,2	0,1	0,3	5,6	7,2	-0,7	-0,2	0,1	1,1	-0,1	-1,0	1,1	-0,2	-0,4	13,0	3,5	3,7	2,4	4,5	1,7	1,1	11,7	-1,8
	PAK	-5,5	-3,0	-0,6	-3,1	-2,7	-1,7	17,0	0,0	-0,6	-0,6	-0,3	-0,2	-3,2	0,1	-0,3	-0,6	-12,5	-8,3	-3,2	1,0	2,6	0,5	-1,8	-19,4	-1,2
	IND	2,6	2,0	-2,6	-0,6	-1,3	1,1	-0,6	0,0	0,3	0,6	0,0	0,6	-0,9	0,4	0,4	-2,2	-24,7	-8,0	-1,7	-0,3	-0,3	1,0	0,0	0,0	-2,0
	SAU	10,9	2,1	-5,6	5,3	8,4	-0,3	7,2	0,7	0,8	2,6	0,2	-0,5	1,5	-2,3	1,7	1,9	8,6	-5,4	-4,3	-4,0	-0,5	2,8	2,3	-1,2	-5,8
	JOR	-6,4	1,9	-1,0	-1,2	-1,0	2,9	19,7	-0,6	0,4	0,7	0,3	-0,2	0,6	1,8	-0,5	-0,8	1,5	11,1	-1,3	-0,7	1,0	3,9	-0,9	8,1	0,0
	ISR	-0,3	-1,8	0,3	-2,4	4,7	-0,3	-23,0	-0,4	-0,1	-0,2	0,1	0,3	1,3	-0,5	0,5	-0,3	-1,7	9,8	-0,1	0,2	2,5	2,2	0,0	5,9	2,6
	EGY	4,6	2,7	2,5	1,2	0,4	-1,6	-17,9	-2,7	-0,8	0,1	0,6	0,9	-0,6	0,5	-1,2	-0,4	-5,6	-10,2	-3,8	-1,0	-7,3	-12,7	-0,4	8,9	1,6
	MAR	6,7	-2,9	0,5	-0,7	-3,1	0,8	3,7	0,4	-0,2	0,1	0,0	-0,1	2,0	-0,5	-0,2	0,5	-6,0	-1,9	20,9	-1,4	-0,3	0,7	0,2	2,3	-1,8
	SEN	-0,9	-2,8	3,3	-3,5	-2,0	-0,2	10,3	1,3	0,5	-0,4	-0,8	0,2	1,0	1,3	-0,7	-0,2	-7,6	1,5	2,6	-0,4	1,8	1,9	0,9	2,1	1,8
	CMR	4,1	-2,0	1,4	-1,6	-4,3	1,1	13,7	1,0	0,1	-0,7	-0,4	0,5	0,9	0,5	-1,7	-0,1	-7,5	7,8	0,1	-1,4	1,8	-0,6	0,3	-1,7	0,6
Africa	CIV	11,6	-2,6	1,9	-1,4	-7,1	0,2	22,6	0,4	-0,4	-0,1	-0,3	-0,4	1,3	1,0	-1,4	-1,2	0,0	15,7	8,4	0,0	1,8	0,7	0,6	6,6	1,4
	NGA	-14,1	1,4	-3,9	-0,7	7,5	-4,0	19,0	-1,1	-0,3	0,3	3,6	-0,9	1,4	-1,9	1,6	-0,3	-0,8	-12,3	1,5	-3,3	-10,3	-6,2	-0,3	5,0	-5,8
	TUN	6,8	-2,7	1,2	-0,3	-4,1	1,0	-0,1	0,2	0,0	-0,6	-0,3	0,5	1,3	-0,4	-0,8	-1,2	-4,4	-6,6	-5,3	-1,5	-2,5	-3,5	-1,8	-6,1	-0,2
	ZAF	-8,7	-0,7	-2,4	-1,3	0,2	-2,5	-19,2	2,5	1,1	0,1	-1,0	-0,8	-2,5	0,3	1,5	-0,7	-13,6	-16,4	-7,0	-1,6	-3,8	2,3	-1,3	-7,7	-4,0
	ROW	2,3	0,1	-1,7	0,1	0,9	1,8	-8,7	-0,3	0,0	1,4	0,8	0,2	0,9	-0,2	1,2	1,4	1,4	-5,0	-4,5	-1,0	0,7	0,5	0,0	4,1	-0,5

Figure 1. National resilience results when benchmarked against the global economic performance

Source: Authors' results.

