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The impact of the pandemic on
industries.
A conceptual map and key
processes

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**The impact of the pandemic on industries.
A conceptual map and key processes**

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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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Abstract

The effects of the COVID-19 pandemic on the world economy and in particular on industries are investigated in this paper by developing a conceptual framework that explores the transmission channels of the crisis through demand dynamics, supply changes, international openness and the role of government policies to contain the recession. Changes at the macroeconomic and industry level are examined. A systematic empirical documentation on changes in GDP, industrial production, exports and government expenditure in the context of the restrictions introduced to contain the pandemic is provided for all world regions and major countries. Changes in specific production systems and business strategies are considered as well to highlight the qualitative changes in the organization of specific global value chains. Finally, some implications for the world economy, structural change and international production hierarchies are discussed.

Keywords: Industries, pandemic crisis, economic and industrial policies

1. Introduction and summary

The COVID-19 pandemic has had a major, pervasive and highly asymmetric impact on world industries. This paper investigates the consequences of the crisis on world industry based on a conceptual map that allows identification of key drivers at different levels of analysis, of the impacts' main channels of transmission and the major variables that characterize these effects. A conceptual map of the key mechanisms affecting world industry is presented, followed by an analysis of the available data and indicators, which can shed some light—as preliminary evidence—on ongoing processes. The dynamics that affect industries and firms and the role of government policies are also investigated. A particular focus is devoted to emerging and developing countries, and the role of industrial capabilities as a key driver of resilience.

The worldwide recession has hit Europe, Latin America and India the hardest, and has had a serious impact on North America as well as on some South Asian and African countries, while China and some other East Asian countries bounced back faster from the coronavirus crisis, ending 2020 with positive growth. Recovery was stronger than expected in many areas in the first half of 2021, but the pattern was again very uneven across countries and sectors.

Manufacturing production has been hit particularly hard by the pandemic, characterized by supply disruptions, drops in demand and overall recession. The industrial and trade performance in some countries and regions, including China, East Asia and Europe, was higher than that of the aggregate economy. After the early impacts of the pandemic, there were promising signs of recovery in manufacturing relatively quickly in some cases, though it will take many countries years to return to their pre-pandemic production and income levels. Compared to services, industry generally demonstrated greater resilience; many service sectors, such as travel, hotels and restaurants and cultural and leisure activities, were severely affected by the mobility restrictions.

Governments' policy responses were targeted at containing losses resulting from the pandemic and at accelerating recovery. Large-scale government interventions in the economy were introduced in many countries, with higher public expenditure—financed by deficits and debt—providing direct support to firms, new forms of industrial policy, and renewed investment in public health systems and vaccine research and production. However, the scale of additional public spending does not necessarily reflect the extent of the pandemic's impact; instead, it seems

to reflect governments' overall policy space: larger, richer economies with greater autonomy in monetary and fiscal policies have been particularly active in protecting their economies.¹

2. The key mechanisms of the pandemic crisis

As argued in the IDR 2022's conceptual framework, to better understand the impact of the COVID-19 crisis on world industry, we need a conceptual map that identifies the key mechanisms operating at the macroeconomic level. These are summarized below.

Demand and supply mechanisms. The COVID-19 crisis has affected economies through both supply and demand mechanisms. On the supply side, industry was affected by lockdowns, mobility restrictions, supply shocks, production stoppages, disruptions of global value chains (GVCs) and uncertainty about short-term prospects.

On the demand side, industry was hit by reductions in domestic consumption demand as household incomes fell and in investments as firms delayed investment projects due to uncertainty and overcapacity. Foreign demand fell amid a global trade slowdown. In this context, State interventions—through public investment and procurement, tax reductions and subsidies to firms—have played a fundamental role in preventing a further deepening of the crisis. Supply and demand effects can reinforce each other through employment effects and distribution mechanisms. A supply shock leads to consequences for employment, with layoffs, reduction of working hours, and lower wages paid, all of which are factors that lead to lower consumption demand. It also affects business profits, lowering both expectations and output, leading to a further drop in demand for investment. In turn, falling demand deepens the crisis in production, increasing competition for smaller markets, lowering profits and pushing weaker firms into bankruptcy. Thereby, a 'vicious circle' could emerge, which can lead to a prolonged depression. Government policy is a major tool for preventing such outcomes.

The world economy. In open economies, the crisis mechanisms introduced in countries hit hardest by the COVID-19 pandemic have had an impact on other countries. Key mechanisms on the supply side include the disruption of international production networks and stoppages in the supply of raw materials and components. On the demand side, dwindling export demand exacerbates the negative effects of domestic depression. Decreases in output and in imports of intermediate inputs in one country lead to a decline in exports in another country, resulting in a

¹ Studies on specific aspects of the international economic impact of the pandemic include Cantore et al. (2020), Coveri et al. (2020), East and Kaspar (2020), Lucchese and Pianta (2020b), Seric et al. (2020). The policies introduced in the case of Europe are addressed by Creel et al. (2020). The policies in the case of Italy are examined in Cresti et al. (2020) and in Pianta et al. (2021).

general reduction of world trade. These effects are not limited to the ‘vertical’ structure of industries alone; they extend to all economic sectors, as lower income and consumption demand lead to decreased imports in all sectors, which in turn are other countries’ exports. Again, a ‘vicious circle’ could arise at the global level.

These negative macroeconomic conditions and continued uncertainty affect foreign investments which influences the demand patterns in receiving countries and, at the same time, limits the expansion of production capacity and supply systems.

Economic structures. Macroeconomic outcomes at the national level—the depth and extent of the recession—depend, among others, on economic structures, in particular on the economy’s general vulnerability to the crisis. A country’s economic structure and the relative importance of industry compared to agriculture, natural resource extraction and private and public services, are a key factor for the vulnerability and resilience of an economy. *Agriculture* might be the least affected sector by a pandemic crisis due to the role of domestic consumption demand; conversely, in countries with major export crops, such as in Latin America, a drop in foreign demand might cause serious disruptions; the same applies to natural resource exporting countries. *Industry* is generally the most dynamic sector of the economy, characterized by higher productivity, higher capital investments, and a higher skilled workforce. Industrial activity might therefore be relatively more resilient in a pandemic crisis, unless the provision of raw materials and inputs is disrupted or demand collapses; again, the actual impact depends on the industrial sector’s internal composition and international integration (see below). Moreover, there is a lot of know-how in industry and it can provide crucial protective equipment during a pandemic, including pharmaceutical products and medical devices. *Private services* have been hit hardest by the pandemic crisis, the restrictions bringing entire subsectors to a halt – travel, transport, hotel, restaurants, cultural and leisure activities, etc. Falling incomes often means households cut spending on non-essential services, further depressing that sector. Reductions in business investment and adaptations to production plans may also disproportionately affect high-knowledge business services. Countries that rely on international tourism and on low-value added services have emerged as highly vulnerable to the recession. In the case of *public services*, the prospects are entirely different. Here, the development of activities is not the result of market processes but rests on government choices and public expenditure. Public health services have increased significantly during the pandemic, contributing to addressing the health emergency and expanding economic activities along the entire healthcare-related supply chain. Smart work has been widely introduced in the public sector, layoffs have been avoided, wages protected, and its

contribution to gross domestic product (GDP) has not declined. The presence of a large public sector has in fact emerged as an important factor of stabilization in national economies.

The composition of industry. The subsectors that make up the industrial sector have different vulnerabilities and potentials for resilience based on the criteria examined above. A country with an industrial composition characterized by higher knowledge, skills, technological capabilities, capital stock and diversified sources of demand clearly has greater resilience. A country that is specialized in pharmaceuticals and medical devices will experience fast-growing demand for its products. A country with more vertically integrated activities might be less affected by mobility restrictions and supply disruptions.

International openness. Economies that depend on exports and imports to a larger degree are more vulnerable to the international transmission mechanisms of the crisis discussed above. A relatively closed economy may also be more resilient to disruptions resulting from crises, as both the drop in demand and supply shocks are easier to contain. The same applies to sources of capital investment; lower reliance on foreign direct investment (FDI) and greater availability of domestic savings to fund industrial investment may contribute to resilience.

Countries' changing relative positions. Due to the uneven impact of both the pandemic across different countries and of each of the underlying mechanisms, national economies will emerge from the pandemic crisis in different relative positions in the world hierarchy. The economic rise of China is clearly accelerating, alongside other East Asian countries; some European economies, on the other hand, may decline further; while some emerging countries might be able to exploit new opportunities, the economic trajectory of others, for example in Latin America, could be pushed back. A new economic geography will emerge after the pandemic crisis – with innovations and new capabilities, industry dynamics and market sizes. This, in turn, will reshape the patterns of international production networks, trade and FDI flows.

The role of government policies. Governments' expansionary macroeconomic policies have been crucial in mitigating the impact of the COVID-19 crisis in all countries. Long-established austerity policies have been abandoned. These policies have led to restored growth in China and a containment of the recession in advanced countries. Government policies have been successful in offsetting the mechanisms that intensified the crisis in several ways. On the demand side, increased public spending—usually financed by deficit spending, monetary means or by increasing public debt—has resulted in greater public consumption and investment, to some extent compensating the drop in private demand and in exports. On the supply side, extensive subsidies for firms, tax reductions, provision of loans and credit guarantees allowed the private

economy to continue operating, with efforts to prevent or limit the loss of production capabilities. Moreover, public policies to strengthen public services, in particular health, have been key for addressing the pandemic; the presence of a large public sector has increased the resilience of economies. In terms of income distribution, governments have introduced major support measures for households with large-scale transfers, income protection measures for both employees and self-employed persons, a freeze on layoffs and new anti-poverty programmes. These measures have cushioned the collapse in consumption and have been crucial for maintaining social inclusion and limiting the increase in inequality associated with the pandemic crisis.

Summary of mechanisms. Figure 1 presents a summary of the conditions and factors that have contained, limited or responded to the pandemic crisis' underlying transmission mechanisms. The macroeconomic dimension and the industry dynamics are jointly examined to identify the factors that could lead to greater resilience in the face of disruptions.

Four aspects are considered – the impact of the pandemic crisis can be analysed in terms of (i) *demand patterns*, (ii) *supply structures*, (iii) *international openness of economies* and (iv) *government policies* that have been mobilized to address the crisis. Each of these aspects has a *macroeconomic* and an *industry* dimension. The macroeconomic factors lie on the horizontal axis, the industry factors on the vertical axis, depicting all possible combinations of mechanisms.

The diagonal of Figure 1 identifies the major mechanisms that can be implemented to address the crisis. For (i) *demand patterns*, aggregate public expenditure can compensate the drop in private consumption demand and investment. For (ii) *supply structures*, the presence of capabilities in high technology and high skills with oligopolistic power and an integration between manufacturing and services can increase the resilience of production systems. Concerning (iii) *international openness*, success in exports and a strong position in global value chains in high value added activities might protect a country's production systems. Finally, (iv) *government policies* can effectively respond to the pandemic crisis with expansionary monetary and fiscal policies at the macroeconomic level, as well as with industrial and technology policies that support investment and new capabilities at the industry level.

From a *macroeconomic* perspective, the bottom-right segment of Figure 1 highlights the importance of a strong vertical integration of the supply system; of export markets in fast-growing economies and activities; of a combination of fiscal policies with public spending supporting incomes and providing public services; of education, R&D and structural policies for upgrading the production system; and of exchange rate and balance of payment policies, including on capital

flows, which can support economic performance and domestic investment, thereby increasing the resilience of the country's economy.

From an *industry* perspective, the top-left segment of Figure 1 depicts the importance of large domestic markets for industrial production and international specialization in high value added activities, while industrial policies could guide the trajectories of business investment, expand demand through public procurement, and provide some degree of trade protection for domestic producers.

This conceptual framework allows us to better understand the transmission mechanisms of the pandemic crisis and the factors that contribute to greater resilience of national economies. In the next section, the empirical documentation on the extent and impact of the crisis on the world economy is assessed, and the mechanisms discussed above provide a conceptual map to understand the nature of the crisis and means to rebuild economies.

Figure 1: Key drivers shaping the economic impact of the pandemic

Factors contributing to greater resilience of economies from a macroeconomic and industry perspective

Industry perspective				
GOVT. POLICIES	Increase in public procurement for specific industries, health equipment, etc.	Industrial policy supporting new private activities, State industries	Trade restrictions favouring domestic production	Expansionary fiscal and monetary policy, new industrial and technology policies
INTERN. OPENNESS	Export demand based on faster growing global value chains in specific industries	Opportunities to move up the value chain in specific industries	Export success for industry, strong position in global value chains	Exchange rate policies, balance of payments policies
SUPPLY	Large, resilient domestic markets for industry production	Economic structure with high-tech, high skill, oligopolistic power, manuf.-service integration	Resilience of export-led model and positive balance of payments	Education, R&D, physical, digital and social infrastructures
DEMAND	Aggregate public expenditures compensating the fall of private demand	Intermediate demand from vertical integration of domestic industries	Export demand based on faster growing economies	Income support for households, public services and health, contrast to inequalities
	DEMAND	SUPPLY	INTERN. OPENNESS	GOVT. POLICIES

3. The economic impact of the COVID-19 crisis

How have the mechanisms outlined above played out in the world economy? We provide a picture of the relative importance of each of these processes based on available data. The data refer to world regions listed in the Appendix, and highlight different patterns within country groups, namely selected industrial, emerging and developing countries which are of major relevance. Data for world regions are based on simple averages of data for each group.

3.1. Changes in GDP

According to IMF estimates of January 2021 (IMF, 2021), the world economy contracted by 3.5 per cent in 2020 and is expected to grow by 5.5 per cent in 2021 and 4.2 per cent in 2022; these estimates rely on the expectation of successes in vaccine-supported recovery and on the new expansionary policies introduced by major countries, including the United States.

Figure 2 maps trends in GDP for major world countries. The first diagram presents annual changes in real GDP based on IMF 2013–2020 data, with projections until 2022. Different trajectories emerge, with China achieving top growth rates over the period, with a brief slowdown in 2020 and a rebound in 2021 and 2022. After experiencing similarly high growth rates, India suffered its biggest plunge in 2020, with expectations of recovery. Malaysia also reported rapid growth followed by a steep decline in 2020, while Indonesia's and Turkey's trajectory is moderate. Conversely, emerging countries, such as Brazil and South Africa, experienced low growth rates before the pandemic and have been hit hardest by the crisis. The growth rate in industrialized countries, namely the Republic of Korea, the United States, Japan and the euro zone witnessed modest GDP increases before the outbreak of the pandemic, significant losses in 2020, with a rebound expected for 2021 and 2022.

The second diagram of Figure 2 shows the long-term development of GDP in major countries based on OECD data in constant prices for the 2008–2020 period, using 2008 as the base year of the GDP index. The continuing rise of China is remarkable, moving from 100 to 230 along the GDP index; the 2008 financial crisis had no major impact on China's GDP, and the country's growth fell by only 2.3 per cent in 2020, while the majority of countries experienced a decline. China's growth rebounded rapidly in the first quarter of 2021, with its GDP growth estimated at 18,3 per cent.

India experienced a similarly rapid increase in GDP until 2017, doubling its 2008 level in 2019, after which growth slowed down to 4,2 per cent, and falling by 10.3 per cent in 2020. Indonesia and Turkey follow, stabilizing in 2020 and achieving a GDP index of around 170.

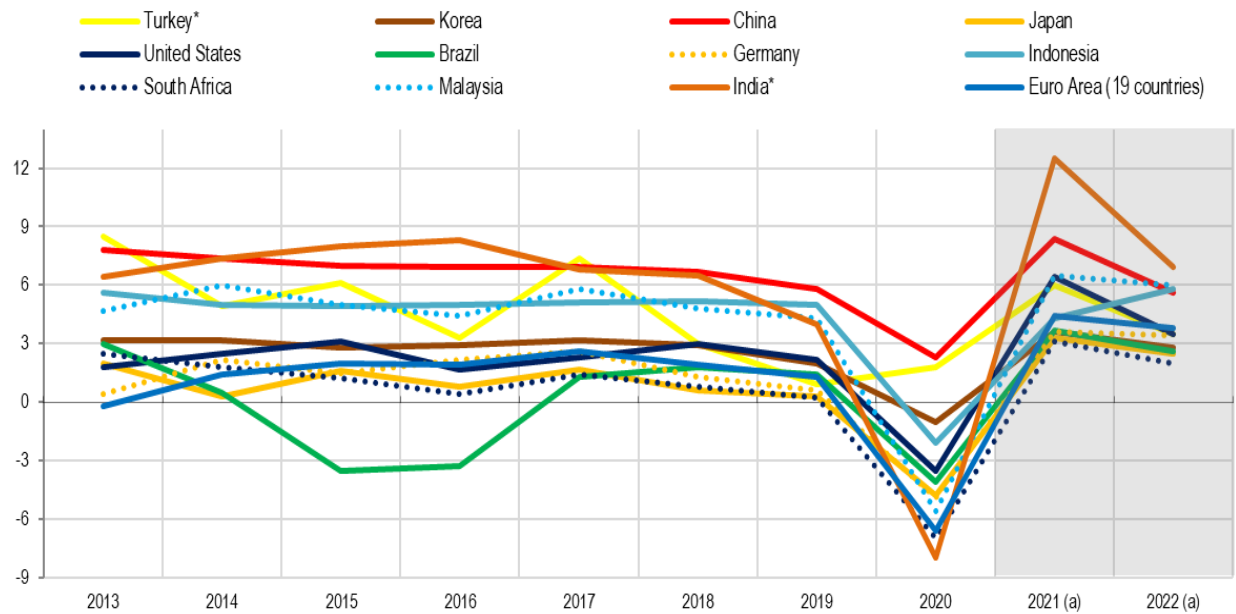
The Republic of Korea's GDP index increased to 140, and was not affected by the financial crisis of 2008, and only experienced a marginal decline due to the COVID-19 crisis (-1.1 per cent in 2020). Brazil deviated from its growth trajectory in 2014, experiencing a steady decline and the pandemic crisis pushing its GDP levels back to those it registered a decade ago. The increase of South Africa's GDP was slower and the country's GDP index fell to 110 in 2020.

