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Does industry resilience matter for postshock industrial policy? A focus on tourism-related industries

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Abstract

Selective industrial policies have been increasingly used by governments to achieve desired normative goals. However, they have been revealed to be complex and vulnerable interventions, demanding robust tools able to justify choices and mitigate potential 'government failures'. In light of the emerging challenges and potential disruptions that might threaten our economies and societies, we contend that *postshock industry resilience* can be a valuable analytical framework to understand how different sectors react to unforeseen shocks. Accordingly, we present a methodology that measures *postshock industry resilience* and apply it to the Italian case in the aftermath of the 2008 shock. Particular attention is devoted to tourism-related industries. Main findings show that the industries reacted heterogeneously to the 2008 shock. For tourism-related industries, the results suggest following an ad hoc approach to the analysis of each tourism-focused industry to avoid generalizations that might lead to incorrect policy interpretations.

Keywords

industry resilience, tourism, industrial policies, composite indicators

JEL Classification: L52, O14, C43, L16

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Introduction

This paper focuses on selective industrial policies. Specifically, we are interested in government interventions that, by choosing and targeting specific industries, aim to govern the complex process of structural change affecting our economies and societies towards relevant societal goals while ensuring, in parallel, that such transformations are economically, socially and environmentally sustainable (Barbieri et al., 2019; Bianchi and Labory, 2011; Cimoli et al., 2009; Chang, 1994; Di Tommaso and Schweitzer, 2013; Di Tommaso et al., 2020a, 2020b; Ferrannini et al., 2021; Lall and Teubal, 1998; Stiglitz and Lin, 2013; Tassinari, 2019). A typical and traditional example are those policies that invest in the national construction industry to contrast recession and unemployment (as happened in the time of the New Deal or, more recently, after the 2008 crisis). Another example, thinking about contemporary challenges, is represented by those policies designed to support the growth of the national renewable-energy industry to fight climate change or to ensure energy independence from abroad in strategic sectors (Cardinale, 2022; Hirschman, 1958; Di Tommaso and Schweitzer, 2013; Jewell et al., 2016; Mazzucato, 2013; Nivola, 2008; Polenske and Sivitanides, 1990). However, in the past and in our present, selective industrial policy has been shown to be a complex and vulnerable intervention, attracting criticisms from a body of scholars pointing out typical circumstances and misconduct that could compromise the selection process of policy targets and ultimately undermine government interventions (Buigues and Sekkat, 2009; Chang, 1994, 2011; Di Tommaso and Schweitzer, 2013; Krueger, 1990; Le Grand, 1991; Schuck, 2014).

Against this backdrop, few recent studies have argued that rigorous tools guiding public action in choosing the appropriate targets to promote desired societal goals are needed to make government interventions more effective, efficient, and oriented towards sustainable structural change (Di Tommaso et al., 2017, 2020a, 2022; Ngo et al., 2022). Indeed, while it is true that selective industrial policy, by definition, favours some industries or societal groups over others, the government's decision to prioritize some groups over others should be conscious, coherent, and linked to the specific pursuit of some normatively defined societal goals in the public interest (Di Tommaso et al., 2020b). In this view, innovative framework and methodologies should be considered as crucial to support the process of industry selection; in particular, they could guide policy-makers to better link policy targets with specific societal goals from the perspective of both policy accountability and social watch.

In this paper, we draw from this emergent research programme on the role that rigorous tools might play in guiding policy-makers to identify how different targets express different capacities to achieve certain desired policy goals (Di Tommaso et al., 2017, 2020a, 2022; Ferrannini et al., 2021; Ngo et al., 2022). Specifically, we build upon early studies on *postshock industry resilience*, which represents an analytical tool that measures sectoral resilience capacity in the aftermath of a shock (Di Tommaso et al., 2022). We focus on *postshock industry resilience* since international organizations and scholars have started to warn governments that they should get used to tackling unexpected shocks of different natures in the upcoming years (Hynes et al., 2020; OECD, 2011; World Economic Forum 2022). Indeed, the COVID-19 pandemic cannot be considered an isolated event; other similar challenges or potential disruptions might threaten our economies and societies in the near future due to the global interconnection of political, economic and commercial relations (Hynes et al., 2020; OECD 2011). In view of this, *postshock industry resilience* can be a valuable analytical framework that provides decision-makers with solid evidence on how different sectors react to unforeseen shocks. It can therefore represent an informative base on which policy-makers – during the complex process of policy design and implementation in which a plurality of actors and

stakeholders are involved – ground the rationales of the intervention and select targeted industries, with the ultimate aim of promoting a sustainable structural change in the postshock period.

In the following paragraphs, we present a methodology that measures *industry resilience* (Di Tommaso et al., 2022) and apply it to the Italian case to assess the resilience capacity of sectors in the aftermath of the 2008 shock. Particular attention will be devoted to tourism-related industries. Indeed, while sectors such as manufacturing and construction have received a great amount of attention from scholars in the aftermath of the crisis due to their vital role in the Italian economy (Girardi, 2012; Lagravinese, 2015; Terkaj and Tolio. (2019), the service sectors have been mostly treated as a homogeneous aggregate. However, the service sector encompasses few subsectors, so-called tourism-related industries, which deserve particular attention in a country such as Italy given the relevance of tourism to the national economy (Bank of Italy, 2019). According to the literature (Leiper, 1979), such tourism-related industries are mainly embodied by the following sectors: (1) transportation, (2) accommodation and food service activities, (3) recreation and other service activities, and (4) retail trade. Since Italy represents one of the leading countries in the world in terms of tourist arrivals (ISTAT, 2021), it is therefore interesting to see how such segments of the tourism industry have reacted to the recessionary crisis, considering the pivotal role that tourism plays in the Italian economy in comparison to the average European data (Cellini and Cuccia, 2015); indeed, tourism represents more than 10% of the Italian GDP. Overall, the tourism total contribution to the GDP in Italy amounted to approximately 163 billion euros in 2021.

The original contribution of this paper is threefold:

1) It refines both the definition of the concept and the methodological application of *industry resilience.*
2) It contributes to the literature on the effectiveness and efficiency of industrial policy interventions and addresses the more general need to better link the capacity of achieving societal goals with selective government actions from the perspective of both policy accountability and social watches.
3) It enriches the debate on selective industrial policies by exploring their role, effectiveness and efficiency in the field of services, particularly with regard to tourism-related sectors.

The rest of the paper is organized as follows. The next section develops the theoretical background, after which we introduce the methodological design and the data used and elaborated. The following section highlights the empirical application to the Italian case and presents the main results. Finally, the last section offers a discussion and some concluding remarks, including policy implications and some future research lines.

Theoretical background

Selective industrial policy and societal goals

Everywhere, in the past and in our present, selective industrial policies have been used by national and local governments to achieve what have been defined – in that country and in that historical moment – as national societal goals (Barbieri et al., 2019; Bellandi et al., 2022; Di Tommaso et al., 2020a, 2020b; Ferrannini et al., 2021; Lall and Teubal, 1998; Landini and Ferrannini, 2022; Prodi, 2022; Silvestri et al., 2022; Tassinari, 2019). However, selective industrial policies have historically attracted criticisms because of their 'potential failures' (Buigues and Sekkat, 2009; Chang, 1994, 2011; Di Tommaso and Schweitzer, 2013; Krueger, 1990; Le Grand, 1991; Schuck, 2014). Indeed,

selective industrial policies have been shown to be complex and vulnerable interventions demanding robust tools able to justify government choices. Hence, public investment and preferences towards one specific sector over another need to be carefully analysed, discussed and evaluated (ex-ante and ex-post) in terms of their supposed capacity to achieve specific societal goals (Di Tommaso et al., 2017, 2020b, 2022; Ngo et al., 2022). In this framework, as a wide and established literature has highlighted (see, e.g., Chang, 1994; Di Tommaso and Schweitzer, 2013; Di Tommaso et al., 2017; Krueger, 1990; Le Grand, 1991), important 'failures' might arise during the process of industry/sector selection. Indeed, before and during the implementation of the policy, a multitude of actors and stakeholders are in the position of influencing the process of target selection (Cardinale, 2017; Hirschman, 1970; Scazzieri et al., 2015). First, we might expect traditional 'internal failures' given that governments are not 'black boxes'. Rather, they are complex organizations in which a lack of competence, scarce and asymmetric information, self-serving bureaucrats, internal competition and overlapping competences might easily push policies away from the expected desired outcomes. This complexity might have an impact on how sectors are actually selected by governments, defining priorities and preferential policies that have limited justification if confronted with those goals that are declared as the real rationale of the intervention. Second, along with governments' 'internal failures', great challenges are related to the fragility of the government–industry–society relationships. Governments might be captured by some partial interests who know how to not only organize themselves but also demand and obtain special policy attention with the further risk of encouraging rent-seeking behaviour, clientelism, corruption and the exchange of political consensus with policy intervention. Once again, these dynamics might have an impact on how sectors are chosen, thereby making (since the very beginning) the policy process both inefficient and ineffective.

Hence, external or internal pressures could favour 'particular' interests over more general ones during the process of industry/sector selection. In this complex and realistic setting, selective government interventions must be justified according to their capacity to achieve specific normatively defined societal goals. In principle, an ideal process would be the discussion and the comparative evaluation of how different sectors might contribute to the promotion of well-defined societal goals. For example, to what extent government support for the manufacturing versus service sector might represent a solution to wide objectives, such as fostering economic growth, innovation or competitiveness; reducing national dependency on foreign strategic technology; fighting unemployment, economic, social and territorial disparities; and contrasting environmental crises and climate change. Or, to enter into a more desirable specificity, one could ask the following: would investing in construction industry to create new public works (roads, trains, bridges, dams, etc.) effectively counteract the economic and social risks connected to job losses? Or again, would the support for electric engine production or renewables (solar or wind power) promote a greener economy and society? In this context, robust frameworks and methodologies should be considered crucial for mitigating the potential rise of the abovementioned 'internal and external government failures' from the perspective of policy accountability and social watches. Such tools would represent clear points of reference during the process of industry selection that might regulate the interactions in this delicate stage between bureaucrats, policy-makers, stakeholders and citizens.

Industry resilience

Resilience is a multifaceted term that has been used in several disciplines. It broadly defines the capacity of a system to either withstand or recover from a shock and to undergo adaptive changes to its socioeconomic structures and institutional arrangements under new emerging circumstances

(Adger, 2006; Cardinale, 2022; Folke, 2006; Martin and Sunley, 2015). Recently, it has also become a relevant concept in the field of industrial policy. The intuitive idea – which has been elaborated during the COVID-19 pandemic – is that making our economies and societies more resilient to unexpected shocks could be considered a desirable national societal goal and thus an equally desirable policy goal (Di Tommaso et al., 2022). COVID-19 is the most recent evidence of the vulnerability of our economies and societies. However, a long list of other possible upcoming 'expected and unexpected shocks' (such as those related to climate change, energy prices or global food insecurity, future financial crises and so on) seems to urge the need for policy interventions that should be able to work along two directions, namely, making postshock economic and social drops less sudden and severe and hence irreparable and fostering recovery capacity and velocity. In other words, as shown in Figure 1, policy efforts could/should aim at minimizing the '*drop'* of the economy and social welfare (the red area) and maximizing the '*recovery'* (the green part). Clearly, the reactions of the economy and society to shocks may vary, following trajectories of partial or full recovery, or even what we might define as an '*ultrarecovery*'. In addition, the possibility exists that shocks may also result in a definitive collapse with no recovery at all (Figure 2).