Region	Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Americas	ARG	-0,001	-0,006	-0,046	-0,105	-0,024	-0,079	-0,474	0,211	0,180	0,121	0,107	0,159	0,137	-0,121	0,202	0,173	0,038	-0,001	-0,101	0,061	-0,139	0,098	-0,173	-0,119	-0,132
	BRA	-0,095	-0,039	-0,067	-0,312	0,217	-0,175	-0,129	0,012	0,145	0,238	0,145	0,184	0,161	-0,134	0,200	0,116	-0,102	-0,065	-0,070	-0,319	-0,107	0,107	-0,047	-0,049	-0,237
	CHL	-0,048	-0,006	-0,118	-0,039	0,053	-0,101	-0,049	0,229	0,388	0,218	0,274	0,113	-0,055	-0,115	0,240	0,120	-0,029	-0,017	-0,103	-0,173	-0,052	0,101	0,060	-0,086	-0,078
	COL	-0,155	-0,102	-0,255	-0,227	0,410	-0,093	-0,057	-0,083	0,164	0,159	0,081	0,187	0,142	-0,104	0,228	0,173	0,057	0,005	-0,015	-0,259	-0,120	0,030	0,040	-0,069	-0,192
	PER	-0,068	-0,025	-0,122	-0,104	0,006	-0,005	0,058	0,055	0,132	0,153	0,177	0,135	0,107	-0,062	0,205	0,174	0,035	-0,010	-0,062	-0,117	-0,025	0,078	0,051	-0,018	-0,153
	CRI	-0,146	-0,061	-0,049	-0,054	-0,088	-0,054	-0,071	-0,044	-0,033	-0,041	0,004	0,069	0,020	-0,097	0,099	0,077	0,039	-0,019	-0,029	0,030	0,030	0,010	0,009	0,012	-0,026
	MEX	-0,120	-0,010	-0,108	-0,047	0,084	-0,051	-0,043	-0,072	0,045	0,105	0,079	0,043	0,024	-0,262	0,141	0,106	-0,015	0,000	-0,027	-0,155	-0,090	0,040	0,010	-0,015	-0,175
	CAN	0,046	0,023	-0,046	0,069	0,131	-0,036	-0,023	0,130	0,134	0,112	0,081	0,078	0,056	-0,180	0,159	0,097	0,004	0,002	-0,035	-0,154	-0,044	0,063	0,030	-0,007	-0,064
	USA	0,030	0,058	0,032	0,031	0,055	-0,034	-0,027	0,024	0,056	0,065	0,027	0,036	0,000	-0,124	0,070	0,055	0,027	0,030	0,035	-0,013	0,001	0,031	0,042	0,008	-0,065
Europe	IRL	0,052	0,077	0,093	0,044	-0,047	0,034	0,072	0,272	0,123	0,074	0,072	0,141	0,069	-0,115	-0,121	-0,082	0,107	0,086	0,024	0,041	0,046	0,060	0,193	-0,081	0,170
	ISL	0,052	-0,103	0,064	0,040	-0,012	-0,110	0,073	0,202	0,189	0,151	0,008	0,262	-0,244	-0,358	0,063	0,089	-0,062	0,022	0,052	-0,058	0,098	0,148	0,041	-0,062	-0,158
	GBR	0,015	0,095	0,042	-0,001	-0,031	-0,020	0,069	0,123	0,173	0,003	0,099	0,087	-0,077	-0,171	0,011	0,051	-0,021	0,010	0,063	-0,067	-0,070	-0,041	0,067	-0,034	-0,071
	NOR	0,076	-0,028	-0,060	0,043	0,036	-0,010	0,076	0,124	0,152	0,167	0,116	0,178	0,139	-0,219	0,069	0,153	0,011	-0,005	-0,056	-0,252	-0,106	0,061	0,088	-0,086	-0,136
	SWE	0,065	-0,065	0,008	0,010	-0,019	-0,098	0,044	0,205	0,168	0,037	0,087	0,149	0,046	-0,196	0,103	0,146	-0,045	0,034	-0,021	-0,150	0,001	0,042	0,038	-0,075	0,011
	FIN	-0,019	-0,046	0,030	0,001	-0,027	-0,049	0,048	0,202	0,166	0,036	0,092	0,151	0,088	-0,185	0,016	0,094	-0,087	0,012	-0,011	-0,169	0,014	0,081	0,087	-0,044	-0,017
	DNK	-0,008	-0,102	-0,007	0,013	-0,058	0,014	0,043	0,171	0,127	0,115	0,078	0,153	0,107	-0,161	-0,035	0,075	-0,056	0,017	0,013	-0,152	0,017	0,067	0,074	-0,029	-0,034
	DEU	-0,052	-0,107	0,019	-0,001	-0,080	-0,014	0,037	0,216	0,133	0,033	0,061	0,147	0,091	-0,142	0,016	0,119	-0,090	0,016	0,023	-0,149	0,019	0,055	0,066	-0,043	-0,009
	AUT	-0,028	-0,097	0,032	-0,002	-0,065	0,001	0,071	0,227	0,144	0,063	0,088	0,151	0,127	-0,123	-0,007	0,103	-0,068	0,024	-0,015	-0,155	-0,005	0,060	0,085	-0,037	-0,060
	BEL	-0,037	-0,086	0,025	0,004	-0,085	-0,014	0,030	0,178	0,155	0,028	0,074	0,141	0,084	-0,147	0,017	0,109	-0,093	0,008	0,020	-0,168	0,013	0,034	0,062	-0,034	-0,049
	FRA	-0,026	-0,086	0,027	0,012	-0,056	0,005	0,049	0,176	0,125	0,032	0,052	0,136	0,074	-0,128	-0,012	0,085	-0,076	0,025	0,006	-0,156	0,000	0,061	0,066	-0,045	-0,038
	LUX	-0,028	0,012	0,132	0,122	0,052	-0,042	0,039	0,226	0,211	0,088	0,176	0,123	0,109	-0,104	0,096	0,042	-0,048	0,099	0,138	-0,022	-0,016	0,081	0,048	0,010	0,034
	NLD	0,003	-0,093	0,021	0,001	-0,058	-0,009	0,027	0,181	0,134	0,045	0,056	0,128	0,118	-0,110	-0,001	0,111	-0,071	0,008	0,007	-0,151	0,005	0,066	0,089	-0,071	-0,044
	CHE	-0,031	-0,120	0,027	-0,018	-0,081	0,000	0,099	0,149	0,143	0,019	0,050	0,133	0,147	-0,036	0,072	0,183	-0,019	0,033	0,015	-0,044	-0,005	0,032	0,059	-0,001	0,029
	PRT	0,016	-0,074	0,015	-0,028	-0,076	-0,021	0,031	0,178	0,135	0,018	0,023	0,132	0,097	-0,135	-0,023	0,038	-0,148	0,016	0,007	-0,152	0,011	0,089	0,081	-0,016	-0,010
	ESP	0,030	-0,076	0,040	0,022	-0,048	0,024	0,131	0,247	0,153	0,079	0,083	0,138	0,022	-0,162	-0,080	0,019	-0,125	-0,002	0,025	-0,146	0,003	0,062	0,088	-0,018	-0,070
	ITA	0,057	-0,058	0,005	-0,013	-0,066	-0,008	0,053	0,192	0,128	0,025	0,045	0,139	0,055	-0,177	-0,005	0,089	-0,128	0,002	0,000	-0,176	-0,001	0,056	0,063	-0,042	-0,057
	CYP	0,002	-0,101	0,098	-0,007	-0,077	0,007	0,090	0,185	0,137	0,042	0,070	0,186	0,090	-0,019	-0,073	0,039	-0,144	-0,031	-0,014	-0,036	0,070	0,107	0,092	-0,048	-0,025
	MLT	-0,067	-0,086	0,029	-0,001	0,032	-0,128	0,088	0,191	0,021	0,023	0,123	0,208	0,210	0,066	-0,010	-0,079	-0,008	0,072	0,095	0,007	0,129	0,106	0,121	0,047	-0,026
	SVN	-0,087	-0,129	-0,017	-0,066	-0,135	-0,065	0,047	0,182	0,144	0,048	0,113	0,215	0,101	-0,174	-0,018	0,062	-0,124	0,010	0,037	-0,132	0,024	0,106	0,105	-0,036	-0,027
	HRV	0,003	-0,049	-0,104	-0,125	-0,120	0,028	0,138	0,295	0,207	0,101	0,095	0,160	0,068	-0,181	-0,074	0,051	-0,122	-0,035	-0,005	-0,140	0,030	0,051	0,134	0,004	-0,028
	CZE	0,011	-0,117	-0,029	-0,063	-0,049	0,068	0,163	0,260	0,197	0,100	0,182	0,201	0,159	-0,210	0,027	0,146	-0,136	-0,022	0,002	-0,132	0,021	0,088	0,112	-0,051	-0,106
	EST	-0,091	0,024	0,043	-0,046	0,001	0,053	0,117	0,297	0,195	0,111	0,117	0,202	0,027	-0,247	0,079	0,204	-0,056	0,059	0,028	-0,159	0,053	0,093	0,103	-0,013	-0,047
	LVA	-0,051	0,050	0,041	-0,008	0,143	0,002	0,077	0,227	0,184	0,126	0,221	0,243	0,028	-0,286	0,024	0,149	-0,032	0,064	-0,042	-0,183	-0,031	0,065	0,106	-0,045	-0,026
	LTU	-0,028	-0,034	0,008	-0,105	0,081	0,058	0,157	0,331	0,245	0,176	0,141	0,186	0,195	-0,304	0,055	0,167	-0,033	0,072	0,012	-0,148	0,001	0,093	0,148	0,041	0,047
	SVK	0,001	-0,023	-0,061	-0,183	-0,065	-0,061	0,125	0,254	0,105	0,098	0,144	0,328	0,237	-0,164	0,001	0,131	-0,071	0,012	0,037	-0,107	0,032	0,057	0,122	-0,074	-0,097
	POL	-0,094	-0,127	-0,013	-0,099	-0,034	0,081	0,006	0,118	0,191	0,167	0,152	0,242	0,185	-0,254	0,091	0,092	-0,089	0,036	0,017	-0,103	0,006	0,110	0,116	0,000	-0,052
	HUN	-0,171	-0,145	-0,095	-0,063	-0,096	0,035	0,146	0,186	0,136	0,107	0,025	0,119	0,066	-0,229	-0,034	0,100	-0,147	0,023	0,023	-0,138	0,051	0,072	0,083	-0,025	-0,117
	GRC	-0,041	-0,112	-0,063	0,004	-0,102	0,001	0,105	0,190	0,187	0,011	0,079	0,128	0,052	-0,097	-0,122	-0,047	-0,127	0,052	0,017	-0,193	-0,032	0,056	0,085	-0,050	-0,136
	BGR	-0,695	-0,901	-0,014	-0,210	-0,077	0,016	0,074	0,281	0,279	0,102	0,112	0,202	0,062	-0,141	-0,042	0,158	-0,085	-0,005	0,096	-0,122	-0,022	0,111	0,098	-0,012	-0,026
	ROU	-0,226	-0,645	-0,385	-0,373	-0,319	-0,191	-0,062	0,099	0,155	0,118	0,165	0,272	0,154	-0,203	0,045	0,118	-0,099	0,078	0,023	-0,148	0,003	0,061	0,088	-0,002	-0,039
	UKR	-0,514	-0,002	-0,256	-0,368	-0,187	0,089	0,093	0,192	0,298	0,078	0,067	0,152	0,008	-0,445	0,064	0,114	0,095	-0,001	-0,350	-0,531	-0,099	0,024	0,050	0,088	0,003
	BLR	-0,431	-0,372	-0,390	-0,785	-0,672	-0,308	-0,273	-0,101	0,121	0,178	0,120	0,131	0,189	-0,324	0,143	-0,172	-0,337	-0,158	-0,175	-0,373	-0,220	0,134	0,058	-0,017	-0,145
	RUS	-0,193	-0,150	-0,508	-0,577	0,116	-0,023	-0,070	0,110	0,212	0,146	0,171	0,187	0,124	-0,346	0,198	0,211	-0,008	-0,019	-0,160	-0,378	-0,111	0,219	0,053	-0,031	-0,160
Asia/Oceania	TUR	-0,392	-0,423	-0,406	-0,426	-0,304	-0,482	-0,105	0,047	0,179	0,135	-0,006	0,092	-0,005	-0,212	0,084	0,055	-0,004	0,016	-0,075	-0,166	-0,074	-0,052	-0,200	-0,144	-0,173
	KAZ	-0,343	-0,085	-0,148	-0,154	0,040	0,086	-0,043	0,144	0,386	0,266	0,253	0,084	0,131	-0,298	1,868	0,176	0,001	0,025	-0,123	-0,252	-0,337	0,301	-0,041	-0,088	-0,127
	CHN	0,064	0,078	0,106	0,089	0,122	0,029	0,028	0,183	0,215	0,240	0,238	0,272	0,177	0,072	0,094	0,218	0,152	0,112	0,095	0,074	-0,106	0,006	0,080	0,004	0,007
	HKG	0,024	-0,005	-0,068	0,030	0,049	-0,040	0,004	0,031	0,074	0,078	0,059	0,069	-0,006	-0,118	0,107	-0,001	-0,061	-0,073	-0,030	-0,019	-0,006	0,011	0,004	0,009	-0,024
	TWN	0,001	0,000	-0,122	0,071	0,075	-0,116	0,013	0,013	0,050	0,059	0,181	0,047	-0,034	-0,184	0,225	0,082	-0,034	-0,005	-0,002	-0,112	-0,034	0,077	0,018	-0,011	0,105
	KOR	0,027	-0,100	-0,290	0,214	0,120	-0,112	0,099	0,086	0,150	0,169	0,127	0,116	-0,051	-0,130	0,200	0,123	0,009	0,035	0,038	-0,074	-0,026	0,069	0,057	-0,054	-0,024
	JPN	-0,117	-0,096	-0,120	0,114	0,105	-0,114	-0,045	0,091	0,106	0,018	-0,005	0,033	0,147	-0,071	0,136	0,116	0,003	-0,164	-0,079	-0,131	0,080	0,014	0,036	0,000	-0,025
	LAO	-0,121	-0,251	-0,566	-0,502	-0,039	-0,090	-0,084	-0,010	0,031	0,214	0,214	0,156	0,173	0,079	0,146	0,277	0,203	0,140	0,059	0,154	0,141	0,069	0,031	0,028	-0,027
	MMR	-0,028	-0,188	-0,582	-0,100	0,278	-0,048	-0,204	-0,331	-0,123	-0,029	0,004	0,011	0,246	0,377	0,206	0,354	0,040	-0,051	0,016	-0,134	0,010	0,002	0,029	-0,051	0,005
	BGD	0,024	0,009	-0,056	-0,035	-0,005	0,003	0,024	0,030	0,027	0,057	0,068	0,061	0,033	0,059	0,029	-0,042	-0,004	0,127	0,086	0,099	0,080	0,082	0,078	0,060	-0,017
	BRN	0,046	0,001	-0,254	0,204	0,443	-0,074	0,069	0,130	0,193	0,230	0,223	0,016	0,248	-0,301	0,189	0,351	0,034	-0,056	-0,059	-0,325	-0,177	0,143	0,119	-0,004	-0,145
	MYS	0,107	-0,036	-0,279	0,070	0,165	-0,067	0,062	0,094	0,111	0,127	0,057	0,149	0,141	-0,135	0,170	0,095	-0,013	-0,019	-0,086	-0,014	0,002	0,016	0,115	0,021	-0,057
	IDN	0,050	-0,082	-0,683	0,188	0,067	-0,137	0,059	0,120	0,019	-0,008	0,126	0,103	0,051	0,021	0,242	0,121	-0,035	-0,085	-0,092	-0,102	0,024	0,047	-0,016	0,040	-0,054
	PHL	-0,021	-0,075	-0,266	0,108	-0,055	-0,103	0,069	0,050	0,067	0,107	0,181	0,176	0,067	-0,059	0,144	0,057	0,076	-0,010	0,015	0,010	0,015	-0,004	-0,026	0,056	-0,042
	AUS	0,095	0,000	-0,110	0,089	-0,060	-0,059	0,098	0,243	0,190	0,099	0,044	0,171	0,046	-0,033	0,201	0,161	0,009	-0,073	-0,076	-0,172	0,026	0,081	0,018	-0,037	0,019
	NZL	0,068	-0,004	-0,145	0,001	-0,030	-0,049	0,058	0,225	0,212	0,111	-0,036	0,149	-0,007	-0,120	0,091	0,122	0,054	0,068	0,026	-0,110	-0,001	0,068	0,045	-0,003	-0,025
	SGP	0,102	0,012	-0,098	-0,025	0,073	0,007	0,064	0,097	0,144	0,155	0,157	0,121	-0,028	0,016	0,187	0,094	0,022	0,017	0,022	-0,036	-0,004	0,060	0,098	-0,007	-0,063
	THA	0,038	-0,190	-0,266	0,062	0,055	-0,050	0,080	0,149	0,140	0,103	0,130	0,180	0,085	-0,032	0,171	0,007	0,039	0,017	-0,047	-0,040	-0,012	0,064	0,084	0,052	-0,052
	VNM	0,125	0,074	-0,045	0,035	0,122	0,110	0,059	0,126	0,269	0,114	0,098	0,075	0,095	0,014	-0,055	0,013	0,171	0,100	0,141	0,127	0,147	0,044	0,062	0,041	0,016
	KHM	-0,067	-0,039	-0,192	0,035	0,040	0,172	0,041	0,037	0,102	0,084	0,152	0,098	-0,001	0,013	0,067	0,072	0,098	0,038	0,076	0,082	0,097	0,089	0,127	0,100	-0,094
	PAK	-0,083	-0,105	-0,049	-0,067	-0,054	-0,099	0,091	0,118	0,051	0,031	0,052	0,091	-0,151	-0,087	0,055	0,042	-0,081	-0,061	-0,035	0,002	0,043	0,050	-0,047	-0,190	-0,075
	IND	0,020	0,026	-0,113	0,013	-0,009	0,002	0,002	0,115	0,153	0,129	0,074	0,179	0,006	-0,063	0,114	-0,145	-0,167	-0,059	-0,012	-0,080	-0,036	0,068	0,058	-0,009	-0,100
	SAU	0,126	0,029	-0,206	0,195	0,295	-0,048	0,041	0,187	0,218	0,286	0,088	0,054	0,170	-0,338	0,218	0,332	0,067	-0,037	-0,053	-0,296	-0,042	0,130	0,195	-0,021	-0,228
	JOR	-0,094	0,025	-0,062	-0,006	-0,002	0,069	0,105	0,049	0,171	0,136	0,096	0,094	0,108	0,086	0,040	0,017	0,017	0,102	-0,005	-0,102	0,001	0,164	0,006	0,066	-0,033
	ISR	-0,017	-0,074	-0,022	-0,045	0,178	-0,048	-0,111	0,066	0,113	0,061	0,084	0,144	0,156	-0,150	0,117	0,080	-0,005	0,091	0,014	-0,047	0,042	0,107	0,061	0,045	0,052
	EGY	0,046	0,046	0,047	0,068	0,044	-0,096	-0,085	-0,193	0,027	0,087	0,118	0,209	0,029	-0,048	-0,012	0,069	-0,032	-0,077	-0,046	-0,118	-0,228	-0,395	0,033	0,073	0,019
Africa	MAR	0,072	-0,103	-0,015	0,008	-0,066	-0,007	0,024	0,160	0,101	0,090	0,071	0,102	0,206	-0,153	0,062	0,172	-0,035	-0,008	0,353	-0,143	-0,035	0,057	0,071	0,012	-0,094
	SEN	-0,024	-0,100	0,070	-0,079	-0,031	-0,045	0,057	0,263	0,182	0,046	0,018	0,137	0,136	0,030	0,024	0,091	-0,046	0,021	0,057	-0,085	0,023	0,097	0,115	0,011	0,028
	CMR	0,039	-0,080	0,012	-0,018	-0,103	0,004	0,074	0,224	0,134	0,022	0,045	0,168	0,133	-0,053	-0,057	0,100	-0,046	0,074	0,018	-0,142	0,022	0,015	0,080	-0,025	-0,013
	CIV	0,135	-0,094	0,029	-0,012	-0,193	-0,028	0,119	0,152	0,072	0,071	0,049	0,065	0,155	-0,003	-0,028	-0,020	0,007	0,140	0,152	-0,061	0,023	0,058	0,099	0,052	0,012
	NGA	-0,193	0,010	-0,154	0,008	0,265	-0,187	0,101	-0,013	0,080	0,104	0,340	0,006	0,166	-0,297	0,206	0,079	0,001	-0,095	0,040	-0,258	-0,310	-0,177	0,045	0,037	-0,229
	TUN	0,073	-0,097	0,006	0,022	-0,096	-0,002	0,005	0,133	0,126	0,031	0,050	0,169	0,161	-0,147	0,014	-0,024	-0,024	-0,047	-0,069	-0,152	-0,096	-0,084	-0,048	-0,066	-0,042
	ZAF	-0,124	-0,044	-0,105	-0,009	0,038	-0,129	-0,092	0,390	0,248	0,090	0,003	0,028	-0,106	-0,076	0,197	0,031	-0,088	-0,129	-0,097	-0,156	-0,132	0,112	-0,015	-0,081	-0,167
	ROW	0,016	-0,023	-0,085	0,034	0,061	0,031	-0,039	0,073	0,119	0,191	0,131	0,133	0,132	-0,124	0,177	0,280	0,017	-0,033	-0,057	-0,119	-0,008	0,052	0,062	0,028	-0,049

Figure 2. National competitiveness results

Source: Authors' results.

