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Abstract

The Corona pandemic is a huge shock for the whole world both socially and economically . The supply side of the economy is impacted via disrupted value chains due to a lack of employees and supplies. Restricted trade and purchasing opportunities and the reluctance of unsettled consumers and investors represent a demand shock. Policymakers have addressed these multiple challenges with broad-based and comprehensive fiscal packages. These have accompanied the recovery in Germany through the summer of 2020. Since the autumn of 2020, a further and stronger wave of infection has led to renewed adverse effects on the German economy. In addition to these short-term burdens, it also becomes clear that the pandemic will have a variety of long-term effects. These can be identified by their impact on macroeconomic production factors. There will be positive experiences – such as a technology and digitization boost triggered by the pandemic. However, there is also a risk that structural unemployment may arise. To avoid this, it is essential to ensure an inclusive access to the labor market and to the education system.

Key words: Business cycles, Corona pandemic, stabilization policy, structural change

1. A historical societal and economic challenge

The Corona pandemic has been an immense societal and economic challenge during 2020. The year 2021 will also be determined by COVID-19. The number of confirmed infected people worldwide exceeded 100 million in mid-February 2021, but the actual incidence of infections is likely to be considerably higher. The cumulative number of deaths worldwide officially associated with the virus, based on country reports and estimates by Johns Hopkins University, was nearly 2.5 million people as of end-February 2021. In Germany, more than 2.4 million infected individuals have been registered as of end-February 2021, and the number of individuals who have died with Corona to date was almost 70,000.

As a result of this global pandemic, economies are being hit by a negative supply shock as well as a negative demand shock simultaneously:

- On the **supply side**, value chains and production processes are disrupted because in some cases foreign and domestic supplies are impaired and transport routes are restricted. Employees cannot go about their work in the usual way due to limited freedom of movement, closed kindergartens and schools, and health precautions. All of this affects the production possibilities of an economy in a way that has never been seen in the last seven decades.
- On the **demand side**, trade with foreign countries is declining. Global investment activity in particular, which is important for the German economy with its relatively strong focus on the production of capital goods (Grömling, 2017; 2019), has slowed significantly. At the same time, domestic demand is being constrained by the lockdown measures – i.e., for example, the closure of restaurants and parts of the retail sector – as well as by the loss of income, increasing employment concerns and a reluctance to invest have been triggered by high economic uncertainty.

This simultaneity of supply and demand shocks and the long duration of the disruptions are likely to be unique compared with previous economic crises. In 2020, the global economy experienced its sharpest downturn in the last seven decades. Given the broad impact of this economic crisis, the macroeconomic effects in Germany were almost on a par with the financial market crisis of 2009, when a decline in real gross domestic product (GDP) of 5.7 percent occurred. Based on initial results, the German economy slumped by 5 percent in 2020. In absolute terms, the loss of value added and the associated incomes in Germany in 2009 compared with the previous year amounted to 100 billion euros; in 2020 the total loss was 120 billion euros.

2. Stabilization policy counters the Corona shock

The direct economic impact of the Corona pandemic on macroeconomic output and income in 2020 has been mitigated by broad-based stabilization policy measures. The fiscal policy volume is expected to amount to more than 200 billion euros in Germany in 2020 (Bardt/Demary et al., 2020). Regarding the sharp rise in infections in March 2020, the primary policy objective was to control the spread of the virus. Government-mandated lockdown measures and restraints by consumers and investors may explain the rapid and sharp drop in supply and demand described above. During this first wave of infections, the aim was to preserve companies and to stabilize jobs and incomes with the help of government stabilization policies (Hüther et al., 2020; SVR, 2020, Chapter 2):

- On the one hand, automatic stabilizers – the progressive income tax, the transfer system (such as unemployment benefits) and the expanded access to the so-called short-time allowance – took effect. In the case of the German short-time allowance program, the employer bears the labor costs only for the actual working hours, which were greatly reduced during the crisis, and the state tops up the income with transfer payments. This allows companies to adjust their labor input (working time) and labor costs to the decline in production. The loss of income and purchasing power of private households is reduced. An increase in unemployment is thus avoided.
- On the other hand, extensive discretionary stabilization policies were deployed: Guarantees for large companies (such as airlines) were made available under the Economic Stabilisation Fund. There were emergency grants for micro-enterprises (up to ten employees) and the self-employed, support for medium-sized companies with up to 249 employees and the special loan programs of the Kreditanstalt für Wiederaufbau (KfW) – a German promotional bank.