It is also clear that the postshock resilience capacity of our economies and societies is the result of a variety of interrelated economic, social and institutional dimensions. This is what we observe and understand, for example, when we realize how heterogeneous the impacts of COVID-19 have been across different actors and territories (Bailey et al., 2020; Cortes and Forsythe 2023; Emmerling et al., 2021). However, in this paper, we are particularly interested in the value of *postshock industry resilience*, where the term industry is synonymous with sector (Di Tommaso et al., 2022; Moss 1984). Building on a growing debate in social, economic and management studies (Cardinale, 2022; Crescenzi et al., 2016; Earvolino-Ramirez, 2007; Longstaff, 2009; Martin, 2012; Raid and Botterill, 2013; Reggiani, 2013), *industry resilience* is herein defined as follows: *the way, extent and speed at which industries return to the previous state trend or trajectory after a shock, thus achieving a partial or a full recovery (or even what we might define an 'ultrarecovery')* (Canova et al., 2012;

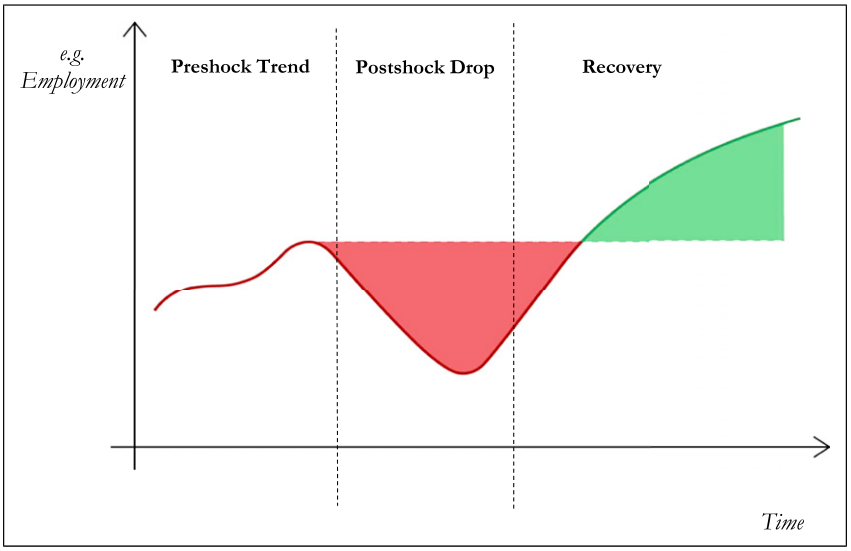

Figure 1. Resilience: Drop and recovery.

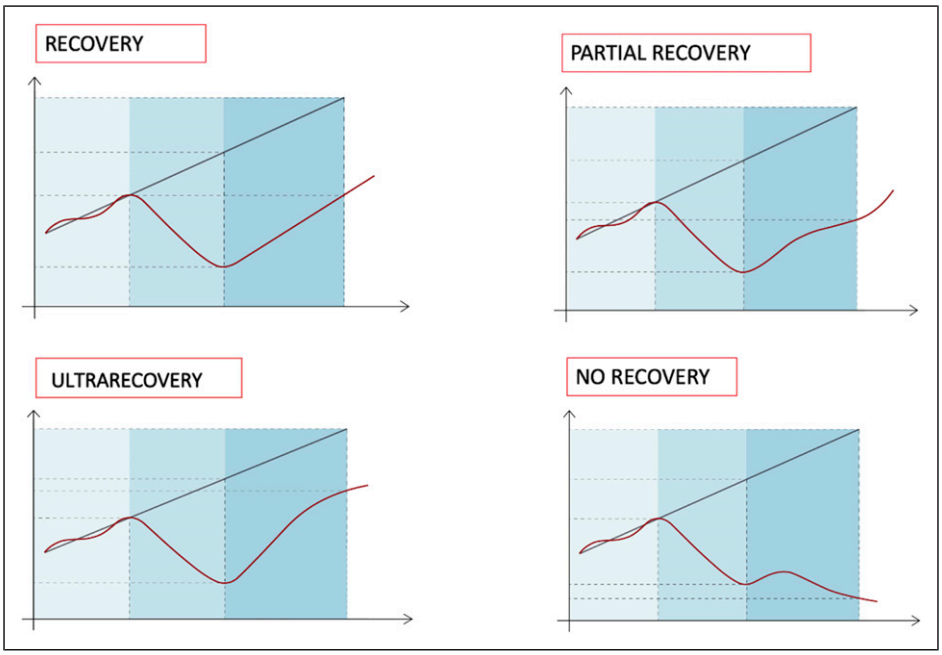

Figure 2. Postshock industry resilience: Different recovery trajectories.

Di Tommaso, 2020a; Di Tommaso et al., 2022; OECD, 2021). As mentioned above, the intuition and the assumption underpinning this paper is that the more resilient our industries are, the better the economy and society as a whole are. Indeed, as many observers and scholars who have animated the international and interdisciplinary debate have suggested (Beck 1986; Hynes et al., 2020; OECD 2011; World Economic Forum 2022), governments should further prepare for upcoming unexpected shocks of different natures in the near future. Unexpected disruptions can both accelerate desirable structural changes or be so severe as to make any type of change unsustainable. In this context, *industry resilience* can represent a valuable analytical framework for policy-makers since it would contribute to orienting the process of structural change towards a trajectory that is sustainable for the socioeconomic system.

In principle, *postshock industry resilience* could assess several dimensions, such as changes in industry value added, trade, employment dynamics, or output. However, in a policy perspective that promotes the social sustainability[1] of structural change and makes our societies more resilient, it has been pointed out that *industry resilience* should primarily address postshock employment dynamics that occur within sectors (Di Tommaso et al., 2022). Indeed, *shocks affect workers differently depending on their industry* (OECD, 2021). Further exacerbation of traditional dualisms in labour markets and social conflicts ensuing from unforeseen shocks might deteriorate the social fabric, thereby threatening the economic prosperity of a country in the long term.

By recognizing the economic and social value of *industry resilience*, novel rationales for industrial policy interventions in favour of specific sectors/industries would arise, for example, supporting the most resilient sectors because of their potential capacity to foster wider dimensions of economic and social resilience or investing in sectors that have proven to be scarcely resilient to shocks to make society more resilient as a whole. From our perspective, such targeting would aim

not solely at the recovery of jobs in those sectors; rather, it could also encompass other aspects encouraging the adaptation of the workforce to the postshock emerging conditions, for instance, through skills conversion or workers requalification to be able to govern the future shift of jobs from declining sectors to more promising ones. In this stream, Fasone and Pedrini (2022) also paid attention to gender equality issues.

Resilience and tourism industry

The literature on the tourism sector has investigated resilience to shocks as well. The first discussion on resilience in the tourism sector was introduced by Farrell and Twining-Ward (2004 and 2005), which stimulated a debate on resilience and the adaptive capacity of complex systems. Calgaro and Cochrane (2009) applied the concept of resilience to identify which actions could mitigate system vulnerability and build a response after a shock; McDonald (2009) used the concept to identify relationships between stakeholders in a tourism destination, thus emphasizing the role and usefulness of complexity science for achieving societal goals such as sustainable development.

However, in tourism studies, the concept of resilience has mainly focused on economic aspects without accounting for other dimensions, such as social or institutional features. Indeed, according to Faulkner (2000), the main perspective of resilience adopted in tourism studies relates to 'the recovery of tourism industries and tourist arrival numbers following fast variable changes – that is, disaster and crisis preparation and recover' (Faulkner, 2000 - cited in Lew, 2014: 3). In line with this, by focusing on a country-level (or regional) analysis, some studies have shown the heterogeneity of resilience capacities based on specific economic conditions. In Italy, for example, Cellini and Cuccia (2015) showed how the tourism industry was more resilient to the 2008 financial crisis than other industries by analysing which characteristics are connected to the resilience capacity of regions. Specifically, the authors emphasized how the differences in the regional-level economic resilience of the tourism sector could explain the degree of success in response to the crisis.

More recently, tourism scholars have included 'slow change variables' in their analyses on resilience (Lew, 2014), such as economic migration and social change (Lew, 2013), global climate change (Becken and Hay, 2007; Kajan and Saarinen, 2013), tourist behaviour and preference (Becken and Wilson, 2013; Bernini et al., 2021), and specific tourism industries (Biggs, 2011; Steiger and Stotter, 2013).

Overall, these studies have tried to emphasize theoretical and practical implications for the tourism sector (Brown et al., 2018; Calgaro et al., 2014; Cochrane, 2010; Lew, 2014). However, studies have been carried out mainly using a qualitative approach and focusing on single case studies; in contrast, the quantitative analysis of resilience is still limited (Okafor et al., 2022). Moreover, other limitations are concerned with the fact that most of the studies on resilience, shock and tourism conducted over the period 1960–2018 address primarily tourism firms or organizations (Orchiston et al., 2016; Ritchie and Jiang, 2019), with a particular focus on the accommodation sector and on 'community resilience' within tourist destinations. In this literature, few studies explore resilience over the different stages of the economic cycle of tourism-related industries.

Based on these gaps in the literature and in light of the challenges posed by COVID-19, it seems necessary to propose a resilience-based framework for tourism industries; this seems particularly relevant in a context in which, according to Sharma et al. (2021), technological innovations such as artificial intelligence (AI) and the Internet of Things (IoTs) are becoming increasingly diffused and, along with other potential disruptions, can trigger a process of structural change in the sector that needs to be addressed in a sustainable way.

Data and methodology

Measuring industry resilience through composite indicators

To assess postshock *industry resilience* in Italy in the aftermath of 2008, we build upon a previous study that developed this concept and a methodology based on composite indicators (CIs) to measure it (Di Tommaso et al., 2022).[2] Such CIs allow us to rank sectors based on their performance during and in the aftermath of an unexpected shock. Specifically, by grasping the amplitude, duration and velocity of the changes affecting sectoral employment, the CIs can support policy-makers in visualizing sectoral performances both dynamically and multidimensionally; they also allow the comparison of each sector with not only other sectors but also their own counterfactual trend.

