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Socioeconomic resilience during the COVID-19 pandemic. The role of industrial capabilities

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Socioeconomic resilience during the COVID-19 pandemic. The role of industrial capabilities

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Abstract

The COVID-19 pandemic has battered the world unlike any other crisis in recent history. However, the socioeconomic impacts of the pandemic have been widely uneven across regions and countries, reflecting the deep underlying differences in their resilience against shocks. Why did the pandemic hit some countries particularly hard, while others navigated the crisis much better? This paper addresses this question from an empirical perspective. We use cross-country econometric techniques to analyse factors of resilience and vulnerability during the COVID-19 pandemic in a large sample of 125 countries. A key finding of the paper is that the level of industrial capabilities previous to the pandemic has been one of the most important factors of resilience. This finding becomes particularly relevant in the current global context, where unexpected disruptions are just around the corner in the form of new outbreaks of disease, geopolitical tensions, armed conflicts or climate change-induced catastrophes.

Keywords: Industrial development; resilience; COVID-19; cross-country regressions.

1 Introduction

The COVID-19 pandemic has battered the world unlike any other crisis in recent history. During 2020, global gross domestic product (GDP) fell by 3.3 per cent, causing the deepest global recession in 70 years (IMF, 2021). What made this crisis unique is that it rapidly became a truly global phenomenon, from which no country was exempt. All countries were affected by COVID-19 and the sudden halt in domestic and global economic activity.

However, the socioeconomic impacts of the pandemic have been widely uneven across regions and countries, reflecting the deep underlying differences in their resilience against shocks. GDP revisions in 2020 and 2021 with respect to pre-pandemic projections differ substantially across countries. Some economies, such as Ireland, Iran or Türkiye, reported net positive output revisions for the respective period. Others registered output declines of over 30 per cent relative to their pre-pandemic projections, such as Mauritius, Panama and the Philippines.

Why did the pandemic hit some countries particularly hard, while others navigated the crisis much better? Over two years after the outbreak of COVID-19, economic literature already provides some initial answers to this fundamental question. The literature identifies two broad groups of factors. On the one hand, there are factors specific to the pandemic, such as the severity of the health emergency and the effectiveness of the policies implemented to curb the spread of the virus and to mollify the economic crisis. On the other hand, there are pre-existing structural factors that shaped countries' ability to cope with the crisis. These include country-specific characteristics such as level of income, macroeconomic conditions, demographic structure and the economy's sectorial composition.

One common finding among these studies is that higher levels of GDP per capita are associated with lower levels of output loss, indicating that all other things being equal, richer countries weathered the COVID-19 storm better. However, the literature remains silent on the specific reasons why a higher level of income translated into stronger socioeconomic resilience during the pandemic. In the literature, the level of income remains something of a "black box" which contains other underlying factors that have not yet been sufficiently explored.

In this paper, we open this black box and explore three factors that are typically associated with higher income levels and are assumed to shape countries' ability to navigate crises of this nature: (i) fiscal space, (ii) state capacity and (iii) industrial capabilities. The first factor reflects countries' ability to implement economic support policies to alleviate the negative socioeconomic impacts generated by the crisis; the second factor reflects the quality of government institutions and their effectiveness in implementing public policies; the last factor reflects countries' capacity to develop, upgrade and remain competitive in the production of manufacturing goods. This paper finds that the most important factor among these three is that related to industrial capabilities.

We use cross-country econometric techniques to analyse a large sample of 125 countries which, taken together, represent 96 per cent of world GDP. To measure the crisis' economic impact, we propose a novel index which captures both the initial shock and the subsequent speed of recovery. This index is calculated by comparing the observed levels of GDP during 2020 and 2021 against those projected by the International Monetary Fund (IMF) before the pandemic.

The findings of this paper contribute to a long strand of literature that emphasizes the key role manufacturing industries play in supporting development (Kaldor, 1960; Rodrik, 2009; Szirmai, 2012). We find that manufacturing is not only the main engine of economic growth and development. It also shields economies against global crises. The manufacturing sector's ability to rapidly respond and adjust to the crisis has been fundamental in explaining why some countries fared better than others. This finding becomes particularly relevant in the current global context, where unexpected disruptions are just around the corner in the form of new outbreaks of disease, geopolitical tensions, armed conflicts or climate change-induced catastrophes.

This paper is structured as follows: in the next section, we provide a snapshot of recent literature that explored factors of resilience and vulnerability during the COVID-19 pandemic from a cross-country comparison perspective. The lack of specific evidence of the role manufacturing plays motivates the next section, which succinctly describes the main contributions that have studied manufacturing as a driver of economic growth. Section 3 presents the empirical analysis and describes our index of output loss and provides descriptive evidence on the pandemic's uneven impact. Building on these findings and the other factors identified in the literature, Section 4 presents the methodology we used to address our research question and the main results obtained through the regression analysis. Section 5 concludes by summarizing the paper's main contributions and discussing the policy implications of our findings. Some additional tables with technical information and robustness checks are presented in the appendix at the end of the paper.

2 Socioeconomic resilience in times of COVID-19

2.1 What do we know so far?

The COVID-19 pandemic exposed extreme differences in countries' ability to deal with global shocks. Unlike epidemic outbreaks of past decades, the COVID-19 virus spread rapidly across the globe and has been extremely difficult to contain. However, the COVID-19 infection fatality rates have been widely heterogeneous across countries. Whereas some countries recorded fatality rates of over 5,000 deaths per million inhabitants due to COVID-19—for example in Peru and Bulgaria—other countries reported rates of less than 20 deaths per one million inhabitants, such as China and New Zealand.

Not only did the impact on public health differ considerably, the socioeconomic consequences have been equally diverse. While all countries were affected by the sudden halt in domestic and global

economic activity, there is substantial variation in the observed impact of this disruption on GDP levels. As documented in the following sections, this impact ranged from estimated losses of more than 30 per cent of pre-pandemic GDP levels to none or even positive GDP revisions.

Ultimately, the severity of the impact depends on the country's capacity to absorb, accommodate and respond to shocks, i.e. on their resilience.[1] Following Andreoni (2021), it is possible to identify two important dimensions of resilience: "robustness" (the capacity to resist and absorb shocks) and "readiness" (the capacity to adapt, transform and recover from shocks). The short-term impact of a crisis depends on the country's structural characteristics (which define the robustness of its ability to absorb the shock) and the type of responses implemented (which reflect the country's readiness to manage the shock).

A large strand of literature has analysed the socioeconomic consequences of COVID-19. As suggested by Galiani (2022), a new field of research on "pandemic economics" has been gaining traction in recent months. In this section, we provide a "snapshot" review of those pandemic economics contributions that have specifically investigated the underlying factors driving countries' socioeconomic resilience and vulnerability against the pandemic shock using cross-country, macro-econometric techniques.[2]

These studies apply different econometric techniques to analyse a variety of country samples and variables. Some of the studies specifically focus on the role government played in managing the pandemic. König and Winkler (2020), for instance, implement OLS regressions to test the significance of a "quality of response" index for a sample of 21 OECD countries. Similarly, Feng et al. (2022) regress GDP variations for 73 countries with a constructed pandemic containment effectiveness (PCE) score. Others examine a broader set of variables: Pitterle and Niermann (2021) carry out a cross-country analysis to identify the variables most strongly correlated with the observed differences in GDP revisions for 150 countries during 2020.[3] Furceri et al. (2021) and Glocker and Piribuer (2021), on the other hand, identify robust determinants of output loss among a large number of parameters by implementing model-averaging techniques.