The financial crisis of 2008 had a significant impact on the United States, and in 2020, the country's GDP decreased by 3.7 per cent, with its GDP index falling below 120. Japan and European countries were also hit particularly hard by the 2008 crisis, and their economies experienced long-term stagnation. The severity of the pandemic's impact was evident in these countries, their GDP levels dropping close to the levels in 2008.

The third diagram of Figure 2 presents quarterly data for selected countries, illustrating the depth of GDP decline in the first half of 2020 and the rapid recovery of some countries. Taking a longer term perspective, we find a strong divergence in countries' growth trajectories post-pandemic, with major Asian economies sustaining growth and—particularly East Asia—able to limit the consequences of the 2020 pandemic. Among emerging countries, Brazil's and South Africa's dynamism will have diminished at the end of what can be described as a 'lost decade'. Conversely, advanced countries, including the United States, Europe and Japan, will be characterized by slow growth or stagnation, while the Republic of Korea will maintain its strong performance.

Figure 2: GDP in major countries

Annual percentage changes of real GDP, 2013–2022

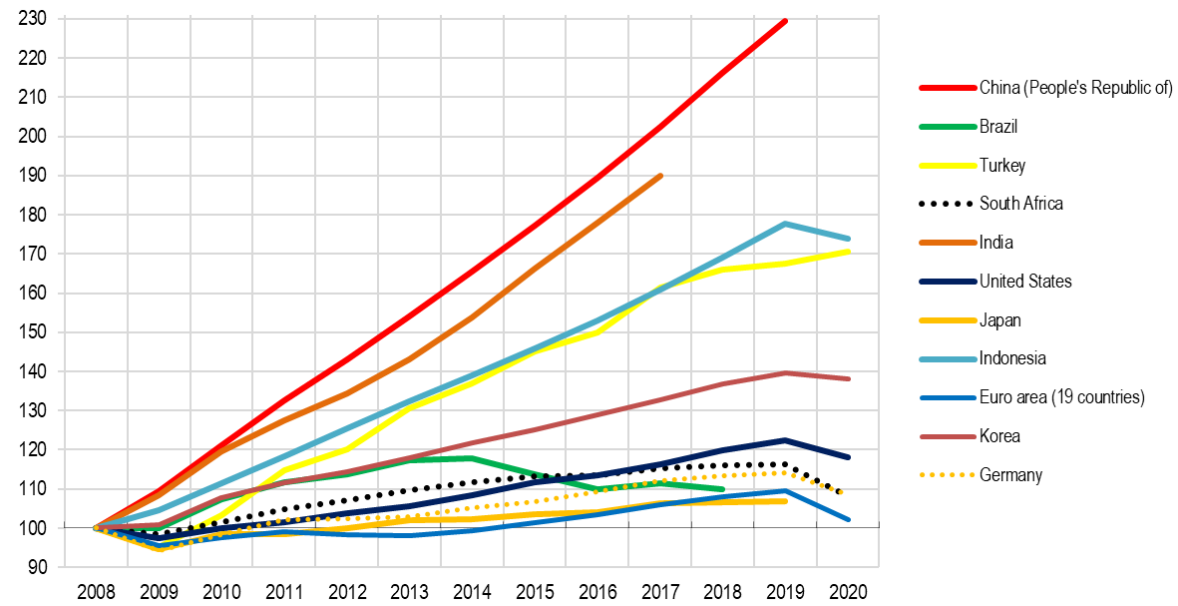


Source: Author's elaboration based on IMF (2021b);

Notes: (a) FMI Projections, see the "Country Notes" section of the Statistical Appendix in IMF (2021b) (pp. 103-104).

GDP trends, 2008–2020

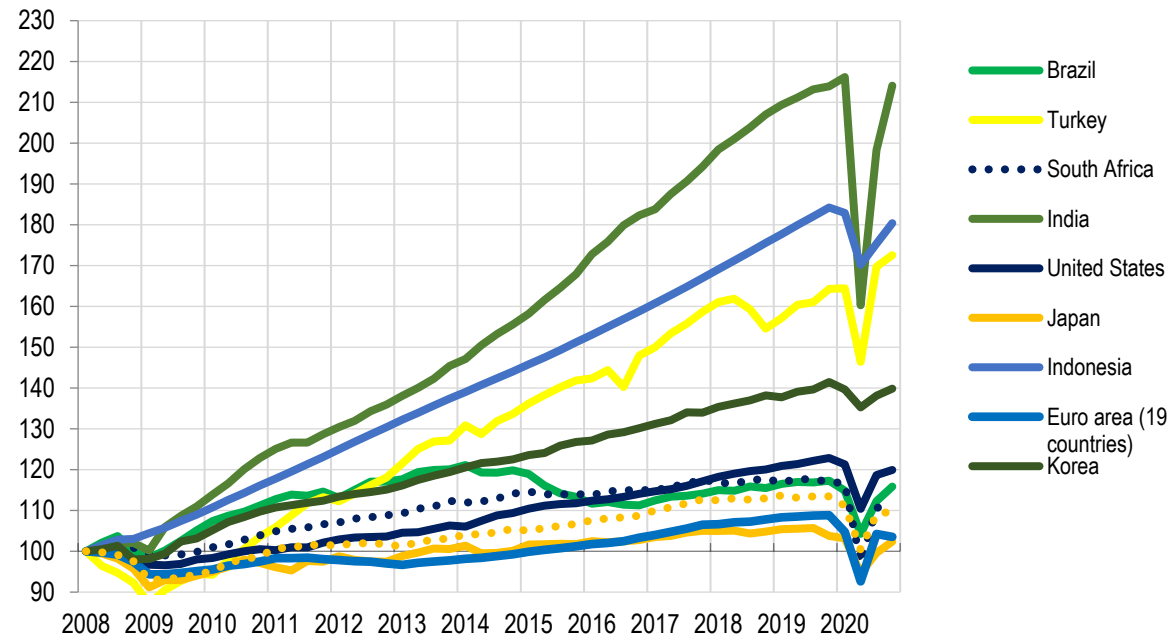
Annual data, constant prices, constant pppts, index 2008=100



Source: Author's elaboration based on OECD (2021) National Accounts. Available at: <https://stats.oecd.org/> [Accessed May 2021].

Quarterly data 2008–2020

T1 2008 to T4 2020, constant prices, index T1 2008=100



Source: Author's elaboration based on OECD (2021) National Accounts. Available at: <https://stats.oecd.org/> [Accessed May 2021].

Data for all countries are shown using a classification that combines UNIDO’s classification by level of industrial development and the UN classification by geographical regions, as listed in Table 1 below, with the acronyms that are used in the diagrams. Data for each region generally reflect the average country data weighted by GDP or manufacturing value added (depending on the variable being considered). Indications are provided whenever different procedures are followed. Additional evidence is provided for major countries that may highlight key patterns of change.

Table 1: Country groups used in the analysis

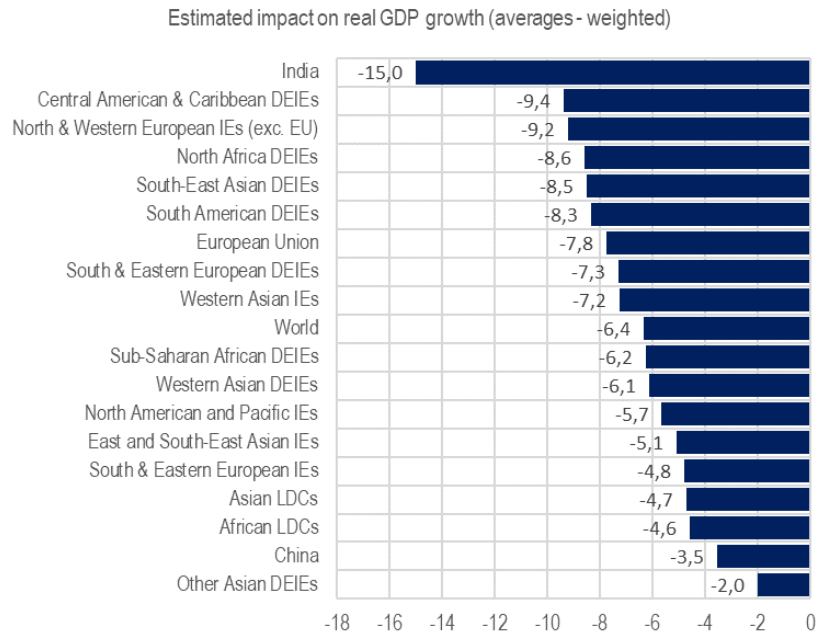
<i>Acronym</i>	<i>Regions</i>
IE	Industrialized Economies
IE-EU	European Union (27 countries)
IE-NWEUR	North-Western European IEs (excluding EU)
IE-EEUR	Eastern European IEs (excluding EU)
IE-NAMEP	North American and Pacific IEs
IE-EASIA	East and South-East Asian IEs
IE-WASIA	Western Asian IEs
DEIE	Developing and Emerging Industrial Economies
DE-SEEUR	South & Eastern European DEIEs
DE-WASIA	Western Asian DEIEs
DE-SEASIA	South-East Asian DEIEs
CHINA	China
INDIA	India
DE-OTASIA	Other Asian DEIEs
DE-CAME	Central American and Caribbean DEIEs
DE-SAME	South American DEIEs
DE-NAFR	North African DEIEs
DE-SSAFR	Sub-Saharan African DEIEs
LDC	Least Developed Countries
LDC-ASIA	Asian LDCs
LDC-AFR	African LDCs
WORLD	World

Patterns for all world regions as well as for major countries are presented in Figure 3, which assesses the economic loss resulting from the pandemic, based on IMF data on the differences between GDP in 2020 and the forecasts developed in 2019 for GDP in 2020. When we look at world regions, the impact of the 2020 crisis on China and Other Asian DEIEs was low, the growth rate decreasing by 3.5 per cent and 2 per cent, respectively. A decline of around 5 per cent or less was reported for Asian and African least developed countries (LDCs), as well as for the group including Russia, East and South-East Asian IEs and regions (Japan, the Republic of Korea, Singapore, Hong Kong Special Administrative Region of China, Taiwan Province of China, and Malaysia). The GDP of the group including the United States fell by 5.7 per cent, the EU registered a decline of 7.8 per cent. What is striking is the concentration of losses (compared with the initial forecasts) in emerging and developing countries, which were expected to grow faster, with India reporting the highest GDP loss (-15 per cent), followed by DEIEs of Central America, North Africa, South-East Asia and South America (-8 per cent).

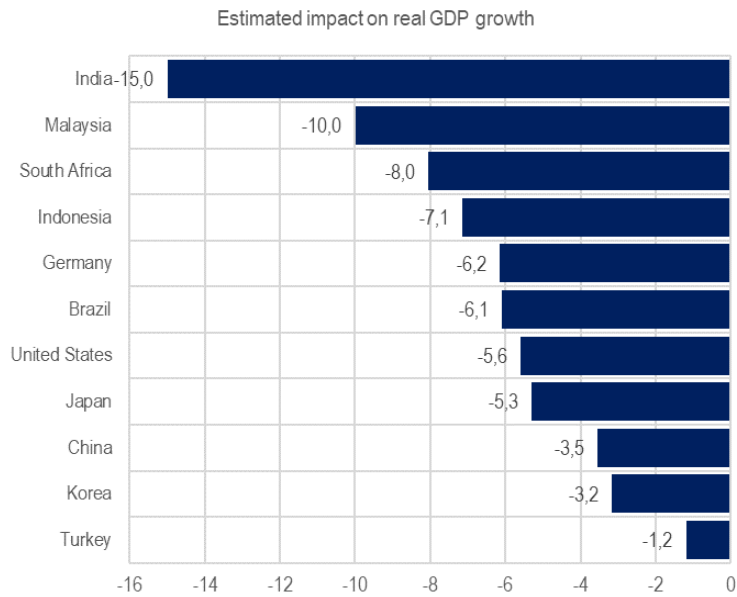
The second diagram of Figure 3 presents the losses experienced by Malaysia (-10 per cent), South Africa (-8 per cent), Indonesia (-7.1 per cent) and Brazil (-6.1 per cent).

Figure 3: Change between GDP in 2020 and forecasts made in 2019 on GDP in 2020, in %

Change in in world regions



Change in major countries

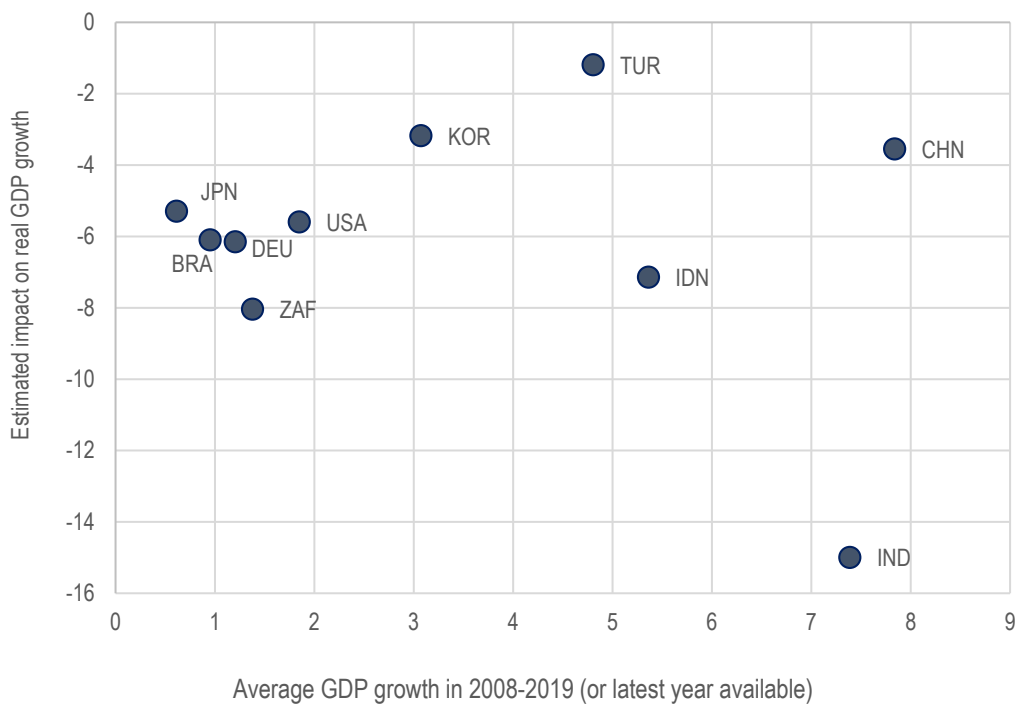


Source: Author's elaboration based on IMF (2021b)

The pandemic crisis has increased the divergence of GDP performance in the world economy and seems to have slowed down significantly in the countries that were expected to grow relatively faster. Consequently, while fairly few countries, such as China and the Republic of Korea, were able to strengthen their position, little convergence in world GDP can be expected, and many emerging and developing countries may face difficulties on their path to recovery and sustained growth and to catch up with industrial economies.

Figure 4 plots the above data and compares them with the average GDP increases in the 2008–2019 period. Advanced economies, South Africa and Brazil witnessed slow long-term growth and a significant decline in GDP is expected in 2020; the Republic of Korea, Turkey and China show a positive trajectory, while Indonesia and India are an example of emerging and developing countries that have experienced serious losses following high growth rates in the past. A greater dispersion of countries’ trajectories could reflect a significant effect of the pandemic.

Figure 4: Reduction in GDP growth in 2020 compared to forecasts in major countries and GDP growth in 2008–2019



Source: Author’s elaboration based on IMF (2021b) and OECD (2021) National Accounts, Available at: <https://stats.oecd.org/> [Accessed May 2021].