In addition, the European Central Bank's monetary policy provided the banking system with additional liquidity on favorable terms, thus ensuring lending to the private sector and avoiding a banking and financial market crisis.

Due to the effectiveness of the lockdown measures and as a result of the gradual calming of the infections, a normalization of social and economic life started from May 2020 onward (Hüther/Bardt, 2020). To stabilize the recovery, a further fiscal stimulus package was adopted in June 2020. This included, for example, measures to stimulate private and government investment. In addition, the normal VAT rate was lowered from 19 to 16 percent and the reduced VAT rate (e.g. for food) from 7 to 5 percent – in both cases for the entire second half of 2020. Families with children were also paid a child bonus in late summer 2020. This was intended to stimulate private consumption.

3. Asymmetric burdens and recoveries

The Corona shock hit the various sectors of the German economy very differently (Figure 1). The impact on the manufacturing sector was particularly strong. In the second quarter of 2020, price-, seasonal- and working-day-adjusted gross value added based on national accounts in the manufacturing sector was 22.5 percent below the annual average for 2019. In the third quarter, the output gap measured in this way had already been reduced to 11.7 percent. The recovery also continued in the fourth quarter of 2020, albeit at a slower pace. The production gap in manufacturing compared with the annual average for 2019 was still 5,8 percent in the fourth quarter.

After the opening the sectors that had previously been shut down by government requirements (e.g. hospitality, parts of retail-trade and personal services) were able to catch up quickly. The gap with the 2019 annual average was only 3.5 percent in the trade/transportation/hospitality sector in the third quarter of 2020, down from 15 percent in the previous quarter. After the renewed lockdown starting in November 2020, there was still an almost 8 percent gap in this sector throughout the fourth quarter of 2020.

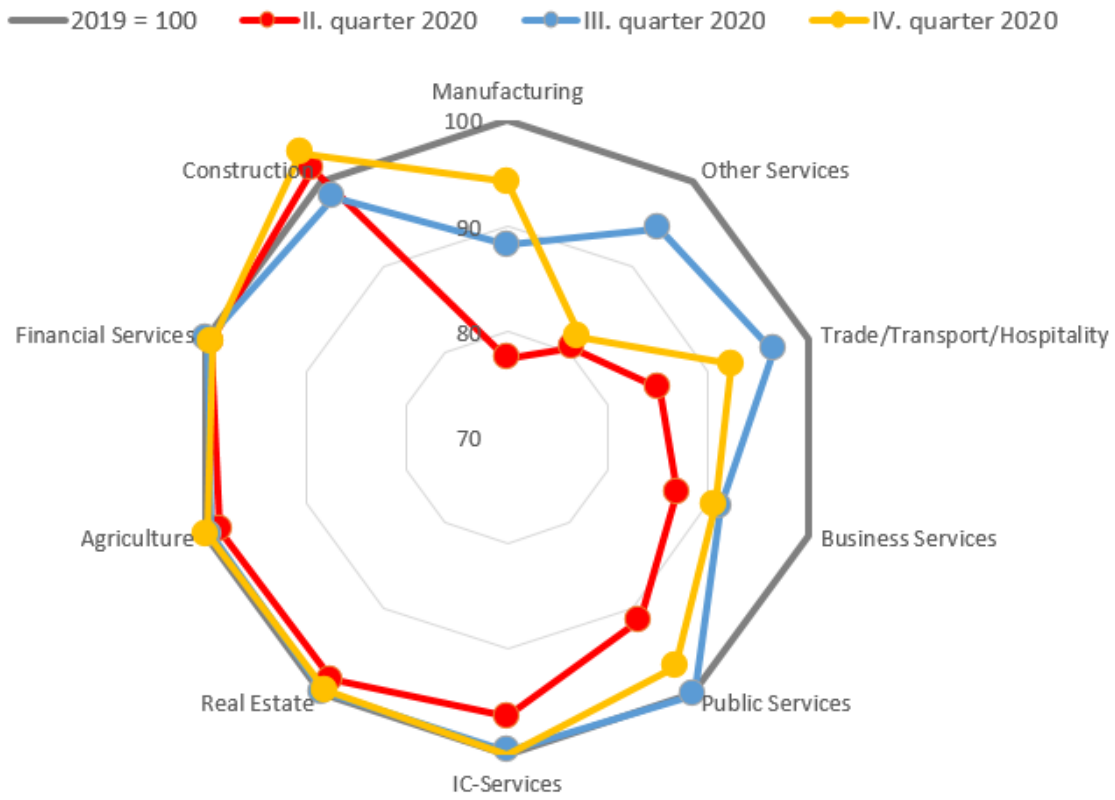
The recovery was initially much slower for business-related services, which in part are closely linked to manufacturing. The gap to 2019 was still 9,3 percent for business services in the in the fourth quarter of 2020 – after -13 percent in the second quarter. Public service providers and information and communication service firms were able to close almost all of the gap that emerged in the second quarter. According to national accounts, there was no production shortfall in the financial and housing sector or in the agricultural sector. The German construction industry was even able to exceed the previous year's output in the fourth quarter of 2020.