Accordingly, we proceed by following three main steps. First, we illustrate the six indicators used to model *industry resilience*. Second, we select the variables that allow us to measure *industry resilience*. Considering the framework of this paper, specifically the idea that ensuring the social sustainability of structural change and making our societies and economies more resilient to shocks should be considered a relevant societal goal in current times, the main variable observed for each sector is employment. In particular, and in line with Di Tommaso et al. (2022), we use employment levels to assess changes in employment quantity and the ratio between temporary employment and total employment to assess changes in employment quality. Third, we detail how we build our CIs after observing the variables' behaviour across all six indicators.

First, *industry resilience* has been modelled by six indicators – eventually synthetized into two CIs – that capture different aspects of postshock sectors' behaviours. Specifically, the indicators capturing different aspects of postshock sectors' behaviours have been identified starting from the local points (i.e., the peak t_0 and the trough t_{min}) that shape sectors' business cycles (Han and Goetz, 2015; Hall et al., 2003). Furthermore, a third crucial point used to create the indicators is the *rebound* point, t_{end}. This point signals where the timespan considered for measuring the recovery of each sector ends; we follow Di Tommaso et al. (2022) and set $_{the\ trend}$ for 24 months after the trough, *'thus allowing the sector to clearly reveal an observable trajectory while at the same time smoothing short-term volatility effects as well as avoiding excessively long timespans, which might be influenced by other factors independent of the shock'* (Di Tommaso et al., 2022: 5). Figure 3 shows how *industry resilience* is modelled.

These three points allow us to retrieve the following information on sectors:

1) The actual behaviour of the postshock curve, proxied by **industry rebound** (IR_j), **industry drop velocity** (IDV_j), **and industry recovery velocity (**IRV_j);
2) The counterfactual behaviour of the curve, captured by the **Rebound-Counterfactual Difference Ratio (**RCD_j**) and the Trough–Counterfactual Difference Ratio (**TCD_j**); and**
3) Sectors' size, which is captured by **Industrial Average Employment** ($\overline{X}_j$).

For details on the indicators' construction, see Di Tommaso et al. (2022).

Overall, *industry resilience* accounts for multiple dimensions characterizing postshock sectors' behaviour, namely, drops, rebounds, velocity, and counterfactual elements related to both employment quantity and employment quality.

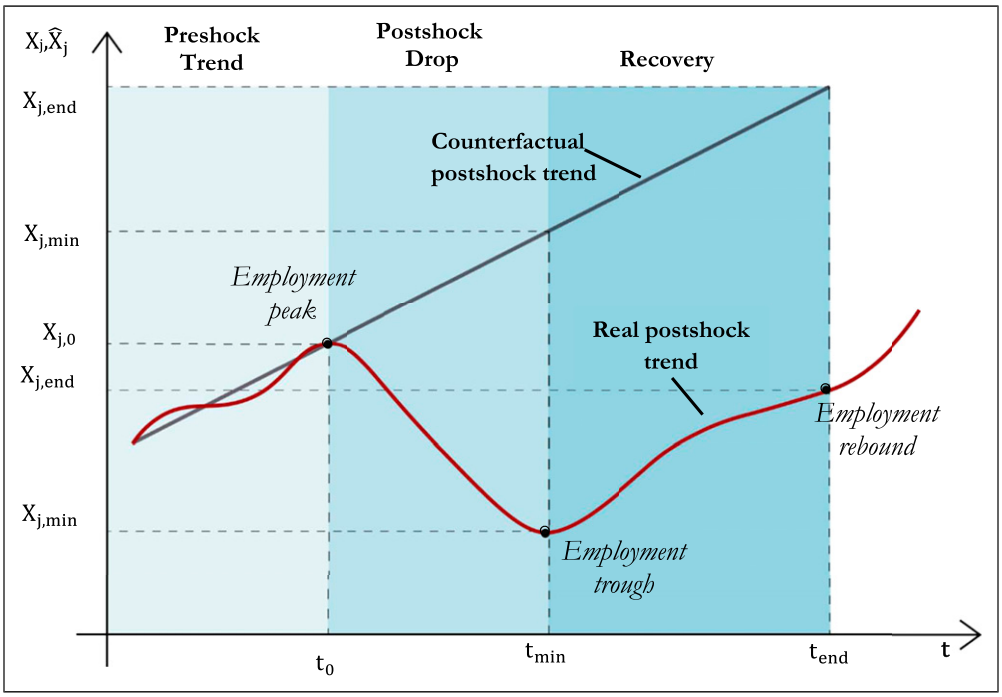

Figure 3. Industry resilience.
Source: Authors' elaboration on Di Tommaso et al. (2022).

Data, variables and indicators

We now present the data used for this exercise on the Italian case.[3] Data are drawn from the European Union Labour Force Survey (EU-LFS), which includes quarterly employment quantity data for 10 one-digit NACE sectors. Table 1 reports the peaks, troughs and rebound points for the 10 sectors;[4] these points identify the overall time frame under analysis (Di Tommaso et al., 2022). Overall, the time frame considered extends from the third quarter in 2007 (where the first peak occurs in manufacturing and arts, entertainment, recreation) to the fourth quarter in 2016 (where the last rebound point occurs in financial and insurance activities).

We exclude from the analysis sectors for which no peak is clearly identified, as well as sectors for which data on counterfactual trends could not be emphasized. We are thus left with 10 sectors, for which we are able to calculate the value of each of the six abovementioned indicators.

For employment quality, Di Tommaso et al. (2022) build a *Good Jobs Index* using information on the stability of employment contracts and earnings. We partly depart from this approach. Indeed, given the lack of appropriate data on salary, we use data on the stability of contracts, which we proxy as the percentage of temporary employment[5] over total employment. Therefore, we assume that the higher the percentage is, the lower the stability of contracts within the sector is and thus, the lower the quality of employment is.[6]

In what follows, we build the two CIs ranking the J sectors on the basis of the $K = 6$ indicators.

I) For each sector, we calculate the value of each one of the six indicators, both for employment quantity (i.e., the number of people employed in the sector) and employment quality (the share of

Table 1. Peaks and troughs by sector.

Sector	Peak quarter	Trough quarter	Rebound quarter	Peak to trough (Months)
Agriculture, forestry and fishing	2010 – Q4	2014 – Q1	2016 – Q1	39
Manufacturing	2007 – Q3	2013 – Q2	2015 – Q2	69
Construction	2008 – Q4	2013 – Q1	2015 – Q1	51
Wholesale and retail trade; repair of motor vehicles and motorcycles	2008 – Q3	2011 – Q2	2013 – Q2	33
Transportation and storage	2008 – Q4	2009 – Q2	2011 – Q2	6
Accommodation and food service activities	2009 – Q3	2014 – Q4	2016 – Q4	63
Financial and insurance activities	2011 – Q4	2014 – Q1	2016 – Q1	27
Real estate activities; professional scientific and technical activities; administrative and support service activities	2007 – Q4	2012 – Q1	2014 – Q1	51
Human health and social work activities	2009 – Q2	2010 – Q4	2012 – Q4	18
Arts, entertainment, recreation and other service activities	2007 – Q3	2011 – Q4	2013 – Q4	51
Mining and quarrying	Data for this sector covering the period 1998–2008 use the NACE Rev. 1.1 classification. The latter, for the aim of this research, is not fully compatible with data covering the period 2008–2022, which use the NACE Rev. 2 classification instead. Such a break in the time series and transitions from NACE Rev. 1.1 to NACE Rev. 2 prevent us from calculating the counterfactual indicators. See online supplementary materials - Appendix A for further details.			
Education	*Ut supra*			
Public administration and defence; compulsory social security	*Ut supra*			
Electricity, gas, steam and air conditioning supply	*Ut supra*			
Water supply; sewerage, waste management and remediation activities	*Ut supra*			
Information and communication	*Ut supra*			
Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	*Ut supra*			

Source: Authors' elaboration based on BLS data.
Note: Q1 encompasses January, February and March; Q2 encompasses April, May and June; Q3 encompasses July, August, and September; and Q4 encompasses October, November, and December.

temporary employment in total employment); to compare sectors, the minimum and rebound values for each sector are computed as the percentage deviation from their respective peak value (=100).

II) We then rank each indicator value normalized to make the variables comparable across indicators and sectors (Becker, 2021; Di Tommaso et al., 2022) as follows

$$I_{kj} = Rank\left(x_{kj}\right) \tag{1}$$

where I_{kj} represents the normalized value of individual indicator k for sector j.

Ranks are defined so that the best-performing indicator's value is ranked as 10, the second-best is ranked as 9 and so on (Becker, 2021) until 1 (the worst-performing indicator's value). For employment quantity, the lowest values generally correspond to the worst quantitative performance (i.e., a contraction of overall jobs). For employment quality, the opposite holds; the lowest values (i.e., lower percentage of temporary employment) generally correspond to better quality performance of the sectors and to a contraction of the percentage of temporary jobs.

An exception is made for the two counterfactual indicators for employment quality. The RCD and TCD indicators originally framed by Di Tommaso et al. (2022), once they are used with our measure of employment quality, generate values that when ordered, do not reflect sector counterfactual performance. We are therefore impeded from creating partial rankings for the counterfactual indicators. To overcome this issue, we have directly ranked sectoral counterfactual performances on the basis of the identification of four groups of sectors' behaviours:

1) *Good trends being maintained:* Sectors where the share of low-quality employment was decreasing before the shock and continued to decline in the aftermath of it. Sectors belonging to this group have the highest rank.
2) *Bad trends being reversed:* Sectors where the share of low-quality employment was increasing before the shock but declined in the aftermath of it. Sectors belonging to this group have a medium-high rank.
3) *Bad trends being maintained:* Sectors where the share of low-quality employment was increasing before the shock and continued to increase in the aftermath of it. Sectors belonging to this group have a medium-low rank.
4) *Good trends being reversed:* Sectors where the share of low-quality employment was declining before the shock but increased in the aftermath of it. Sectors belonging to this group have the lowest rank.

Hence, in terms of the relationship between their counterfactual and actual trends, sectors belonging to the first group are the best performers, while the fourth group includes the worst-performing sectors. Sectoral performances within groups are ordered based on the amount of low-quality employment reduced; thus; they are ranked in descending order (see online supplementary materials - Appendix B).

III) We weight indicators by attaching the same weight to each one of the six indicators, as the literature has suggested in similar cases (JRC-EC, 2008; Marozzi, 2015; Saisana et al., 2005);

IV) We follow Di Tommaso et al. (2022) and use the equally weighted geometric mean as the aggregation method, which uses the product of the indicators as follows. For each sector j

$$gM_j = \left(\prod_{i=1}^{k} I_j^{w_k} \right)^{1 \Big/ \sum_{i=1}^{k} w_k} \tag{2}$$

where I_j is the rank-normalized indicator, and w_k is the corresponding weight.

The geometric mean is more robust to outliers and allows for no substitutability of the information provided by each indicator (Becker, 2021; JRC-EC, 2008).