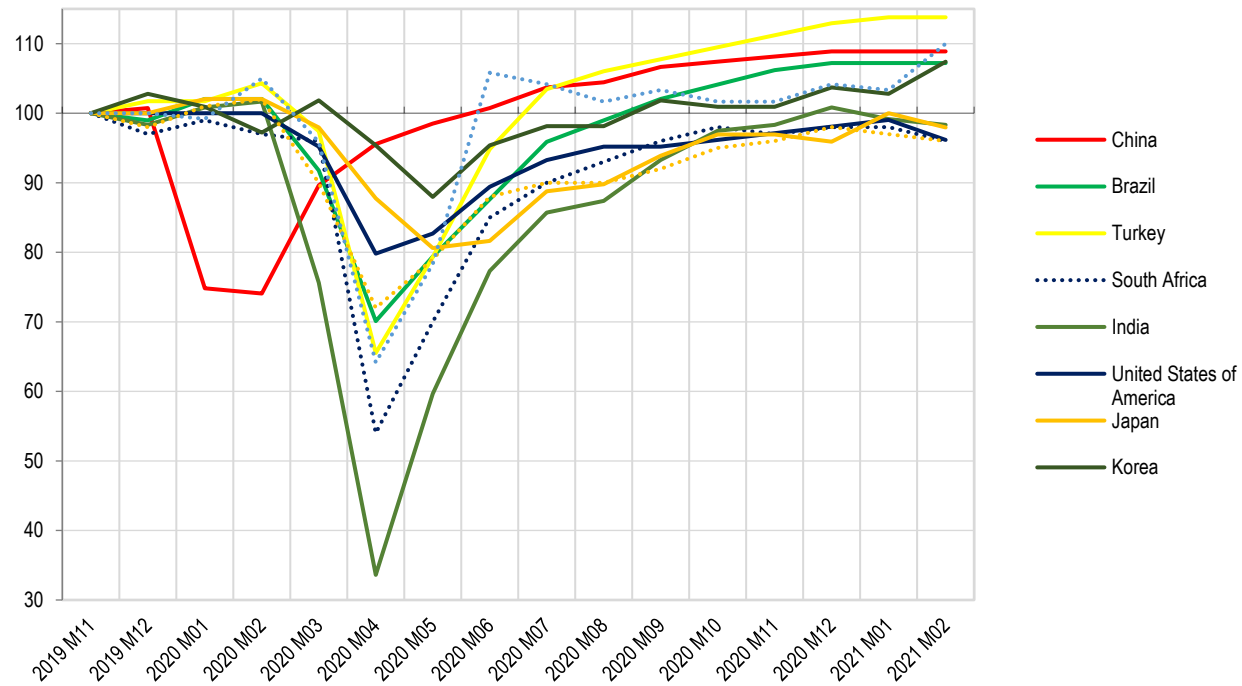
3.2. Changes in industrial production

Figure 5 illustrates major countries' industrial production, using UNIDO's Index of Industrial Production for the period November 2019 to January 2021. It is remarkable that the differences between the major countries is much lower than for GDP as a whole. China experienced an early drop in output in the first months of 2020, returning to initial levels by May, its production has slowly increased since. Production in all other countries plunged around April 2020, with reductions ranging from 10 per cent in the Republic of Korea to 65 per cent in India. Nevertheless, by January 2021, all countries—including advanced ones—had returned to their initial levels, with Turkey, Brazil and Malaysia showing stronger increases. We find evidence here of greater resilience of industry compared to the economy as a whole.

Figure 5: Industrial production, 2019–2020

UNIDO Index of Industrial Production, November 2019 to January 2021

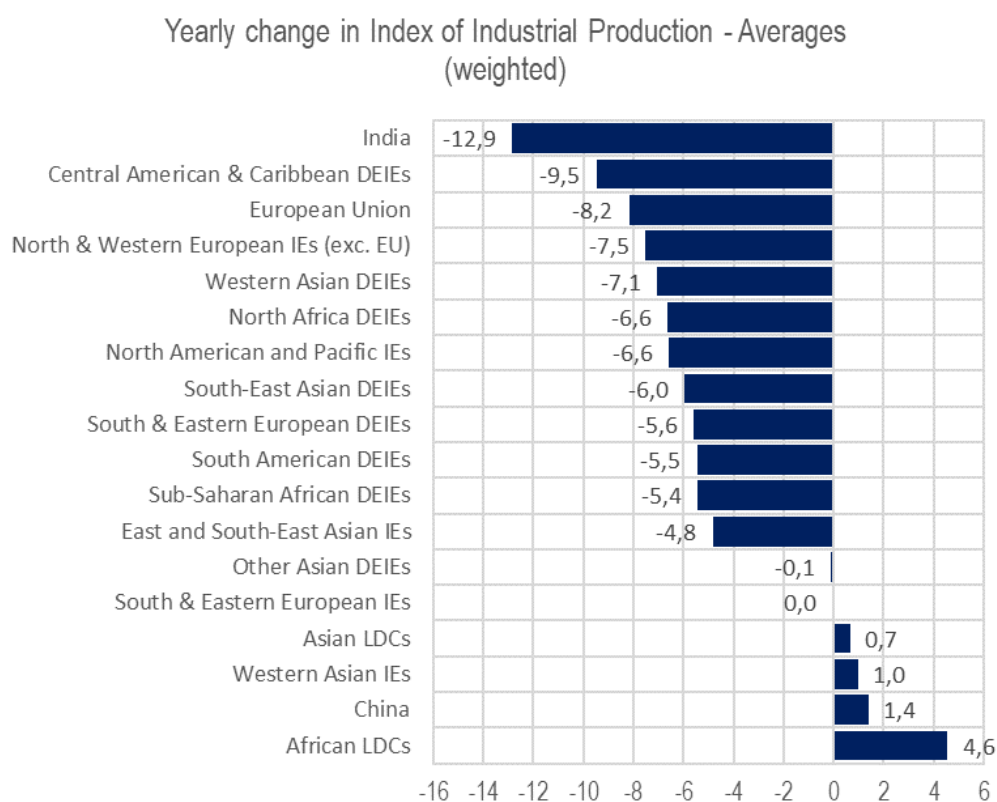
Changes in major countries



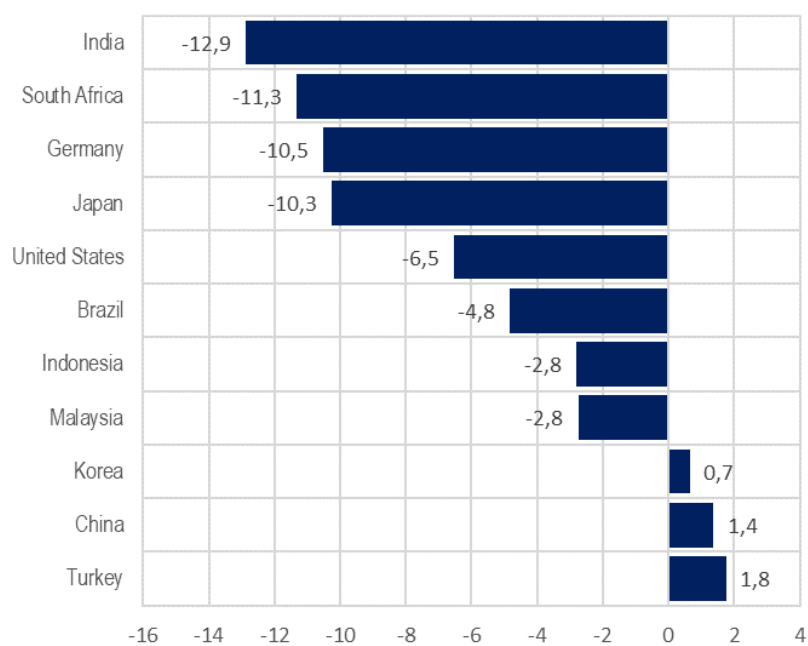
Source: Author's elaboration based on UNIDO (2021). Monthly Index of Industrial Production (IIP) at the 2-digit level of ISIC Revision 4. Database. Available at: <https://stat.unido.org/database/Monthly%20IIP> [Accessed April 2021].

Figure 6: Change in the Index of Industrial Production 2019–2020, in %

World regions



Major countries



Source: Author's elaboration based on UNIDO (2021b)

Figure 6 shows the changes in 2020 in the Index of Industrial Production for world regions (top diagram) and major countries (bottom diagram). Important differences are evident compared to the development of GDP presented in Figure 3. When we consider actual losses (as opposed to those estimated based on 2020 growth forecasts) and focus on industrial production, countries' overall losses are lower.

Alongside China, Asian and African LDCs and Western Asia IEs recorded a slight positive growth. East Asia IEs experienced a limited loss of -4.8 per cent. The growth in DEIEs was between 5 per cent and 7 per cent, while that of Central America was lower. Europe (both EU and non-EU Western countries) reported higher losses of around 8 per cent. Among the major countries in the bottom diagram of Figure 6, industrial production in India fell considerably (-12.9 per cent), followed by South Africa (-11.3 per cent), Germany (-10.5 per cent) and Japan (-10.3 per cent).

East Asia as a whole clearly emerges in a stronger position in industrial production on the whole, moving closer to Europe and leaving behind other emerging economies. This geographical pattern could become an important fault line of divergence in industrial development post-COVID-19.

What are the likely consequences of this development for employment? According to the ILO (2020), the expected decline in hours worked in 2020 in the world economy is 8.6 per cent, corresponding to 245 million fewer full-time jobs, and leading to higher levels of unemployment and inactivity. The consequences for work have so far been contained by government measures, with income support and a freeze on layoffs; the IMF estimates that these measures have protected at least 54 million jobs, but they are temporary in nature and might only postpone job and wage losses.

3.3. Changes in exports

The evolution of world trade is particularly interesting. According to the WTO (2020), world merchandise trade volume is expected to fall by 9.2 per cent in 2020, and to increase by 7.2 per cent in 2021, remaining well below its pre-crisis trajectory. This decrease is about three times greater than the decline in world GDP. As can be expected, the fall in trade in Asia is less than half of that of global trade.² Figure 7 shows the pattern of world exports based on index values (January 2010=100); following general stability in 2019, a drop in world exports of 25 per cent

² See WTO press report at https://www.wto.org/english/news_e/pres20_e/pr862_e.htmhttps://www.wto.org/english/news_e/pres20_e/pr862_e.htm. After the 2008 crisis, the decline in global trade was six times greater than that of world GDP.

was reported in the first half of 2020, followed by a return close to pre-crisis levels by the end of the year. China is driving the recovery of world trade, with a 25 per cent increase in the second half of 2020, and a positive performance was also recorded by emerging economies. Latin America returned to its previous levels, while advanced countries suffered the heaviest losses (-30 per cent in mid-2020) and had the slowest recovery.

Aggregate world merchandise exports decreased in 2019 and were expected to fall by around 5 per cent in 2020. Conversely, service exports are anticipated to decline by 15 per cent in 2020 due to the greater vulnerability of activities such as international travel, tourism and business services.

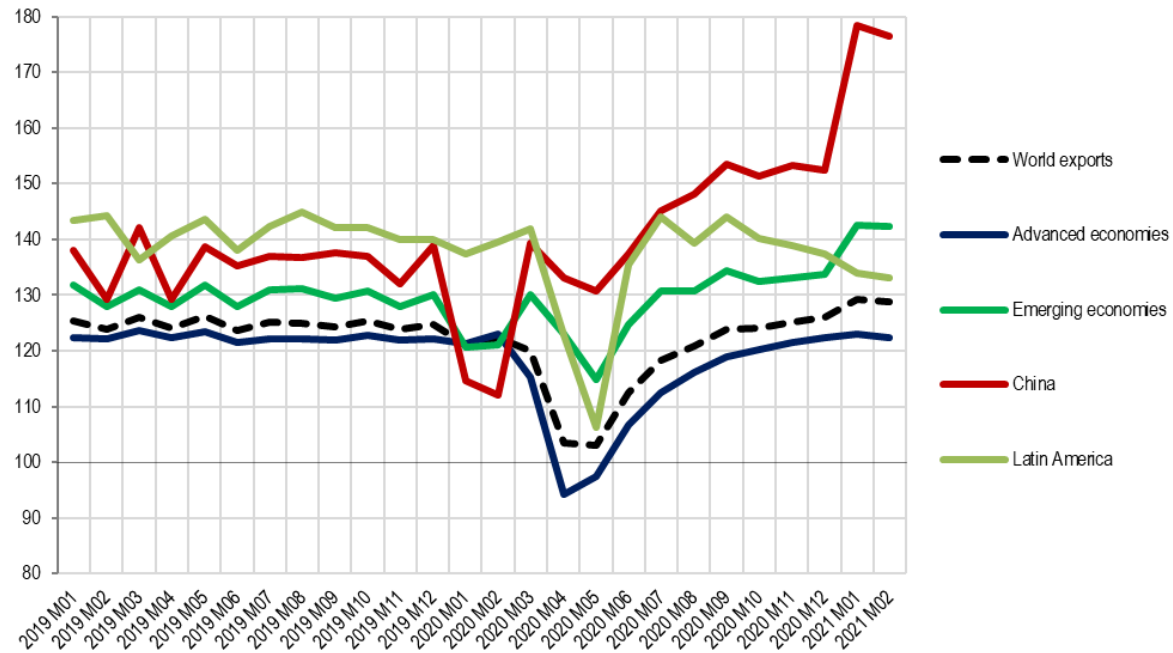
The second diagram of Figure 8 presents the quarterly pattern of merchandise exports, (measured as year-over-year percentage changes), where we again find a very similar performance among all countries. The decline in exports ranged between 5 per cent and 30 per cent in major countries, yet by the fourth quarter of 2020, changes in exports compared to the previous year ranged between -5 per cent and +5 per cent in all countries. The performances of both China and Malaysia were better than average (exports from China increased by 12 per cent compared to 12 months earlier). Conversely, Germany's export levels returned to the 2019 levels; U.S. exports fell by 5 per cent. The resilience of merchandise exports and the limited divergence reported among countries are an important factor, and are most likely linked to the interconnectedness of manufacturing activities in world trade that are increasingly linked in global value chains.

The pattern of service exports, shown in the third diagram of Figure 8, is very different. A slowdown in exports has been evident since 2018, with China being the only country reporting an increase in exports over the previous year and in the last quarter of 2020. Advanced countries, namely the United States, Japan, the Republic of Korea and Germany, alongside India and Brazil, saw reductions in service exports of between 20 per cent and 30 per cent, with a recovery at the end of 2020. Conversely, emerging countries such as Turkey, Malaysia, Indonesia and South Africa, recorded much steeper losses of around 60 per cent and 70 per cent in mid-2020 compared to the previous year, with a much slower recovery. These trends highlight the vulnerability of services, such as international travel and tourism, in the pandemic crisis, and the weakness of emerging countries' economic structures, where traditional services are dominant, with a limited relevance of business services and a lower integration with manufacturing. These factors are likely to influence the divergence in world recovery and the weakening of the position of some emerging countries.

Figure 7: Exports

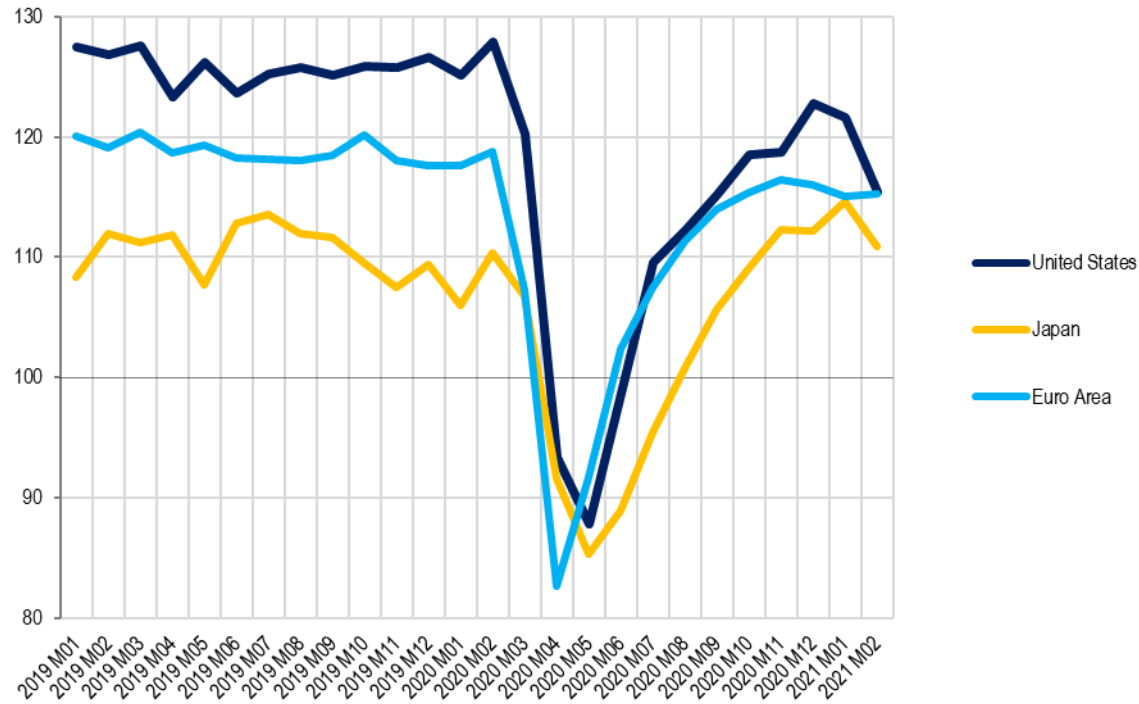
Export volume in major regions, 2019–2020

January 2019 to December 2020 (seasonally adjusted index, index January 2010=100)



Source: Author's elaboration based on CPB (2021) World Trade Monitor February 2021. Available at: <https://www.cpb.nl/en/world-trade-monitor-february-2021> [Accessed May 2021].