Two broad sets of explanatory variables are recurrently explored in this literature. On the one hand are those specific to the pandemic, such as the severity of the health emergency and the effectiveness of policies implemented to mollify the crisis, such as preventive and containment measures. On the other hand are pre-existing structural factors that shaped countries' ability to cope with the crisis. These

[1] The concept of resilience can be defined as 'the ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management' (UNDRR 2020).
[2] That is, we exclude from the review any contribution that either exclusively focuses on the drivers of resilience from a public health perspective and/or analyses the economic impact using either qualitative tools or focusing on a single country analysis or micro-level data.
[3] GDP revisions are calculated by comparing the latest available estimates of GDP growth rates for 2020 against the forecast made prior to the outbreak of the pandemic.

include country-specific characteristics such as level of income, macroeconomic conditions, demographic structure and the sectorial composition of the economy.

Among the pandemic-specific factors, the severity of the health emergency is present in nearly all studies, generally captured by the total number of COVID-19 deaths per million inhabitants (Furceri et al., 2021; Glocker & Piribauer, 2021; König & Winkler, 2020; Mena et al., 2022). This factor is expected to have an amplifying effect on the crisis' economic impact, as countries with a more acute public health emergency would have higher supply and demand disruptions. However, the indicators used often significantly underestimate the true severity of the health emergency as many COVID-19 related-deaths might have remained undetected, especially in countries with weak healthcare systems (Pitterle & Niermann, 2021).[4]

The literature also examines the responses and measures taken to mitigate the pandemic's deleterious effects. A key indicator used to capture the scope of the containment interventions is the Oxford COVID-19 Government Response Tracker (OxCGRT), which has been collecting data on closures and containment, health and economic policies for over 180 countries since the start of the pandemic (Hale et al., 2021). The tracker's most widely used indicator is the "Stringency Index", which is a synthetic measure of the strictness of policies implemented by different countries, ranging from zero (least strict) to 100 (most strict). Studies that incorporate this index present compelling results, indicating that the adoption of stringent containment measures, while slowing the spread of the disease, was also associated with higher downward revisions in GDP growth, at least in the short run (Furceri et al., 2021; König & Winkler, 2020; Pitterle & Niermann, 2021).

A third pandemic-specific factor commonly explored in the literature is the implementation of fiscal support measures (Feng et al., 2022; Furceri et al., 2021; Mena et al., 2022; Pitterle & Niermann, 2021). Governments across the world sought to cushion both the health and economic damage caused by the pandemic by increasing public spending. The literature uses different indicators to proxy this variable. Furceri et al. (2021), for instance, test the role of fiscal stimuli and policy rate cuts, concluding that these measures helped reduce economic losses but were less effective in poorer countries. Likewise, results from the cross-country analysis carried out by Pitterle and Niermann (2021) reveal a significant positive relationship between fiscal support, captured by the IMF Fiscal Monitor, and economic performance. Feng et al. (2022), on the other hand, implement the COVID-19 Economic Stimulus Index (CESI) developed by Elgin et al. (2020)[5] as a control variable to evaluate the effectiveness of pandemic containment measures for GDP performance.

[4] An alternative and more reliable indicator would be the excess mortality, which is calculated as the difference between the number of deaths that occurred and the expected number of deaths in the absence of the pandemic based on data from previous years (WHO 2022).

[5] This index is constructed on the basis of an extensive review of economic policy packages adopted by 166 countries between March 2020 and May 2021, which includes fiscal, monetary and exchange rate measures.

Besides these pandemic-specific factors, the literature we reviewed also delves deeper into countries' structural characteristics and explores the role of country-level factors such as income levels, demographic characteristics, trade orientation and openness, sectorial composition and institutional quality (Furceri et al., 2021; König & Winkler, 2020; Monsod & Gochoco-Bautista, 2021; Pitterle & Niermann, 2021). Among these factors, most studies find that the level of income per capita is an important determinant of resilience: richer countries were better suited to respond to the pandemic (Feng et al., 2022; Furceri et al., 2021; Mena et al., 2022; Pitterle & Niermann, 2021).[6]

Sectorial composition is also found to have played a major role in shaping the pandemic's socioeconomic impact. The share of tourism-related activities on GDP is typically the factor most strongly correlated with output losses (Furceri et al., 2021; König & Winkler, 2020; Monsod & Gochoco-Bautista, 2021; Pitterle & Niermann, 2021). The economic fallout was particularly acute in high-contact sectors such as tourism and retail. Unlike the financial meltdown of 2008—when the services sector tended to be more resilient (Kopelman & Rosen, 2014)—the nature of the pandemic crisis meant that high-contact sectors suffered more due to social distancing requirements and restrictions in international travel (Stephany et al., 2020).

Initial conditions at the macroeconomic level, such as government debt or GDP growth rate trends before 2020, are also explored in this literature, showing mixed results (Furceri et al., 2021; Glocker & Piribauer, 2021; Pitterle & Niermann, 2021). One structural characteristic found to have a strong impact is the degree of exposure to international trade. High dependence on exports and imports caused major vulnerabilities in the context of trade uncertainty triggered by the pandemic. In this regard, Pianta (2021) provides evidence of the significance of large domestic markets for resilience. By comparing the share of domestic demand in GDP and the estimated output variation in 2020, it appears that domestic markets played a crucial role in restoring growth during the crisis as a source of more stable demand.

A summary of all variables found to be significant in the literature as determinants of the observed cross-country differences in GDP losses are presented in Table 1. The effect of these factors on output performance during the pandemic either cushioned the impact, meaning the fallout was lower and resilience was stronger; or the impact was amplified, meaning that vulnerabilities increased, generating higher economic costs.[7]

[6] In some cases, the level of income per capita is only significant when no variable of fiscal support is added. This is the case, for instance, of Pitterle & Niermann (2021). In their analysis income level is no longer significant when fiscal support is introduced in the model.

[7] It is important to stress that these studies are not free from econometric limitations. In many cases, the number of observations is small, the potential factors affecting resilience is high and country characteristics can be correlated with one another. For these reasons, some authors either opt to use BMA techniques (Furceri et al., 2021; Glocker & Piribauer, 2021) or make explicit reference to limitations in the interpretation of the results (particularly for the variable of fiscal stimulus, which might be susceptible to reverse causality and potential endogeneity bias).

This brief review of the literature provides an interesting picture of the key factors that emerge when addressing this paper's guiding question. However, the contributions reviewed typically reveal two important limitations. Firstly, the variable used to measure the pandemic's economic impact tends to be suboptimal. By looking exclusively at GDP revisions for the year 2020 (either on the level of or growth rate), these contributions fail to fully capture the concept of resilience as they omit the differences observed in the recovery rates after the initial shock. Resilience is not only about absorbing shocks but also about reacting and responding to them. From a macroeconomic perspective, this would be captured by the speed of GDP growth recovery, which in most cases occurred during 2021. Secondly, one of the key factors of resilience identified, namely the level of income, is something of a "black box", as it is not income per se which can explain why some countries fared better than others, but other underlying factors that are associated with a higher level of income. In this paper, we address both limitations.

To tackle the first limitation, we propose a new indicator to measure the pandemic's economic impact. We construct an index of GDP loss that measures both the initial impact during the first year of the crisis and the recovery during the second year. Using this index, we compare the observed level of GDP during 2020 and 2021 with the projections carried out by the IMF in October 2019, before the outbreak of the pandemic. Thereby, we can fully capture countries' resilience by incorporating their ability to resist, adapt to and recover from external shocks.

To address the second limitation, we open the black box of level of income and explore three factors that are commonly associated with higher levels of income, which can be expected to shape countries' ability to navigate a crisis such as the COVID-19 pandemic: (i) fiscal space, (ii) state capacity and (iii) industrial capabilities. The first factor reflects the ability of governments to implement economic support measures to alleviate the negative socioeconomic impacts caused by the crisis; the second factor signifies the quality of government institutions and their effectiveness in implementing public policies; and the last factor reflects the capacity of countries to develop, upgrade and remain competitive in the production of manufacturing goods.