Region	Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Americas	ARG	39	-3	10	-216	-321	-169	-10541	71	73	531	355	29	258	0	163	90	473	279	-1390	414	-1619	163	-254	-533	-207
	BRA	4504	-136	11631	-530	1348	-517	-2832	-44	12	1009	303	41	-28	-63	686	10	-702	-705	-773	-1058	-773	190	-94	-181	-708
	CHL	0	41	-435	-91	-37	-280	-930	60	74	632	305	-3	73	-73	173	17	186	-514	-1790	-24	-497	195	69	1378	-41
	COL	-254	-225	-1537	-430	5431	-284	-641	-88	33	450	271	58	52	-55	230	-2	555	1447	-644	-762	-1501	163	-33	-206	-405
	PER	-202	-44	-552	-159	149	60	1099	-20	19	1448	1313	14	143	77	119	9	741	-103	-637	-379	-453	66	13	-93	-30
	CRI	-484	-70	-161	-73	-210	128	-563	-15	-47	-414	-261	-21	-27	83	172	17	588	4663	14	-333	930	-23	226	-98	100
	MEX	-592	-5	-484	-122	405	35	-737	-64	-41	-59	-185	-39	-158	-102	7	-31	29	1294	25	-103	-934	-30	-33	3	-381
	CAN	174	129	-39	47	717	47	303	18	3	451	261	-12	17	-48	128	-7	125	409	-608	-199	-334	59	-18	24	30
	USA	127	161	307	-52	75	-31	-466	-39	-29	-193	-76	-39	-50	-27	-25	-23	161	-232	1	197	130	-32	-25	-4	-34
Europe	IRL	70	227	913	7714	-680	584	-151	72	-4	-295	182	41	-106	43	-135	-126	1832	-1081	404	-576	1314	44	163	135	1141
	ISL	313	524	-70	82	-20	-463	1179	84	25	846	-241	85	-446	-290	-13	44	-470	-405	843	78	1835	250	-22	385	-342
	GBR	181	197	246	-69	-513	13	907	4	25	14	-36	-8	-139	-86	-99	-9	82	-244	481	-215	-414	-79	20	-177	-144
	NOR	220	19	16	-32	-826	209	2220	0	-2	287	402	48	39	-56	38	5	69	1804	-537	-778	-295	5	-4	-272	-311
	SWE	410	-12	344	-95	-137	-315	728	48	20	23	235	14	152	-58	0	14	-265	-842	-396	-272	292	-7	-34	-332	124
	FIN	-19	-91	354	-61	-460	-17	2434	46	23	26	83	17	104	-20	-51	2	-460	-459	-176	-449	168	250	20	-272	206
	DNK	-20	-174	458	-25	-617	129	1444	22	6	-262	149	13	168	-34	-120	1	-447	-1347	-15	-482	590	47	12	-73	-95
	DEU	-79	-123	229	-63	-619	148	-10	44	7	20	88	16	43	-18	-131	29	-748	254	119	575	327	75	-4	-165	84
	AUT	-43	-129	234	-36	-578	122	1368	41	10	-296	476	13	213	-13	-104	54	-474	277	-181	-427	244	19	94	-103	-71
	BEL	-125	-110	187	-28	-505	103	1132	38	8	-458	-49	14	102	-26	-51	7	-622	-32	145	-618	581	-31	46	-58	-34
	FRA	-52	-133	256	-29	-584	103	717	22	1	155	58	8	54	-29	-99	-4	-572	65	234	-399	186	170	15	-242	19
	LUX	-33	89	1494	-37	226	43	1896	37	61	704	544	47	113	-92	107	-8	-341	757	-874	-179	1523	35	29	-122	105
	NLD	55	-132	359	-63	-629	65	173	34	8	75	71	16	112	-21	-80	9	-638	376	118	-146	192	105	30	-281	-40
	CHE	17	-166	281	-115	-803	67	1496	14	16	-109	101	11	161	40	7	48	-315	1684	117	-110	-117	-120	21	250	121
	PRT	-15	-87	427	-112	-400	-41	962	36	10	-132	20	14	106	-33	-106	-25	-1215	905	425	-336	424	177	34	43	148
	ESP	87	-144	509	56	-506	34	1833	54	14	360	109	26	206	-39	-231	-42	-912	-390	194	-271	475	70	34	12	-30
	ITA	272	-74	118	-59	-661	25	942	28	7	-71	60	13	-69	-71	-91	-1	-897	307	54	-409	-150	131	1	-206	-52
	CYP	361	-54	1352	-42	-942	-12	41	42	12	288	312	51	46	82	-250	-45	-760	2541	768	-376	889	79	332	-208	319
	MLT	-169	-93	433	5	252	184	-163	38	0	390	971	33	289	-13	-130	7	-208	-795	829	-337	1150	156	47	708	512
	SVN	-172	-242	358	-155	-1039	-266	1298	23	19	-85	84	37	148	-43	-126	-4	-1037	-743	-21	-367	217	230	105	-239	-8
	HRV	137	85	-64	-240	-589	211	4993	64	47	-40	263	45	121	-72	-123	-5	-1006	-2065	101	-252	1475	112	46	40	93
	CZE	46	-291	-839	-206	-434	-354	3611	70	38	-309	623	37	195	-95	-68	30	-967	-33	104	-339	529	288	63	-96	-182
	EST	1570	146	-203	-162	201	121	4867	78	89	326	225	43	144	-143	-58	70	-110	768	678	-326	409	160	38	-66	-22
	LVA	-6	194	-318	121	716	261	1215	58	46	1050	1125	2859	32	-177	-79	61	-90	14272	-1042	-498	147	59	61	-16	262
	LTU	-92	178	214	-157	925	170	96334	97	90	-758	-88	127	168	-120	-112	-14	91	2238	1697	-346	899	118	27	359	369
	SVK	-437	216	-401	-376	-380	-341	1054	54	28	-405	422	116	344	-171	-129	33	-83	1240	1112	-357	377	61	68	-372	-184
	POL	90	-57	922	-285	-291	442	-104	10	14	1013	351	58	332	-154	-12	-25	-614	225	498	-259	201	143	67	10	-27
	HUN	-269	-326	11	-206	-899	281	3483	29	9	356	103	3	-129	-112	-239	-8	-1153	-194	9	-298	986	139	63	-73	-242
	GRC	-84	-242	-46	-45	-1018	-60	2337	72	26	50	428	4	142	113	-316	-39	-1101	393	-132	-405	-59	535	24	-160	-287
	BGR	-1825	-1873	3717	-53	-289	562	1340	75	60	1611	765	175	110	116	-67	67	-277	821	4103	-163	-142	213	77	-138	3
	ROU	-1011	-1307	-1810	-850	-1981	246	922	15	8	1851	809	95	1916	40	-2	49	-174	862	3755	-194	-168	316	88	16	5
	UKR	-1568	49	-543	-749	-992	516	3652	62	72	298	1679	26	193	-371	-45	15	824	-392	-3734	-1779	1087	-73	-65	656	154
	BLR	-1287	-728	-1796	-1745	-4493	-1117	-4629	-94	-10	1081	618	20	223	-169	253	-185	-2509	-2184	-1604	-1241	-1602	249	-41	36	-389
	RUS	-658	-376	-2726	-1178	1379	-67	-932	12	50	683	450	60	152	-240	140	53	212	-899	-1260	-1185	-1117	415	-28	349	-217
Asia/Oceania	TUR	-1175	-854	-2037	-929	-1965	-1671	703	-20	30	364	-337	-9	-114	-244	375	-22	298	1601	-555	-298	-572	-200	-271	-391	-434
	KAZ	-1424	-127	-1058	27	861	417	-582	11	115	1829	1842	3030	50	570	5200	91	129	1115	-98	-978	-2693	2724	-116	-540	-403
	CHN	233	309	859	117	735	638	1060	18	68	409	2241	91	85	70	76	131	1446	2023	862	327	-1112	-119	41	125	23
	HKG	7	39	235	-45	376	-615	-400	-58	-36	-27	-71	-43	-14	-67	105	-41	-219	-1885	716	114	267	-109	-26	363	-155
	TWN	76	52	-115	204	628	-438	325	-25	-12	-419	982	-33	-63	-123	206	35	-284	-680	67	-226	-197	112	-9	203	350
	KOR	4852	-96	-1589	444	799	-187	2607	-9	-9	740	-142	5	-184	-7	996	10	22	331	876	-11	-18	119	-8	-79	-110
	JPN	-280	-183	-510	191	501	-184	-767	-10	-13	-206	-678	-39	163	64	90	-38	137	-3028	-895	-268	1224	-38	-3	20	68
	LAO	-493	251	-2859	-1160	-1151	-448	-865	6	-28	519	3188	18	225	59	272	321	874	-1582	4900	-528	1144	97	29	331	-18
	MMR	-98	-291	-3580	-288	1202	-75	-3079	-187	-102	-332	-23	8	565	583	325	115	206	71	-919	-422	-307	30	75	-305	50
	BGD	38	67	-568	-135	-64	8	580	-33	-30	401	287	-19	-48	141	-33	-81	80	1954	936	511	600	168	52	322	-33
	BRN	293	39	-1551	2269	4475	-374	1414	97	38	884	975	-15	940	-402	183	553	126	-2131	-722	-366	-1484	80	137	-83	-330
	MYS	435	-41	-1191	141	416	-317	1097	2	-1	678	59	10	199	-160	234	140	-163	-520	-1059	492	119	6	73	64	-165
	IDN	2829	-115	-3509	401	371	-352	1520	15	-25	554	-297	-17	36	39	352	33	-323	-1289	-801	-299	-73	89	-68	307	-82
	PHL	16	-240	-1601	257	-387	-182	1308	-21	-10	815	756	52	294	-18	177	-9	-62	1911	240	-133	309	-91	-106	251	-43
	AUS	347	31	-442	153	-584	-224	2054	58	29	81	-59	20	-6	48	212	32	114	-2113	-304	-655	280	37	-11	-115	73
	NZL	197	8	-657	-52	-423	-212	1947	50	41	392	-233	15	3	-50	73	29	434	-228	511	-404	56	141	15	39	-23
	SGP	357	55	-579	-86	534	-86	760	0	29	884	1443	18	-186	106	220	31	170	1001	420	-124	353	-86	-12	-62	-199
	THA	36	-395	-1823	62	1002	-53	2144	32	21	751	2746	32	133	-77	263	27	351	391	-499	-275	-241	130	63	115	-189
	VNM	371	154	24	38	1096	442	767	18	112	427	161	-19	65	71	-185	-14	1481	2066	1739	520	1693	52	19	202	62
	KHM	-139	-125	-1117	-127	864	561	3119	-48	4392	127	-643	-10	-96	134	-74	5	651	825	536	94	863	136	84	538	-123
	PAK	-258	-195	-116	-142	-274	-257	1659	-1	-17	-6	165	6	-315	-18	24	-24	-521	-3046	-459	59	574	-66	-93	-874	-218
	IND	104	70	-656	-35	31	78	484	4	3	733	-25	34	6	8	107	-137	-1016	-3372	871	-269	82	129	8	49	-260
	SAU	515	128	-2067	713	2578	-91	963	57	53	772	90	-44	483	-359	309	208	39	-879	-517	-302	1106	264	193	299	-310
	JOR	-272	42	-546	-22	215	256	1808	-17	41	551	281	-2	101	159	16	13	215	2823	-24	-328	776	614	-37	363	-71
	ISR	-2	-125	-5	-127	1140	-145	-2110	-14	8	276	334	76	253	-165	128	5	34	1926	1620	-82	332	206	32	201	201
	EGY	352	1	261	178	-230	-376	-740	-115	-42	244	379	93	-50	63	-30	77	18	-3394	-190	-228	-2868	-581	-25	356	180
Africa	MAR	237	-185	-282	-38	-116	107	1269	17	-9	-348	94	-1	151	14	-83	-4	-151	1691	4255	-342	63	26	33	69	-275
	SEN	-48	-224	4869	-262	-226	-78	1356	81	39	-152	365	12	72	121	-12	9	-198	-175	932	286	980	168	73	73	96
	CMR	-101	-205	611	46	-763	232	1104	65	17	1255	-139	46	144	29	-189	48	-226	-952	101	-399	2039	28	-60	66	481
	CIV	3067	-4	602	3	-1459	122	2038	-15	-13	215	1680	-14	546	28	-19	-70	497	-582	1237	124	515	126	83	570	32
	NGA	-720	45	-632	-120	2290	-479	-1850	26	-2	-97	1732	345	-223	940	431	55	719	39405	1929	-623	-1989	-530	60	316	-958
	TUN	612	-185	-25	-4	-680	113	827	12	16	-487	19124	28	171	-35	-12	-51	5	-1189	-680	-584	-773	-258	-80	-628	-76
	ZAF	-365	-55	-515	-30	99	-465	-1542	130	57	396	-123	-28	-200	-38	302	-28	-426	-1416	-622	-313	-1291	79	-126	-349	-430
	ROW	-9	-1	-389	30	47	393	-1728	-21	-10	633	345	16	112	-42	183	91	220	-970	-551	-260	199	58	9	158	-54
	Countries total	**8764**	**-7546**	**-9203**	**750**	**1314**	**-3366**	**142527**	**1313**	**5680**	**24997**	**50178**	**7869**	**8815**	**-1096**	**9349**	**1680**	**-8524**	**53925**	**14868**	**-22177**	**7357**	**8634**	**1303**	**1589**	**-4028**

Figure 3. Industrial resilience from Country's industrial portfolio perspective

Source: Authors' results.