The final CIs are obtained by ordering the geometric mean values in descending order and assigning higher rankings to higher values, which corresponds to an overall better performance. The

results consist of two rank-based CIs, namely, one for quantity (*CI_QUANT*) and the other for quality **(***CI_QUAL).*

Empirical analysis and results

In this section, we apply the two CIs – measuring *industry resilience* in terms of changes in job quantity and quality across sectors in the aftermath of the 2008 shock – to the Italian case. The emerging results related to the postshock quantitative and qualitative profiles of sectoral employment are then analysed to draw useful insights for industrial policy design and implementation. In particular, we offer a specific focus on tourism-related industries, which, as anticipated in the introductory paragraph, deserve particular attention in a country such as Italy given their relevance to the national economy (see also Bank of Italy, 2019). Indeed, we want to understand how the different tourism sectors perform in terms of postshock resilience within the Italian economy.

As already recalled, according to Leiper (1979), four aspects compose the tourism product: (1) transport, (2) hospitality, (3) recreation, and (4) shopping. In our study, these components are encompassed by the following sectors ([7]): (1) 'transportation and storage', (2) 'accommodation and food service activities', and (3) 'arts, entertainment and recreation and other service activities'.[8]

Before proceeding with the calculations of the indices, we begin our empirical analysis by emphasizing industry trends in terms of dynamics of total employment. Accordingly, we report in Figure 4 the trends of employment quantity by sector in Italy over the years 1998–2021.

As first evidence, we observe a heterogeneous cross-sector performance and a different response to the diverse *stimuli* coming from the environment, including financial or economic shocks. Primarily, sectors' behaviours can be classified into three major groups.

The first group maintains almost the same trend if we compare the starting point of the observation (i.e., 1998) with its end, although some fluctuations over time appear. Within this group, even though the final numbers of workers in the sector remain similar to the initial stage, we can emphasize some sectors with a more evident instability and others with a certain stability.

The second and third clusters of sectors show a constant increasing and a decreasing trend, respectively; consequently, different levels of employment are considered at the end of the period. Specifically, the sectors 'financial and insurance activities', 'transportation and storage', and 'wholesale and retail trade: repair of motor vehicles and motorcycles' belong to the first group. In particular, 'transportation and storage' is the sector with a higher rate of instability; in contrast, the sector 'wholesale and retail trade: repair of motor vehicles and motorcycles' reports a lower rate of instability.

For 'accommodation and food service activities', 'arts, entertainment and recreation and other service activities', 'human health and social work activities', and 'real estate activities, professional, scientific and technical activities, administrative and support service activities', the graph shows a constant increase in employment. As expected, particular evidence emerged during the pandemic period which showed that 'accommodation and food service activities' and 'arts, entertainment and recreation and other service activities' had collapsed while 'human health and social work activities' had maintained the same increasing trend.

'Agriculture, forestry and fishing', 'construction' and 'manufacturing' are the sectors that experienced the worst performance. All these sectors reduced their number of workers over time. In contrast to the other two sectors in this group, 'construction' represents the only industry that increased its figure for a limited time (from 1998 to 2010) just before the crisis collapse. 'Agriculture, forestry and fishing' and 'manufacturing' maintained relative stability after 2012.

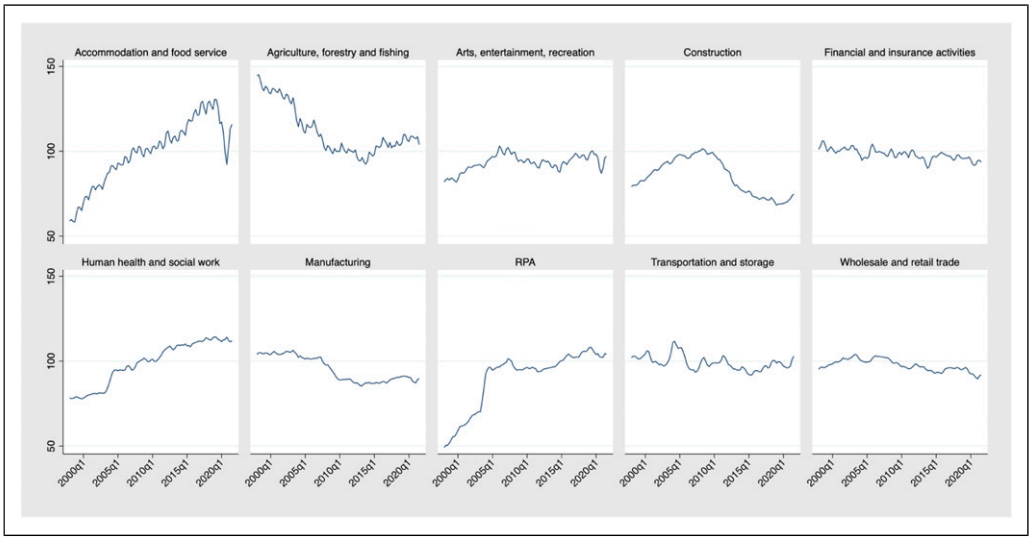

Figure 4. Employment trends for Italy's sectors from 1998 to 2021.
Source: Authors' elaboration on EU-LSF quarterly data. Data were smoothed using the moving average technique.
Note: RPA: Real estate activities; professional, scientific and technical activities; administrative and support service activities.

In Figure 5, we complement the descriptive information provided above. We report the trends of employment quantity by sector, each indexed to its own preshock peak value, for the sake of cross-sector comparability.

Generally, Figure 5 confirms that sectors have reacted very differently to the shock. Some of them, for instance, 'accommodation and food service activities' and 'human health and social work activities', have recovered and improved with respect to precrisis periods; others, such as 'transportation and storage' and 'wholesale and retail trade: repair of motor vehicles and motorcycles', are experiencing a long-run stagnation, with virtually no recovery, as in the case of 'manufacturing' and 'construction'. This latter sector represents a peculiar case, since it records an increasing trend until 2008, after which it obtains the worst results of the ten compared industries (see the grey line). A 'fan-shaped' trend captures the reaction to the crisis of the different sectors. These reactions have also given rise in some cases to among-sector divergent trends that appear to be persistent over time.

Focusing on tourism-related industries, the heterogeneity among sectors is well-ordered. 'Accommodation and food service activities' and 'arts, entertainment, recreation and other service activities' report an increasing trend in the number of employees, although their respective curves are very dissimilar, while 'transportation and storage' recovers its previous levels; indeed, the increasing trend of 'accommodation and food service' is constant until COVID-19 diffusion. Conversely, 'arts, entertainment, recreation and other service activities' experienced a slight increasing trend until 2008 and then experienced general stability. The 'accommodation and food service' industry represents a sector that has improved its performance with respect to precrisis periods, whereas 'transportation and storage' seems to face long-run stagnation; however, this general trend is characterized by particular volatility.

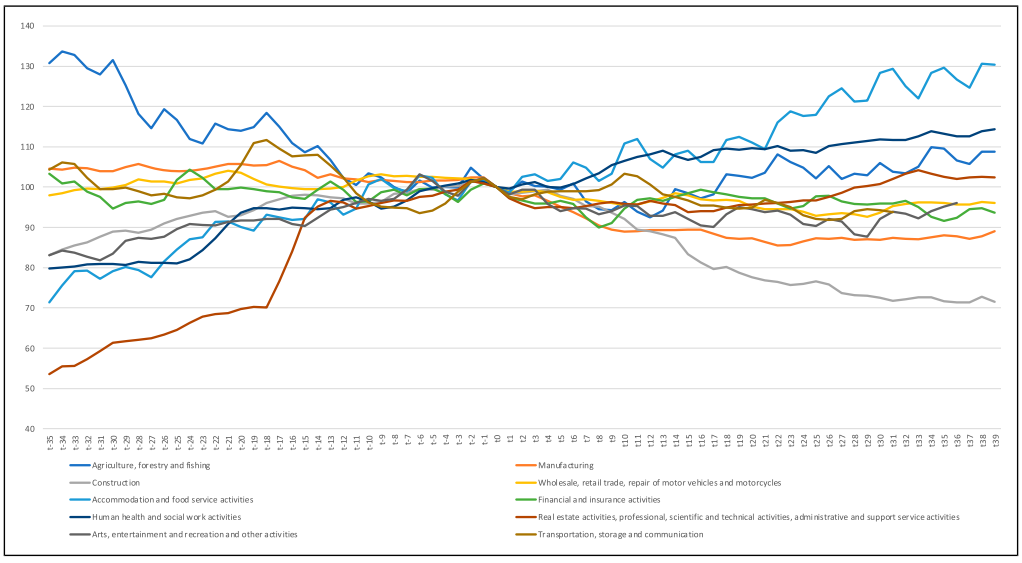

Figure 5. Employment trends for Italy's sectors during the 2008 recession (preshock peak value = 100).
Source: Authors' elaborations on EU-LSF quarterly data. Data were smoothed using the moving average technique.
Note: All variations are measured as the percentage change with respect to the preshock peak value of each sector.

Moving to the empirical application of the two CIs, Table 2 reports the cross-sector variation in employment quantity measured against the six indicators, while Table 3 reports the results for the qualitative dimension of employment. The partial rankings' values related to the indicators TCD and RCD for quality employment are reported in online supplementary materials – Appendix B. Table 4 summarizes the final ranking for both *CI_QUANT* and *CI_QUAL*.

In both Tables 2 and 3, we report for each sector the value of the indicators and the respective position in partial ranking *I*. The higher the value is, the higher the position in the ranking is. We also report for each sector the geographic mean (*gM*) encompassing the six individual indicators and the associated final ranking for both *CI_QUANT* and *CI_QUAL*. Concerning the synthetic quantitative index *CI_QUANT*, Table 2 shows that the best performer is 'accommodation and food service activities', while the worst is 'construction'. Looking at the synthetic qualitative index *CI_QUAL,* 'financial and insurance activities' receives the best score, while 'agriculture, forestry and fishing' has the worst position in the ranking.

It is worth noting that 'accommodation and food service activities' ranks high in *CI_QUAL*, while 'construction' ranks as the worst sector in *CI_QUANT.* This makes 'accommodation and food service activities' the overall best-performing sector, while 'construction' is the overall worst-performing sector for both CIs.

'Human health and social work activities' and 'wholesale and retail trade: repair of motor vehicles and motorcycles' both receive a medium-high ranking position (respectively, the second place in quantity and sixth in quality and vice versa for the case of wholesale and retail trade). The other two sectors achieve a medium-low classification: 'arts, entertainment, recreation and other service activities' (seventh place in quantity and fifth in quality) and 'transportation and storage' (fifth rank in quantity and seventh in quality). 'Real estate activities, professional, scientific and

Table 2. Quantitative resilience: Building *CI_QUANT*.