The first two factors have already been explored in the literature. As discussed above, some of the papers reviewed have investigated government effectiveness and fiscal support indicators, typically finding that they have played a positive role in cushioning the impact of the crisis. The third factor, however, has so far not been explored in the literature. Its inclusion arises from the crucial role industrialization and manufacturing capabilities play in the process of economic development. The next subsection briefly reviews the arguments supporting the hypothesis that manufacturing is the main engine of economic growth.

2.2 The missing factor: industrial capabilities

Development economists have highlighted the key role manufacturing plays in achieving economic progress early on. Authors such as Prebisch, Hirschmann and Rosenstein-Rodan emphasize the relevance of manufacturing as a strategic sector capable of stimulating productivity and innovation across the entire economy. According to this strand of literature, different sectors and products entail varying learning opportunities and income elasticities of demand. Therefore, a change in the productive structure towards the industrial sector is desirable, given the inherent characteristics of this sector in increasing returns to scale, high synergies and linkage effects.

A similar case on the importance of manufacturing for economic development was put forward by post-Keynesian scholars, who argued that pursuing sustained industrialization has long-lasting benefits on development. Kaldor (1960) was the first to provide a conceptual framework to test the "engine of growth hypothesis". In his seminal work, he identified three important regularities that are now known as the "Kaldor Laws". These can be summarized as follows: (i) the higher the growth rate of manufacturing output, the higher the growth rate of the economy as a whole; (ii) the manufacturing sector's productivity growth is positively related to the growth of the manufacturing sector's output; and (iii) the non-manufacturing sector's productivity growth is positively related to the growth of the manufacturing sector's output (Thirlwall, 2003).

More recently, authors rooted in the neo-Schumpeterian tradition have also highlighted the role of manufacturing, mostly in relation to innovation and technological change. Szirmai (2012) asserts that the industrialization process offers special opportunities for technological progress that originates in the manufacturing sector and diffuses to other sectors of the economy. Manufacturing industries accelerate capital accumulation, which is associated with innovation as it embodies the latest state-of-the art technology. Cimoli et al. (2009) and Szirmai-Verspagen (2015) suggest that the process of *great transformation*—borrowing Karl Polanyi's (1944) expression—associated with industrialization arises from the transfer of knowledge and accumulation of dynamic capabilities.

Table 1: Determinants of COVID-19 economic impacts according to the literature reviewed

	Category	Variable	Literature	Effect
Pandemic-specific	Public health	Severity	Pitterle and Niermann (2021)	Amplifying
			König and Winkler (2020)	Amplifying
			Glocker and Piribauer (2021)	Amplifying
			Mena et al. (2022)	Amplifying
		Stringency Index	Furceri et al. (2021)	Amplifying
			Pitterle and Niermann (2021)	Amplifying
			König and Winkler (2020)	Amplifying
	Economic support	Fiscal support	Furceri et al. (2021)	Cushioning
			Pitterle and Niermann (2021)	Cushioning
			Mena et al. (2022)	Cushioning
			Feng et al (2022)	Cushioning
Structural	Macroeconomic fundamentals	GDP per capita	Furceri et al. (2021)	Cushioning
			Pitterle and Niermann (2021)	Cushioning
			Feng et al (2022)	Cushioning
			Mena et al. (2022)	Cushioning
		Domestic market	Pianta (2021)	Cushioning
		Debt-to-GDP ratio	Furceri et al. (2021)	Amplifying
			Pitterle and Niermann (2021)	Amplifying
		GDP growth trends	Furceri et al. (2021)	Amplifying
			Pitterle and Niermann (2021)	Cushioning
			König and Winkler (2020)	Amplifying
	Demographic	Elderly population	Furceri et al. (2021)	Amplifying
			Feng et al (2022)	Amplifying
	Governance & institutions	Government effectiveness	Pitterle and Niermann (2021)	Cushioning
		Income inequality	Furceri et al. (2021)	Amplifying
			Feng et al (2022)	Amplifying
	Sectorial composition	Services as a share of GDP	Glocker and Piribauer (2021)	Amplifying
		Tourism as a share of GDP	Furceri et al. (2021)	Amplifying
			Pitterle and Niermann (2021)	Amplifying
			König and Winkler (2020)	Amplifying
			Monsod and Gochoco-Bautista (2021)	Amplifying

Source: Authors' elaborations

A host of recent studies has empirically tested these hypotheses, in most cases finding supporting evidence (Cantore et al., 2017; Gabriel & de Santana Ribeiro, 2019; Haraguchi et al., 2019; Jia et al., 2020; Marconi et al., 2016). These contributions use updated datasets and current methodological approaches that allow for more precise estimates to assess whether manufacturing is in fact the engine of growth. The results obtained generally confirm the postulates of early developmental pioneers.

Marconi et al. (2016) evaluate the validity of Kaldor's first and second laws using a revised version of Kaldor's methodology. They test whether the Kaldorian system of equations still holds based on a sample of 63 middle- and high-income countries—according to the World Bank categories—for the period 1990 and 2011. The results confirm the relevance of these laws, especially for countries in intermediate stages of development. Their findings suggest that there is a positive contribution of manufacturing output growth on the total factors' input growth in middle-income countries, indicating that the manufacturing sector stimulates productivity increases.

Gabriel and de Santana Ribeiro (2019), on the other hand, analyse the importance of manufacturing in terms of intersectoral linkages effects. The logic behind this is that sectors that simultaneously demonstrate high backward and forward linkages are capable of leading the growth process. They evaluate the relationship between manufacturing and economic growth over time using input-output matrices for 29 countries for the years 1995, 2000, 2055 and 2010. Their results reaffirm the manufacturing sector's significance in terms of its growth and linkages effects, especially for developing countries. They conclude that manufacturing industries can still act as an "engine of growth" for these countries, mainly through its forward linkages.

The fundamental thesis of manufacturing as an engine of growth is also examined by Cantore et al. (2017) and Jia et al. (2020). Both studies find evidence supporting the role of manufacturing as the leading sector that drives economic development. Analysing the period from 1970–80s to 2010, they discover a positive relationship between the rate of per capita income growth and the share of manufacturing industry in GDP. The results show that manufacturing directly contributes to economic growth by increasing factor productivity and indirectly through structural transformation. This occurs through positive spillovers that spread to other economic sectors in the form of learning and knowledge diffusion. By contrast, such direct and indirect effects are not observed for non-manufacturing sectors.

To identify the best fuel for this engine of growth, Haraguchi et al. (2019) determine the main drivers of successful industrialization in developing countries between 1970 and 2014. They propose an interesting method to categorize which countries were "successful industrializers" during this period and run a multivariate analysis to identify the determinants for achieving this stage of development. Some of the factors found to be of relevance in supporting the process of sustained industrialization include high institutional stability, investment in human capital and low levels of income inequality.

The role of specific industrial policies is also highlighted, such as reforms in capital flows and effective exchange rate regimes which allow for the domestic sector to be more competitive.

The role of manufacturing and industrial capabilities in igniting and supporting economic development is thus well established in the literature. In a nutshell, the characteristics of the manufacturing sector that explain its special role relate to its higher potential to exploit static and dynamic economies of scale, foster technological innovation, create good quality jobs and foreign exchange and have a pull on the rest of the economy through productive linkages and technological spillovers. Yet one additional special characteristic the COVID-19 pandemic seems to have unveiled is the potential of this sector to strengthen socioeconomic resilience in times of global shocks.

Anecdotal evidence collected during the pandemic crisis supports this claim. As reported in López-Gómez et al. (2021), manufacturing industries were crucial during the pandemic in suppling goods that were critical to tackling the emergency itself; they also contributed to countries' swift recovery following the initial shock. Within the manufacturing sector, the country's level of industrial capabilities play a leading role in supporting socio-economic resilience. These capabilities can be broadly defined as the personal and collective skills, productive knowledge and experiences embedded in physical agents and organizations needed for manufacturing firms to be able to perform different productive tasks, absorb new technologies, and coordinate production along the supply chain (Andreoni, 2021).