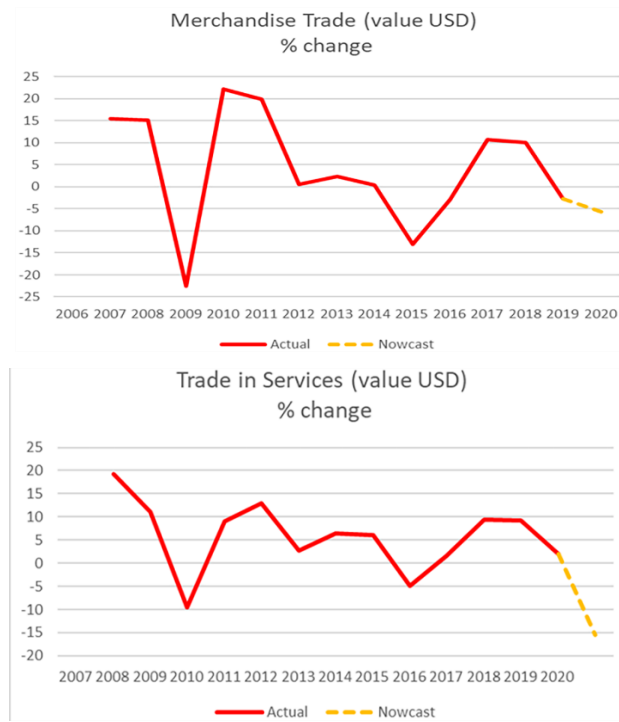
Breakdown of advanced economies



Source: Author's elaboration based on CPB (2021) World Trade Monitor February 2021. Available at: <https://www.cpb.nl/en/world-trade-monitor-february-2021> [Accessed May 2021]. As Figure 8 illustrates, separating the trends in manufacturing from those in services exposes important trade patterns.

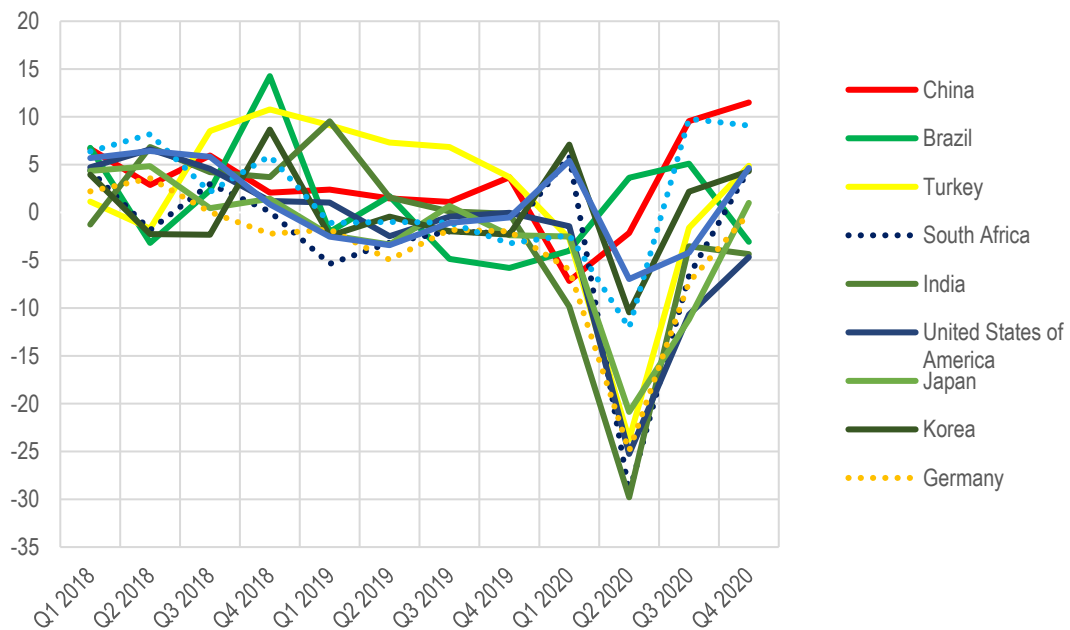
Figure 8: Merchandise and service exports

Trade in merchandise and services nowcasts for 2020



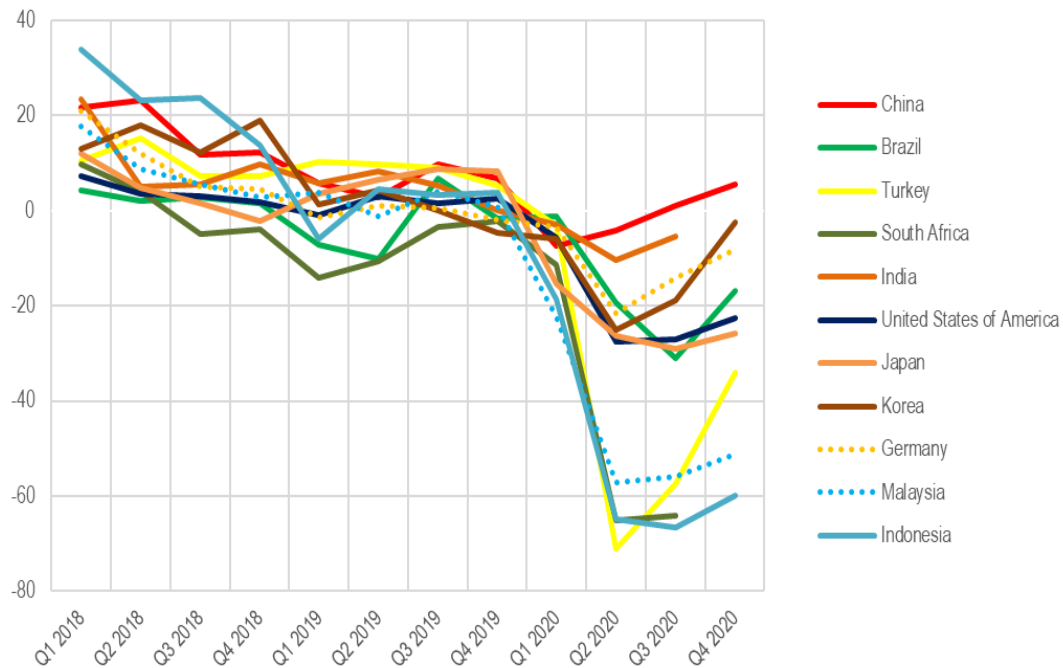
Source: Author's elaboration based on UNCTAD (2020), UNCTADSTAT Data Center. Available at: <https://unctadstat.unctad.org/EN/> [Accessed May 2020].

Merchandise exports, volume growth rates, quarterly data, 2018-2020, year-over-year



Source: Author's elaboration based on UNCTAD (2020), UNCTADSTAT Data Center. Available at: <https://unctadstat.unctad.org/EN/> [Accessed May 2020].

Service exports, volume growth rates, quarterly data, 2018–2020, year-over-year



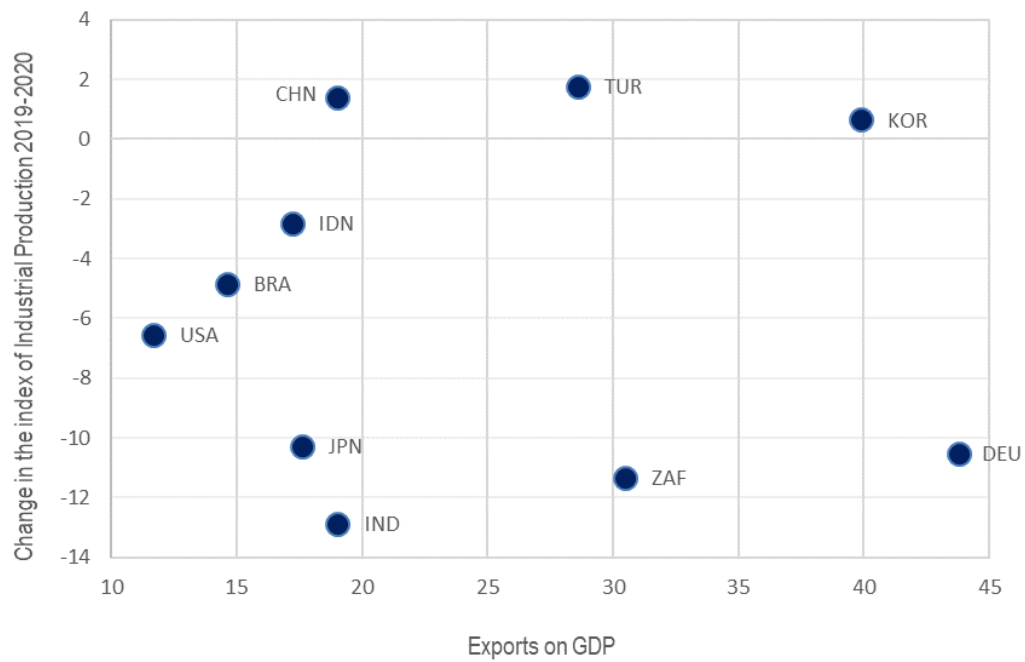
Source: Author’s elaboration based on UNCTAD (2020), UNCTADSTAT Data Center. Available at: <https://unctadstat.unctad.org/EN/> [Accessed May 2020].

Figure 9 explores the link between international openness and economic change. The first diagram of Figure 9 shows the relevance of exports as a share of GDP (for 2020 or closest available year) and the percentage change in industrial production between 2019 and 2020 in major countries. Does greater export orientation lead to a lower reduction in industrial output as a result of the pandemic? The evidence is mixed. Both the best and the worst performing countries in terms of change in industrial production have widely differing export to GDP ratios. Industrial output in China, Turkey and the Republic of Korea rose close to 2 per cent in 2020, while their export to GDP level ranged from 20 per cent to 40 per cent. Similarly, in Japan, India, South Africa and Germany, industrial production fell by more than 10 per cent in 2020, while their export to GDP ratios ranged from 18 per cent to 45 per cent. Large countries—both advanced such as the United States and emerging countries, such as Brazil and Indonesia—registered moderate decreases in industrial output while demonstrating low export orientation. For both advanced and emerging countries, it appears that high export levels are no guarantee against a considerable drop in industrial output as a result of the COVID-19 crisis.

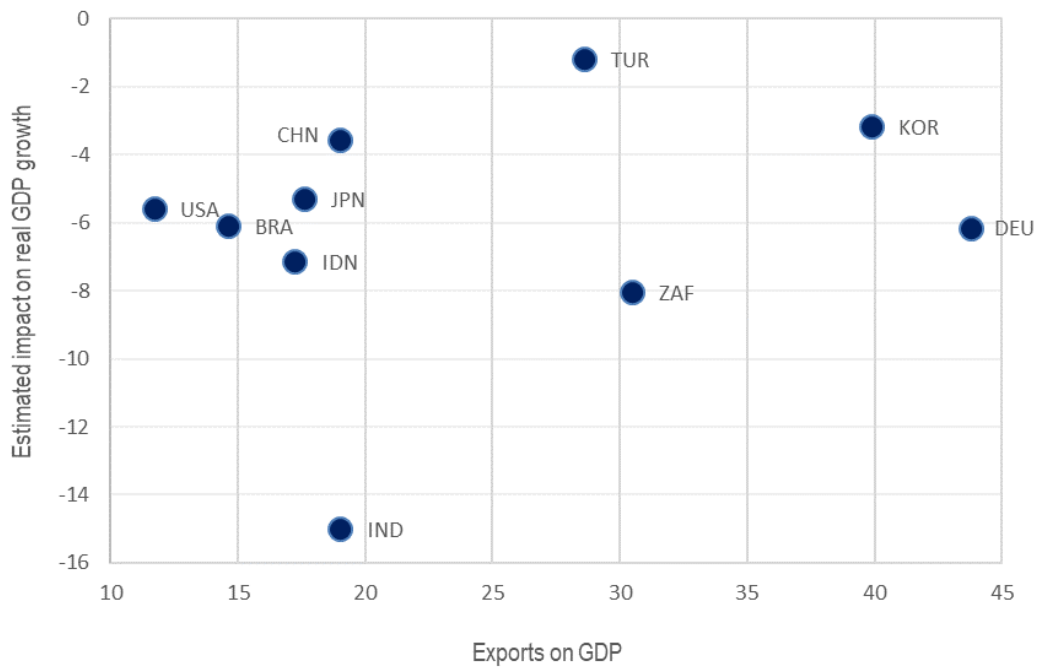
In the second diagram of Figure 9, we replace industrial production with the pandemic's estimated impact on GDP; the divergence in outcomes is slightly reduced, but countries with very different degrees of openness report similar estimates of GDP fall. The differentiated impact of the pandemic on countries and their distinct responses to the crisis appear to have played a more important role than export orientation *per se* in terms of outcomes.

Figure 9: International openness and economic change, major countries

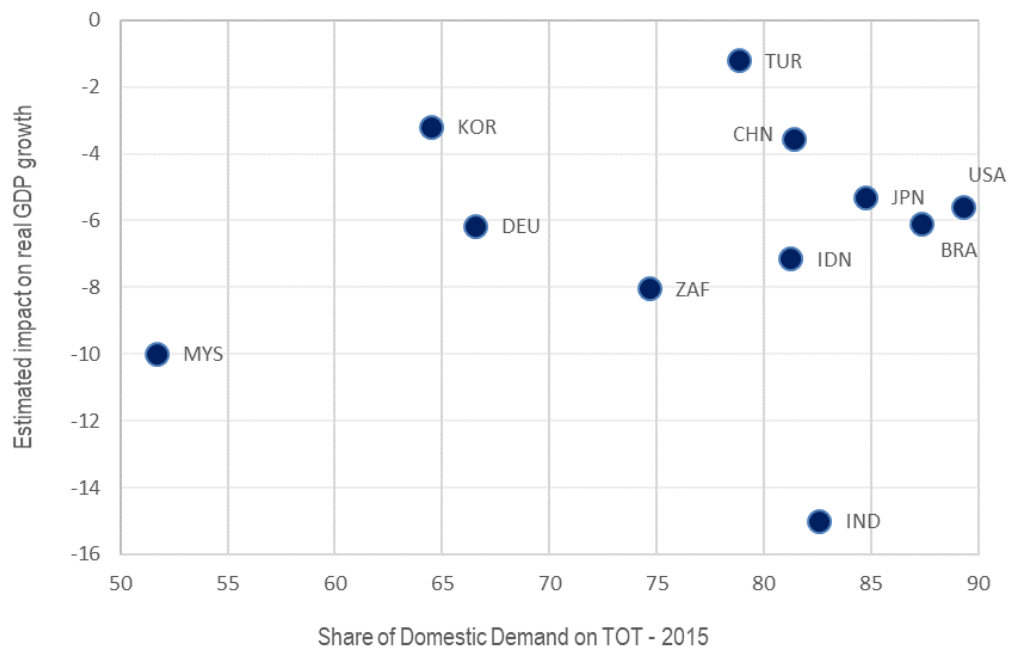
Exports as a share of GDP and change in industrial production, 2019–2020, in %



Exports as a share of GDP and change between GDP in 2020 and forecasts made in 2019 on GDP in 2020, in %



Domestic demand as a share of GDP and change between GDP in 2020 and forecasts made in 2019 on GDP in 2020, in %



Source: Author's elaboration based on UNIDO (2021b) Quarterly index of industrial production database, IMF (2021b) WEO January 2021, OECD (2018), OECD Inter-Country Input-Output Database, OECD (2021) National Accounts. Available at: <https://stats.oecd.org/> [Accessed May 2021]

These patterns suggest that more attention should be paid to domestic demand and to its possible contribution to greater resilience in the face of the pandemic. The last diagram of Figure 9 illustrates the link between the share of domestic demand in GDP and estimated GDP change in 2020 (the difference between GDP growth and previous forecasts). Larger countries—with the exception of India—tend to be grouped in the top right part of the diagram, with a high relevance of domestic demand and an impact of the pandemic ranging between -1 per cent and -7 per cent. More open, medium sized economies experienced greater losses, with the exception of the Republic of Korea, with a limited decrease in GDP.