Code	Industry	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
01T02	Agriculture, hunting, forestry	-476	-43	-36	-183	-10	-135	100	-8	3	-25	182	-10	-4	-92	29	-17	-165	-34	-142	-191	36	88	-30	-152	-1060
03	Fishing and aquaculture	-78	-63	0	-181	-358	62	252	19	-13	-34	294	-13	38	-431	54	10	-183	61	0	-298	109	2056	-27	-5	-104
05T06	Mining and quarrying, energy producing products	-112	-48	6	-123	-52	-19	81	-16	-23	-20	-11	6	-10	21	-23	14	-161	78	-47	6	15	3	-21	60	36
07T08	Mining and quarrying, non-energy producing products	-116	-4	0	-1169	-109	-113	162	-2	-24	-33	-26	-5	100	-53	-37	-14	-530	-17	-2	-7	102	27	-3	141	3
09	Mining support service activities	-346	-52	7	176	-57	-119	111	17	-5	-32	-20	129	93	4	-19	10	-111	688	1997	10	85	81	67	1795	23
10T12	Food products, beverages and tobacco	-96	-35	-52	-75	59	-160	554	-10	25	27	51	-14	-19	-48	104	-10	-112	-12	-94	-168	44	604	222	630	-61
13T15	Textiles, textile products, leather and footwear	-63	-87	-23	-125	-2008	38	30	-18	-8	-47	-19	-45	-83	-707	4	-5	-107	-86	-72	-893	31	48	-57	358	-717
16	Wood and products of wood and cork	16	-116	-68	-172	25	8	12	51	12	69	19	50	67	-14	2	-28	-261	-82	2	-200	56	0	-18	41	-248
17T18	Paper products and printing	2	-25	-86	-709	-96	20	112	183	54	115	25	41	57	-29	30	3	-66	1314	-79	-53	-46	27	88	-101	8
19	Coke and refined petroleum products	-87	-740	-10	-18	-23	9	54	-1	-1	22	-9	2788	1	9	-9	1	-164	226	8	2	-19	81	225	-42	32
20	Chemical and chemical products	-24	-118	-63	-1011	-78	29	177	24	21	-19	-7	2	57	-32	0	-11	-173	-195	-584	-32	43	2	36	41	-13
21	Pharmaceuticals, medicinal chemical and botanical products	306	-42	-896	108	102	-151	-39	15	39	61	81	-27	29	-618	209	150	-232	138	3237	-301	-247	149	6	568	-65
22	Rubber and plastics products	-25	-47	-82	-206	-83	55	41	60	25	44	-4	29	75	-26	2	-9	-287	180	4	-138	41	69	-37	-89	-15
23	Other non-metallic mineral products	-74	-42	-11	-244	-203	3	131	-16	22	6	145	10	-43	-84	6	11	-291	-70	-73	-479	63	42	-28	51	-104
24	Basic metals	5	-172	1	-1	-91	13	-191	5	6	-37	10	-6	-35	-19	29	-25	-672	59	-138	-74	9	38	33	-84	-10
25	Fabricated metal products	-70	-55	-94	-1365	-74	35	257	37	45	8	46	12	78	-7	17	-7	-212	-123	-103	-82	-85	250	-21	19	2
26	Computer, electronic and optical equipment	269	-111	3286	35	281	89	2521	73	3122	1	21	42	135	126	48	291	-150	-22	-97	-308	457	21	8	155	645
27	Electrical equipment	105	-72	-194	-14	405	43	1819	-10	1274	243	51	293	-76	72	87	-27	-159	-112	-126	-517	81	50	-41	122	84
28	Machinery and equipment, nec	-16	-161	-37	69	-61	87	250	32	33	-34	71	80	-15	87	36	9	252	12354	-51	-954	75	19	70	10	143
29	Motor vehicles, trailers and semi-trailers	292	-174	539	-18	-171	58	214	33	51	-42	2595	31	18	92	22	44	-49	12	-47	-5417	44	1000	350	157	96
30	Other transport equipment	216	-118	-39	61	87	98	251	87	138	-12	232	-7	11	7	105	20	58	96	-68	-346	185	172	295	49	82
31T33	Manufacturing nec; repair and installation of machinery/equipment	11	-14	-75	-166	-60	29	352	33	43	158	6	50	-15	-19	24	117	-14	167	-2029	-28	-65	164	18	75	-89
35	Electricity, gas, steam and air conditioning supply	-36	-41	-321	-100	-62	-170	108	2	18	-15	32	-11	-16	1	27	39	-107	158	-266	-37	43	11	-16	-672	-62
36T39	Water supply; sewerage, waste management and remediation	-9	-25	-4471	-42	2224	-260	-15	6	25	45	186	5	480	-17	35	-4	49	163	-109	-30	-80	15	-31	-145	-458
41T43	Construction	-111	-93	-156	22	162	32	-1	14	27	40	119	73	176	34	617	210	74	251	316	-6	30	252	34	-37	590
45T47	Wholesale and retail trade; repair of motor vehicles	-52	-87	-96	-138	-80	10	58	21	10	44	125	47	15	-9	12	-23	-242	347	337	-43	22	43	0	46	-71
49	Land transport and transport via pipelines	33	-42	-132	-300	37	-706	35	17	12	17	69	28	-12	-16	16	-32	-1119	11	-93	-74	29	58	-26	19	-63
50	Water transport	22	-200	-131	-228	-61	-1714	-55	-10	-18	-10	26	1	1	19	-12	-43	-70	63	24	-25	9	8	-39	-224	-21
51	Air transport	-239	-1193	-111	-374	-72	32	95	11	25	12	33	24	30	-4	4	-19	-73	78	134	-55	80	277	28	47	23
52	Warehousing and support activities for transportation	-55	-76	-1113	-112	290	-544	-38	5	9	35	17	27	21	-6	42	10	-304	496	-30	-27	-9	75	4	5	-67
53	Postal and courier activities	-16	-167	-329	-95	-1827	-63	30	38	59	319	49	74	514	-36	1170	21	2	-27	-213	-99	76	208	2	52	-105
55T56	Accommodation and food service activities	-40	18	-107	-155	121	-225	497	104	74	259	252	107	75	-81	758	65	154	53	5	-10260	-71	140	12	204	40
58T60	Publishing, audiovisual and broadcasting activities	-92	-105	-284	-106	-91	-77	925	97	52	284	112	111	93	-58	162	499	-758	55	-6	-61	-68	94	-27	90	-206
61	Telecommunications	-91	-165	-185	-58	-47	-101	406	72	112	382	412	89	170	-71	1146	-55	-92	65	-64	-121	-189	195	-45	-80	-638
62T63	IT and other information services	24	-110	-43	-43	67	173	6	64	50	136	99	69	-4	-53	151	10	17	67	-29	-112	-35	33	-15	98	-142
64T66	Financial and insurance activities	-3118	-2685	-630	-128	-360	27	-14	17	31	162	3	86	1182	-383	1698	-14	-150	24	-84	-80	-8	-2	11	-367	-363
68	Real estate activities	34	-78	-149	-88	-86	-30	5	14	30	13	165	224	560	-8	120	51	-2071	53	-117	-385	-31	420	5	-90	18
69T75	Professional, scientific and technical activities	-148	-417	-268	-106	-89	-262	20	20	28	71	34	22	80	-13	110	-4	-289	31	-36	-170	3450	76	12	-81	-905
77T82	Administrative and support services	-130	-433	-191	-107	-68	42	38377	23	28	44	60	57	35	-5	58	-1	329	147	-22	-52	-43	81	-7	-79	-44
84	Public administration and defence; compulsory social security	8331	142	337	268	772	-101	93344	92	134	109	2687	3125	843	880	107	164	153	14982	3672	51	733	890	43	-963	10
85	Education	265	431	11618	7937	37	1086	102	27	15	189	13842	62	3717	97	724	122	-192	16631	476	10	2505	297	3	-15	-58
86T88	Human health and social work activities	17	58	-258	323	530	-290	503	34	36	40	8492	30	113	446	775	85	-34	5261	8744	-19	323	160	140	-35	-143
90T93	Arts, entertainment and recreation	-118	36	-13997	-88	2150	-251	106	14	52	434	296	69	158	-43	751	37	-17	182	14	-67	-8	83	33	54	10
94T96	Other service activities	4654	23	-260	-203	343	50	782	43	32	21967	19334	110	128	-7	160	36	7	212	718	-46	-413	228	48	-38	-42
97T98	Activities of households as employers*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Industries total	**8764**	**-7546**	**-9203**	**750**	**1314**	**-3366**	**142527**	**1313**	**5680**	**24997**	**50178**	**7869**	**8815**	**-1096**	**9349**	**1680**	**-8524**	**53925**	**14868**	**-22177**	**7357**	**8634**	**1303**	**1589**	**-4028**

*Undifferentiated goods- and services-producing activities of households for own use

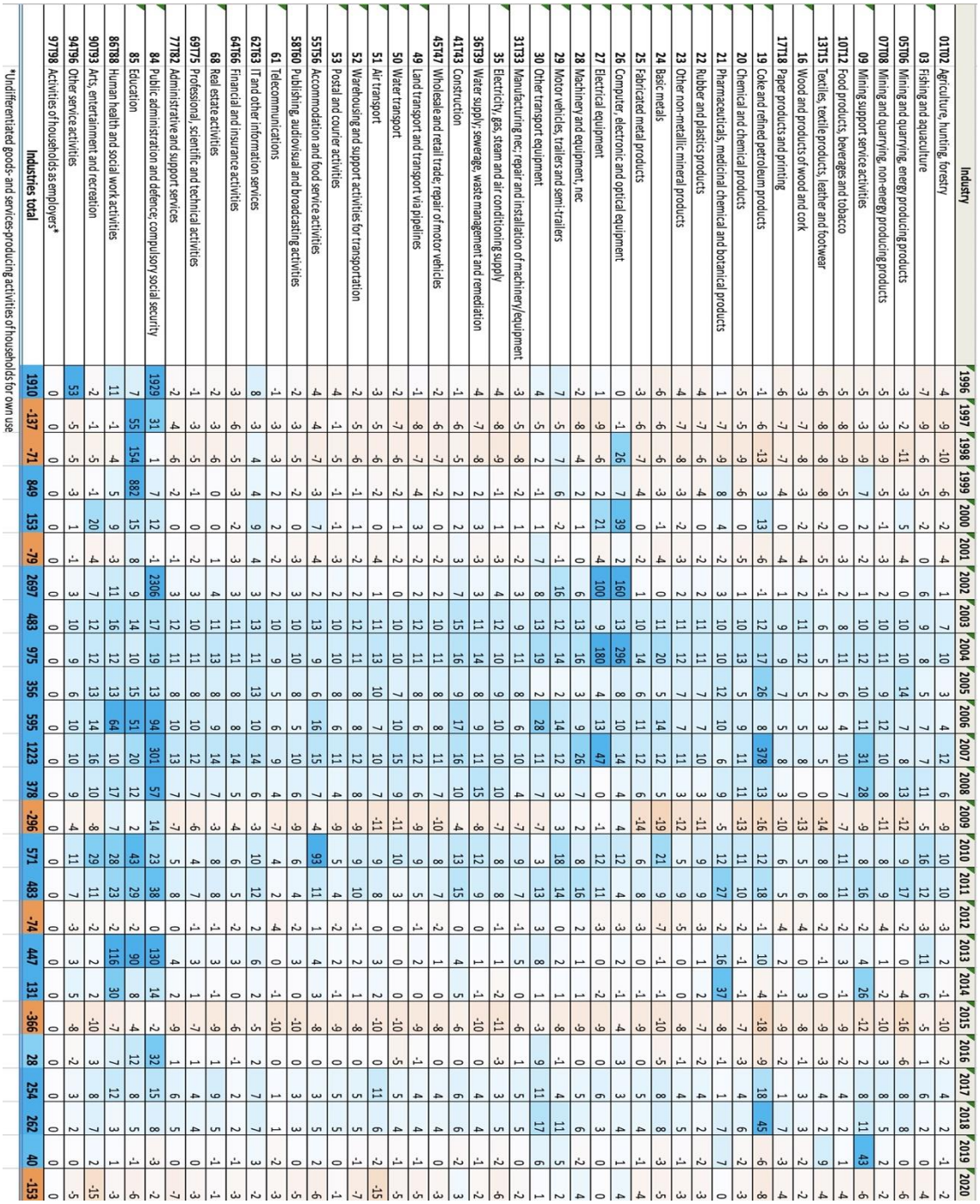
Figure 4. Industrial resistance or recoverability from the global industry perspective

Source: Authors' results.