4. German manufacturing was already in crisis before Corona

Figure 1 shows that manufacturing in Germany was initially the most severely affected sector by the pandemic and, looking at the third quarter of 2020, manufacturers still reported the largest output gap compared with 2019. A deficit can still be seen in the fourth quarter of 2020. The crash in spring 2020 was considerably more severe in terms of speed and magnitude than during the global financial market crisis of 2008/2009 (Figure 2). Whereas the slump in German manufacturing production at that time totaled 20 percent in five months, the fall in the Corona crisis in spring 2020 was faster and deeper, at almost 30 percent in two months (Bardt/Grömling, 2021).

Figure 1. Sectoral output gaps due to the Corona shock in Germany

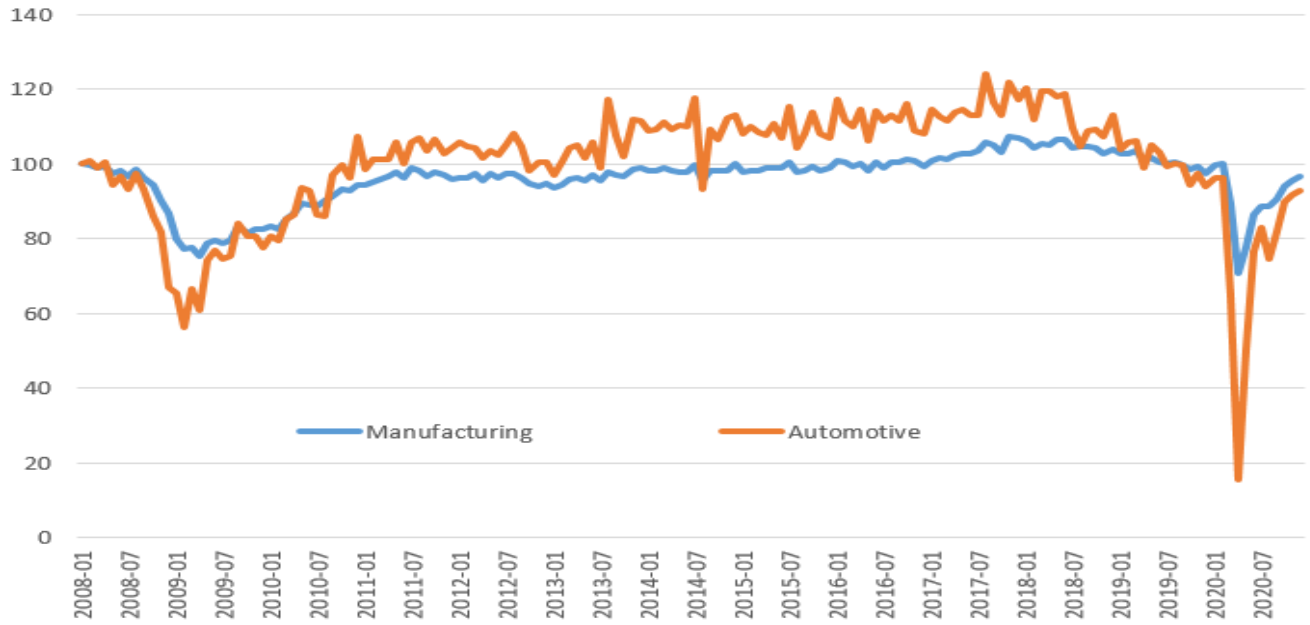
Price-, seasonal- and working-day-adjusted gross value added; index: year 2019 = 100



Sources: Federal Statistical Office; own calculations

Figure 2. Corona-crash in German manufacturing industry

Seasonally and working-day-adjusted production; index January 2008 = 100



Sources: Deutsche Bundesbank; own calculations

The slump in the German automotive industry was even more pronounced (Figure 2). During the global financial market crisis, the automotive industry lost over 40 percent of production (February 2009 versus August 2008). By contrast, the automotive industry almost came to a standstill during the Corona crisis, with an output-drop of over 80 percent (April 2020 versus February 2019). It was also the case for other parts of the manufacturing sectors that the more strongly the subsectors were linked with the automotive industry, the more severe the production declines were. The almost complete halt in production in the automotive industry was central to the intensification and extent of the Corona crisis in German manufacturing industry.