As indicated earlier, one important contribution of this paper is to empirically examine the role industrial capabilities played in supporting countries' resilience during the COVID-19 pandemic crisis.

3 Assessing the (uneven) economic impact of COVID-19

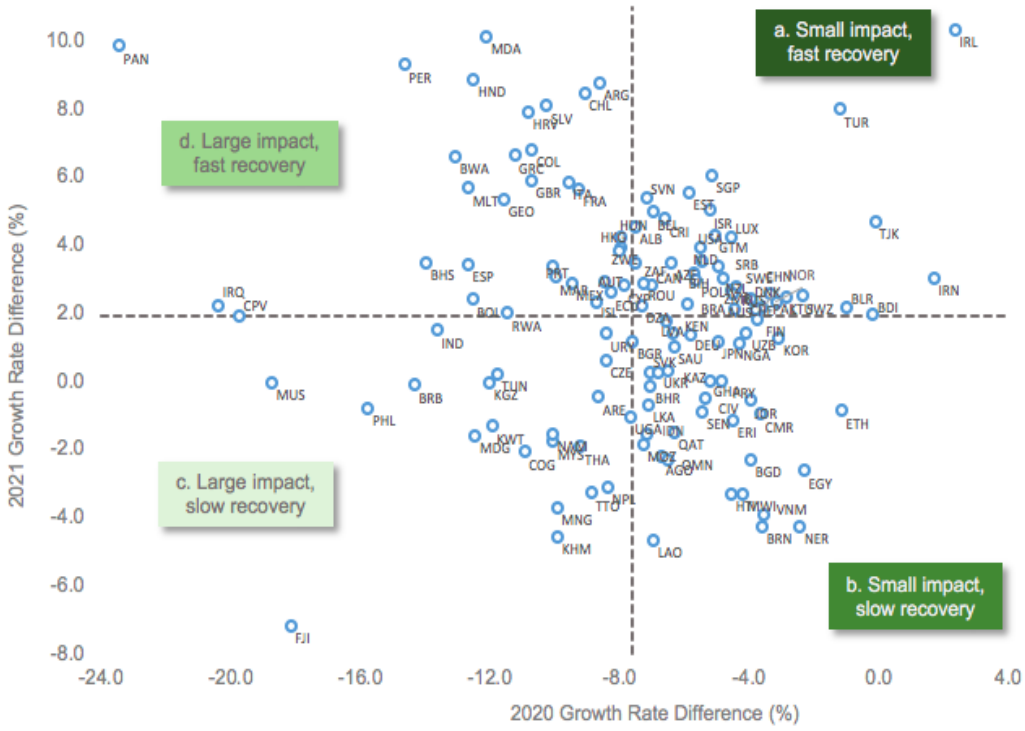
When assessing the economic impact of COVID-19, all stages of the crisis, from the initial shock to the subsequent recovery, must be investigated. Moreover, the deceleration observed in economic activity (i.e. the GDP growth rates during 2020 and 2021) should be quantified in comparison to the growth forecasts published before the pandemic. Thereby, both the direct impact on output contraction and the indirect losses caused by the pandemic can be measured.

One way of measuring this is to compare the observed growth in GDP during 2020 and 2021 against that projected before the pandemic. In this paper, we look at the pre-pandemic projections of GDP published by the IMF in their WEO in October 2019 (IMF, 2019). These projections are compared against the latest estimates of observed GDP performance published by the IMF in April 2022 (IMF, 2022a).[8]

[8] The GDP growth rates observed during 2020 and 2021 have been updated for 30 countries for which data on real GDP growth rates are available in the WEO publication of July 2022 (IMF, 2022b).

A wide divergence becomes evident just by looking at the difference between countries' projected GDP growth rates and those observed for the years 2020 and 2021. Taking the average differences for both years as reference points, it is possible to distinguish four broad categories of countries (see quadrants of Figure 1). First, some countries experienced a low initial impact—i.e. the rate differential for 2020 falls to the right-hand side of the vertical line—but recovered rapidly in the subsequent year—i.e. the rate differential for 2021 falls above the horizontal line. These countries achieved the best performance in terms of GDP. This group includes Ireland, Singapore and Türkiye. Other countries experienced a low impact and only recovered very slowly (Group b in the figure). This includes Egypt, Ethiopia and Viet Nam. Another country group represents the countries that were hit hardest by the pandemic: they experienced a high initial impact and slow recovery (quadrant c). Some of these countries include Fiji, Mauritius and the Philippines. Finally, the last country group includes those that experienced a high initial impact but recovered fast, partially counterbalancing the initial impact. Panama and Peru belong to this group.

Figure 1. Difference between pre-pandemic projections and observed GDP growth rates for 2020 and 2021



Source: Authors' elaboration based on IMF WEOs October 2019 and April 2022

Note: The horizontal axis presents the difference between the projected and the observed GDP growth rate for the first year of the pandemic (2020), while the vertical axis illustrates this comparison for the second year of the pandemic (2021). The dashed lines represent the average values observed in the sample of all 125 countries considered.

Even though the observation of growth rate differentials for each year provides interesting insights, the overall impact of the pandemic should be accounted for in a cumulative fashion by combining both years of the analysis. Different combinations in the growth rates of each year might lead to different results in a country's overall performance. For example, a country with a small but sustained GDP contraction during both years might have experienced a similar cumulative impact as a country that suffered a much higher impact in 2020 but recovered quickly in 2021. A closer look at the dynamics of individual countries sheds new light on this issue (see Figure 2).

Figure 2. Development of GDP level for selected countries: Differences in initial impact and post-recovery dynamism

Source: Authors' elaboration based on IMF WEOs October 2019 and April 2022

Figure 2 presents different dynamics and the economic losses these entailed. The graphs illustrate the development of output performance of four countries between 2017 and 2021, each representing one of the situations depicted in Figure 1. The solid line indicates the observed GDP level published by the IMF in April 2022; the dotted line denotes the pre-pandemic projection from October 2019. To make the comparisons between countries easier, we indexed GDP levels using 2019 as the base year. The grey area between the lines, therefore, represents the cumulative economic losses during the pandemic.

Tunisia experienced the highest losses among the four countries included in our sample, i.e. the differences in GDP witnessed in 2020 and 2021 amounted to an economic loss of 24 per cent of GDP reported in 2019. Lower losses were observed in Norway, with the grey area only representing 4 per cent of the country's pre-pandemic GDP level. Chile and Indonesia, on the other hand, experienced similar losses despite their contrasting dynamics: while Chile was considerably affected at the outset of the crisis but rapidly recovered in the second year, the pandemic impacted Indonesia less in the first year, but the country's GDP only recovered slowly in 2021. In cumulative terms, both countries were similarly affected by the pandemic (with the grey area representing 11 per cent of Chile's pre-pandemic GDP level and 16 per cent of Indonesia's).