Region	Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	ARG	5	0	4	-4	0	-3	-21	11	12	7	6	7	6	-3	9	8	2	1	-6	4	-7	5	-8	-7	-6
	BRA	50	-2	154	6	8	-8	-5	0	6	11	6	8	12	-6	30	5	-5	-3	-3	-14	-5	5	-2	-2	-11
	CHL	13	-1	-3	-1	1	-4	-2	11	13	6	5	4	6	-5	12	5	1	1	-5	-5	-3	4	5	37	-3
	COL	18	-5	-11	-7	50	-3	-3	-4	8	6	4	10	3	-4	9	5	4	0	-1	-10	-6	3	1	-2	-8
Americas	PER	0	0	-5	-2	1	1	4	2	7	7	9	6	6	3	5	6	3	1	-1	-6	-2	2	2	-1	-4
	CRI	-6	-2	4	4	0	1	-2	4	0	-1	-1	3	0	10	3	4	3	0	0	-1	-1	2	9	2	2
	MEX	-7	-1	-4	-1	4	0	-1	-2	1	4	1	1	-2	-9	4	2	-1	12	-1	-5	-4	1	1	0	-8
	CAN	3	2	-1	3	6	-1	-1	6	6	4	4	3	0	-6	7	3	0	2	-2	-5	-2	3	1	0	-3
	USA	2	2	1	0	2	-1	-1	1	3	3	1	1	0	-6	3	3	0	1	1	-1	-1	1	2	-1	-4
	IRL	3	5	5	845	-1	6	3	11	5	2	5	9	3	-5	-4	-3	8	0	1	-2	3	5	11	-4	8
	ISL	3	66	2	4	0	-5	1	13	7	11	-3	13	-11	-17	3	6	-3	9	2	-4	7	15	1	9	-5
	GBR	1	4	1	0	-1	-1	2	5	8	1	2	4	-2	-8	-1	3	0	0	3	-3	-4	-2	3	-2	-4
	NOR	3	0	-1	1	-3	1	6	5	5	6	5	9	4	-7	3	4	0	1	-1	-10	-4	1	3	-3	-6
	SWE	3	-3	1	-1	-1	-4	2	9	7	3	4	6	4	-8	5	6	-2	1	-2	-7	0	2	1	-3	-1
	FIN	0	-2	2	0	-2	0	3	9	8	2	5	7	11	-7	2	5	-3	1	0	-7	3	5	3	-1	-1
	DNK	1	-4	0	2	-2	1	2	7	6	4	3	6	5	-6	-2	5	-3	0	0	-7	3	2	3	0	-3
	DEU	3	-6	1	0	-1	-1	2	9	6	2	2	6	5	-6	1	6	-4	1	1	-6	0	2	3	-2	-1
	AUT	-1	-4	1	1	-3	2	4	9	6	3	4	6	17	-5	-1	13	-3	1	0	-7	1	3	8	-2	-4
	BEL	-2	-3	2	0	-2	0	0	9	6	0	3	6	5	-6	2	4	-4	1	1	-7	-1	1	5	0	-4
	FRA	0	-3	1	0	-2	0	2	7	5	2	3	5	4	-6	1	4	-4	1	2	-8	0	3	3	-3	-3
	LUX	0	-1	4	0	-1	1	15	8	11	3	17	9	4	-2	4	4	-2	3	2	-4	3	3	4	-2	1
	NLD	0	-4	1	0	-2	-1	1	8	6	2	2	6	5	-6	0	5	-4	0	1	-6	0	2	4	-3	0
	CHE	-2	-6	2	-1	-5	0	5	6	7	1	2	6	7	-1	3	8	0	2	0	-3	2	1	3	2	1
	PRT	2	-3	1	-1	-3	-1	1	8	6	0	2	6	4	-5	1	3	-6	1	1	-6	1	4	4	0	0
	ESP	2	-3	2	2	-1	1	4	10	6	2	3	7	3	-7	-1	1	-6	0	1	-7	1	3	5	1	-4
Europe	ITA	3	-2	0	0	-3	-1	2	7	5	1	2	6	1	-8	4	4	-4	1	0	-8	2	5	2	-2	-4
	CYP	0	0	8	2	-5	9	1	9	6	1	6	10	5	-1	-8	2	-8	7	-4	-1	9	7	36	-2	6
	MLT	-1	-3	3	1	2	-5	6	8	5	1	9	7	7	-3	1	3	-3	4	4	-5	6	9	4	10	8
	SVN	-3	-5	0	-2	-5	-3	2	7	7	2	4	8	6	-7	-1	3	-5	0	2	-6	0	5	13	-2	-1
	HRV	2	3	-4	-4	-3	2	7	11	10	7	5	8	4	-7	-2	3	-5	0	1	-6	7	3	6	1	0
	CZE	1	-5	-2	-2	-2	2	7	12	9	5	8	8	6	-8	0	7	-6	-2	0	-6	1	4	4	-1	-5
	EST	194	1	2	1	2	3	7	13	13	6	6	10	5	-10	5	9	-3	2	3	-7	3	4	4	-1	-1
	LVA	-2	3	-1	4	10	0	5	11	11	17	10	379	4	-9	3	14	-1	13	-4	-6	0	3	5	0	6
	LTU	-1	3	2	-1	7	5	2308	14	14	7	6	16	5	-9	4	5	-1	5	7	-5	0	6	5	5	3
	SVK	0	-1	-2	0	-3	-1	8	10	8	7	7	16	9	-9	-3	9	-2	2	8	-5	3	3	6	-4	-5
	POL	-2	-5	1	-4	-1	4	1	6	7	8	6	10	9	-10	5	3	-3	3	1	-5	0	5	5	0	-3
	HUN	-4	-6	-3	-3	-4	2	9	7	6	4	2	5	3	-9	-2	4	-7	2	1	-6	2	5	6	0	-6
	GRC	-2	-6	-1	1	-4	1	2	12	8	-1	5	4	5	4	-6	2	-6	3	1	-7	0	10	3	-2	-5
	BGR	-27	-40	6	-1	-3	4	6	12	12	7	8	29	4	-2	3	7	-1	0	12	-5	-1	5	5	-1	-1
	ROU	-9	-28	-15	-15	-13	-3	1	6	6	14	8	14	58	-4	6	10	-6	6	18	-4	0	7	5	0	-1
	UKR	-22	1	-10	-14	-6	6	8	11	13	3	8	6	1	-19	4	4	9	2	-16	-24	4	2	2	7	1
	BLR	-18	-16	-16	-34	-29	-14	-13	-5	4	7	6	7	7	-12	9	-9	-15	-2	-8	-17	-6	6	2	0	-6
	RUS	-9	-9	-23	-22	8	-1	-5	6	10	7	7	10	6	-14	8	10	0	0	-7	-16	-4	9	1	2	-5
	TUR	-17	-19	-18	-17	-11	-21	-2	3	8	7	0	4	0	-11	6	2	0	1	-3	-7	-3	-3	-8	-4	-8
	KAZ	-19	-3	-8	5	4	5	-2	5	17	18	23	290	11	0	173	9	2	10	-1	-11	-16	23	-2	-5	-7
	CHN	4	26	6	3	5	6	0	8	12	12	60	13	7	2	3	15	7	9	5	3	-4	-1	4	1	0
	HKG	0	-1	-2	0	5	-6	-2	-2	0	2	1	-1	3	-4	5	1	-3	-4	24	0	3	0	0	5	-2
	TWN	1	4	-4	5	5	-5	2	2	3	3	13	1	-1	-8	8	6	-2	-1	-1	-4	-2	4	2	1	4
	KOR	1077	-3	-13	10	5	-4	5	4	5	5	6	5	-4	-4	93	4	0	2	3	-2	-1	3	2	-1	-2
	JPN	-5	-4	-5	5	4	-4	-2	4	4	1	-3	1	6	-1	5	5	0	-7	-3	-6	3	0	2	0	0
	LAO	-7	-1	-26	-23	-3	-5	-5	5	1	10	22	6	9	1	18	24	7	3	21	1	7	3	3	2	1
	MMR	-1	-7	-27	-6	10	-2	-5	-14	-6	-2	1	5	14	20	10	13	1	-3	-1	-8	-1	2	4	-3	1
	BGD	1	1	-3	-1	0	0	2	1	2	3	3	3	0	3	1	-3	0	6	4	5	3	4	4	3	-1
	BRN	3	0	-12	64	44	-4	9	14	9	13	15	4	13	-15	3	69	-1	6	37	5	-7	3	10	0	-5
	MYS	14	-1	-10	3	7	-4	2	5	5	7	2	6	6	-7	7	15	-1	-1	-5	3	1	1	5	1	-3
Asia/Oceania	IDN	615	-1	-30	9	3	-4	3	6	2	3	3	3	3	0	11	12	-3	-4	-4	-4	0	3	-1	3	-2
	PHL	1	-5	-12	6	-2	-4	4	2	3	5	13	10	5	-2	6	3	3	1	1	0	0	-1	-2	2	-1
	AUS	5	-1	-5	4	-2	-3	5	10	8	4	1	7	1	-1	7	7	0	-4	-2	-8	0	3	2	-1	0
	NZL	3	0	-6	-1	-2	-3	3	10	9	4	-2	7	0	-6	4	5	3	2	3	-5	-1	2	2	0	-1
	SGP	5	0	-3	-1	3	0	2	4	7	8	9	6	-3	2	7	7	1	0	1	-1	-1	1	2	0	-2
	THA	1	-9	-13	2	7	-2	4	8	7	5	14	8	4	-3	9	6	2	0	-3	-4	-2	3	4	1	-3
	VNM	5	3	-1	2	6	4	4	7	16	6	5	3	4	0	-3	1	10	8	8	7	8	2	3	2	0
	KHM	-3	-2	-8	-1	53	4	258	0	466	0	7	4	-1	3	5	3	4	3	3	5	5	3	5	4	0
	PAK	-4	-4	-2	-2	-2	-4	4	4	3	1	2	5	-7	-4	3	1	-3	-5	-2	0	4	1	-2	-8	-4
	IND	1	1	-5	0	0	1	1	5	5	7	4	8	1	-2	4	-8	-7	-2	10	-3	-1	3	2	0	-5
	SAU	7	1	-12	16	18	-4	4	10	10	7	2	0	20	-17	16	19	3	-2	-5	-7	9	6	12	2	-8
	JOR	-4	2	-3	1	0	4	5	3	8	7	5	4	5	4	2	3	0	6	0	-5	2	10	0	3	-1
	ISR	0	-3	-1	-2	9	-2	-5	3	5	3	4	14	8	-7	6	4	1	4	0	-2	2	4	3	2	2
	EGY	4	0	2	4	1	-5	-4	-8	0	3	6	14	0	4	-1	12	-2	0	-5	-5	-10	-8	1	3	1
	MAR	6	-5	-1	-1	-2	-1	2	6	4	3	4	4	6	-2	1	6	0	1	27	-6	-2	2	3	0	-4
	SEN	-2	-6	44	-6	-1	-2	4	13	9	3	3	6	4	2	2	5	-1	0	2	-3	3	6	6	5	1
	CMR	0	-3	5	10	-5	4	3	10	8	-1	0	9	5	-1	-2	6	-1	3	0	-6	30	3	0	1	9
Africa	CIV	29	-3	5	3	-10	0	24	2	4	5	15	3	7	5	-2	-1	-1	10	8	1	6	3	5	7	2
	NGA	-11	0	-5	0	15	-2	-4	7	5	-1	18	49	0	26	20	12	6	329	7	-9	-11	-7	5	3	-17
	TUN	13	-6	1	1	-4	-1	2	6	6	0	124	8	7	-4	-2	-1	0	-2	-3	-9	-3	-4	-2	-5	0
	ZAF	-5	-2	-5	0	1	-6	-4	18	11	4	0	2	-5	-3	10	2	-3	-6	-4	-5	-6	3	-2	-3	-7
	ROW	0	-1	-3	2	2	3	-2	2	4	7	5	6	4	-4	8	13	1	-2	-2	-4	1	2	2	1	-2
	Countries total	1910	-137	-71	849	153	-79	2697	483	975	356	595	1223	378	-296	571	483	-74	447	131	-366	28	254	262	40	-153

Figure 5. Industrial competitiveness from Country's industrial portfolio perspective

Source: Authors' results.