The end of the first lockdown in spring 2020, the re-opening of businesses, the fiscal stimulus packages (see Section 2) and the significant calming of the infections in summer 2020 were accompanied by a rapid macroeconomic recovery. In just three months, the manufacturing output gap narrowed from just over –29 percent to –11 percent compared with the pre-crisis month of February 2020. In the automotive industry, the output gap was reduced from just under –84 percent compared with the February level to –13.5 percent in the same period. In December 2020, the output gap (compared with February 2020) was just under 4 percent in both manufacturing as a whole and the automotive sector. In the crisis a decade earlier, it took 20 months in manufacturing and 15 months in the automotive industry to regain around 95 percent of the pre-crisis production level (Figure 2).

However, when assessing and interpreting the German manufacturing sector in the wake of the Corona pandemic, it should also be noted that German manufacturers have already been in decline since the end of 2017 (see also Figure 2). The last peak in manufacturing production was in November 2017, and manufacturing output has been in continuous decline since May 2018. The same applies to the automotive industry. Between the peak of the last upswing in November 2017 and February 2020, the last month before the immediate onset of the Corona crisis, manufacturing output already fell by almost 7 percent, and that of the automotive industry by more than 20 percent.

Since the manufacturing downturn in Germany had already begun before the Corona crisis, a normal capacity utilization of existing production factors can only be achieved once the immediate effects of the Corona crisis have been overcome. For the manufacturing sector, in contrast to a number of service sectors, it is also a matter of overcoming not only the Corona crisis but also the adjustment burdens that have already had an impact beforehand – for example, as a result of protectionism, decarbonization, digitalization (Grömling, 2017; 2019; 2021). Nevertheless, it should be borne in mind that the Corona pandemic may also trigger long-term structural changes in the service economy, according to which a return to the former level of the output potential should not be taken for granted either.

5. Hibernation instead of recovery

Many economies around the globe have been in the midst of a second wave of infections since autumn 2020, triggered by the COVID-19 corona virus and exacerbated by mutations of the virus. This resurgence of infections has also interrupted the strong recovery that had begun in early summer 2020. However, in order to break the second wave, restrictions on social and economic life have once again been initiated in the European countries. As of mid-February 2021, it remains to be seen whether these measures and corresponding behavioral changes will also be able to stop and noticeably reduce the renewed incidence of infection. There are still fears that the first quarter of 2021 could be marked by high strains on the healthcare systems. This second wave would trigger another stop-and-go in economic activities. Supply and demand shocks could once again accumulate into macroeconomic slumps. Nonetheless, the approvals of vaccines and the vaccination rollout that is now underway are once again creating confidence that the pandemic will be sustainably contained in the course of 2021.

This complex epidemiological situation – in addition to economic and geopolitical determinants – forms the background for current economic forecasts (Bardt/Demary et al., 2020). At present, an economic forecast must develop and incorporate an idea of how the course of infection may be over the forecast period. Furthermore, ideas about possible political reactions to the assumed course of infection must be developed. This makes it clear once again that an economic forecast is based on a large number of assumptions (Bardt/Demary et al., 2020).

Negative growth is expected for the German economy in the first quarter of 2021 (compared with the fourth quarter of 2020). The dampening effects are likely to dominate overall, with economic output even falling below the level of the third quarter of 2020. The negative effects resulting from the return of VAT to its normal level of 19 percent are having an impact. The internationally tense infection situation is also dampening exports, although the German manufacturing industry has made a relatively robust start into 2021. The temporary school closures may make overall economic production processes less efficient. Last but not least, it should be borne in mind that the state of health is generally weaker in the first quarter of a year and thus susceptibility to infectious diseases is generally higher. As a result of this macroeconomic weakness, labor input will decline because of short-time work, restrained hirings and job losses in the service sector.