To capture the economic losses in a single indicator, we measure the grey area and present it as a share of the pre-pandemic GDP level for each country in our sample. More specifically, we calculate:

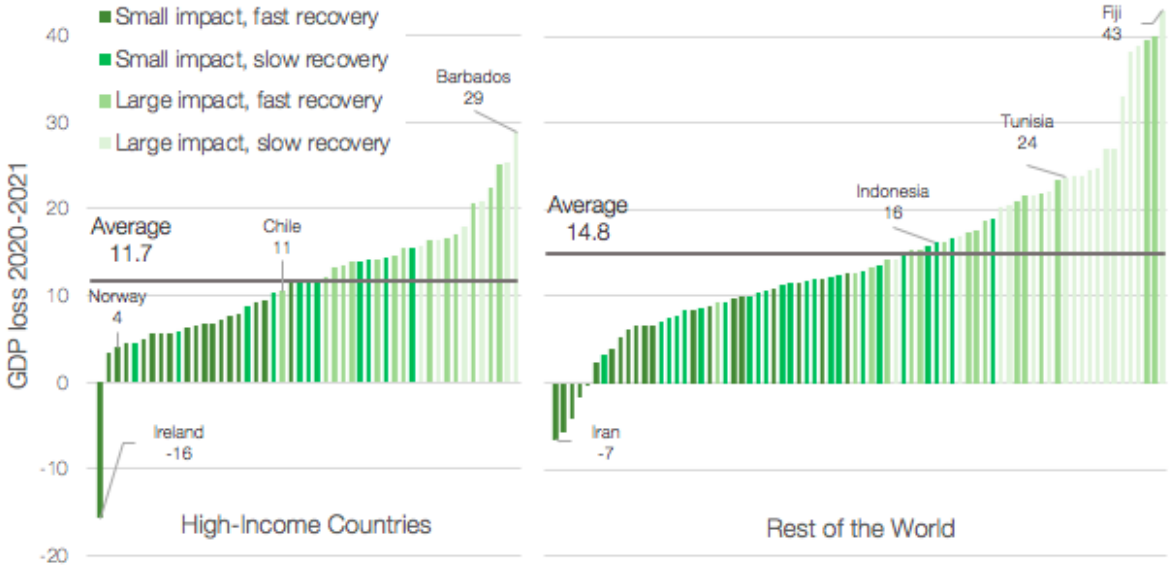
$$GDP\ Loss_i = \frac{[(GDP20_o - GDP20_p) + (GDP21_o - GDP21_p)]}{GDP19_o} \quad (1)$$

where $GDP\ Loss$ represents the cumulative level of output contraction for country i. $GDP20o$ and $GDP21o$ are the observed levels of GDP for 2020 and 2021 published in the latest WEO (IMF, 2022a, 2022b); and $GDP20p$ and $GDP21p$ represent the pre-pandemic projections from October 2019 (IMF, 2019).[9] These differences are measured in relation to the output level prior to the pandemic ($GDP19o$).

By imputing this formula, we can obtain a simple but comprehensive measure for economic losses resulting from the pandemic. A value of 10 means that the country lost the equivalent of 10 per cent of its pre-pandemic GDP level as a result of COVID-19. Figure 3 presents the result of this indicator for the 125 countries in our sample, divided by level of income according to the World Bank categories. The distribution ranges from a minimum of -16 per cent (Ireland) to a maximum of 29 per cent (Barbados) among high-Income countries and from -7 per cent (Iran) to 43 per cent (Fiji) for the rest of the world. This again demonstrates that the economic consequences of COVID-19 were extremely heterogeneous across countries, even among economies with a similar level of income.

[9] For a more accurate comparison of these values, we adjusted the projections of 2020 and 2021 by applying the projected growth rate from October 2019 to the observed level of GDP in 2019 published in April 2022.

Figure 3. Cumulative level of GDP losses in 2020 and 2021 by income group (%)



Source: Authors' elaboration based on IMF (2019, 2022a, 2022b) .

Note: GDP losses calculated following Equation (1).

Using this indicator as our target variable, we can now address the main research question of this paper: why did some countries fare better during the COVID-19 crisis than others?

4 Factors of resilience and vulnerability: Cross-country evidence

4.1 Approach to assess factors of resilience and vulnerability

Our approach is based on an econometric model to assess the main explanatory factors behind the scores of the output loss indicator:

$$GDP\ Loss_i = \beta\chi_i + \delta\theta_i + \omega_i + \varepsilon_i \qquad (2)$$

where the dependent variable $GDP\ Loss$ is calculated following Equation (1) for each country $i \in \{1, 2, \ldots, 125\}$. χ_i and θ_i are the two sets of explanatory variables, the first comprising pandemic-specific factors, and the second including country-specific structural factors. β and δ represent the vectors of parameters to be estimated by the regression model. ω_i signifies regional dummies to capture unobserved factors specific to five broad geographical regions: Africa, Asia-Pacific, Europe, Latin America and the Caribbean, and North America. ε_i denotes the error term.

The variables included in vectors χ_i and θ_i are defined in accordance with the literature reviewed in section 2. They only include those variables that were found to have had a significant impact on economic activity as reported in Table 1. χ_i includes two variables: SEVERITY and STRINGENCY, both of which are expected to have amplified the shock. SEVERITY reflects the pandemic's impact in

terms of public health and is proxied by the excess mortality due to COVID-19 per million inhabitants between 1 January 2020 and 31 December 2021. This indicator was recently published by the WHO (2021) and is calculated as the difference between the total number of reported deaths during this period and the mortality that would have been expected in a non-crisis scenario based on data from earlier years. We find this to be an accurate measure of the health burden attributable to the pandemic as it accounts for the possible issue of underestimation. STRINGENCY, on the other hand, captures the restrictiveness of the containment measures that were implemented to slow the spread of the virus. The variable is proxied by the cumulative average level of the Oxford Stringency Index score between 1 January 2020 and 31 December 2021 taken from the Oxford COVID-19 Government Response Tracker.

θ_i includes six variables, three that are expected to have amplified the effect of the crisis (TOURISM, ELD.POP and PUB.DEB) and three that are expected to have cushioned it (INCOME, GROWTH AND DOMESTIC). TOURISM captures a country's dependence on the tourism sector prior to the pandemic and is proxied by the share of tourism and tourism receipts in total output for 2019, using data from the World Travel and Tourism Council (WTTC). Economies that are highly dependent on the tourism sector are expected to have been hit harder by the pandemic due to the plunge in international travel. ELD.POP reflects a country's demographic structure and is proxied by the share of population aged 65 or above. Countries with larger shares of elderly populations are expected to have been more vulnerable to the pandemic as the COVID-19 virus disproportionately affected older people. PUB.DEB denotes a country's macroeconomic stability and is proxied by the ratio of public debt to GDP. Countries with a higher debt are expected to have been in a weaker position to face the economic contraction caused by the pandemic by implementing countercyclical policies.

By contrast, the other three structural variables are expected to have cushioned the pandemic's impact. DOMESTIC signifies the importance of local markets for the country's economic activity and is proxied by the share of domestic absorption in final demand in 2019 (i.e. before the pandemic). This variable is expected to reduce economic losses within the context of trade uncertainty triggered by the pandemic. GROWTH reflects past growth, measured as the three-year average GDP growth preceding the crisis as reported in the IMF database. This variable is incorporated as a measure of economic strength. INCOME refers to the level of income proxied by per capita GDP in 2019 in international PPP dollars.

Equation (2) presents our baseline model which explores whether the factors of resilience identified by the literature so far are correlated with our indicator of GDP loss. The baseline model is then augmented to open the "black box" of income and explore countries' deeper structural characteristics that might explain why richer countries were more resilient: fiscal space, government capabilities and industrial capabilities.

Fiscal space here refers to a government's ability to implement economic support measures as a means to ameliorate the damage caused by the crisis. Evidence from the pandemic suggests that not all countries were equally suited to effectively implement support policies and deal with these extraordinary expenses in a sustainable way. To capture these differences, we use the COVID-19 Economic Stimulus Index (CESI) proposed by Elgin et al. (2020). This index is constructed based on an extensive review of economic policy packages adopted by 166 countries between March 2020 and May 2021, and includes fiscal, monetary and exchange rate measures. The index was obtained using principal component analysis and ranges from -4.25 (score for Algeria, which is the country with the lowest stimulus according to this indicator) to 4.85 (score for Bahrain, the country with the highest stimulus). The large scope of this index, both in terms of country and policy coverage, make it better suitable to capture fiscal space compared with other indicators used in the literature.