	A												B	
	IR		*IDV*		*IRV*		*RCD*		*TCD*		$\overline{X}$			
Sector	Value	*I*	Value	*I*	Value	*I*	Value	*I*	Value	*I*	Value	*I*	*gM*	*CI_QUANT*
Accommodation and food service activities	11.5	9	0.446	10	1.91	10	0.342	7	−0.169	8	100.4	10	8.92	1
Human health and social work activities	12.7	10	−0.282	8	1.36	9	0.810	9	−1.13	7	100.3	9	8.61	2
Agriculture, forestry and fishing	9.84	7	−0.757	4	1.25	8	2.35	10	7.42	9	91.4	4	6.57	3
Real estate activities, professional, scientific and technical activities, administrative and support service activities	4.45	5	−0.234	9	0.426	5	−0.684	6	−1.73	5	92.8	6	5.86	4
Transportation and storage	5.9	6	−4.04	1	0.49	6	0,80	8	14.77	10	96.2	8	5.33	5
Wholesale, retail trade, repair of motor vehicles and motorcycles	2.89	4	−0.486	7	0.217	4	−0.892	4	−2.69	4	95.7	7	4.29	6
Arts, entertainment, recreation and other service activities	2.2	2	−0.54	6	0.39	2	−0.78	5	−1.34	6	88.8	3	4.04	7
Financial and insurance activities	10.6	8	−1.16	2	1.17	7	−1.90	3	−9.53	1	91.6	5	3.45	8
Manufacturing	2.47	3	−0.622	5	0.218	3	−4.93	2	−7.73	2	87.3	2	2.38	9
Construction	−4.10	1	−1.08	3	−0.667	1	−2.51	1	−3.20	3	86.5	1	1.62	10

Source: Authors' elaboration based on Eurostat data.
Note: IR: industry rebound; IDV: industry drop velocity; IRV: industry recovery velocity; RCD: rebound-counterfactual difference ratio; TCD: trough-counterfactual difference ratio; $\overline{X}$: industrial average employment gM: geometric mean.

Table 3. Qualitative resilience: Building CI_QUAL.

	A										B	
	IR		*IDV*		*IRV*		*RCD*	*TCD*	$\overline{X}$			
Sector	Value	*I*	Value	*I*	Value	*I*	*I*	*I*	Value	*I*	*gM*	*CI_QUAL*
Financial and insurance activities	−31.1	10	−3.93	9	−1.73	10	10	10	69.9	10	10.00	1
Wholesale, retail trade, repair of motor vehicles and motorcycles	7.7	5	−0.10	7	0.80	6	9	7	93.5	8	6.85	2
Accommodation and food service activities	2.6	6	0.72	3	1.44	5	7	4	88.5	9	5.92	3
Real estate activities, professional, scientific and technical activities, administrative and support service activities	−4.5	7	0.07	6	−1.12	9	6	3	106.7	2	5.14	4
Human health and social work activities	12.9	3	−1.93	8	1.99	3	2	9	95.0	6	4.54	5
Arts, entertainment, recreation and other service activities	−19.6	8	0.65	4	0.10	7	5	2	95.9	6	3.73	6
Manufacturing	22.7	1	0.25	5	3.02	2	4	6	99.4	5	3.66	7
Construction	−22.8	9	1.37	1	−0.47	8	3	1	106.4	3	3.30	8
Transportation and storage	15	2	−10.95	10	3.19	1	8	5	91.2	8	3.15	9
Agriculture, forestry and fishing	8.9	4	1.07	2	1.87	4	1	8	106.82	1	2.70	10

Source: Authors' elaboration based on Eurostat data.
Note: IR: industry rebound; IDV: industry drop velocity; IRV: industry recovery velocity; RCD: rebound-counterfactual difference ratio; TCD: trough-counterfactual difference ratio; $\overline{X}$: industrial average employment; gM: geometric mean.

Table 4. *CI_QUANT* and *CI_QUAL* – all sectors.

Sector	*CI_QUANT*	*CI_QUAL*
Accommodation and food service activities	1	3
Human health and social work activities	2	6
Agriculture, forestry and fishing	3	10
Real estate activities, professional, scientific and technical activities, administrative and support service activities	4	4
Transportation and storage	5	7
Wholesale, retail trade, repair of motor vehicles and motorcycles	6	2
Arts, entertainment, recreation and other service activities	7	5
Financial and insurance activities	8	1
Manufacturing	9	8
Construction	10	9

Source: Authors' elaboration based on Eurostat data.

technical activities, administrative and support service activities' is the only category that obtains the same place in both rankings, that is, fourth.

'Manufacturing', as is the case for 'construction', experiences a negative performance both in terms of quantity and quality employment, scoring overall as the second-to-last worst sector after 'construction'.

It is worth focusing on the partial ranking positions scored by each sector. On the quantitative side, 'accommodation and food service activities' obtains good results for industry drop velocity and industry recovery velocity, 'human health and social work activities' has the highest industry rebound rate and, more generally, high results for the indices, and 'transportation and storage' shows the highest index regarding the velocity of the employment decline, while 'financial and insurance activities' has the highest value related to the counterfactual measure of the trough. Finally, 'construction' has the worst values for nearly every one of the six partial indicators.

Turning to the six quality indicators, the only sector – and the best performer – that records a good result across all of the indicators is 'financial and insurance activities'. All the other industries show heterogeneous values. For instance, 'agriculture, forestry and fishing' has the worst result on both the counterfactual measure of the rebound and the industrial average employment; in contrast, it has a relatively high trough-counterfactual difference ratio. 'Construction' registers a lower drop velocity and a difference in the trough-counterfactual and a high industry rebound rate. Finally, 'transportation and storage' reports a very low rebound velocity and the highest drop velocity, while 'manufacturing' reports a lower industry rebound rate.

The analysis of the partial ranking for the four tourism-related industries highlights the following:

1) 'Transportation and storage' shows, on the quantitative side, the highest result for the IDV indicator and very low performance for the two counterfactual indices. Concerning the quality indicators, the rebound and the recovery velocity are very low.
2) 'Accommodation and food service activities' performs very well on each single quantitative indicator by reaching higher place in the ranking. On the qualitative side, the sector obtains medium results with a high industrial average employment performance.
3) For 'arts, entertainment and recreation and other service activities', it is important to note how, under the quantitative profile, the sector obtains a low result in regard to the industry rebound and recovery velocity indicators yet a very high performance in regard to the rebound and trough-counterfactual index on the qualitative side.

Figure 6 reports the matrix representing quantitative and qualitative resilience jointly. The main result emerging from the matrix is that sectors behave quite heterogeneously among themselves in terms of both employment quantity and quality. Indeed, all of the sectors under analysis are equally distributed across the matrix, where at least two sectors lie in each quadrant. In two additional cases, we have sectors located on the border line: (1) 'wholesale and retail trade: repair of motor vehicles and motorcycles' between the first and second quadrant and (2) 'human health and social work activities' between first and fourth quadrant. Overall, sectors in the Italian economy show different *postshock industry resilience* capacities. In some cases, such heterogeneity seems to take the form of a trade-off between the quantitative and qualitative aspects of employment. In particular, it is worth noting that all of the sectors in the service industry are scattered in the first, second or fourth quadrant; this means that they have scored sufficiently good either on the quantitative or the qualitative side. Conversely, 'manufacturing' and 'construction' are the only industries located in

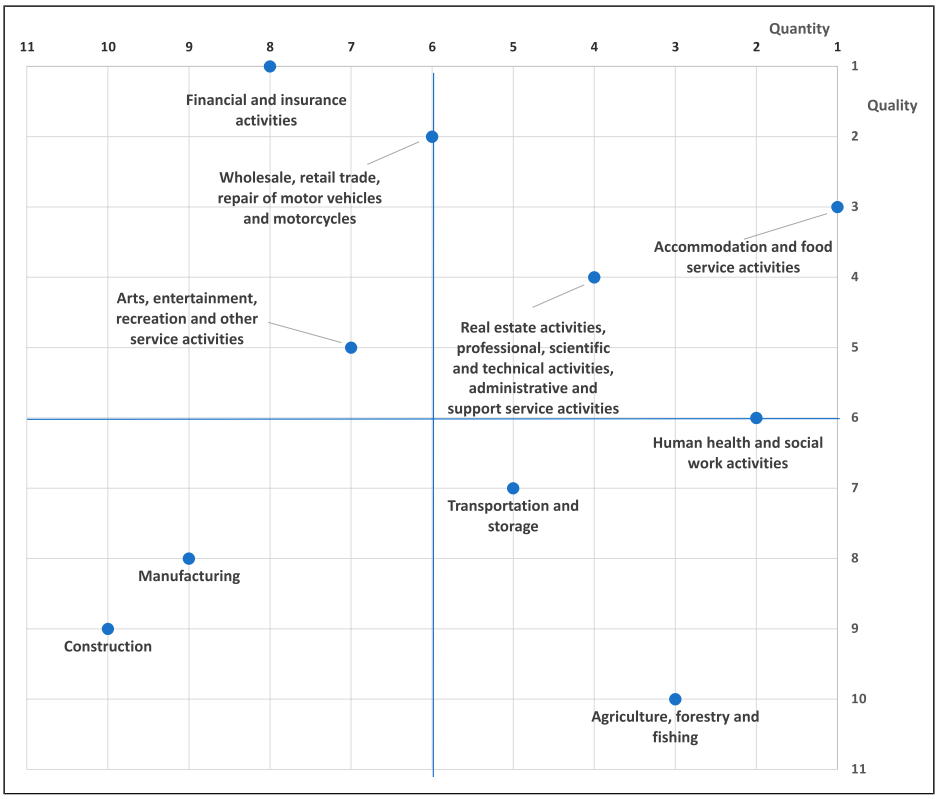

Figure 6. Industry resilience matrix.
Source: Authors' elaboration based on Eurostat data.

the third quadrant, which means that they performed negatively for both quantity and quality employment.

Tourism-related industries show the same abovementioned dynamics. The three sectors are located in three different quadrants. 'Accommodation and food service activities' shows the overall best performance (high in quantity and quality), positioned in the first quadrant. 'Arts, entertainment, recreation and other service activities' and 'transportation and storage' are located in the second and fourth quadrants, respectively, scoring medium results on both dimensions. Specifically, these two sectors have indeed experienced opposite performance in terms of quality and quantity employment; while 'transportation and storage' has experienced a good performance in terms of quantity, 'arts, entertainment, recreation and other service activities' has performed better on the qualitative side.

Robustness check

To test the robustness of the two CIs, we resort to uncertainty analysis (UA), which is a Monte Carlo simulation-based procedure applied to the formula defining the composite indicator. UA 'focuses on how uncertainty in the input factors propagates through the structure of the composite indicator and affects the composite indicator value' (JRC-EC, 2008: 34); it is frequently used to assess the

synthetic index robustness. We follow Di Tommaso et al. (2022) and perform an UA in which we assume that the major source of the uncertainty that might affect the CIs could arise from weight distributions. Indeed, we assume equal weights for each of the six indicators, although an inherent degree of uncertainty often surrounds weight values (JRC-EC, 2008; Munda and Nardo, 2005; Pontarollo and Serpieri, 2020). We thus perform a random weight perturbation to assess whether and to what extent our CIs could depend on the underlying weights.