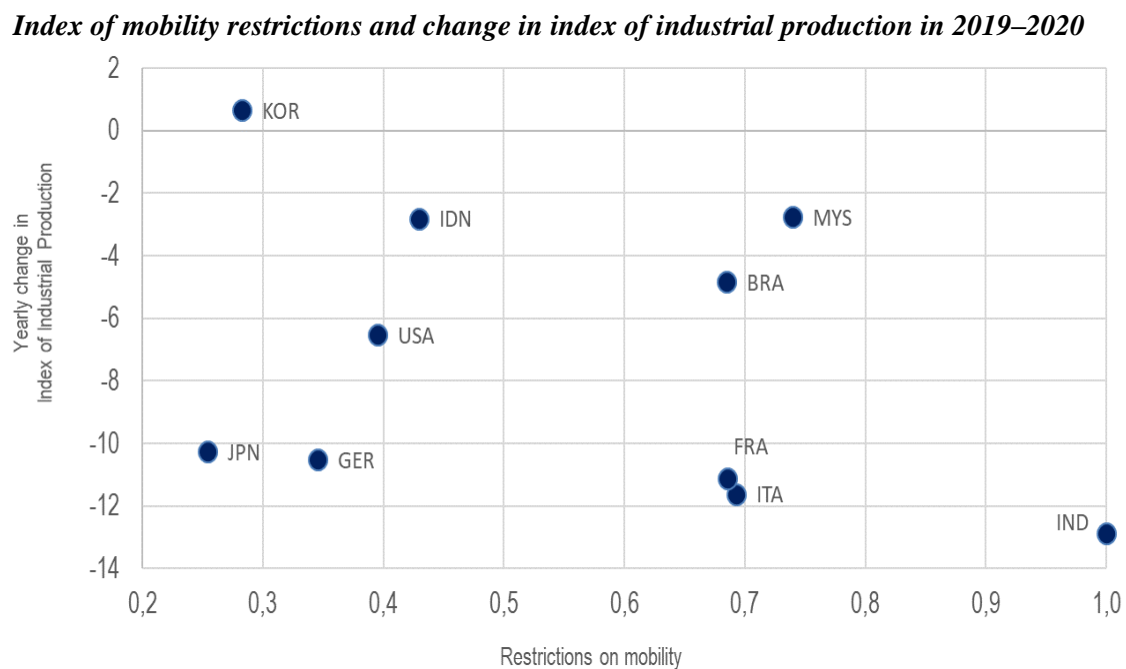
Can we relate the development of industrial production to the mobility restrictions introduced to contain the pandemic? Figure 10 maps the evidence. The first diagram of Figure 10 uses data released by Google on the mobility of users moving for purposes of retail shopping and recreation (including mobility trends for places such as restaurants, cafés, shopping centres, theme parks, museums, libraries and movie theatres). We calculated an index of restrictions using the 2019 mobility level as the standard with zero restrictions; monthly averages of the decrease in mobility were summed up to calculate the index, which was then normalized, with a value of 1 for the country with the strongest reduction in mobility flows, namely India. The most severe lockdowns in Europe in April 2020 led to a level of mobility equal to between 10 per cent and 20 per cent of the 2019 level; Google mobility data are not available for China. These measures were effective in containing the pandemic and slowing down contagions and deaths. At the same time, these measures came at an economic price; mobility restrictions immediately reduced industrial production and exports, which fell by 30 per cent to 40 per cent in European countries during the lockdowns of April 2020. As soon as the restrictions were eased, production picked up again, as did infection rates. New restrictions were introduced in many countries in autumn 2020, with a lower overall impact on individual mobility and economic performance.

The first diagram of Figure 10 presents the values of the restriction index and the decrease in industrial production in 2020 for major countries. A relationship between the intensity of restrictions and the severity of the reduction in industrial production is evident, with India and the Republic of Korea at opposite extremes of the distribution. The output of advanced countries, namely of Italy, France, Germany, Japan and the United States, dropped sharply.

The second diagram of Figure 10 depicts the relationship between mobility restrictions and the estimated impact on GDP growth. A more linear negative relationship emerges, with India at one extreme and the Republic of Korea and Japan at the other end.

The third diagram of Figure 10 shows a different indicator of restrictions, the Oxford Stringency Index, based on a quantitative scale of the measures introduced by governments, and relates it to the estimated impact on GDP. A higher number of countries are included in this indicator, with the lowest effects on GDP found in countries with very diverse restriction policies (China, the Republic of Korea, Turkey and Japan). Japan and China are outliers; the strong lockdown in the early stages of the pandemic in China was successful in containing the spread of the virus and allowing fast economic recovery. At the other extreme, Japan introduced modest restrictions, resulting in a moderate loss of GDP. With the exception of these two countries, a negative relationship is evident between the stringency of restrictions and drop in GDP.

Figure 10: Mobility restrictions and economic impact in major countries



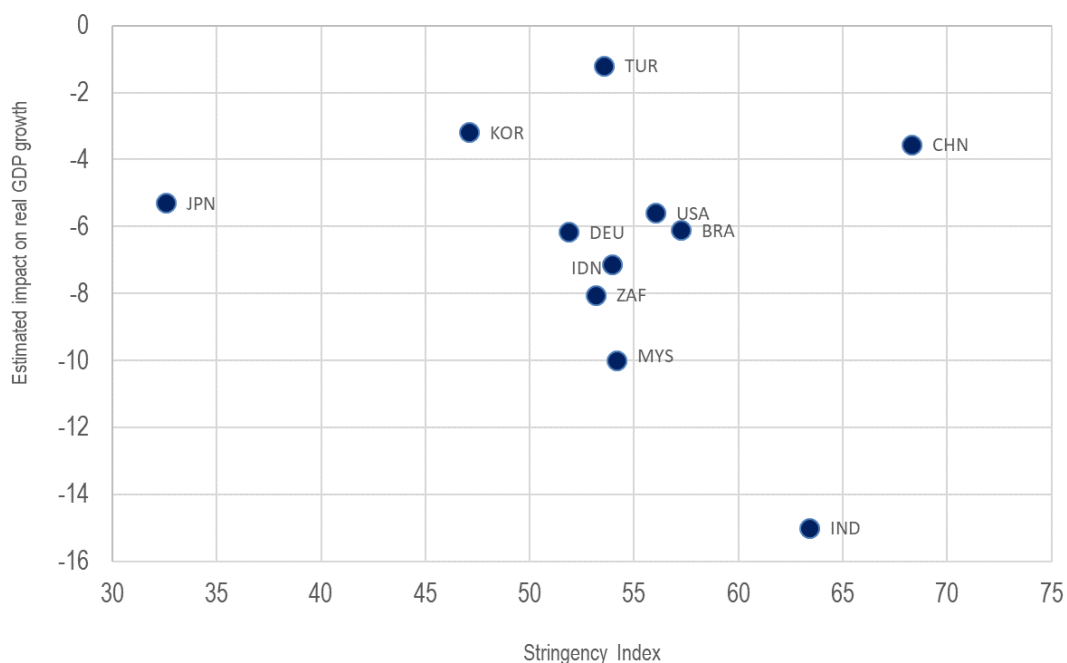
Source: Author's elaboration based on UNIDO (2021b) Quarterly index of industrial production database and Google Mobility Index, <https://www.google.com/covid19/mobility/>

Index of mobility restrictions and change between GDP in 2020 and the forecasts made in 2019 on GDP in 2020, in %



Source: Author's elaboration based on IMF (2021b) and Google Mobility Index, <https://www.google.com/covid19/mobility/>

Stringency index and change between GDP in 2020 and forecasts made in 2019 on GDP in 2020, in %



Source: Author's elaboration based on IMF (2021b) WEO January 2021, and Hale et al. (2021)

On the potential policy trade-offs between the protection of health through lockdowns and the loss of economic activity, the International Monetary Fund (IMF, 2020) has found that while significant economic costs arise in the short term, the economic benefits of a lockdown are greater than the costs in the medium term.

4. Government policies to address the pandemic

Economic policies are one of the key measures implemented by governments to respond to the pandemic. Governments used their power to address both the pandemic (by introducing health protection measures and bolstering their public health systems) and the resultant economic crisis. The measures adopted were very similar across all countries: an increase in public spending and public deficits to compensate businesses that had to halt production as a result of government restrictions and workers who could not work, as well as to cover the costs of the health emergency.³

Alongside this expansionary fiscal policy, expansionary monetary policies to increase money supply were frequently implemented to allow governments to engage in deficit spending, offer credit to banks and businesses, and to increase liquidity in financial markets, thus preventing the collapse of stock exchanges. In 2020, the size of the balance sheets of the world's major central banks increased by around USD 7.5 trillion, an amount that is equivalent to just under half of the European Union's GDP (IMF, 2020).

The extent of economic measures introduced in major countries reflects the severity of the pandemic crisis in the given country. Figure 11 shows the expected loss of GDP in 2020 compared to previous forecasts and the scope of stimulus measures—additional spending or foregone revenue in the form of tax breaks—implemented by governments to respond to the emergency (as a share of GDP) based on IMF estimates in the World Economic Outlook. Additional government spending has focused on emergency preparedness for healthcare and direct support for businesses and families, as well as 'automatic stabilizers', including an increase in unemployment benefits. The first diagram of Figure 11 presents world regions while the second one focuses on major countries.

It could be expected that the more severe the pandemic's negative effects, the higher additional government spending, resulting in a negative relationship. This, however, is not the case. The level of a country's development and its fiscal capacity are crucial factors in explaining countries'

³ On the international economy and on the policy measures adopted by governments during the pandemic, see the analyses in IMF (2020, 2021a, 201b), OECD (2018, 2021), Hepburn et al. (2020), UNCTAD (2020, 2021).

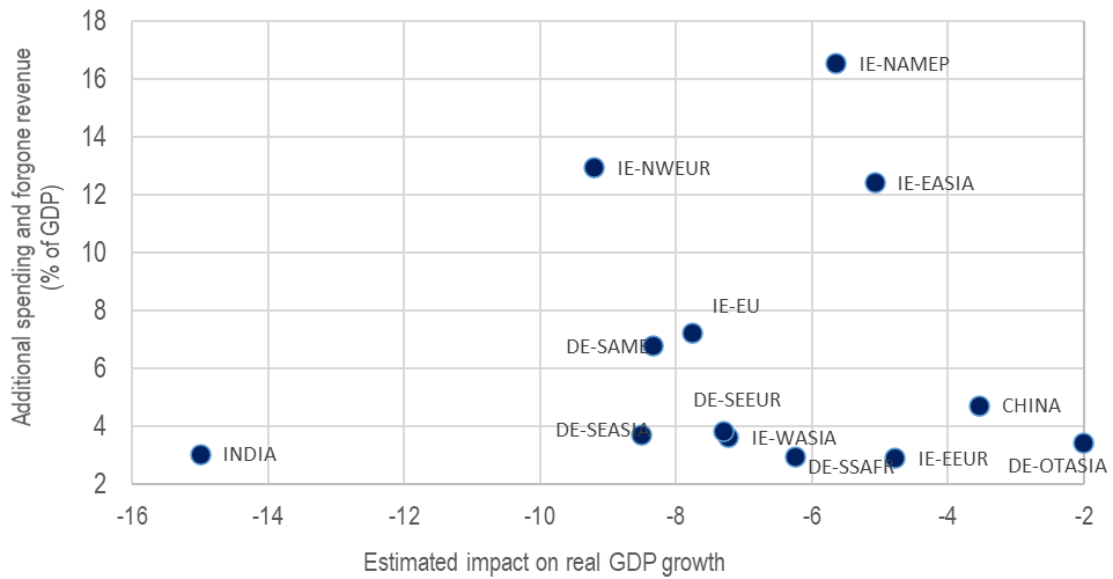
policy responses. The amount of additional spending was highest in the advanced countries of North America and the Pacific (the group including the United States), followed by advanced countries in East Asia (including Japan and the Republic of Korea); the pandemic has had limited negative effects on GDP losses in both groups. Conversely, emerging and developing economies and least developed countries had few possibilities to increase public spending, regardless of the gravity of setbacks suffered by their economies.

The second diagram of Figure 11 shows that additional government spending in the United States, Canada, Japan and Germany amounted to more than 10 per cent of GDP, although the countries' relative GDP contraction was between 5 per cent and 7 per cent. France, Italy, Brazil and South Africa experienced a more serious economic decline but their additional spending was lower, namely between 5 per cent and 8 per cent of GDP. On the other hand, China and the Republic of Korea, which were least affected by GDP losses, only mobilized additional spending in the amount of 3 per cent to 5 per cent of GDP.

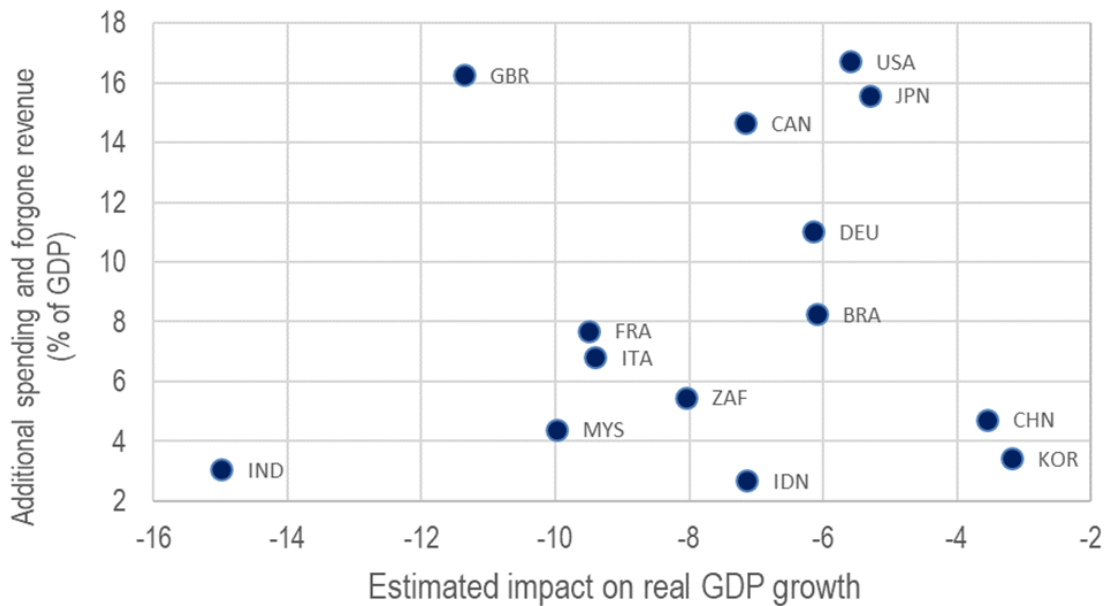
Greater economic power and policy space—which is characteristic of richer countries—resulted in increased spending, while the fiscal and monetary policies of countries with lower income levels were more conservative. This asymmetry in the use of policy as a tool to limit the effects of the pandemic crisis may emerge as an additional factor of divergence between world regions. It also underscores the need for new policy tools to support emerging and developing economies in managing macroeconomic shocks.

Figure 11: Changes in GDP and additional public expenditure as a share of GDP, 2020

Estimated impact on real GDP growth



Major countries



Source: Author's elaboration based on IMF (2021a) Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic, April 2021 and IMF (2021b)WEO January 2021

In the wake of the pandemic, countries' unequal capabilities in terms of economic development, public sector financing ability and policy power have emerged as key factors shaping their response to the pandemic crisis. This is likely to contribute to the divergence in the development trajectories identified above.

The strongest advanced economies implemented unprecedented interventions based among others on their monetary sovereignty and the absence of constraints to public spending to offset the recession and prepare for a rapid recovery. The weaker economies in Europe and some emerging countries with less room for fiscal manoeuvres and a legacy of austerity policies suffered greater setbacks and their spending capacity was more constrained. Finally, poorer developing and emerging countries have been hit hardest by the pandemic crisis and have few resources and no policy space to intervene and implement public spending policies to restore economic growth. These countries are expected to have a slower recovery, which will widen the gap to countries that have the possibility of using economic policy instruments to offset the impacts of the crisis.

This evidence from the UNIDO's database has been used for a quantitative exercise to identify the relationships that have emerged across countries (see Lavopa et al., 2021).

How can these empirical trends be summarized to better understand them with reference to the conceptual analysis developed in Section 2? Figure 12 builds on the framework provided in Figure 1 and identifies some of the processes that appear to have been most relevant in the different world regions considered in this study.

In terms of *demand patterns*, the empirical evidence suggests that the lack of private demand represented a major limitation for recovery, and we find that additional government spending is not closely related to the gravity of the economic crisis experienced by countries. In fact, what matters most is the policy space governments can use based on their economic power, their sovereignty in monetary and fiscal policies, or their sheer size.

In terms of *supply structures*, we find that manufacturing shows greater resilience than services in the face of the pandemic crisis, both in terms of production and exports. High-tech industries tend to have been less affected than medium- and low-tech industries (see next section). Moreover, as a result of the pandemic crisis, countries' performances have differed considerably in terms of GDP, but divergence in terms of industrial production and exports has been far lower. Higher resilience of the industrial sector and international integration of production systems have contributed to a reduction in the divergence across countries and regions. Conversely, the strong diversity in the service sectors of countries that have been hit hardest by the crisis, has led to higher divergence of aggregate economic trajectories.

In terms of *international openness*, stronger export orientation is no guarantee against a decline in output as a result of the pandemic. Current account surpluses are not associated with higher GDP growth. There are signs that the position in value chains and the technological level of output play a role alongside the presence of large domestic markets that may be a source of large and more stable demand.