The level of government capabilities is also expected to have played a critical role in countries' immediate response to the pandemic. As Pitterle and Niermann assert: "…in times of crisis, good governance matters more than ever" (2021, p. 6). Such capabilities are also difficult to capture as they refer to multiple dimensions. We use the measure of state capacity proposed by Hanson and Sigman (2021) to reflect this type of capabilities, as this indicator is most closely linked to the type of capabilities that can be considered relevant for our analysis.[10] The authors consider state capacity to be a latent variable at the conjunction of a wide range of selected indicators such as administrative efficiency, bureaucratic quality, census frequency and state authority over the territory for a total sample of 163 countries.

The final variable we introduce aims to capture industrial capabilities. Here again, difficulties arise in finding a suitable indicator that can capture this type of capabilities. We use UNIDO's Competitive Industrial Performance (CIP) index as a proxy for countries' underlying capabilities in manufacturing production (UNIDO, 2021). This index combines three dimensions: (i) capacity to produce and export manufactured goods; (ii) technological deepening and upgrading; and (iii) world impact. The higher the score in any of these dimensions, the higher the country's industrial competitiveness and overall score in the CIP index.

The augmented model is calculated as follows:

$$GDP\ Loss_i = \beta\chi_i + \delta\emptyset_i + \omega_i + \pi_i + \varepsilon_i \quad (3)$$

[10] Other indicators used in the literature are the University of Gothenburg's Quality of Government Index (QoG), and the World Bank's Government Effectiveness Index. See Vaccaro (2020) for a recent review of common cross-national measures of state capacity.

where $\emptyset_i$ is the adjusted vector of structural variables, which excludes the variable related to income levels (INCOME) and includes the three additional variables on fiscal space and capabilities (STIMULUS, GOV.CAP, IND.CAP).[11] π_i signifies income dummies to capture unobserved factors specific to the income groups defined by the World Bank.[12]

The table below summarizes all variables used in our analysis with their corresponding definition and data sources.

[11] Since level of GDP per capita showed a strong correlation with these three additional variables, we decided to exclude the variable related to level of income in the augmented model to avoid a problem of multicollinearity. However, we test the model by controlling INCOME as a robustness check.

[12] Note that the income dummies are not included in Equation (2) as these effects are already fully captured in the variable INCOME.

Table 2. Variables used in the analysis, definition and sources

VARIABLE	DEFINITION	SOURCE	EXPECTED EFFECT
GDP Loss	Difference between observed and projected GDP, relative to 2019 GDP [cum. 2020-21]	IMF WEO (Oct-19, Apr-22 and Jul-22)	-
SEVERITY	Excess mortality per million inhabitants [cum. 2020-21]	WHO	Amplify
STRINGENCY	Stringency Index [cum. 2020-21]	Oxford Policy Tracker	Amplify
DOMESTIC	Private consumption share in final demand (%) [2019]	UNDESA, National Accounts Main Aggregate Database	Buffer
TOURISM	Tourism receipts (% of GDP) [2019]	WTTC	Amplify
ELD.POP	Population aged 65 and above (% of total population) [2019]	World Bank WDI	Amplify
GROWTH	GDP growth rates (%) [average 2017-19]	IMF WEO APR 2022	Buffer
PUBLIC DEBT	Government gross debt (% of GDP) [average 2017-19]	IMF IFS	Amplify
INCOME	GDP per capita [2019]	IMF WEO APR 2022	Buffer
STIMULUS	COVID-19 Economic Stimulus Index (CESI) [Mar 2020-May 2021]	Elgin et al (2020)	Buffer
GOV.CAP	Estimates of state capacity [2015]	Hanson & Sigman (2021)	Buffer
IND.CAP	Competitive Industrial Performance index [2019]	UNIDO CIP Database	Buffer

Note: The variables STIMULUS, GOV.CAP and IND.CAP are normalized to range from 0 to 100 in the analysis.

Equations (2) and (3) are implemented for a total sample of 125 countries for which data are available for all indicators used in the analysis.[13] Table 3 presents the summary statistics for each of these variables within the sample of reference.

[13] See Table 5 in the Annex for the full list of countries included in the analysis and their income classification according to the World Bank.

Table 3. Descriptive statistics

VARIABLE	Unit	Mean	Std. Dev.	Min	Max
GDP loss	*Percentage*	13.6	9.3	-15.7	43.0
SEVERITY	*Deaths per million population*	2,100	2,030	-1,240	8,735
STRINGENCY	*Index number*	53.1	9.9	13.6	73.6
DOMESTIC	*Percentage*	72.1	13.3	23.5	94.1
TOURISM	*Percentage*	10.4	6.8	1.9	44.4
ELD.POP	*Percentage*	10.4	6.9	1.2	28
GROWTH	*Percentage*	3.2	2.2	-3.2	9.0
PUBLIC DEBT	*Percentage*	56.9	33.3	2.7	233.1
GDP.PC	*Thousand PPP dollars*	26.7	23.6	0.8	121
STIMULUS	*Index number*	49.4	14.6	0	100
GOV.CAP	*Index number*	50.2	21.0	0	100
IND.CAP	*Index number*	17.0	20.8	0	100

Due to the recent nature of the pandemic, the use of panel or pooled cross-sectional data techniques is not possible in our exercise. Our analysis can only be conducted using cross-sectional, country-level data. This type of analysis, however, is more likely to encounter problems of heteroscedasticity, which may invalidate standard statistical tests of significance of the estimated coefficients. To minimize the potential problems associated with this, we use White's (1980) covariance matrix to report robust standard errors for the estimated coefficients.

4.2 Main results: Amplifiers, buffers and the role of capabilities

The results of our analysis are presented in Table 4. All reported coefficients are standardized to simplify the interpretation and improve the comparability of relative magnitudes across explanatory variables.[14] The estimated coefficients indicate the amount of GDP loss associated with a one standard deviation increase in the explanatory variable, all else being equal. Hence, the larger the coefficient, the higher its impact on economic performance. Negative coefficients indicate factors that buffered the impact of the crisis by reducing GDP loss, whereas positive coefficients indicate factors that amplified the impact.

[14] For the standardization of the coefficients, we use the Stata Beta procedure.

The variables of interest have been included in sequential order in the table. Model (1) only includes pandemic-specific variables. Model (2) integrates the structural variables reviewed in the literature, as reported in Equation (2). The following models augment the original model to include the three additional variables that would explain why higher incomes support resilience. These variables are first included separately (models 3 to 5) and then merged together (model 6). When the income variable is dropped from the analysis (columns (3) to (6)), income-level dummies are included to control for other characteristics that can be related to incomes but are not captured in the three dimensions we are interested in. All models also include regional dummies.

Table 4. Econometric results

Y: GDP Loss	(1)	(2)	(3)	(4)	(5)	(6)
SEVERITY (Log)	-0.058	0.008	0.024	0.042	0.007	0.015
	(1.616)	(1.247)	(1.711)	(1.716)	(1.580)	(1.669)
STRINGENCY	0.307***	0.305***	0.280***	0.308***	0.315***	0.326***
	(0.082)	(0.075)	(0.075)	(0.079)	(0.071)	(0.076)
DOMESTIC		-0.218**	-0.144	-0.127	-0.154	-0.145
		(0.072)	(0.076)	(0.074)	(0.069)	(0.070)
TOURISM		0.500***	0.503***	0.478***	0.441***	0.435***
		(0.132)	(0.150)	(0.151)	(0.139)	(0.146)
ELD.POP		-0.012	-0.115	0.037	0.025	0.075
		(0.229)	(0.293)	(0.259)	(0.261)	(0.307)
GOV.DEBT		-0.011	0.018	0.010	0.044	0.040
		(0.023)	(0.027)	(0.024)	(0.025)	(0.026)
GDP.GROWTH		-0.093	-0.054	-0.044	-0.044	-0.037
		(0.525)	(0.616)	(0.555)	(0.531)	(0.554)
INCOME (Log)		-0.313*				
		(1.575)				
FISCAL SPACE			-0.040			-0.011
			(0.073)			(0.068)
STATE CAP.				-0.212		-0.109
				(0.061)		(0.057)
INDUSTRIAL CAP.					-0.258**	-0.225**
					(0.047)	(0.047)
Observations	125	125	125	125	125	125
R-squared	0.15	0.42	0.40	0.41	0.43	0.43

Robust standard errors in parentheses

**** p<0.01, ** p<0.05, * p<0.1*

Note: For simplicity, the results of regional and income dummies are not reported as they did not present any statistical significance (full table available upon request). Excess mortality per million inhabitants (SEVERITY) and GDP per capita (INCOME) are introduced in logarithm to better account for their functional form.