Industry	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
01T02 Agriculture, hunting, forestry	-4	-9	-10	-6	-2	-4	1	7	10	3	4	12	6	-9	10	10	-3	2	-1	-10	-2	4	2	-1	-2
03 Fishing and aquaculture	-7	-9	-6	-5	-2	0	6	9	8	5	7	7	11	-5	16	12	-3	11	6	-5	1	6	2	0	-4
05T06 Mining and quarrying, energy producing products	-3	-2	-11	-3	5	-4	0	10	10	14	7	8	13	-12	9	17	-2	0	-4	-16	-6	8	8	0	-6
07T08 Mining and quarrying, non-energy producing products	-5	-3	-9	-5	-1	-3	2	10	11	9	12	10	8	-11	8	9	-4	1	-2	-10	3	8	5	2	-2
09 Mining support service activities	-5	-3	-9	7	2	-2	1	10	12	10	11	31	28	-9	8	16	-2	4	26	-12	2	8	11	43	-6
10T12 Food products, beverages and tobacco	-5	-8	-9	-5	0	-3	2	8	11	6	4	10	7	-7	11	11	-2	3	-1	-9	-2	4	2	1	-4
13T15 Textiles, textile products, leather and footwear	-6	-8	-8	-8	-2	-5	-1	6	5	2	3	5	0	-14	8	8	-2	-1	0	-9	-3	4	2	9	-4
16 Wood and products of wood and cork	-3	-7	-8	-3	-2	-4	2	11	12	5	5	8	0	-13	5	6	-4	0	3	-8	-1	3	3	-2	-2
17T18 Paper products and printing	-6	-7	-7	-4	0	-4	1	9	9	7	5	8	3	-10	6	5	-4	2	-1	-9	-2	1	7	-3	-4
19 Coke and refined petroleum products	-1	-6	-13	3	13	-6	-1	12	17	26	8	378	13	-16	12	18	-1	10	-4	-18	-9	18	45	-6	-8
20 Chemical and chemical products	-5	-5	-9	-6	0	-5	1	10	13	5	9	11	11	-13	11	10	-2	-1	-1	-7	-3	4	6	-2	-3
21 Pharmaceuticals, medicinal chemical and botanical products	1	-7	-9	8	4	-2	3	10	10	12	10	6	9	-5	12	27	-2	16	37	-8	-1	1	7	7	0
22 Rubber and plastics products	-4	-7	-6	-4	0	-2	2	11	11	7	7	10	3	-11	9	9	-3	1	2	-7	-2	4	2	-2	-3
23 Other non-metallic mineral products	-4	-7	-8	-3	-2	-3	2	11	12	7	7	11	3	-12	5	9	-5	0	0	-8	-1	4	5	-1	-3
24 Basic metals	-6	-6	-6	-3	-1	-4	0	11	20	5	14	12	5	-19	21	9	-7	-1	-1	-10	-5	8	8	-3	-5
25 Fabricated metal products	-3	-6	-7	-4	0	-2	1	10	14	6	11	12	6	-14	6	8	-3	0	-1	-9	0	5	4	-1	-4
26 Computer, electronic and optical equipment	0	-1	26	7	39	2	160	13	296	8	10	14	4	4	12	4	-3	2	-1	-4	3	3	4	1	4
27 Electrical equipment	1	-9	-6	2	21	-4	100	9	180	4	13	47	0	-1	12	11	-3	0	-2	-9	0	6	3	0	0
28 Machinery and equipment, nec	-2	-8	-4	2	1	0	6	13	16	3	9	26	7	2	8	16	2	1	1	-9	0	5	6	-2	4
29 Motor vehicles, trailers and semi-trailers	7	-5	7	6	-2	-1	16	12	14	2	14	12	3	3	18	14	0	2	1	-8	-1	4	11	5	2
30 Other transport equipment	4	-5	2	-1	1	7	8	13	19	2	28	11	7	-7	3	13	3	8	1	-3	9	11	17	6	1
31T33 Manufacturing nec; repair and installation of machinery/equipment	-3	-5	-8	-2	1	-2	3	9	11	8	6	10	4	-7	9	7	-1	5	0	-6	1	5	5	0	-2
35 Electricity, gas, steam and air conditioning supply	-4	-8	-9	-1	1	-3	4	12	10	9	10	10	-7	8	8	8	-1	1	-2	-11	-3	3	5	-2	-6
36T39 Water supply; sewerage, waste management and remediation	-4	-7	-8	2	3	-3	3	11	14	8	9	11	15	-8	12	9	0	1	-1	-10	0	4	4	-1	-2
41T43 Construction	-1	-6	-5	2	2	3	7	15	16	9	17	16	10	-4	13	15	0	4	5	-6	0	6	6	-2	3
45T47 Wholesale and retail trade; repair of motor vehicles	-2	-6	-7	-2	0	-2	2	10	11	8	8	11	7	-10	8	7	-2	1	0	-8	0	4	4	0	0
49 Land transport and transport via pipelines	-1	-8	-7	-4	3	-2	2	12	11	8	6	12	6	-9	9	5	-1	2	0	-9	-1	4	4	-1	-5
50 Water transport	-2	-7	-6	-2	1	-2	0	10	10	7	10	15	9	-11	10	3	0	0	0	-10	-5	5	4	-1	-5
51 Air transport	-3	-5	-6	-2	0	-4	1	11	13	10	7	10	7	-11	9	8	0	3	2	-10	0	11	6	-2	-15
52 Warehousing and support activities for transportation	-2	-5	-6	-1	1	-2	2	12	11	8	8	12	8	-9	9	10	-1	2	1	-8	0	5	5	-1	-7
53 Postal and courier activities	-4	-1	-5	-1	-1	-3	2	10	10	8	6	11	4	-9	5	4	-2	2	-1	-9	0	5	5	0	-1
55T56 Accommodation and food service activities	-4	-4	-7	-3	7	-4	2	13	9	6	16	15	7	-4	93	11	1	4	3	-8	0	3	3	2	-6
58T60 Publishing, audiovisual and broadcasting activities	-2	-3	-5	-2	0	-3	3	10	10	8	5	10	6	-9	6	4	-2	3	0	-10	0	3	3	0	-5
61 Telecommunications	-1	-3	-3	2	2	-2	2	10	9	5	6	9	4	-7	4	2	-4	0	-1	-10	0	1	1	-2	-3
62T63 IT and other information services	8	-3	4	4	9	4	3	13	11	13	10	14	6	-3	10	12	2	6	2	-5	2	7	7	3	-2
64T66 Financial and insurance activities	-3	-6	-5	-3	-2	-3	3	11	11	8	8	14	5	-4	6	5	-2	3	0	-6	-1	2	2	-1	-3
68 Real estate activities	-2	-3	-6	0	0	1	4	11	13	8	9	14	7	-3	8	8	-1	3	-1	-9	1	9	5	-1	-1
69T75 Professional, scientific and technical activities	-1	-3	-5	-1	0	-2	3	10	11	8	10	12	7	-6	4	7	-1	3	1	-7	1	4	4	0	-3
77T82 Administrative and support services	-2	-4	-6	-2	0	-1	3	12	11	8	10	13	7	-7	5	8	0	4	2	-9	1	6	5	0	-7
84 Public administration and defence; compulsory social security	1929	31	1	7	12	-1	2306	17	19	13	94	301	57	14	23	38	0	130	14	-2	32	15	8	-3	-2
85 Education	7	55	154	882	15	8	9	14	10	15	51	20	12	2	43	29	-2	90	8	-4	12	8	5	-1	-6
86T88 Human health and social work activities	11	-1	-4	5	9	-3	11	16	12	13	64	10	17	7	28	23	-2	116	30	-7	7	12	3	1	-3
90T93 Arts, entertainment and recreation	-2	-1	-5	-1	20	-4	7	12	12	13	14	16	10	-8	29	11	-2	2	2	-10	3	8	7	2	-15
94T96 Other service activities	53	-5	-5	-3	1	-1	3	10	9	6	10	10	9	-4	11	7	-3	3	5	-8	-2	3	2	0	-5
97T98 Activities of households as employers*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industries total	**1910**	**-137**	**-71**	**849**	**153**	**-79**	**2697**	**483**	**975**	**356**	**595**	**1223**	**378**	**-296**	**571**	**483**	**-74**	**447**	**131**	**-366**	**28**	**254**	**262**	**40**	**-153**

*Undifferentiated goods- and services-producing activities of households for own use

Figure 6. Industrial competitiveness from the global industry perspective

Source: Authors' results.

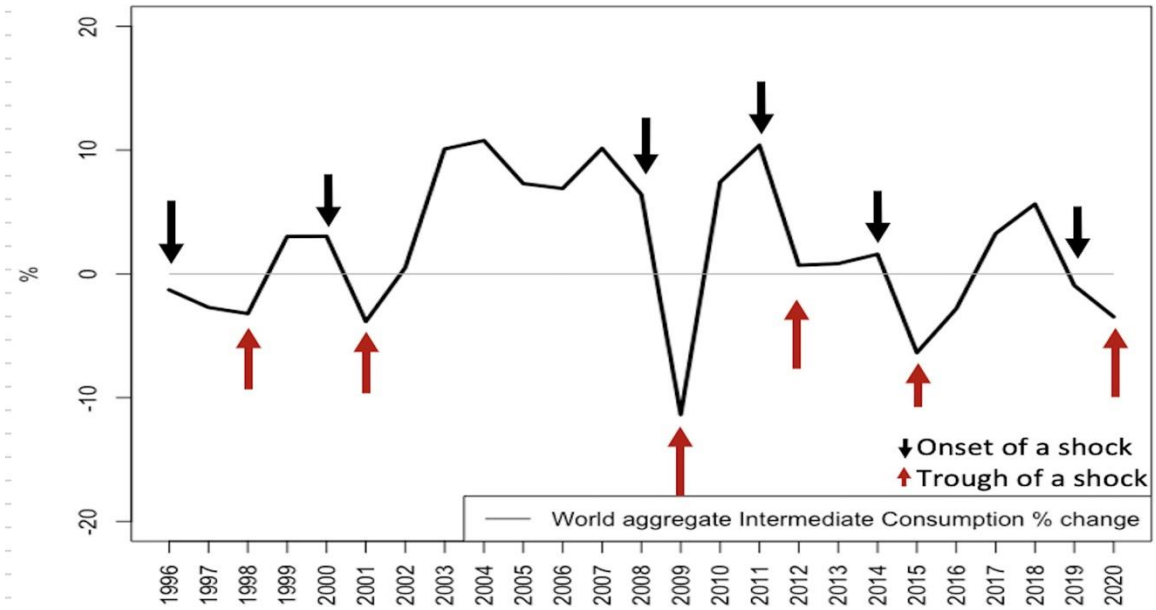


Figure 7. Identification of onsets and troughs of the shocks in the world economic performance

Source: Authors' results.