In terms of *government policies*, we find a general orientation towards expansionary fiscal and monetary policies, but the size of stimulus provided is often inadequate to prevent a major recession. As noted above, economic power matters for the ability to introduce extraordinary measures of monetary expansion and deficit spending at a scale comparable with the negative effects of the pandemic crisis. Developing and emerging economies, as well as LDCs, are unable to introduce major expansionary policies due to their limited policy space in terms of ability to finance public debt, operate in international financial markets, obtain foreign currency, effectively confront external constraints, etc.

Figure 12: A macroeconomic perspective on the impact of the pandemic

	<i>Factors of resilience</i>	<i>Summary of evidence</i>
DEMAND	Aggregate public expenditure compensates the drop in private demand	<i>Additional government spending is related to policy space, not to the gravity of the crisis. Lack of private demand limits recovery</i>
SUPPLY	Economic structure with high-tech, high skill, oligopolistic power, manuf.-service integration	<i>Manufacturing shows greater resilience and less divergence. Services have been hit hardest. High-tech industries have suffered less</i>
INTERNATIONAL OPENNESS	Export success for industry. Strong position in global value chains	<i>Current account surpluses do not sustain growth. Position in value chains matters. Large domestic markets matter</i>
GOVT. POLICIES	Expansionary fiscal and monetary policies, new industrial and technology policies	<i>Expansionary fiscal and monetary orientation, but size of stimulus is often inadequate in developing and emerging economies</i>

5. Changes in world industries

5.1 The key mechanisms

We now turn to the developments at industry level to explore the key mechanisms that affect change. The COVID-19 crisis has affected industries in different ways. The key factors that have shaped outcomes include the characteristics of industries: their level of technology, capital intensity, labour skills, markets, etc., their ability to support the export-led growth model, their degree of international openness and export orientation, their organization in global or regional value chains, the impact of changes in demand patterns following the pandemic, and the type of government intervention that has been implemented.

Industries' characteristics. The impact of the COVID-19 crisis on world industries has been linked to their specific characteristics such as level of technology, capital intensity, labour skills, production structures, type and location of markets and international openness. Aspects worth exploring are the factors of vulnerability and resilience among these industry characteristics to develop a more detailed analysis of industry composition, technological intensity and international openness.

The weakness of export-led growth. We have provided some evidence of the importance of large domestic markets for industrial performance during the pandemic. Domestic demand has played a crucial role in restoring growth in countries that have been less affected by the recession caused by COVID-19 – first and foremost China. Many larger economies experienced lower GDP losses; conversely, countries with smaller, more open economies that rely on world exports, including services such as tourism, as drivers of growth tended to report more negative economic effects, even when their export performance remained high. Several factors should be taken into account, such as the drop in world exports, which has been more serious than the decline in world GDP and in service production, which has been steeper than that of industry. This factor has short-term and long-term dimensions. The rapid rebound of world merchandise trade and industrial production could mean that a return to export-led industrialization is possible for some countries, particularly when a combination of other favourable exists. In the longer term, however, this model may become less prevalent, considering the slower growth of world trade and likely restructuring of international production systems. The question to be investigated is whether the ability of export-led industrialization model to drive economic growth is decreasing, especially in emerging countries, and whether more attention should be devoted to the potential role of domestic demand, especially in large economies.

Global and regional production networks. There were initially serious concerns about disruptions of the global production system due to the pandemic, but it did not generally result in systematic shortages of production inputs, production stoppages, and inadequate supply of final products. Global value chains, however, are changing as a result of the pandemic towards greater regional orientation and consolidation of some activities, factors that may increase the resilience of industrial production in countries that have greater control over value chains, while further weakening the position of those with low value added participation in global value chains. The key questions to be explored are whether a shift from global to regional value chains will take place, and whether long complex networks will be replaced by shorter, more compact production chains. The changing relative importance of geographical areas will play a role in these developments, with that of East Asia significantly increasing.

The role of government industrial policy. The role governments have played in preserving production capabilities and key national industries during the pandemic crisis has been crucial in many countries. In addition to ‘macro-level’ emergency support for firms and households discussed in Section 3, specific measures targeted at selected industries have also played a relevant role. We find the emergence of a fully-fledged industrial policy in many countries, identifying selected areas of economic activity where efforts after the pandemic will be concentrated to rebuild efforts. This is a major change compared to the previous decades when State intervention was mainly deemed as causing ‘distortions’ in the ‘efficient’ operation of markets. National industrial policies are likely to play a more significant and more explicit role in the development of world industries.

5.2. Analysis of industries’ dynamics

To explore the breakdown of industrial production at the sectoral level, it is important to understand the specific impact the pandemic crisis has on the economic structures in all countries. We consider the standard Nace Revision 2 industry classification adopted by UNIDO, summarized in Table 2, where industries are grouped on the basis of their level of technology (more details on industries are provided in the Appendix). We group industries into *high-tech industries*, defined by the OECD as ‘high- and medium high-tech’ industries; *medium-tech industries* defined as ‘medium low-tech’ industries and *low-tech industries* (based on the OECD’s definition).

Table 2: Classification of industries by technology groups

<p>High-technology</p> <p><i>Chemicals and chemical products</i> <i>Pharmaceuticals, medicinal chemicals, etc.</i> <i>Computer, electronic and optical products</i> <i>Electrical equipment</i> <i>Machinery and equipment n.e.c.</i> <i>Motor vehicles, trailers and semi-trailers</i> <i>Other transport equipment</i></p>
<p>Medium-technology</p> <p><i>Coke and refined petroleum products</i> <i>Rubber and plastics products</i> <i>Other non-metallic mineral products</i> <i>Basic metals</i> <i>Fabricated metal products, except machinery</i></p>
<p>Low-technology</p> <p><i>Food products</i> <i>Beverages</i> <i>Tobacco products</i> <i>Textiles</i> <i>Wearing apparel</i> <i>Leather and related products</i> <i>Wood products, excluding furniture</i> <i>Paper and paper products</i> <i>Printing and reproduction of recorded media</i> <i>Furniture</i> <i>Other manufacturing</i></p>

Figure 13 maps the changes in industries' output in world regions. It presents the major patterns of structural change triggered by the pandemic crisis. The data provide important insights both in terms of structural change and industries' different trajectories, as well as in terms of divergence between regions and countries. The data for regions are weighted with countries' manufacturing value added. The three diagrams of Figure 13 present industrial economies, followed by European and Asian developing and emerging economies, and DEIEs in the Americas and Africa. Data for LDCs is limited to a few countries only and unfortunately, no meaningful evidence is available.

The overall findings can be summarized as follows. First, those industries that recorded the most severe decline in output were low-tech industries, such as textile, apparel, leather, wood products and printing, as well as higher-tech industries, including motor vehicles and other transport equipment. Conversely, other high-tech industries, such as pharmaceutical and chemicals, as well as other low-tech industries, such as food and beverages, have experienced limited declines or increases in their 2020 output compared to 2019. The population's basic needs explain the greater resilience of food and beverages; the health emergency has driven the growth in pharmaceutical and chemical products.

Intermediate losses are generally found in the high-tech electronic and computer industries, and in the majority of medium-tech industries (metals, minerals, rubber and oil); the fall in oil production has been severe in some countries. It remains to be seen whether these diverging patterns will continue in 2021, or whether the end of the pandemic will lead to a rapid return to previous trends, with a stronger growth of medium- and high-technology industries.

Second, regional trajectories have differed widely. In China, 11 of the 24 industries included in Figure 13 registered positive growth; 10 of these are in the high- and medium-tech group. India witnessed the most severe and widespread losses in production, followed by emerging countries and advanced countries. The industrial output plummeted in many emerging countries. While a stronger short-term rebound can be expected post-pandemic, the trajectories of emerging economies could be characterized by growing divergence, with serious implications for their capability to catch up.

When we consider major regional trends, it appears that the pandemic has considerably changed China's economic structure, on the one hand, with its high-tech industries growing much faster than its low-tech industries, and its international position, on the other, inching closer to advanced countries. The industrial economies of East Asia (including Japan and the Republic of Korea) have experienced limited losses, with the exception of motor vehicles, other transport equipment and metals. Also, South-East Asian DEIEs were less affected than most DEIEs in other geographical regions, with lower losses in electrical and computers. The relative importance of high-tech industries in all of these countries appears to be expanding; consequently, East Asia as a whole is likely to exit the pandemic crisis faster than other regions, with an industrial base characterized by technology-intensive activities and stronger regional integration.

The only industries in advanced countries in North America and Europe that witnessed positive growth in 2020 were pharmaceuticals and chemicals, while computers and electronics showed near stability. Structural change may strengthen the relative importance of these industries. Strong differences in the trajectories within the group of advanced economies have emerged, with some countries in Southern and Eastern Europe hit hardest by the crisis and losing ground relative to the fast recovery in the United States, Germany and other more dynamic economies.

Industries in developing and emerging economies have been hit hardest by the pandemic, with India bearing the brunt. Industrial output in North Africa, sub-Saharan Africa and Latin America has also plunged.

The largest losses are concentrated in two industry types: first, in industries that are more integrated in the low value added activities of global value chains; the losses of production in textiles, wearing apparel and leather in 2020 reached around 20 per cent. Second, high-tech industries, including automotive, other transport equipment, machinery, electrical equipment and computers, suffered losses of around 10 per cent to 15 per cent in most regions. This outcome results from a combination of several factors; the disruption of global value chains in these industries, the fragility of domestic industries that require extensive high-tech intermediate imports; the collapse of demand—both domestic and foreign—in expensive goods. Conversely, chemical and pharmaceutical industries have seen a generally positive growth in DEIEs, driven by the efforts to contain the spread of COVID-19.

The extensive losses of the two groups of industries that have been hit hardest raise two major concerns. From the perspective of international production, the fragility of most DEIEs in the current organization of global value chains implies that this model of integration makes countries highly vulnerable to shocks, and often unable to upgrade their position in the production hierarchy.

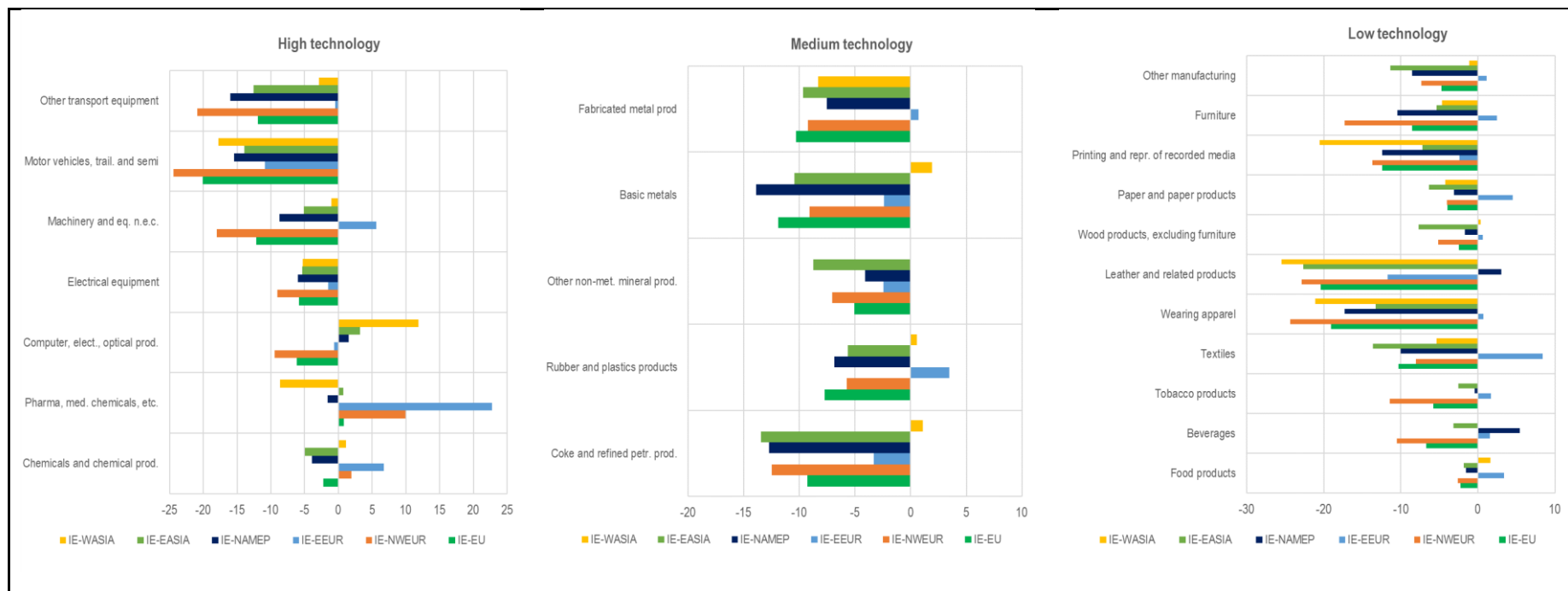
From the vantage point of structural change, the setback of high-tech industries may lead to a stronger relative specialization in low-tech and resource-based subsectors, with weaker prospects for industrial development and for an improvement in their position in international trade.

Moreover, among the DEIEs in different regions, the present patterns are diversified and may diverge even more in the future. After the temporary shock of the pandemic, a quick rebound of industrial production could be expected in DEIEs that were able to preserve their manufacturing capabilities or have diversified their markets, but recovery is likely to be uneven across countries and industries, with a slow return only to the previous output for many economies.

Figure 13: Changes in industrial production 2019–2020 by industry

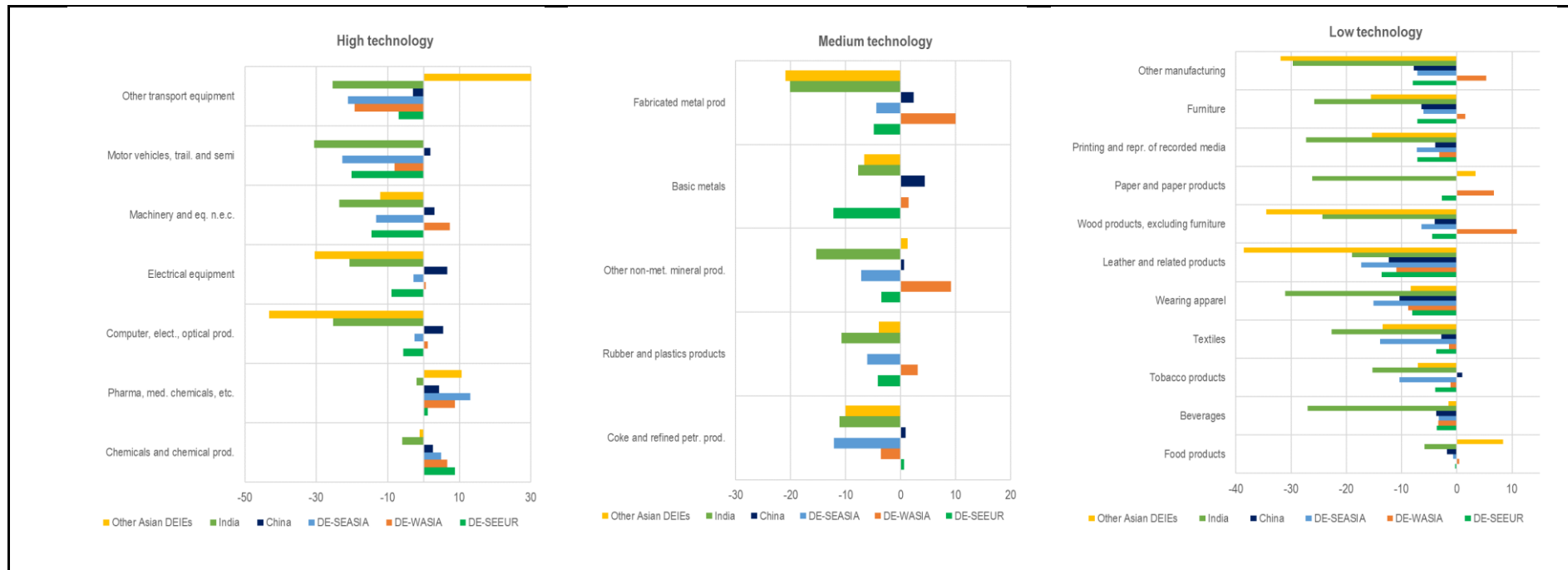
Industrial country groups

41



Source: Author's elaboration based on UNIDO (2021b). Quarterly Index of Industrial Production (IIP) at the 2-digit level of ISIC Revision 4. Database. Available at: <https://stat.unido.org/database/Quarterly%20IIP> [Accessed April 2021].