Results from the first regression, which only incorporates SEVERITY and STRINGENCY controlled by regional dummies, confirm that the crisis' negative impact cannot be exclusively explained by pandemic-specific factors. The estimated equation using these variables only explains 15 per cent of the variation in output loss across countries (R-squared). When we include the structural variables in the model (regression 2), the explanatory power increases significantly. The results of this model support the main findings of the literature in two ways. On the one hand, the coefficients associated with the stringency of containment measures implemented and the share of the tourism sector are positive and statistically significant, confirming the crisis' amplifying effect. All other things being equal, countries that introduced more stringent containment measure and those more dependent on tourism suffered more than the rest. On the other hand, the coefficients associated with size of domestic market and level of income are negative and statistically significant, confirming their buffering effect during the crisis. Richer countries and countries with a larger domestic market (or that are less integrated in the global economy) suffered less than other countries. The remaining coefficients are not statistically significant, although they have the expected sign in the majority of cases. The only exception is the elderly population, which has a negative (buffering) sign.

All things being equal, richer countries suffered less than the rest. But why was this the case? The following models open up the "black box" of level of income, using the three additional explanatory variables included in Equation (3). When explored both separately and together, the coefficients associated with these variables are negative, suggesting that these factors have indeed buffered the negative impacts of the crisis. However, of the three factors examined, the only one that is statistically significant is that related to industrial capabilities. That factor is not only significant. It also has the largest absolute value, suggesting that it had the highest cushioning effect of all factors considered. Interestingly, our augmented model has the highest explanatory power (R-square).

Industrial capabilities played a crucial role in supporting countries' ability to absorb and resist the global shock generated by the COVID-19 pandemic. Our results once again underscore the key role manufacturing industries played in mollifying the impact of the pandemic crisis. To assess the robustness of this important finding, we performed a series of robustness checks.

One could argue that the significance of industrial capabilities "just" captures the dichotomy of rich versus poor countries. To check for robustness, we performed an analysis of model (6) among the subset of 75 countries of our sample that belonged to the group of low- or middle-income countries in 2019 according to the World Bank (results reported in the Annex). In this case, the coefficient associated with industrial capabilities continues to be negative and significant, indicating that this is the case even within developing countries. Interestingly, for this restricted sample of countries, the relative size of the domestic market is negative and highly significant, stressing the importance of a strong domestic market for developing countries in times of global turbulences.

Next, we performed the econometric exercise using different model specifications and variables following the literature (see Table 6 of the Annex). As previously mentioned, INCOME is excluded from the augmented model to avoid multicollinearity with other variables, but in regression (8), we add it as a control variable to fully assess the significance of the explored factors of resilience. Model (9) includes the variable INEQUALITY, which was excluded from the main model to avoid losing observations due to lack of data.[15] However, unlike the reviewed studies which find that countries with higher levels of income inequality were more severely affected by the crisis, the results are not statistically significant in our model. Model (10) uses an alternative variable to capture economies' sectorial composition: the share of the service sector in GDP (instead of limiting this to the tourism sector alone). This change, however, turns the coefficient associated with this factor non-significant. Model (11) explores alternative indicators for fiscal space and state capacity: the cumulative level of additional spending and forgone revenue as a percentage of GDP in 2020 and 2021 as reported by the IMF Fiscal Monitor for fiscal space, and the Government Effectiveness Estimate from the World Bank Governance Indicators project for government capabilities. Lastly, model (12) incorporates the number of deaths per capita reported by the Oxford Policy Tracker as an alternative proxy for the severity of the crisis. In all cases, the main result of our regression remains: industrial capabilities continue to be significantly associated with lower output losses.

As a final robustness check, we implement Bayesian Model Averaging (BMA) techniques. This methodology was used in some studies included in our literature review to address the challenge of over-parametrization inherent to linear cross-country regressions (Furceri et al., 2021; Glocker & Piribauer, 2021). These techniques allow us to consider a large set of explanatory variables and combine them in different regressions to evaluate the probability that the variable belongs to the true model.[16] The results obtained are presented in Table 7 of the Annex. These findings demonstrate that the variables included in our preferred model are relevant, presenting a posterior inclusion probability (PIP) higher than 50. This means that these variables would enter in at least 50 per cent of the 2^{11} (2048) models resulting from the combination of all the variables of interest.

Overall, the findings presented in Table 5 are robust to the performed robustness checks. Even after regressing the model with a restricted sample and controlling for the other potential determinants of output loss or variable definitions, the estimated coefficient of industrial capabilities is negative and significant. In addition, after implementing an alternative econometric technique, the variable of industrial capabilities is also found to be highly relevant. All of these results validate our main

[15] This variable is proxied using the latest available Gini coefficient from the ALG (All the Ginis) database.

[16] By building on existing literature and only including those variables that were found to be statistically significant in previous analyses, our model is less likely to suffer problems of over-parametrization. Therefore, we opted for regular OLS techniques for our primary model and used BMA techniques only to check the robustness of these results.

hypothesis that stronger industrial capabilities were instrumental in countries' resilience and in cushioning the economic impact of the COVID-19 pandemic.

5 Conclusions

The COVID-19 pandemic has altered the lives of all people around the world, almost without exception. This is a unique phenomenon and takes place once in centuries. As such, the pandemic has also been a major test for economies and societies around the world to determine how well-prepared they are for the unexpected. A pandemic like this one might be a rare occurrence. But global, unforeseen and disruptive shocks are very likely to reoccur in the future. Resilience has emerged as a crucial factor in dealing with global crises. And it will continue to play a crucial role in the years to come.

Against this backdrop, this paper contributes to the analysis of those factors that strengthened the socioeconomic dimension of resilience during the pandemic. The focus was placed on changes in GDP, which is the conventional indicator of economic activity. To assess the pandemic's impact on this dimension, we have proposed a novel index that uses the most updated information and provides a single, comparable measure of the COVID-19 impact across countries around the world. The measure is used here to analyse the pandemic's impact, but can easily by applied to analyse other global disruptive shocks as well, such as the financial crisis of 2008/9 or the armed conflict in Ukraine today.

To identify relevant factors of resilience, we relied on an extensive review of the growing literature that is exploring this issue. By reviewing the literature, we found an important gap: the role of industrial capabilities had not yet been considered in the analysis. A second contribution this paper makes is to explicitly study the role of industrial capabilities in supporting resilience and to assess their significance once other relevant factors have been accounted for. This was achieved using cross-sectional OLS econometric techniques complemented by a BMA technique.

Our findings reiterate the importance of building industrial capabilities. A strong and dynamic manufacturing sector not only supports economic development but also contributes to countries' preparedness against shocks of this nature. Our econometric results confirm prior anecdotical evidence indicating that manufacturing industries are crucial in providing essential goods that are critical to life and national security; during the COVID-19 crisis, they played a key role in suppling goods critical to tackling the emergency itself and also contributed to the swift recovery of nations after the initial shock (López-Gómez et al., 2021).