To perform the UA, we use the R software package COINr (Becker, 2021). We run 10,000 Monte Carlo simulations and obtain 10,000 alternative combinations of the input values that make up our CIs. COINr assumes equal probability for all alternatives, that is, uniform distributions of the outcomes (Becker, 2021).

For each replication of the composite indicator, a random value is attributed to the weight $\omega_i^{'}$, following the form (Becker, 2021)

$$\omega_i^{'} = \omega_i + \epsilon_i, \epsilon_i \sim U[-\phi\omega_i, \phi\omega_i] \tag{3}$$

where ω_i is the nominal weight, ϵ_i is the added noise, and ϕ is a 'noise factor'. In our case, $\phi = 0.3$, which means that we let $\omega_i^{'}$ vary between +/−30% of its nominal value, following a uniform distribution.

The results of the UA are reported in Figures 7 and 8. The graphs report sectors' ranking positions and their uncertainty interval; the narrower the uncertainty interval is, the more robust the ranking position is. In other words, this means that the ranking position depends on the associated weight only to a limited extent; thus, it is reasonably independent from the CI design.

Both Figures 7 and 8 show that the CIs are sufficiently robust to weight perturbances. For both cases, the heads of the rankings are stable. For the intermediate positions, the confidence intervals tend to be generally narrow, with a maximum possible variation of only two positions. The tail of the ranking is highly stable for *CI_QUANT,* while it experiences limited variation (maximum one position) for *CI_QUAL.*

Discussion and conclusion

This paper is grounded in the debate on selective industrial policy, societal goals and government failures. As we have highlighted, at the present time, government selective interventions have to be justified according to their capacity to achieve specific normatively defined societal goals; developing innovative framework and methodologies, such as the one used in this paper, can help with this process. In particular, in this study, we have defined *industrial resilience* as '*the way, the extent and the speed at which industries return to the previous state trend or trajectory after a shock, thus achieving a partial or a full recovery (or even what we might define an "ultrarecovery")'*; we have also contended that such resilience should be considered a valuable framework that supports policy-makers in promoting more resilient economies and societies, as well as structural changes that are socially sustainable. Moreover, building upon Di Tommaso et al. (2022), we have presented a methodology to measure *industry resilience* and apply it to the case of Italy, showing how different sectors reacted to the 2008 shocks, with particular attention to tourism-related industries.

The general evidence, presented in Figure 6, shows that industries reacted heterogeneously in response to the 2008 shock. This means that sectors display different capacities for dealing with employment retention and good-quality jobs. This reinforces the idea that policy-makers should be aware of such different postshock sectoral behaviours when framing industrial policy intervention aimed at supporting the resilience of our economies and societies.

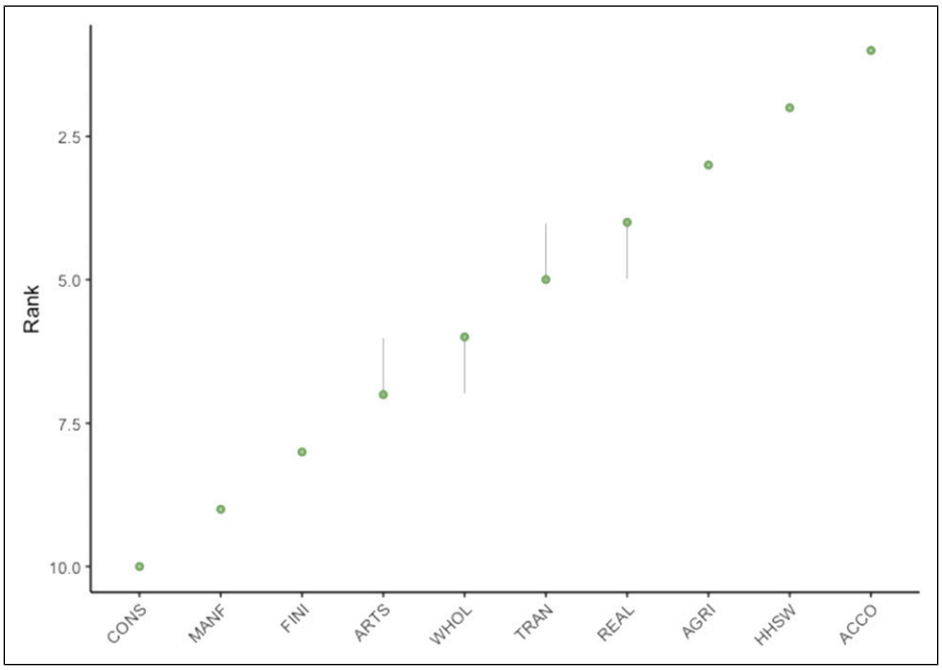

Figure 7. Uncertainty analysis on *CI_QUAN*.
Note: The results show the median (green dot) and the corresponding 5th and 95th percentiles (bounds) of the distribution of sectors. Uncertain input factor: weights. Sector coding: AGRI: agriculture, forestry and fishing; MANF: manufacturing; CONS: construction; WHOL: wholesale and retail trade; repair of motor vehicles and motorcycles; ACCOs: accommodation and food service activities; TRAN: transportation and storage; FINIs: financial and insurance activities; REALs: real estate activities; professional, scientific and technical activities; administrative and support service activities; HHSWs: human health and social work activities; ARTS: arts, entertainment and recreation; other service activities.

Overall, the rankings and their visualization through the *industry resilience* matrix we have elaborated (Figure 6) enable a novel *modus operandi* (one among the many possible) (Di Tommaso et al., 2020a, 2022) for selecting and prioritizing policy targets. However, it is worth specifying that the value of the methodology and of the illustrative exercise using the Italian case do not lie in the specific rankings we presented; rather, it is rather grounded in the idea that robust methodologies for sector selection matter for policy-making. Indeed, sectors' rankings may vary according to different societal goals, but what is important is that such rankings represent an informative basis to support decision-making to communicate – both to internal and external actors and stakeholders – why some sectors could be preferable over others. From this perspective, such methodologies contribute to mitigating the rise of potential government failures while increasing policy transparency and social accountability.

For the results on tourism-related industries, the quantity and quality performances displayed by the CIs point to a high level of heterogeneity in terms of their respective ranking positions. The overall matrix (Figure 6) reveals different degrees of resilience characterizing tourism-related industries; this would suggest to policy-makers that policy initiatives targeting tourism should be crafted taking into account the specificities – including their individual *industry resilience* capacity – of the sectors that make up the tourism industry. These results call, on the one hand, for the need to study tourism-related industries individually, with the aim of capturing their specific reactions in the

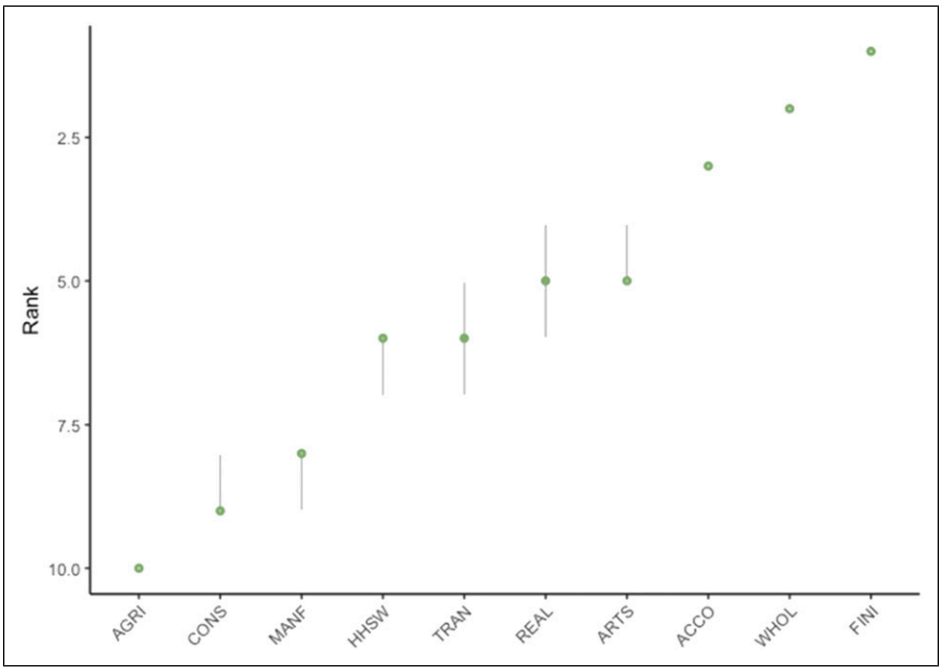

Figure 8. Uncertainty analysis on *CI_QUAL*.
Note: The results show the median (green dot) and the corresponding 5th and 95th percentiles (bounds) of the distribution of sectors. Uncertain input factor: weights. Sector coding: AGRI: agriculture, forestry and fishing; MANF: manufacturing; CONS: construction; WHOL: wholesale and retail trade; repair of motor vehicles and motorcycles; ACCOs: accommodation and food service activities; TRAN: transportation and storage; FINIs: financial and insurance activities; REALs: real estate activities; Professional, scientific and technical activities; Administrative and support service activities; HHSWs: human health and social work activities; ARTS: arts, entertainment and recreation; Other service activities.

aftermath of a shock; on the other hand, they also call for a renovated research approach able to develop a more comprehensive analysis of tourism-related industries through the lens of complex adaptive systems (Farrell and Twining-Ward, 2004, 2005), in line with the studies that first introduced the notion of resilience in the field of tourism.

However, customizing industrial policy intervention (also) according to their *postshock industry resilience* capacity might entail the involvement of a multitude of actors and stakeholders in the policy design and implementation; the latter, through lobbying activities and rent-seeking behaviour, could eventually oppose a genuine recovery and adaptation of the sector after the shock, thereby drifting the sectoral trajectory away from a desirable transformation. Policy-makers should take into account this risk and act accordingly to avoid the rise of this kind of government failure.

The paper has some limitations. First, the main variable taken into consideration is employment. We account for both the quantitative and qualitative aspects, in line with Di Tommaso et al. (2022). We do not look, instead, at other possible dimensions of *industry resilience* that could, in principle, encompass changes in value added, trade flows, and output. The choice of the specific dimension to look at should be justified on the basis of the normative societal goals that policy-makers might want to achieve. In this paper, we have stressed the importance of making our economies and societies more resilient to future shocks, as well as ensuring socially sustainable structural change. In view of this, we have considered employment as a relevant variable for supporting sectoral interventions

that would match this objective. However, future studies might explore other dimensions of *industry resilience* related to other societal goals, thus enriching the concept and its measurement.