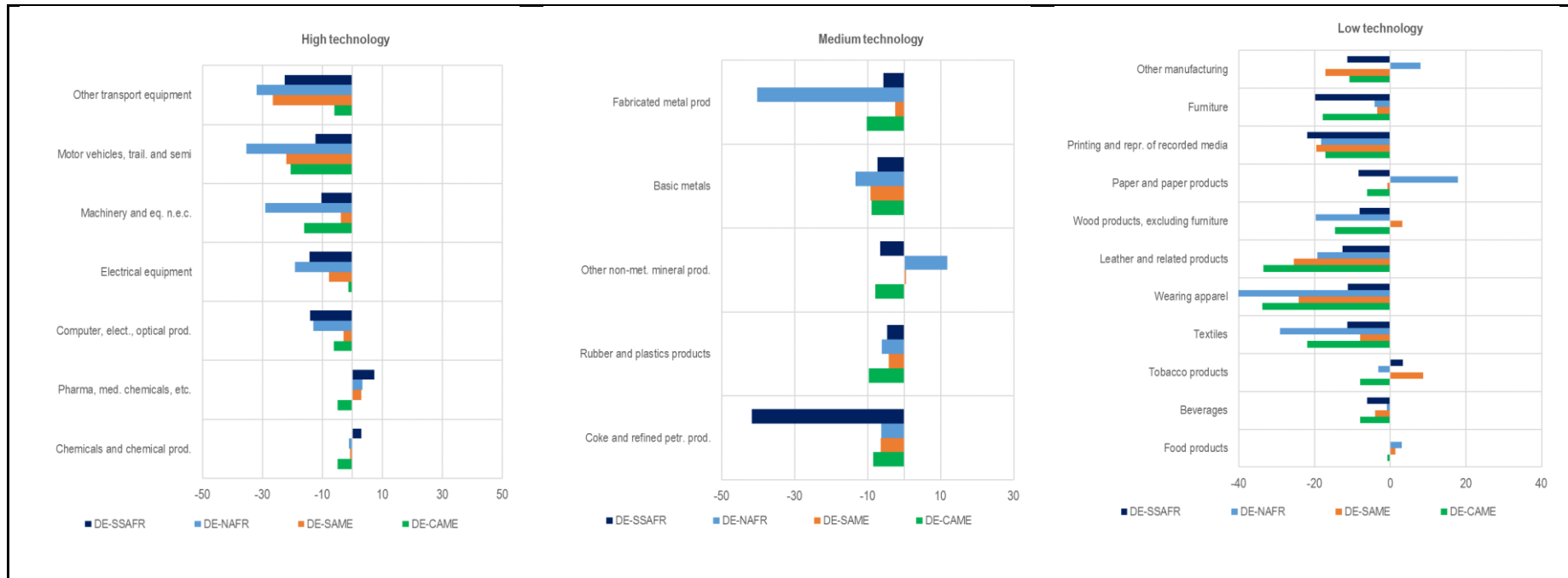
DEIES of Europe and Asia



Source: Author's elaboration based on UNIDO (2021b). Quarterly Index of Industrial Production (IIP) at the 2-digit level of ISIC Revision 4. Database. Available at: <https://stat.unido.org/database/Quarterly%20IIP> [Accessed April 2021].

DEIES of the Americas and Africa

43



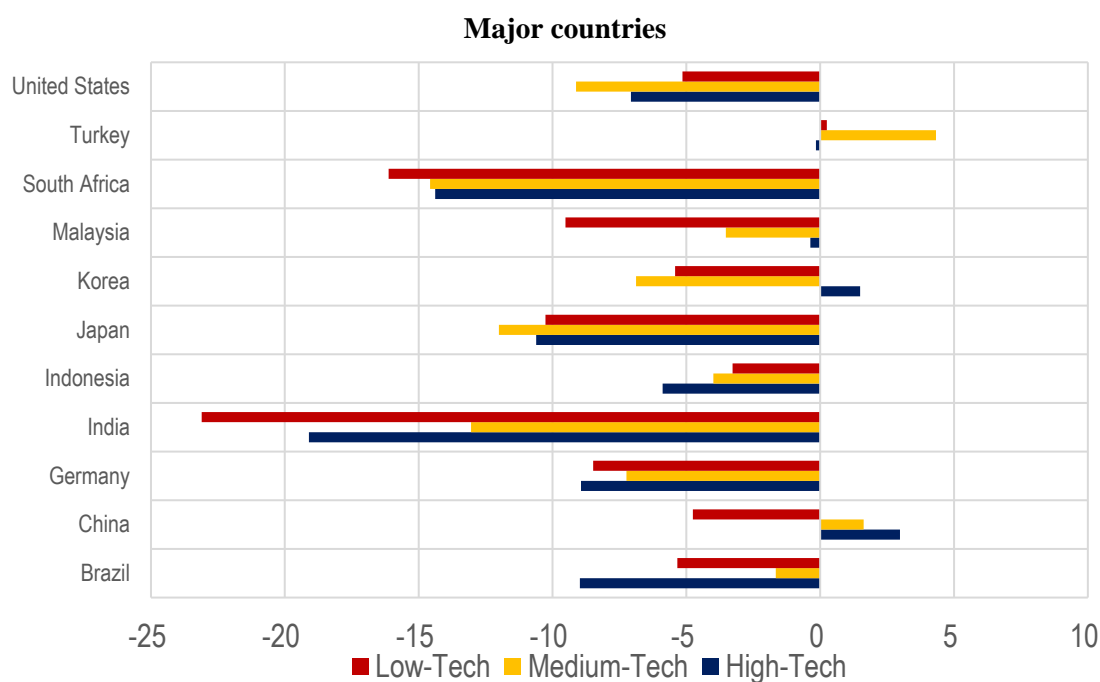
Source: Author's elaboration based on UNIDO (2021b). Quarterly Index of Industrial Production (IIP) at the 2-digit level of ISIC Revision 4. Database. Available at: <https://stat.unido.org/database/Quarterly%20IIP> [Accessed April 2021].

A further development concerns the breakdown of industries according to their technological content. Figure 14 shows the changes in industrial production for the aggregate of high-, medium- and low-tech industries in major countries.

The extent of output losses in regions and countries reflects the patterns already documented by previous evidence. As expected, one interesting outcome is that industries characterized by higher technologies have generally been better protected against the impact of the crisis. Yet the differences across countries are important, with China and the Republic of Korea achieving positive growth, high-tech industry in Turkey and Malaysia reporting minimal losses, with the remaining countries witnessing losses even in high-tech industries. High-tech industries recorded the most severe losses (similar to other technology groups) in India and in the emerging economies of Africa and Latin America.

On the whole, the country and regional effects appear to play a more important role than industry specificities; in other words, a greater loss in output affects all industries, although with the differentiation noted above along technology groups. The impact of the pandemic and the macroeconomic context appear to be important factors in shaping industry outcomes in individual countries.

Figure 14: Changes in the Index of Industrial Production in Technology Groups (high-tech, medium-tech and low-tech industries in 2019–2020, in %



Source: Author’s elaboration based on UNIDO (2021b). Quarterly Index of Industrial Production (IIP) at the 2-digit level of ISIC Revision 4. Database. Available at: <https://stat.unido.org/database/Quarterly%20IIP> [Accessed April 2021].

5.3 The impact of the pandemic on industries and exports

What is the impact of industries' international openness on countries' overall growth performance? Does greater integration in world markets and success in current account balances lead to more resilient economies and to a lower decrease in GDP as a result of the pandemic crisis? Can the impact of export-led industrialization as a driver of countries' growth be assessed?

The preliminary evidence shows that the presence of large domestic demand may have played a role in limiting losses of GDP and in restoring growth. It is puzzling that success in terms of current account balance as a share of GDP has often been associated with weaker overall economic performance, where the drop in service activities has been a major factor. Even when the 'export machine' is primarily based on manufacturing (and in some cases of emerging countries on natural resources) was successful in terms of current account performances, it appears that this was insufficient to drive overall GDP growth. The case of major net exporters is remarkable. In 2020 in Europe, Germany reported an account surplus of GDP of 6.8 per cent and a loss of GDP of 5.3 per cent; Italy had a surplus of 3.2 per cent and a loss of GDP of 8.9 per cent. In Asia, both Singapore and Hong Kong Special Administrative Region of China witnessed a major growth in exports with a decline in GDP of 5.8 per cent; Malaysia achieved a surplus of 4.8 per cent and a loss of GDP of 5.3 per cent; the Philippines had a surplus of 3.4 per cent and a decline of GDP of 9.4 per cent. Conversely, China's account surplus fell to 1.7 per cent of GDP while recording a significant growth of GDP in 2020.

Figure 15 provides evidence for major countries. In the first diagram, changes in real GDP in 2020 are related to current account balances as a share of GDP based on IMF data. The surprising result is that the latter is not a factor that is related to better economic performances. Countries with higher current account surpluses, both advanced countries, such as Germany and Japan, and emerging countries, such as Malaysia and South Africa, tend to have greater GDP losses in 2020. Conversely, Turkey had a 5 per cent external deficit and a positive GDP growth in 2020.

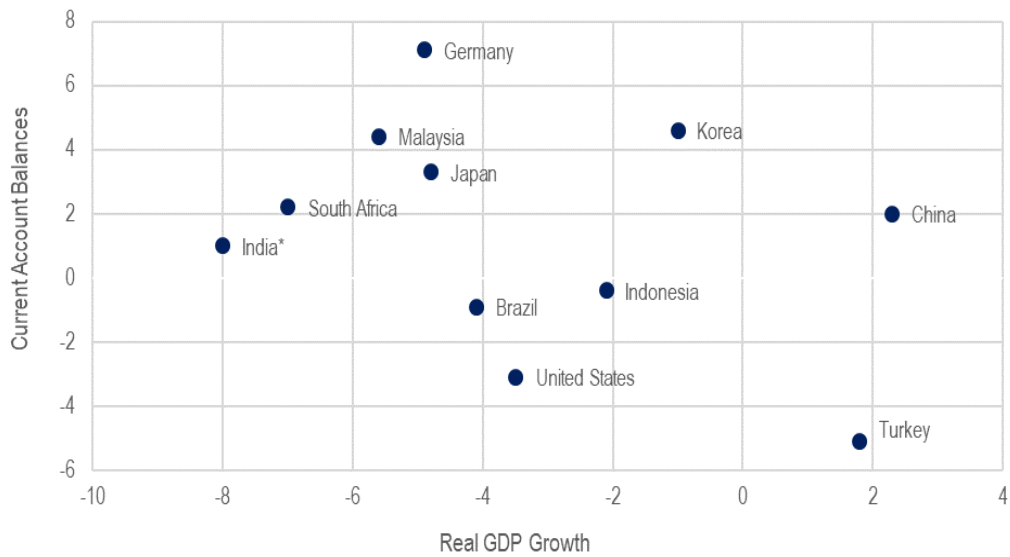
When focusing on the contribution of trade to external balances, the lower diagram shows the link between the 2019 trade balance as a share of GDP and the same GDP growth in 2020. A broadly similar picture emerges, with Malaysia and Germany achieving the highest trade balance, but experiencing significant GDP losses.

This finding raises important questions about the role of export-led industrialization, with a need for deeper investigations into the lower ability of such a model to sustain growth in countries at different stages of development. In particular, a 'thinning' of national industrial production may emerge when global value chains drive the process, with weaker effects on the national economy.

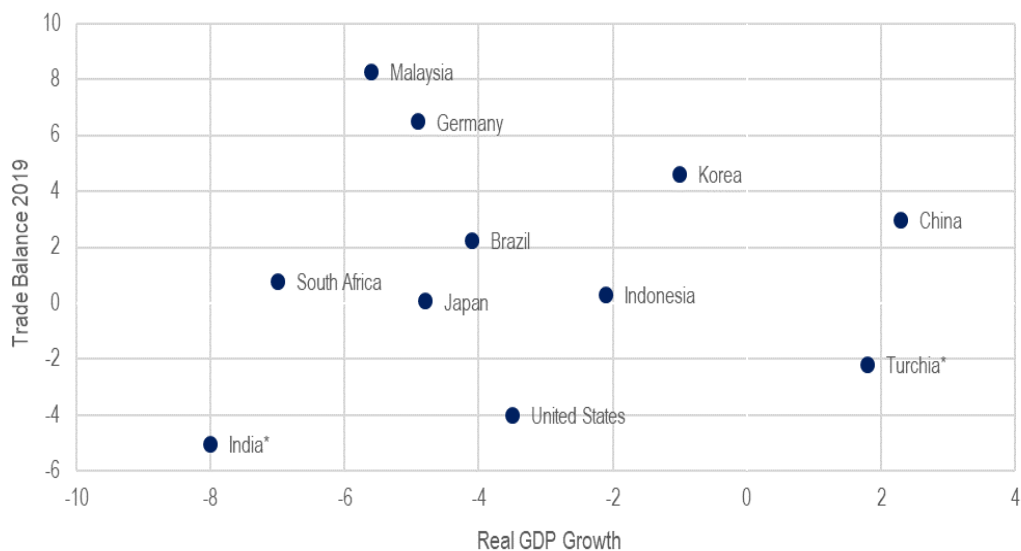
Lower backward and forward linkages in the domestic economy, the acquisition of inputs and economies of scale and the scope of the national economy could ‘detach’ export-serving industries from the broader economic base, reducing the multiplier effects of export surpluses. In addition, as the pandemic crisis has hit the services open to international trade the hardest, a weak integration between manufacturing and services could become a factor of vulnerability in emerging countries.

Figure 15: External balances and change in GDP

Changes in GDP in 2020 and current account balance in 2020 as a percentage of GDP



Changes in GDP in 2020 and trade balance in 2019 as a percentage of GDP



Source: Author’s elaboration based on IMF (2021b) WEO January 2021 and UNCTAD (2021) UNCTADSTAT Data Center. Available at: <https://unctadstat.unctad.org/EN/> [Accessed May 2020].

5.4 Government support for firms and industrial policy

Governments' expansionary macroeconomic policies have played a crucial role in reducing the impact of the COVID-19 pandemic in all countries. A clear policy strategy at the industry level has not yet emerged, however. 'Horizontal' support has been provided to all firms in many countries as an emergency measure. Some specific actions to support major national firms that were struggling—nationalization, economic support, etc.—were implemented in several countries on an ad-hoc basis. For many countries, the challenge now is to develop a more strategic industrial policy that could shape the reconstruction of production capacities post-pandemic. An integration of industrial policy with 'green deal' approaches could effectively contribute to a new trajectory of sustainable industrial development.

Aside from the emergency support to firms and household income documented in Section 2, specific actions on selected industries have played a relevant role. Key questions for governments in developing such policies have been:

- a. *the size and duration* of public assistance to firms based on available public resources, on the policy space for monetary and fiscal action, on the ability of the economic system to 'rebound' after the pandemic crisis;
- b. *the framing* of the goal to support firms in terms of the overall policy position;
- c. *the tools* that could be used, moving beyond 'horizontal' actions and introducing selective industrial policies.

An authoritative answer to these questions came in July 2020 with the report of the *Group of 30*, an international body of financiers and academics chaired by the former governor of the Indian Central Bank, Raghuram Rajan, and by Mario Draghi. It provides guidelines to governments on how to move from general support for businesses towards more targeted measures, ensuring the prudent use of limited public resources and allowing market forces to gradually manage "the pace of the needed creative destruction", according to Rajan.⁴

This argument is exemplary of the more 'mainstream' approach to state measures for firms during the pandemic. Based on a continued belief in the ability of markets to operate effectively and overcome the crisis, some Western governments have avoided a more direct involvement in industrial development.

⁴ Group of 30, "Reviving and Restructuring the Corporate Sector Post-Covid" (<https://group30.org/publications/detail/4820>).

A more ‘interventionist’ approach has, however, emerged even in the United States. The Senate passed the *US Innovation and Competition Act (USICA)* in June 2021, which mobilized billions of dollars for applied research, linking universities to business, to support semiconductor development and production, and for a variety of industrial policy actions. At the time of writing, the bill had yet to be approved by the House of Representatives.

In Europe, a new attitude is consolidating. In early 2020, the EU Commission suspended the ban on “state aid” to businesses; all governments—Germany more than any other country—offered subsidies, tax breaks and public capital to businesses most affected by the crisis. This suspension is temporary, and the regulations will be renegotiated by the end of 2021.⁵ The European Union has launched *Next Generation EU* as a major programme for a joint EU fiscal policy supporting investment and public expenditure of Member States, with the goal of accelerating green and digital transitions. Moreover, the EU has launched industrial policy projects such as the *Important Projects of Common European Interest (IPCEI)* and the “Industrial Alliances” among firms of the region. Initiatives are underway in the area of batteries for electric cars, microelectronics, plastics, clean hydrogen, low carbon industries and digital industrial platforms (European Commission 2020; European Parliament, 2020). A new goal of EU policy is the strengthening of ‘industrial sovereignty and autonomy’ in strategic areas.⁶ Vaccines are a key issue, and former President of the EU Commission, Romano Prodi, has argued that governments should organize and finance the production of COVID-19 vaccines in “the largest possible number of firms” in all countries.⁷

At the national level, major plans have been developed in Germany and France for high-tech industries, for health equipment and for the green transition, with billions of euros in public investment, financial support for firms and targeted research and innovation efforts. Similar

⁵ It is remarkable that even so-called “frugal” countries that are usually critical of state support for businesses are pressing for more policy space. The Danish Minister of Industry, together with Austria and the Czech Republic, has asked Brussels to raise the limit of subsidies to businesses (EUR 800,000) and of the compensation permitted so far (EUR 3 million); see Dan Joergensen, “The EU must lift limits on Covid-19 aid to business”, *Financial Times* (<https://www.ft.com/content/19897de4-196f-4211-bcb2-fb39195c261c>).