One key policy implication from the analysis is that countries need to pay special attention to ensure that their industrial sectors are functioning properly. Policies to develop industrial capabilities need to be a top priority to prepare for an increasingly uncertain future. Building industrial capabilities, however, does not happen overnight and requires long-term commitments that will only pay off after

several years of continued investments. If countries are to prepare for future shocks of this nature, it is fundamental that they strengthen their industrial base, upgrade the technologies they are using and improve the supporting infrastructure necessary for a vibrant and dynamic industrial sector. National efforts alone might not suffice to build such capabilities, especially in the case of least developed countries. The international community must therefore stand ready to support them in achieving global resilience against future global shocks.

6 References

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7 Annex

7.1 Countries included in the analysis

Table 5 Countries included in the analysis by income group

Country Name	Income	Country Name	Income	Country Name	Income
1. Albania	UM	43. Germany	H	85. Norway	H
2. Algeria	LM	44. Ghana	LM	86. Oman	H
3. Angola	LM	45. Greece	H	87. Pakistan	LM
4. Argentina	UM	46. Guatemala	UM	88. Panama	H
5. Australia	H	47. Haiti	LM	89. Paraguay	UM
6. Austria	H	48. Honduras	LM	90. Peru	UM
7. Azerbaijan	UM	49. Hungary	H	91. Philippines	LM
8. Bahrain	H	50. Iceland	H	92. Poland	H
9. Bangladesh	LM	51. India	LM	93. Portugal	H
10. Barbados	H	52. Indonesia	LM	94. Qatar	H
11. Belarus	UM	53. Iraq	UM	95. Republic of Congo	LM
12. Belgium	H	54. Ireland	H	96. Romania	UM
13. Bolivia	LM	55. Islamic Republic of Iran	LM	97. Russia	UM
14. Bosnia and Herzegovina	UM	56. Israel	H	98. Rwanda	L
15. Botswana	UM	57. Italy	H	99. Saudi Arabia	H
16. Brazil	UM	58. Japan	H	100. Senegal	LM
17. Brunei	H	59. Jordan	UM	101. Serbia	UM
18. Bulgaria	UM	60. Kazakhstan	UM	102. Singapore	H
19. Burundi	L	61. Kenya	LM	103. Slovak Republic	H
20. Cabo Verde	LM	62. Korea	H	104. Slovenia	H
21. Cambodia	LM	63. Kuwait	H	105. South Africa	UM
22. Cameroon	LM	64. Kyrgyz Rep.	LM	106. Spain	H
23. Canada	H	65. Lao P.D.R.	LM	107. Sri Lanka	LM
24. Chile	H	66. Latvia	H	108. Sweden	H
25. China	UM	67. Lithuania	H	109. Switzerland	H
26. Colombia	UM	68. Luxembourg	H	110. Tajikistan	LM
27. Costa Rica	UM	69. Madagascar	L	111. Thailand	UM
28. Côte d'Ivoire	LM	70. Malawi	L	112. Bahamas	H
29. Croatia	H	71. Malaysia	UM	113. Trinidad and Tobago	H
30. Cyprus	H	72. Malta	H	114. Tunisia	LM
31. Czech Republic	H	73. Mauritius	UM	115. Turkey	UM
32. Denmark	H	74. Mexico	UM	116. Uganda	L
33. Ecuador	UM	75. Moldova	UM	117. Ukraine	LM
34. Egypt	LM	76. Mongolia	LM	118. UAE	H
35. El Salvador	LM	77. Morocco	LM	119. UK	H
36. Estonia	H	78. Mozambique	L	120. USA	H
37. Eswatini	LM	79. Namibia	UM	121. Uruguay	H
38. Ethiopia	L	80. Nepal	LM	122. Uzbekistan	LM
39. Fiji	UM	81. Netherlands	H	123. Vietnam	LM
40. Finland	H	82. New Zealand	H	124. Zambia	LM
41. France	H	83. Niger	L	125. Zimbabwe	LM
42. Georgia	UM	84. Nigeria	LM		

Note: Groups defined according to the World Bank classification for 2019. H=High; UM=Upper Middle; LM=Lower Middle; L=Low.

7.2 Robustness checks

Table 6 Econometric results (alternative regressions)

Y: GDP Loss	(6)	(7)	(8)	(9)	(10)	(11)	(12)
SEVERITY (Log)	0.015	-0.031	-0.003	0.008	-0.021	-0.012	
	(1.669)	(3.181)	(1.265)	(1.682)	(2.333)	(1.769)	
DEATHS.PC (Log)							0.154
							(0.798)
STRINGENCY	0.326***	0.335***	0.331***	0.319***	0.353***	0.320***	0.274***
	(0.076)	(0.099)	(0.074)	(0.077)	(0.080)	(0.073)	(0.080)
DOMESTIC	-0.145	-0.298**	-0.200*	-0.138	-0.191	-0.172*	-0.116
	(0.070)	(0.134)	(0.071)	(0.071)	(0.081)	(0.071)	(0.076)
TOURISM	0.435***	0.457***	0.445***	0.445***		0.450***	0.429***
	(0.146)	(0.152)	(0.130)	(0.145)		(0.141)	(0.142)
SERVICES					0.110		
					(0.136)		
ELD.POP	0.075	-0.019	0.110	0.133	0.109	0.116	0.076
	(0.307)	(0.578)	(0.289)	(0.354)	(0.336)	(0.260)	(0.296)
INEQUALITY				-0.009			
				(0.124)			
GOV.DEBT	0.040	0.058	0.016	0.055	0.148	0.032	0.030
	(0.026)	(0.046)	(0.024)	(0.027)	(0.029)	(0.025)	(0.027)
GDP.GROWTH	-0.037	0.125	-0.071	-0.006	0.053	-0.024	-0.030
	(0.554)	(0.601)	(0.494)	(0.585)	(0.570)	(0.560)	(0.558)
INCOME (Log)			-0.199				
			(1.732)				
FISCAL SPACE	-0.011	-0.024	0.020	-0.001	-0.038		0.000
	(0.068)	(0.101)	(0.057)	(0.073)	(0.073)		(0.066)
ECON.SUPPORT						-0.045	
						(0.186)	
STATE CAP.	-0.109	-0.091	-0.056	-0.090	-0.153		-0.148
	(0.057)	(0.147)	(0.051)	(0.060)	(0.060)		(0.056)
GOV.EFF.						-0.164	
						(2.020)	
INDUSTRIAL CAP.	-0.225**	-0.208**	-0.206**	-0.221**	-0.372***	-0.218*	-0.184*
	(0.047)	(0.077)	(0.044)	(0.049)	(0.059)	(0.050)	(0.047)
Observations	125	75	125	119	124	124	125
R-squared	0.43	0.48	0.44	0.44	0.28	0.44	0.44

*Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*

Note: Model (6) is the same as reported in Table 4. Models (7) and (8) only include regional dummies. For simplicity, the results of regional and income dummies are not reported as these presented no statistical significance (full table available upon request). Excess mortality per million inhabitants (SEVERITY), DEATHS per capita and GDP per capita (INCOME) are introduced in logarithm to better account for their functional form.

Table 7. Bayesian Model Averaging (BMA) estimates

VARIABLES	PIP	t-statistics	Coef.	Std. Error
SEVERITY (Log)	0.09	-0.10	-0.04	0.38
STRINGENCY	**0.99**	**3.74**	**0.27**	**0.07**
DOMESTIC	0.20	-0.38	-0.02	0.05
TOURISM	**1.00**	**6.10**	**0.62**	**0.10**
ELD.POP	0.14	-0.28	-0.02	0.08
GOV.DEBT	0.11	0.19	0.00	0.01
GDP.GROWTH	0.11	-0.19	-0.02	0.13
INCOME (Log)	0.24	-0.43	-0.44	1.02
FISCAL SPACE	0.09	-0.11	0.00	0.02
STATE CAP.	0.26	-0.48	-0.02	0.04
INDUSTRIAL CAP.	**0.72**	**-1.33**	**-0.08**	**0.06**

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