Other limitations refer to the possibility of analysing Italian subsectors that make up the wider industry level considered in this paper. This has not been possible due to the lack of data and breaks in time series for both employment quantity and quality. Third, our results are context specific, refer to a market economy and cannot be generalized, for instance, to other economic systems, such as that of a developing country. Future research could test this methodology against other economic systems, such as China, or focus on more limited geographical levels, such as region/province.

Moreover, while we have offered a contribution to the issue of how to measure industrial resilience, future studies are needed to identify the industry-level determinants of resilience, which could depend upon a number of factors, including the organization of production, the structure of the production network, and technological endowments (OECD, 2021; Scazzieri, 2021). In this stream, an interesting analysis could be carried out on different tourism destinations at the national or regional level and, consequently, by encompassing their different stages of the life cycle.

Furthermore, another interesting and under investigated domain refers to the performances of tourism-dependent regions or the estimation of the weight of tourism in the overall resilience results of these territories. A pioneering study by Watson and Deller (2022), for instance, used US county-level resiliency data and found that, overall, greater levels of dependency reduce rates of resiliency; however, at the same time, they found pockets within the United States, where greater levels of dependency enhance economic resiliency. In light of these contrasting results, the authors state that the 'location and nature of the tourism and hospitality industry matter and blanket generalizations might lead to incorrect policy interpretations'.

Finally, further research could expand on this evidence by exploring the *industry resilience* of sectors facing shocks of a different nature and transmission mechanisms, such as in the case of the COVID-19 pandemic. Of course, this latter point calls for actions from governments. The tourism industry, as argued by Assaf and Scuderi (2020), needs credible measures from governments to generate market confidence and reduce risks by incentivizing sustainable recovery and innovation. Clearly, there is also space to question the ways through which policy-makers should include tourism in their development strategies for innovation.

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Supplemental Material

Supplemental material for this article is available online.

Notes

1. Social sustainability has been broadly defined as a set of conditions that allow for improvements to the living conditions of current and future generations (Boström, 2012; Barbieri et al., 2020).
2. Composite indicators have often been used to aggregate multiple information on complex phenomena and synthetize them into simple and easily understandable pieces of information. On the increasing use and diffusion of composite indicators among decision-makers, international organizations and other bodies for policy-making informing purposes, see UNDP, 2021, and previous years; Pichon et al., 2020; and Alkire and Santos, 2014.
3. For the design of this research, we used a *maximum variation sampling* method. According to Patton (2002), this kind of non-probabilistic sampling enables to collect data and to describe and explain the key elements related to the phenomenon under analysis by encompassing the maximum variation of its features. In line with this approach, Italy is a representative case in which we can find the most part of the different characteristics of the sector in terms of motivation for travelling, destination, accommodation, seasonality, quality and price, and so on.
4. Appendix A (see online supplementary materials) contains further details on sectors selection.
5. According to the Eurostat glossary, data on temporary employment include types of work categorized under a fixed-term contract versus permanent work for which there is no end-date. Typical cases include people in seasonal employment; people engaged first by an agency or employment exchange and then hired to a third party to do a specific task (unless there is a written work contract of unlimited life); and people with specific training contracts.
6. Such an assumption is in line with both theoretical and empirical studies contending that firms using temporary contracts to pursue low-road employment strategies, characterized by the creation of cheap and low-quality jobs. In other words, and generalizing to the sectoral level, the number of temporary contracts used within a given sector signals the presence of low quality of jobs in that sector (Alpert et al., 2019; Kalleberg, 2011; ILO, 2015).
7. See online supplementary materials – Appendix A for the related NACE classification.
8. As already stated in the literature by Leiper and more generally in practices demonstrated in the national accounts, the tourism industry also includes the retail sector (i.e., shopping activities). Unfortunately, in this study, we are not able to account for the 'retail sector' because of availability of data. In fact, in the Eurostat database from which we draw our information, this sector is included in the macro sector 'wholesale and retail trade: repair of motor vehicles and motorcycles', thereby making data processing difficult. Nevertheless, the analysis maintains a good level of reliability in the light of the relative weight of retail trade within such an industry. The Bank of Italy (2019), in the last report issued before the diffusion of the pandemic, by determining the value added by a branch of tourism industries, attributes to the retail sector a percentage of 6.1 in the general account of tourism industry. Obviously, the core branch of the sector is 'accommodation and food service activities', to which is attributed 55.6% of the tourism industry.

References

Adger WN (2006) Vulnerability. *Global Environmental Change* 16: 268–281.

Alkire S and Santos ME (2014) Measuring acute poverty in the developing world: robustness and scope of the multidimensional poverty index. *World Development* 59: 251–274.

Alpert D, Ferry J, Hockett RC, et al. (2019) *The US Private Sector Job Quality Index*. Ithaca, NY: Cornell Legal Studies Research Paper, pp. 20–33.

Assaf A and Scuderi R (2020) COVID-19 and the recovery of the tourism industry. *Tourism Economics* 26(5): 731–733.

Bailey D, Clark J, Colombelli A, et al. (2020) Regions in a time of pandemic. *Regional Studies* 54(9): 1163–1174.

Barbieri E, Di Tommaso MR, Pollio C, et al. (2019) Industrial policy in China: the planned growth of specialised towns in Guangdong province. *Cambridge Journal of Regions, Economy and Society* 12(3): 401–422. DOI: 10.1093/cjres/rsz012.

Bank of Italy (2019) Turismo in Italia: numeri e potenziale di sviluppo (transl. *Tourism in Italy: figures and potential of development*). *Quaderni di Economia e finanza (Occasional papers)* 505: 7–111. https://www.bancaditalia.it/pubblicazioni/qef/2019-0505/QEF_505_19.pdf

Barbieri E, Di Tommaso MR, Pollio C, et al. (2020) Getting the specialization right. Industrialization in Southern China in a sustainable development perspective. *World Development* 126: 104701.

Becken S and Hay JE (2007) *Tourism and Climate Change: Risks and Opportunities*. Clevedon, UK: Channel View.

Becken S and Wilson J (2013) The impacts of weather on tourist travel. *Tourism Geographies* 15(4): 620–639. DOI: 10.1080/14616688.2012.762541.

Becker W (2021) Composite indicator development and analysis in R with COINr. https://bluefoxr.github.io/COINrDoc/

Bernini C, Emili S and Vici L (2021) Are mass tourists sensitive to sustainability? *Tourism Economics* 27(7): 1375–1397.

Bellandi M, Giannini V and Iacobucci D (2022) La Missione 1 del pnrr: quali opportunità da cogliere e barriere da superare? *L'industria* 43(2): 227–244.

Bianchi P and Labory S (2011) *Industrial policy after the crisis: seizing the future*. Cheltenham, UK: Edward Elgar Publishing.

Biggs D (2011) Understanding resilience in a vulnerable industry: the case of reef tourism in Australia. *Ecology and society* 16(1).

Boström M (2012) A missing pillar? Challenges in theorizing and practicing social sustainability: introduction to the special issue *Sustainability: Science, practice and policy* 8(1): 3–14.

Brown NA, Orchiston C, Rovins JE, et al. (2018) An integrative framework for investigating disaster resilience within the hotel sector. *Journal of Hospitality and Tourism Management* 36: 67–75. DOI: 10.1016/j.jhtm.2018.07.004

Buigues PA and Sekkat K (2009) *Industrial Policy in Europe. Japan and the USA. Amounts, Mechanisms and Effectiveness*. London: Palgrave Macmillan.

Calgaro E and Cochrane J (2009) *Comparative Destination Vulnerability Assessment for Thailand and Sri Lanka*. Stockholm, Sweden: Stockholm Environment Institute.

Calgaro E, Lloyd K and Dominey-Howes D (2014) From vulnerability to transformation: a framework for assessing the vulnerability and resilience of tourism destinations. *Journal of Sustainable Tourism* 22(3): 341–360. DOI: 10.1080/09669582.2013.826229

Canova F, Coutinho L and Kontolemis ZG (2012) *Measuring the Macroeconomic Resilience of Industrial Sectors in the EU and Assessing the Role of Product Market Regulations*. Brussels: Publications Office of the European Union, Vol 112.

Cardinale I (2017) Sectoral interests and 'systemic' interest: towards a structural po- litical economy of the Eurozone. In: Cardinale I, Coffman D and Scazzieri R (eds) *The Political Economy of the Eurozone*. Cambridge, UK: Cambridge University Press, pp. 216–237.

Cardinale I (2022) Vulnerability, resilience and 'systemic interest': a connectivity approach. *Networks and Spatial Economics* 22(3): 691–707.

Cellini R and Cuccia T (2015) The economic resilience of tourism industry in Italy: what the 'great recession' data show. *Tourism Management Perspectives* 16: 346–356.

Chang H-J (1994) *The Political Economy of Industrial Policy*. New York, NY: St. Martin's Press.

Chang H-J (2011) Industrial policy: can we go beyond an unproductive confrontation? In: Lin JY and Pleskovic B (eds) *Global: Lessons from East Asia and the Global Financial Crisis*. Washington, DC: World Bank.

Cimoli M, Dosi G and Stiglitz JE (2009) *Industrial policy and development: the political economy of capabilities accumulation*. New York: Oxford University Press.

Cochrane J (2010) The sphere of tourism resilience. *Tourism Recreation Research* 35(2): 173–185. DOI: 10.1080/02508281.2010.11081632

Cortes GM and Forsythe E (2023) Heterogeneous labor market impacts of the COVID-19 pandemic. *ILR Review* 76(1): 30–55.

Crescenzi R, Luca D and Milio S (2016) The geography of the economic crisis in Europe: national macroeconomic conditions, regional structural factors and short-term economic performance. *Cambridge Journal of Regions, Economy and Society* 9(1): 13–32.

Di Tommaso MR (2020) Una strategia di resilienza intelligente per il dopo coronavirus. Sulla centralità della domanda e offerta di politica industriale. *L'industria* 41(1): 3–20.

Di Tommaso MR and Schweitzer SO (2013) *Industrial Policy in America. Industrial Policy in America. Breaking the Taboo*. Cheltenham, UK and Northampton: Edward Elgar, MA, USA.

Di Tommaso MR, Tassinari M, Bonnini S, et al. (2017) Industrial policy and manufacturing targeting in the US: new methodological tools for strategic policy-making. *International Review of Applied Economics* 31(5): 681–703.

Di Tommaso MR, Tassinari M, Barbieri E, et al. (2020a) Selective industrial policy and 'sustainable' structural change. Discussing the political economy of sectoral priorities in the US. *Structural change and economic dynamics* 54: 309–323.

Di Tommaso MR, Tassinari M and Ferrannini A (2020b) Industrial policy and societal goals. In: Pressman S (ed) *A New Look at the American Case (From Hamilton to Obama and Trump). How Social Forces Impact the Economy*. London: Routledge. ISBN 9780367439002.