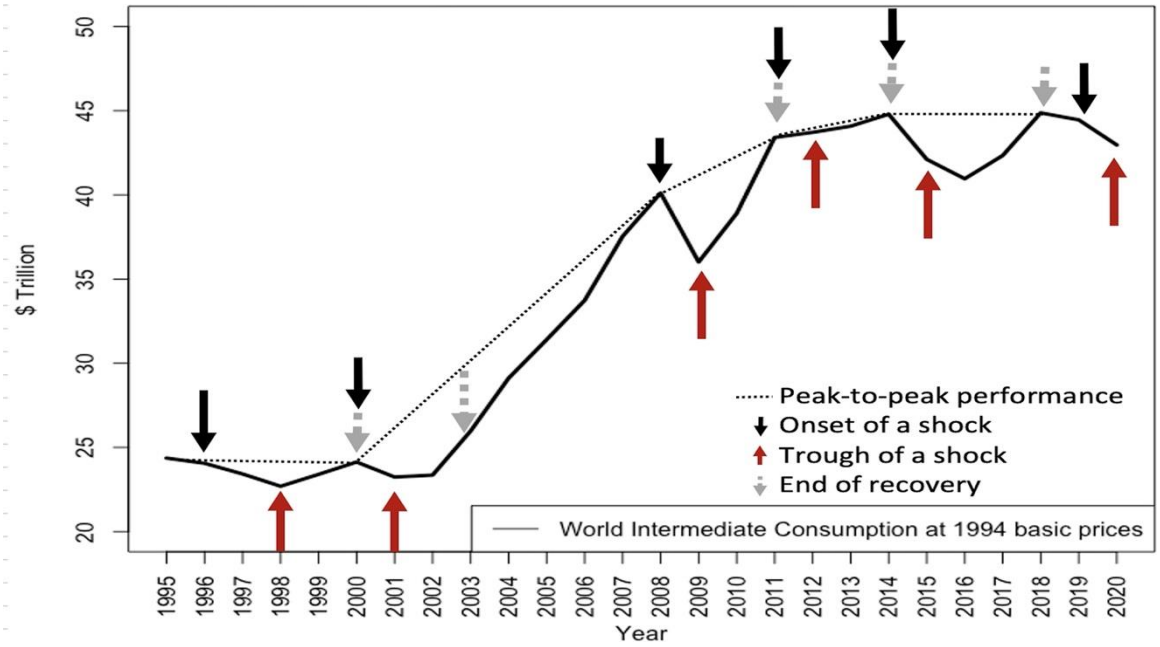


Figure 8. Progress of the world aggregate IC growth and indication of peak-to-peak performances

Source: Authors' results.

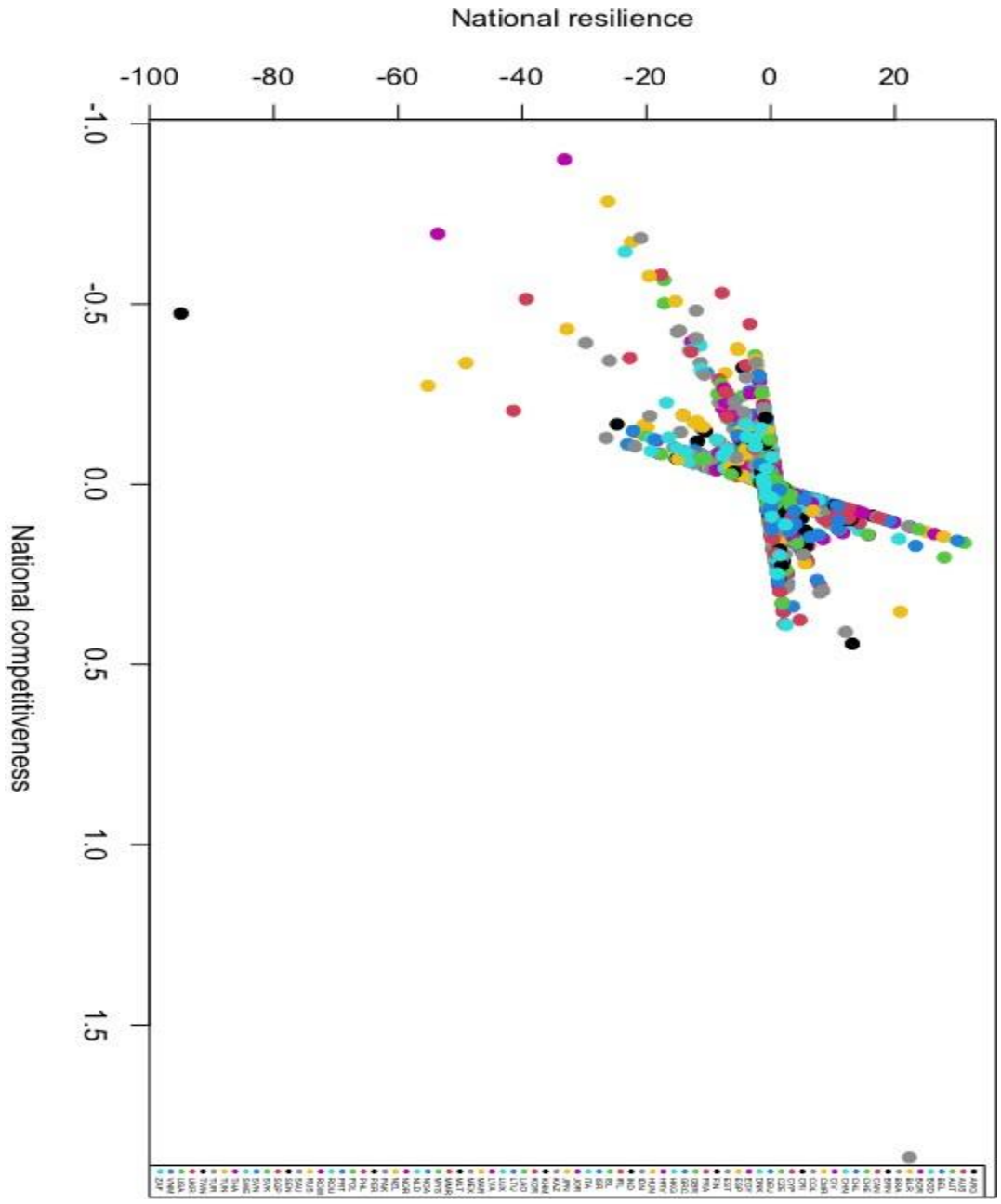


Figure 9: Direct correlation results of national resilience and competitiveness by Countries

Source: Authors' results.

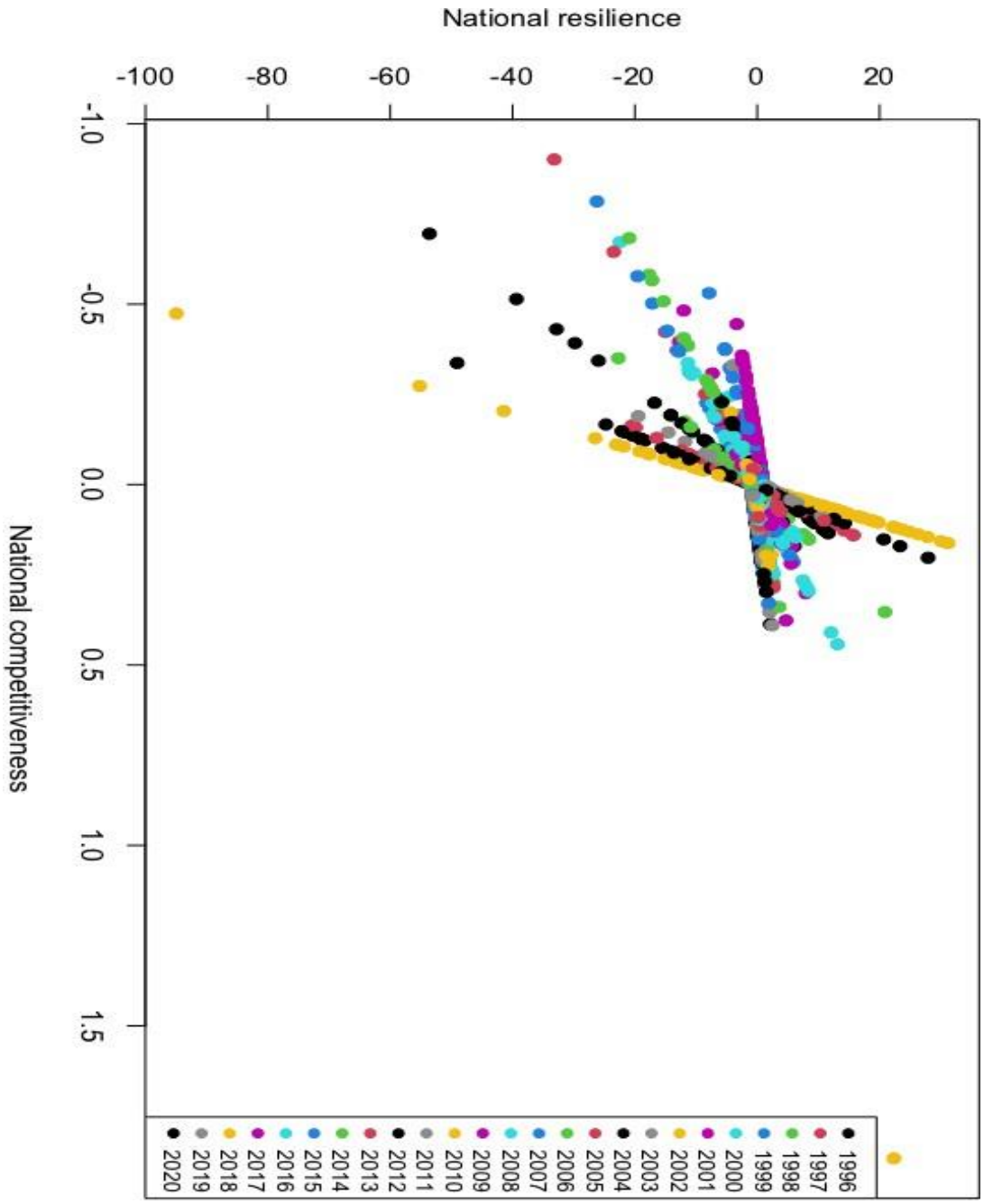


Figure 10. Direct correlation results of national resilience and competitiveness by year

Source: Authors' results.

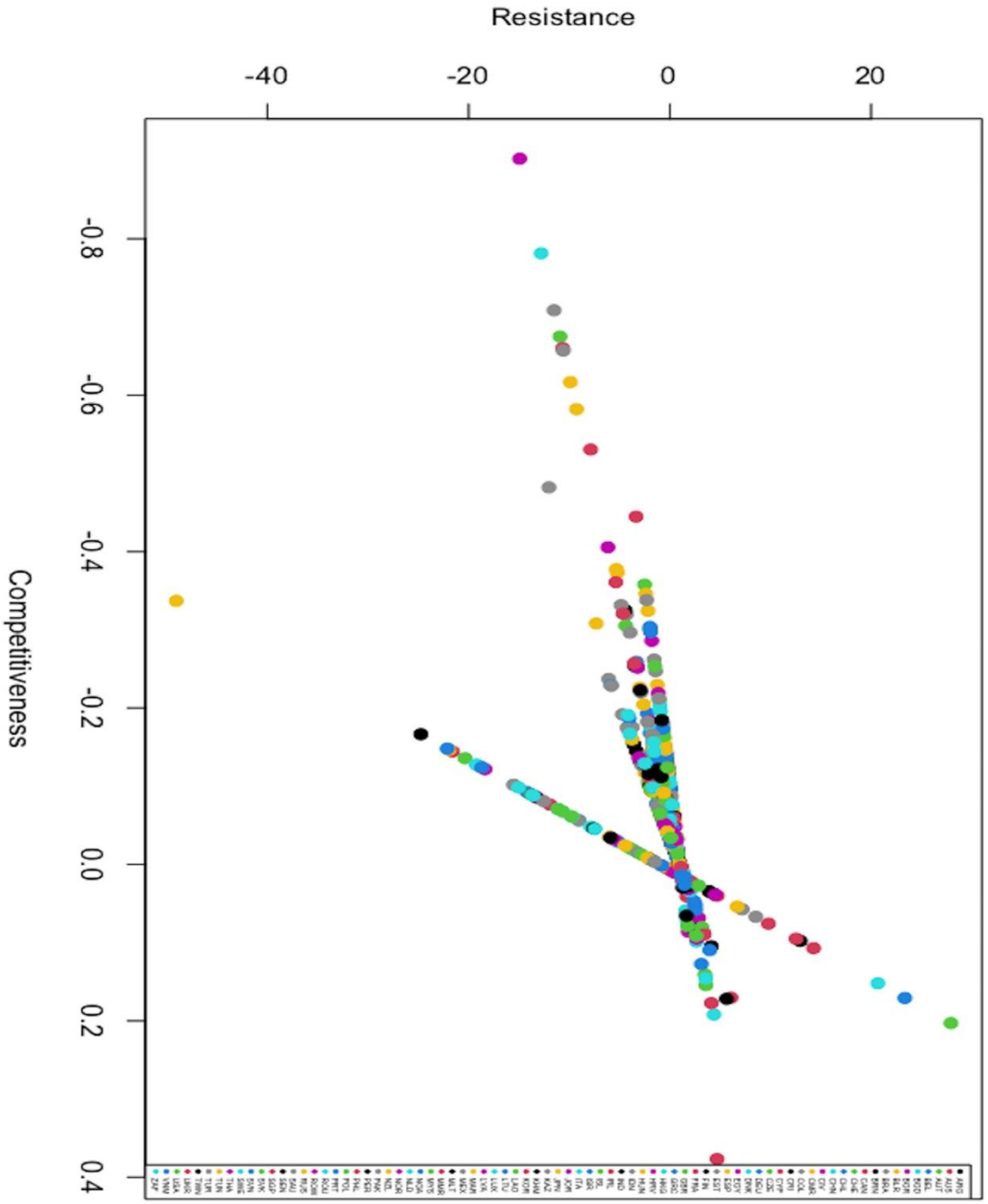


Figure 11: Direct correlation between the results of national resilience components and competitiveness during shocks, by Countries

Source: Authors' results.