⁶ See Pianta et al. (2020). See also ‘Germany and France: Together for a new and innovative European industrial strategy’ (<https://www.bmwi.de/Redaktion/EN/Pressemitteilungen/2021/02/20210216-germany-and-france-together-for-a-new-and-innovative-european-industrial-strategy.html>) and ‘A Franco-German Manifesto for a European industrial policy for the 21st Century’ published by the German and the French governments in February 2019 (<https://www.gouvernement.fr/en/a-franco-german-manifesto-for-european-industrial-policy-fit-for-the-21st-century>). Broader discussions of industrial policies to address climate change and other challenges are in Lucchese and Pianta (2020a) and Mazzucato (2021).

⁷ R. Prodi, “Il G20 riduca i diritti sul siero e l’Italia inizi la produzione” *Il Messaggero*, https://www.ilmessaggero.it/editoriali/primopiano/tempo_scaduto_il_g20_riduca_i_diritti_sul_siero_e_l_italia_inizi_la_produzione-5780272.html.

actions have emerged in most Western countries.⁸

However, a new shared ‘paradigm’ for an industrial policy to support the reconstruction of economies after the COVID-19 crisis has not yet emerged. Country experiences in this regard, remain distinct. On the one hand, East Asia’s and China’s industrialization has long been supported by an explicit, long-term industrial policy, but little international dialogue has evolved on how other countries could learn to effectively move in the same direction in the current context of post-pandemic policies.

Emerging countries in Latin America, Africa and other regions have responded in very different ways, building on existing industrial capabilities and public resources. The question is whether an ‘institutionalization’ of industrial policy will take place, charting a new growth trajectory for the post-pandemic economy. Specific goals have emerged in many countries, including a search for environmentally sustainable economic activities with a high content of knowledge, technology and quality of work. In many cases, concern about reducing social and territorial disparities between regions is also evident. The search for a ‘new industrial policy paradigm’ is likely to become one of the major open questions in the post-pandemic world.

How can we sum up these empirical trends at the industry level and understand them in the light of the conceptual analysis developed in Section 2? Figure 15 builds on the framework provided in Figure 1, with a focus on the industry level and identifies some of the processes that appear to be most relevant in the different world regions we have considered in this study.

In terms of *demand patterns*, the empirical evidence suggests that large domestic demand supports industries’ resilience. Foreign demand and international trade have experienced major reductions, especially in services. There are signs of a potentially strong rebound in some manufacturing industries associated with fast growing consumer demand in advanced countries in 2021. In IEs, China and some DEIEs, selected government policies have supported specific industries, mainly high-tech industries, compensating for the decline of private demand.

In terms of *supply structures*, one of the effects of the pandemic crisis appears to be an acceleration of structural change towards high-tech industries. Nearly all world regions reported an expansion of the pharmaceutical and chemical industries, whose output was needed to contain COVID-19 infections. IEs and China tend to have increased their relative specialization in high-tech industries, in particular in electronics and computers, while different patterns have been identified for automotive and other transport equipment. Conversely, most countries among the

⁸ An analysis of industrial policy actions after the covid-19 pandemic in Europe and Italy is in Pianta (2021).

DEIEs lost more production in high-tech industries than in others, revealing the fragility of their position in GVCs. LDCs, with a smaller industrial base, indicate more stable patterns. The analysis of major countries, however, shows a strong divergence within each group, depending on the severity of the pandemic, on the macroeconomic context and on countries' specific industrial capabilities. Considering the resilience shown by manufacturing industries, a rapid return to previous patterns might be possible, but some DEIEs might also face major difficulties.

In terms of *international openness*, industries where production is primarily organized in global value chains tend to show stronger losses in production among DEIEs and LDCs, compared to IEs. These countries occupy more vulnerable positions in the international production hierarchy and could now have different trajectories of recovery. In selected countries and industries, more controls over trade have been introduced to support domestic production. As noted above, the resilience of international manufacturing may become a driver for a faster recovery in some GVC-dominated industries.

In terms of *government policies*, the measures to mitigate the impact of the pandemic have had a significant effect in most countries, resulting in greater public procurement of health-related goods and services, and driving the growth of pharmaceutical and chemical industries, especially in IEs and DEIEs. Major countries have introduced policies for a transition towards digitalization and sustainability, and to support specific industries. In the United States, a very large stimulus programme has been directed towards high-tech, environmental and infrastructure priorities. In the European Union, the Next Generation EU programme supports investments in digitalization and sustainability. Germany, France and other countries have developed specific plans for high-tech industries, the automotive industry (including a shift towards electric cars) and environmental priorities. Similar measures have been introduced in Japan, the Republic of Korea and other IEs. China has proceeded with its long-term strategy towards environmental sustainability and a shift to high-tech industry, mobilizing extensive resources. All of these countries have significant policy space and could choose between a more general macroeconomic stimulus and a more focused industrial and technology policy.

Conversely, we have found that emerging countries have been more constrained in their ability to carry out expansionary policies that would entail higher public debt and external deficits. Their industrial policy measures appear to be more fragmentary, supporting existing public enterprises and major firms in strategic fields, or protecting domestic capabilities in high-tech industries.

Combining all of these developments together, major changes in the world's industrial geography are visible. The rise of China, the limited losses of East Asian IE, and the performance of South-East Asian DEIEs, where setbacks have often been lower than in other regions' DEIEs, indicate a general strengthening of East Asia compared to Western IEs and to other world regions. This rise of East Asian industries appears to be driven by the combination of several factors: the limited diffusion of the pandemic; the presence of large domestic markets; the extent of government macroeconomic and industrial policies; the potential for structural change towards high-tech industries and the emergence of regionally-centred value chains in some industries.

Figure 16: An industry perspective on the pandemic’s impact

	<i>Factors of resilience</i>	<i>Summary of the evidence</i>
DEMAND	Aggregate public expenditure compensating the decline in private demand	<i>Large domestic demand supports industries’ resilience. A strong fall in foreign demand, with a potential for rebound, for services as well. In IEs, China and some DEIEs, selected govt. policies support industries</i>
SUPPLY	Economic structure with high-tech, high skill, oligopolistic power, manuf.-service integration	<i>Structural change has accelerated the expansion of pharmaceuticals; in most high-tech industries, IEs and China have become relatively stronger, DEIEs have become weaker. LDCs are more stable. There is high divergence in each group. East Asia has registered stronger growth</i>
INTERN. OPENNESS	Export success for industry. Strong position in global value chains	<i>In industries shaped by GVCs, DEIEs and LDCs have lost more production. More controls over trade in some industries support domestic production. There is potential for faster recovery when industries are integrated in GVCs</i>
GOVT. POLICIES	Expansionary fiscal and monetary policy, new industrial and technology policy	<i>Public procurement drives the growth of pharmaceutical and chemical industries in IEs and DEIEs. Industrial and technology policies in IEs favour digitalization and sustainability</i>

6. Changes in firms and business

The response of larger firms to the pandemic is affected by the above processes and by specific business strategies. Factors that could be of relevance include international vulnerabilities in firms’ supply and demand patterns, type of ownership—national, foreign, public—long-term vs. short-term investment horizons, access to finance and new capital as well as strategies of capturing larger market power and increasing industry concentration, as opposed to exit markets to reduce losses. Moreover, industry differences are important and are likely to become increasingly so in the post-pandemic world.

Specific issues that are likely to play a crucial role in the development of business structures include the following:

a. Price increases. Following the collapse in the price of many natural resources in 2020—most notably oil—the recovery in 2021 has strained the supply of raw materials, natural resources and of some high value intermediate goods, such as semiconductors. As global value chains returned

to full activity, supply bottlenecks emerged, leading to price increases that are now widespread. Such changes in international prices are likely to have a major, highly differentiated and persisting effect on the post-pandemic recovery.

This is the result of disruptions in supply systems discussed above, in combination with broader problems of technological change, the organization of shipping and logistics, vulnerability of ‘just-in-time’ supply systems, the presence of market power by oligopolistic firms and the imbalance of power between advanced and less developed economies.

Production shortages are a key factor in price increases, especially in the case of internationally traded energy sources, raw materials, chips and electronic components, chemicals, food and lumber. In addition, long distance shipping has been severely disrupted and serious bottlenecks have emerged in the availability of merchant ships and containers, leading to major price increases in maritime transport.

Business strategies based on the ‘just-in-time’ model, aiming to cut inventories and costs, have led many corporations to make mistakes in their procurement policies for key inputs, such as electronic chips for cars or equipment. In the automotive industry, Toyota cut production by 40 per cent in September 2021 in its plants on all continents, from 900,000 to 540,000 vehicles; one major factor for this was the surge in COVID-19 cases in Viet Nam, Malaysia and Thailand, where a large number of parts are sourced, including electronic components and chips.⁹

Companies are likely to pass increased costs on to consumers; in the majority of countries, the presence of oligopolistic power may make it unlikely for competitive pressures to be effective in preventing price increases.¹⁰ Especially in DEIEs, the presence of a limited number of producers and sellers of imported goods increases vulnerability to shortages and price hikes, as concluded by the UNIDO survey on firms (see IDR 2022, Chapter 1, Figure 13).

Food prices pose a specific problem. According to the FAO and the WFP, the increase in world food prices has reached 30 per cent above the average for 2014–2016. This rise is particularly strong in DEIEs and LDCs in Africa and Asia, with increases in the cost of the food basket above 30 per cent (compared to the previous 5 years) for many countries in sub-Saharan Africa, as well as for Viet Nam, Turkey and Pakistan. This rise is disproportionately hitting the poorest countries

⁹ Kana Inagaki and Steff Chavez, Chip shortage deepens supply problems at global carmakers Financial Times, 20 August 2021, <https://www.ft.com/content/89bd676c-fc10-4a69-9b03-dc50ed3f441d>

¹⁰ A study of pricing strategies by sellers on the Amazon website considering 750 items before and after the pandemic found that the prices of 409 goods had increased by over 20 per cent, while 136 had more than doubled. Dave Lee, Pandemic price rises still rampant on Amazon, research finds, Financial Times, 22 JANUARY 2021, <https://www.ft.com/content/8a3b8c02-df79-43ea-abc9-6494b4f12273>

and those affected by major conflicts, leading in 2002 alone to an estimate of 320 million people who have lost access to adequate nutrition.¹¹

The aggregate effect of such price increases is already visible; in advanced countries, the rate of inflation has increased to around 5 per cent in the United States and 3 per cent in the eurozone; in Brazil, inflation has reached 9 per cent. Import prices are a key driving force; in July 2021, German import prices increased by a record 15 per cent compared to a year earlier.

In this context, central bankers are moving towards a reduction of their expansionary monetary policies with potentially serious consequences for the pace of in June 2021 recovery. A tighter monetary policy, with increasing interest rates, could discourage investment and reduce the policy space for expansionary fiscal measures, further delaying recovery in all countries.

For DEIEs and LDCs with high foreign debt and a strong dependence on imports of high-tech goods, an increase in import prices, international interest rates and foreign debt servicing may compromise balances of payments and government budgets, with the risk of slowing down post-pandemic recovery and opening up new fronts of domestic crisis.

b. *Acceleration of structural change.* The pandemic and the responses adopted by firms and governments have led to a wider use of digital technologies, including automation of production, diffusion of remote work practices, and a massive expansion of the activities of global platforms for buying and delivering goods. Long-term trends towards technological change have accelerated, leading to major reductions in the workforce, especially in Western countries. Successful economies tend to shift towards activities with greater technological intensities and product variety and complexity. In parallel, the pressure towards environmental sustainability is becoming stronger in all countries, accelerating the phasing out of carbon-intensive activities and the search for new, cleaner industrial production.

c. *Changes in trade flows and reorganization of global value chains.* Since the beginning of 2020, the uneven geography of production stoppages, fall in demand, and production and consumption recovery has created temporary chaos in trade flows and in shipping activities, in particular. New centres of expanding demand are emerging in East Asia. The large rise in shipping costs since the end of 2020 is a major sign of the current disbalance, and of the difficulty of adjusting trade and transport infrastructure to the uncertainties brought by the pandemic. The rise in shipping costs

¹¹ Emiko Terazono and Jonathan Wheatley, Pandemic and higher food prices fuel sharp rise in global hunger, Financial Times, JULY 12 2021 <https://www.ft.com/content/f7828907-32e5-4926-a0c7-6f1577c77d3f>

may also contribute to higher price increases and to changes in the relative advantages of particular locations of production.

These trends contribute to the shape, and are in turn affected by, the reorganization of global value chains. Multinational corporations are adjusting to the post-pandemic world with efforts to retain market power, enter expanding economies, cut back on labour costs, and increase the resilience of their production systems with multiple, regionally diversified supply lines. A new geography of world industrial capabilities is likely to emerge, driven by these processes.

All of these factors unlock a phase of great uncertainty for businesses, workers, trade unions and governments. Success in such uncharted waters will require far-sighted investment by all decision-makers, close coordination, and open policy debates on the trajectories that may support industrial production in the future.

A framework for summarizing the fragmentary information that is emerging about firms—related to the impact of the pandemic and to the trends pointed out above—is provided in Figure 16. Building on the conceptual framework developed in this paper, we can identify the vulnerabilities and factors of resilience for businesses in the four areas already discussed in previous sections: (i) demand dynamics, (ii) supply structures, (iii) international openness and (iv) government policies.

When considering *demand dynamics*, the evidence points to a sharp fall in demand during the crisis, followed by rapid recovery as previous markets, especially in China, East Asia and Western countries, expanded again as a result of the combination of both private and public demand in consumption as well as in investment, in domestic and in international markets. These changes offer opportunities to large firms to adjust in different directions. On the one hand, expanding firms might enter new markets, control new production niches, upgrade their technological activities or establish new locations of production. On the other hand, declining firms might exit markets and production lines as a result of the fall in demand.

Figure 17: Business perspectives in key areas on the impact of the pandemic

	Vulnerabilities	Factors of resilience	<i>Summary of the evidence</i>
DEMAND	Fall in demand, dependence on few customers, shift in locations	Stable demand for products, diversified markets, oligopolistic power, public demand	<i>Deep fall and rapid rise in demand during recovery with higher prices, efforts to enter expanding markets (niches, new tech, locations), relevance of domestic private and public demand</i>
SUPPLY	Production disruptions, input shortages, shipping bottlenecks	Diversified supply chains, higher tech, higher skills, manuf.-service integration	<i>Input shortages (chips), higher commodity prices, weakness of production links (health equip., vaccines), limits of ‘just-in-time’, relevance of greater vertical integration, acceleration of tech/ind. changes (electric cars)</i>
INTERN. OPENNESS	Large dependence on export markets for mass products, new competitors, trade uncertainty	Strong position in global value chains, large domestic market	<i>Higher shipping costs, longer transport time to new locations, moves to diversified regional value chains, limited reshoring, relevance of domestic market</i>
GOVT. POLICIES	Lack of national industrial policy, weak investment in knowledge, infrastructure	Public demand, credit, industrial and technology policy for upgrading and transitions	<i>Industrial and technology policies to fill gaps in capabilities (health, vaccines, chips, digital infrastructures), guiding the shift to electric car production, encouraging the ecological transition</i>

The development of *supply structures* has been characterized by input shortages (for example, in semiconductors), higher commodity prices, weakness of some production capabilities (in health equipment as well as in vaccines), witnessed the limits of the ‘just-in-time’ model, the relevance of greater vertical integration, the acceleration of changes in technologies and products that could reshape entire industrial systems, as in the case of the automotive industry with the rise of electric cars.

When considering *international openness*, there is evidence of changing trade routes, higher shipping costs, longer transport time to new locations, efforts to develop more diversified supply lines, with greater attention to regional value chains; in parallel, there is limited evidence of reshoring, and a stronger role for domestic markets for expanding economies.

Finally, the return of a bigger role for *government policies* to address economic challenges is likely to be a lasting legacy of the pandemic. Industrial policies, in particular, guide business investments and private production in a wide range of activities. The goals include efforts to fill gaps in industrial capabilities (such as in the case of health equipment, vaccines, chips, digital infrastructure, etc.), coordinate major shifts in industries and products (as in the case of electric cars), and to encourage the long-term investment required to achieve the ecological transition towards a sustainable economy.

The post-pandemic development of businesses, industries and national economies—particularly in emerging and developing countries—is characterized by high uncertainty. One particular concern that emerges from these analyses is that disparities in industrial production across countries and industries could expand as a result of the pandemic crisis. Hierarchies in industrial production are likely to change, with a clear rise of China; the industrial capabilities in other Asian countries could improve based on close connections with China's economy. The impact of the above trends on emerging countries are likely to be problematic; access to technologies, capital and foreign markets could become more difficult; the opportunities offered by integration in world trade and by FDI inflows could become less relevant; and national industrial policies could become more important in shaping the future of industry. In this scenario, greater divides and more challenging industrialization for many developing and emerging countries could be a lasting legacy of the COVID-19 pandemic.

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