Di Tommaso MR, Prodi E, Pollio C, et al. (2022) Conceptualizing and measuring "industry resilience": composite indicators for postshock industrial policy decision-making. *Socio-Economic Planning Sciences* in press: 101448.

Earvolino-Ramirez M (2007) Resilience: a concept analysis. *Nursing Forum* 42(2): 73–82.

Emmerling J, Furceri D, Libano Monteiro F, et al. (2021), Will the economic impact of COVID-19 persist? Prognosis from 21st century pandemics, IMF working papers, No. 2021/119.

Farrell BH and Twining-Ward L (2004) Reconceptualizing tourism. *Annals of Tourism Research* 31(2): 274–295.

Farrell BH and Twining-Ward L (2005) Seven steps towards sustainability: tourism in the context of new knowledge. *Journal of Sustainable Tourism* 13(2): 109–122.

Fasone V and Pedrini G (2022) Industry-specific upskilling of seasonal tourism workers: does occupational gender inequality matter? *Tourism Economics*. DOI: 10.1177/13548166221146850.

Faulkner B (2000). The future ain't what it used to be": coping with change, turbulence and disasters in tourism research and destination management. Griffith University Professorial Lecture Series No, 6.

Ferrannini A, Barbieri E, Biggeri M and Di Tommaso MR (2021) Industrial policy for sustainable human development in the post-Covid19 era. *World Development*, DOI: 10.1016/j.worlddev.2020.105215.

Folke C (2006) Resilience: the emergence of a perspective for social-ecological systems analyses. *Global Environmental Change* 16: 253–267.

Girardi D (2012) The construction sector in Italy, crisis and change. MPRA Paper, (49901).

Hall R, Feldstein M, Frankel J, et al. (2003) *The NBER's Business-Cycle Dating Procedure*. Cambridge, MA: Business Cycle Dating Committee, National Bureau of Economic Research.

Han Y and Goetz SJ (2015) The economic resilience of US counties during the great recession. *The Review of Regional Studies* 45(2): 131–149.

Hirschman AO (1958) *The Strategy of Economic Development*. New Haven, CT: Yale University Press.

Hirschman AO (1970) *Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States*. Cambridge, MA: Harvard University Press.

Hynes W, Trump B, Love P, et al. (2020) Bouncing forward: a resilience approach to dealing with COVID-19 and future systemic shocks. *Environment Systems and Decisions* 40(2): 174–184.

ILO (International Labour Office) (2015) *Non-standard Forms of Employment*. Geneva, Switzerland: International Labour Office.

ISTAT (2021) *Annuario Statistico Italiano. (Transl. Annual Report of the Italian National Institute of Statistics")*. Rome: ISTAT. https://www.istat.it/storage/ASI/2021/capitoli/C07.pdf

Jewell J, Vinichenko V, McCollum D, et al. (2016) Comparison and interactions between the long-term pursuit of energy independence and climate policies. *Nature Energy* 1(6): 1–9.

Joint Research Centre-European Commission (JRC-EC) (2008) *Handbook on Constructing Composite Indicators: Methodology and User Guide*. Paris: OECD publishing.

Kajan E and Saarinen J (2013) Tourism, climate change and adaptation: a review. *Current Issues in Tourism* 16(2): 167–195.

Kalleberg AL (2011) *Good Jobs, Bad Jobs: The Rise of Polarized and Precarious Employment Systems in the United States, 1970s-2000s*. New York: Russell Sage Foundation.

Krueger AO (1990) Government failures in development. *J. Econ. Perspect* 4(3): 9–23.

Lagravinese R (2015) Economic crisis and rising gaps North–South: evidence from the Italian regions. *Cambridge Journal of Regions, Economy and Society* 8(2): 331–342.

Lall S and Teuball M (1998) Market-stimulating technology policies in developing countries: A framework with examples from East Asia. *World Development* 26(8): 1369–1385.

Landini F and Ferrannini A (2022) Politiche e investimenti per l'inclusione e la coesione nel Piano Nazionale di Ripresa e Resilienza: analisi critica dell'approccio, degli obiettivi e delle strategie d'intervento. *L'industria* 43(3): 381–402.

Le Grand J (1991) The theory of government failure. *British Journal of Political Science* 21(4): 423–442.

Leiper N (1979) The framework of tourism: towards a definition of tourism, tourist, and the tourist industry. *Annals of tourism research* 6(4): 390–407.

Lew AA (2013) Defining community resilience in community-based tourism: Miso Walai and Pulau Mabul in Sabah, Malaysia. *BIMP-EAGA Journal of Sustainable Tourism Development* 2(2).

Lew AA (2014) Scale, change and resilience in community tourism planning. *Tourism Geographies* 16(1): 14–22. DOI: 10.1080/14616688.2013.864325

Longstaff PH (2009) Managing surprises in complex systems: multidisciplinary perspectives on resilience. *Ecology and Society* 49(1): 49.

Marozzi M (2015) Measuring trust in European public institutions. *Social Indicators Research* 123(3): 879–895.

Martin RL (2012) Regional economic resilience, hysteresis and recessionary shocks. *Journal of Economic Geography* 12(1): 1–32.

Martin R and Sunley P (2015) On the notion of regional economic resilience: conceptualization and explanation. *Journal of economic geography* 15(1): 1–42.

Mazzucato M (2013) *The Entrepreneurial State. Debunking Public vs. Private Sector Myths*. London, NY: Anthem Press.

McDonald JR (2009) Complexity science: an alternative world view for understanding sustainable tourism development. *Journal of Sustainable Tourism* 17(4): 455–471.

Moss S (1984) The history of the theory of the firm from Marshall to Robinson and Chamberlin: the source of positivism in economics. *Economica* 51(203): 307–318.

Munda G and Nardo M (2005), Constructing consistent composite indicators: the issue of weights, EUR 21834 EN, Joint research centre, Ispra.

Ngo CN, Di Tommaso MR, Tassinari M, et al. (2022) The future of work: conceptual considerations and a new analytical approach for the political economy. *Review of Political Economy* 34(4): 735–765. DOI: 10.1080/09538259.2021.1897750

Nivola PS (2008) Rethinking" energy independence, brookings. Available at: https://www.brookings.edu/wp-content/uploads/2016/06/1230_energy_nivola.pdf

OECD (2011) Future global shocks: improving risk governance. *OECD Reviews of Risk Management Polices*. Paris: OECD, Publishing. DOI: 10.1787/9789264114586-en.

OECD (2021) *Strengthening Economic Resilience Following the COVID-19 Crisis: A Firm and Industry Perspective*. Paris: OECD, Publishing. DOI: 10.1787/2a7081d8-en

Okafor LE, Khalid U and Burzynska K (2022) Does the level of a country's resilience moderate the link between the tourism industry and the economic policy response to the COVID-19 pandemic? *Current Issues in Tourism* 25(2): 303–318.

Orchiston C, Prayag G and Brown C (2016) Organizational resilience in the tourism sector. *Annals of Tourism Research* 56: 145–148.

Patton MQ (2002) Two decades of developments in qualitative inquiry: a personal, experiential perspective. *Qualitative social work* 1(3): 261–283.

Pichon E, Widuto A, Dobreva A, et al. (2020) Ten composite indices for policy-making, European Parliamentary Research Service. Available at: https://www.europarl.europa.eu/RegData/etudes/IDAN/2021/696203/EPRS_IDA(2021)696203_EN.pdf

Polenske KR and Sivitanides P (1990) Linkages in the construction sector. *The Annals of Regional Science* 24(2): 147–161.

Pontarollo N and Serpieri C (2020) A composite policy tool to measure territorial resilience capacity. *Socio-Economic Planning Sciences* 70: 100669.

Prodi E (2022) La collaborazione tra ricerca e imprese in Italia e in Germania: analisi e implicazioni di politica industriale per il PNRR. L'industria 43(4). forthcoming.

Raid R and Botterill LC (2013) The multiple meanings of 'resilience': an overview of the literature. *Australian Journal of Public Administration* 72(1): 31–40.

Reggiani A (2013) Network resilience for transport security: some methodological considerations. *Transport Policy* 28: 63–68.

Ritchie BW and Jiang Y (2019) A review of research on tourism risk, crisis and disaster management: launching the annals of tourism research curated collection on tourism risk, crisis and disaster management. *Annals of Tourism Research* 79: 102812.

Saisana M, Saltelli A and Tarantola S (2005) Uncertainty and sensitivity analysis tech- niques as tools for the quality assessment of composite indicators. *Journal of the Royal Statistical Society: Series A (Statistics in Society)* 168: 307–323.

Scazzieri R (2021) Complex structures and relative invariance in economic dynamics. In: Reggiani A, Schintlter LS, Czamanski D and Patuelli R (eds) *Handbook on entropy, complexity and spatial dynamics: a rebirth of theory?* Cheltenham, UK and Northampton, Massachusetts, USA: Edward Elgar. p. 274–289

Scazzieri R, Baranzini M and Rotondi C (2015) Resources, scarcities and rents: tech- nological interdependence and the dynamics of socio-economic structures. In: Baranzini M, Rotondi C and Scazzieri R (eds) *Resources, Production and Structural Dynamics*. Cambridge: Cambridge University Press, pp. 427–484.

Schuck P (2014) *Why Government Fails So Often and How it Can Do Better*. Princeton, NJ: Princeton University Press.

Sharma GD, Thomas A and Paul J (2021) Reviving tourism industry post-COVID-19: a resilience-based framework. *Tourism management perspectives* 37: 100786.

Silvestri F, Lepore D, Spigarelli F, et al. (2022) Transizione ecologica nel pnrr: alcune riflessioni sui processi di cambiamento e innovazione. *L'industria* 43(3): 403–423.

Steiger R and Stotter J (2013) Climate change impact assessment of ski tourism in Tyrol. *Tourism Geographies* 15(4): 577–600.

Stiglitz JE and Lin JY (2013) *The Industrial Policy Revolution I: The Role of Government Beyond Ideology*. New York: Palgrave Macmillan.

Tassinari M (2019) *Capitalizing Economic Power in the US. Industrial Strategy in the Neoliberal Era, International Political Economy Series*. Cham: Palgrave Macmillan. DOI: 10.1007/978-3-319-76648-5_1.

Terkaj W and Tolio T (2019) *The Italian flagship project: factories of the future factories of the future*. Cham: Springer, pp. 3–35.

UNDP (2021) Human development report 2020. Available at: http://hdr.undp.org/sites/default/files/hdr2020.pdf

Watson P and Deller S (2022) Tourism and economic resilience. *Tourism Economics* 28(5): 1193–1215.

World Economic Forum (2022) Inflation: how are rising food and energy prices affecting the economy? Available at: https://www.weforum.org/agenda/2022/09/inflation-rising-food-energy-prices-economy.

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