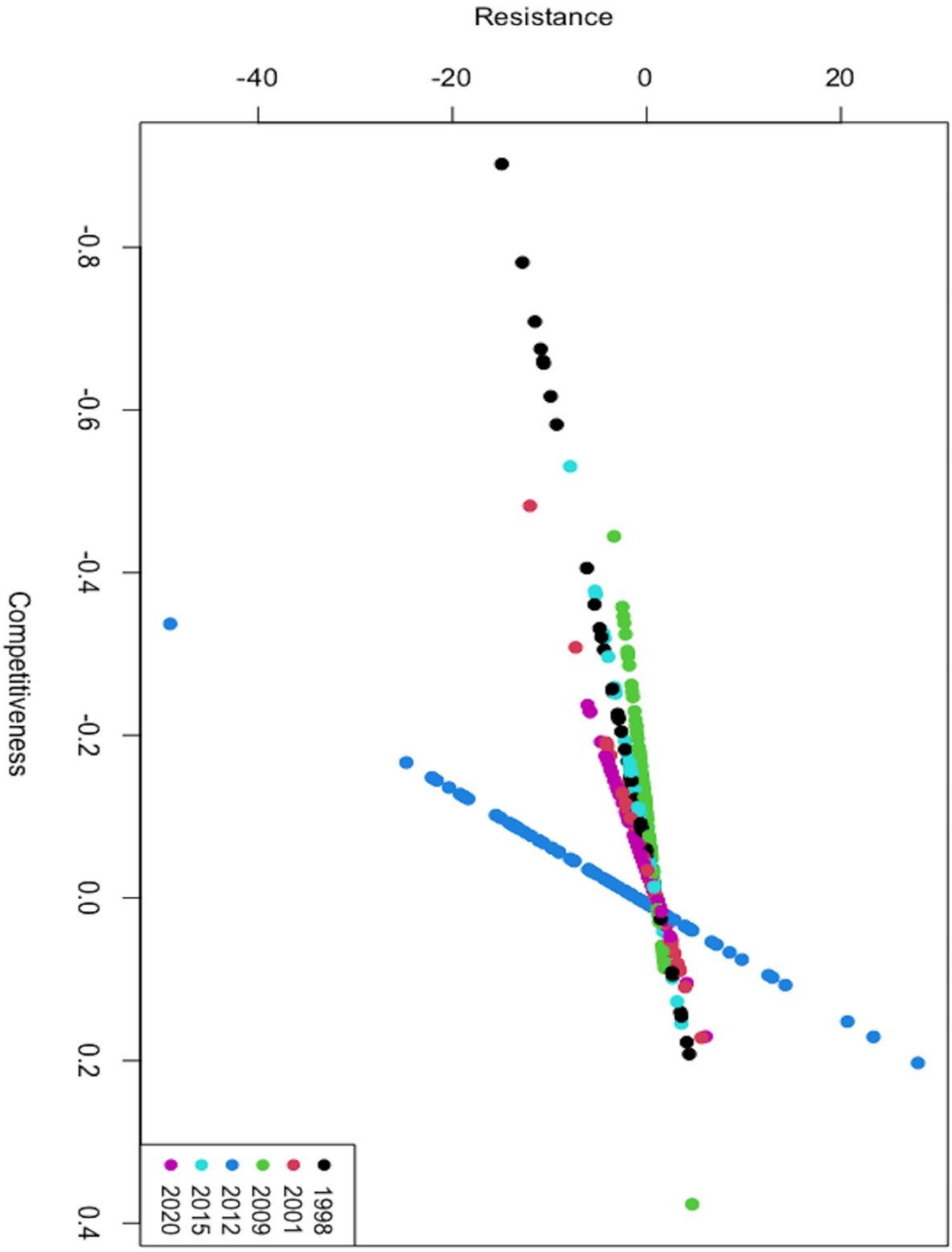


Figure 12: Direct correlation between the results of national resilience components and competitiveness during shocks, by identified periods

Source: Authors' results.

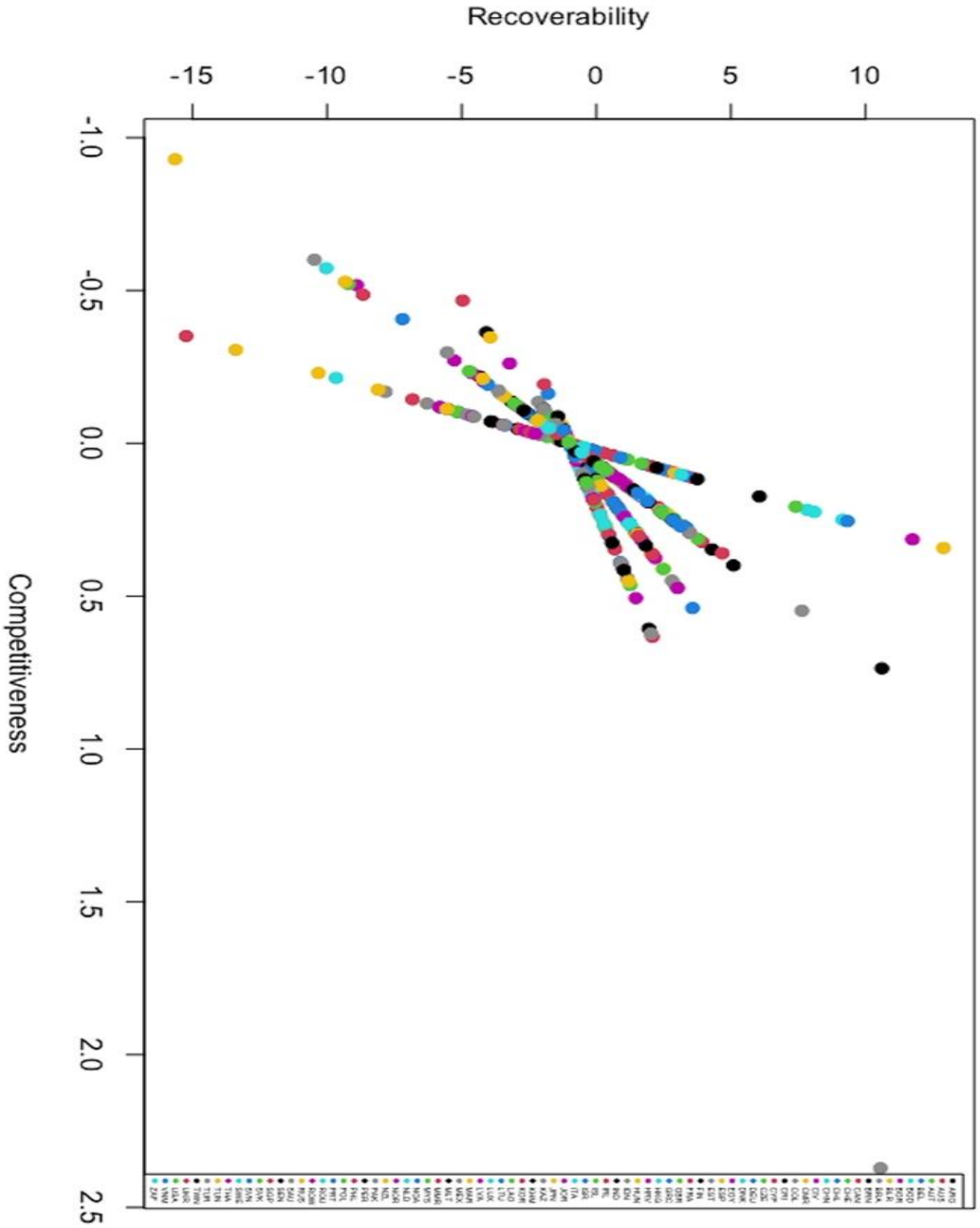


Figure 13: Direct correlation between the results of national resilience components and competitiveness during recoveries, by Countries

Source: Authors' results.

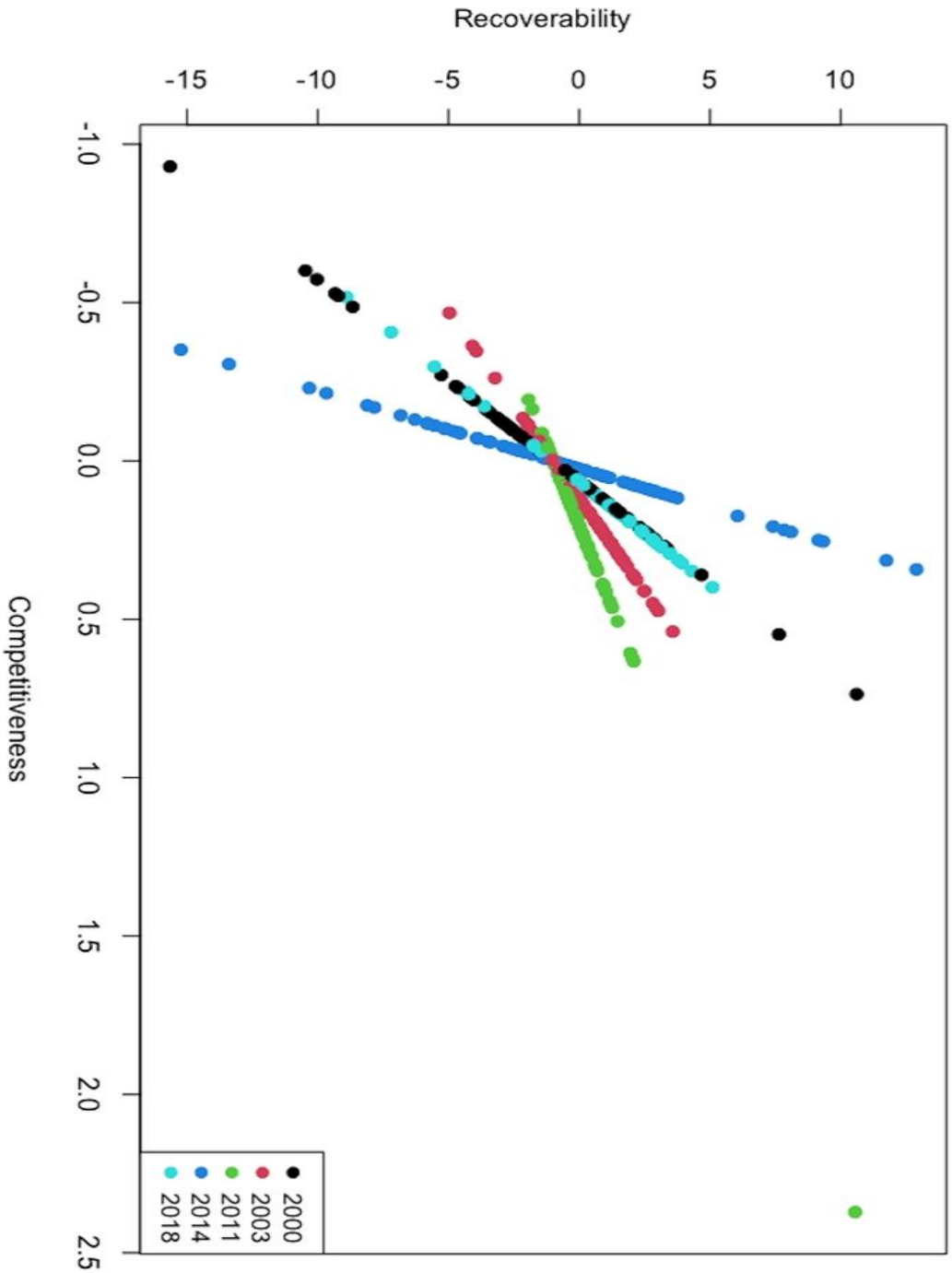


Figure 14. Direct correlation between the results of national resilience components and competitiveness during recoveries, by identified periods

Source: Authors' results.