These negative economic adjustment burdens resulting from the renewed sharp rise in infections at the turn of 2020/2021 are expected to be concentrated in the first quarter of 2021. As the weather improves, the susceptibility of the population decreases. Vaccinations beginning in the first quarter of 2021 will show their positive effects on the healthcare system and other critical sectors with a time lag. Overall confidence and safety increase as vaccination progresses. This will allow pent-up consumption (also supported by continued high savings and tax reliefs) and the catch-up on postponed investments to take effect strongly. All this applies not only to the German economy, but also to our trading partners – especially the hard-hit countries in Europe. As a result, export business will also receive a strong boost again from spring 2021 on. Over the summer of 2021 as a whole, the positive effects – above all on a global scale – are likely to consolidate and gain "drive".

6. Long shadows of the pandemic

In addition to this rather short-term economic dimensions of the pandemic, the question arises as to what lasting effects seem possible. Following Grömling (2021), some considerations are given to the long-term effects of this global pandemic for Germany. The table summarizes a number of possible long-term effects of the Corona pandemic. The main focus is on the possible impact on the macroeconomic production potential, i.e., the endowment of an economy with labor, physical capital (including infrastructure and intangibles), human capital, natural capital and the diverse stock of technical knowledge.

Table 1. Long-term effects of the corona pandemic – an orientation

Positive effects	Negative effects
• Openness to innovation	• Scarring effects: education, labor market, investments Investitionen
• Push for digitization	• Deleveraging
• Human capital promotion	• Structural unemployment
• Impulses for public infrastructure	• De-Globalization
• Stability of value added chains	• Protectionism / geopolitical tensions
• Technological sovereignty	• Growing state influence
• Risk diversification	• Market criticism
• Start-up of new companies	• Market concentration

Source: Grömling (2021)

Impact on labor input: In historical pandemics, immediate and in particular long-lasting impairments of the labor supply had occurred (Jordà et al., 2020). Up to now, health impairments and deaths resulting from the Corona pandemic have been concentrated primarily among the elderly. Accordingly, the direct macroeconomic labor supply effects in Germany are likely to be small. However, frustration among young people about limited learning, study and work opportunities as a result of the pandemic can cause long-lasting damage to the growth potential – via the effects on labor market integration and the incentives for human capital formation. Research (Möller/Umkehrer, 2015; Maguire, 2020; Tamesberger/Bacher, 2020) on past economic crises shows that the curricula and associated lifetime earnings of young people who become unemployed or have a more difficult time entering the labor force during a recession are affected over the long term ("scarring effects"). Studies (such as Fuchs-Schündeln et al., 2020) affirm that missing school can permanently reduce the skill development and future labor market success of affected children.

Another possibility for lasting damages to the growth potential as a result of the pandemic is that pre-crisis geopolitical threats and protectionist attitudes are reinforced. This may inhibit cross-border labor allocation and international knowledge transfer – for example, via limited opportunities and reduced incentives for training and work experience abroad. If the pandemic and a less open global economy lead to restricted migration of skilled workers in the long term, demographically induced output gaps will increase.

Furthermore, it is possible that the Corona pandemic will reinforce structural changes (Grömling, 2017; 2019). The effects of digitalization, the energy transition, decarbonization, and demographic change should be considered in this context. With regard to social adjustment burdens, it is relevant whether there are long-term problems for the labor market as a result of structural changes. High structural unemployment means that two central factors of production – labor and human capital – are not being used adequately, and thus growth opportunities are being wasted. Employees with certain skills are no longer in demand in certain areas in the wake of changes in preferences and technology, or even as a result of the pandemic. And this raises the question of whether these skills can be used in other sectors of the economy. If such a transformation does not occur, there might be a permanent mismatch between the qualifications of the redundant workforce and the requirements of the companies.

Impact on capital formation: The dependencies that have become visible in parts of the German economy – for example, through a lack of foreign or domestic inputs in the manufacturing but also in the service sector – have increased the pressure to search for alternatives. On the one hand, restructuring production processes, such as shifting value-added components back to Germany or Europe, can increase companies' production costs – as a result of their own higher vertical integration or broader-based inventory management (Barrero et al., 2020). On the other hand, this sets corresponding incentives for increased domestic capital formation.

The pandemic may reinforce investment in public infrastructure. The crisis has revealed the great potential – for example in schools, healthcare or public administration – for digitizing services and production processes. The current crisis may accentuate pre-existing investment needs (Bardt/Dullien et al., 2020) and trigger a corresponding wave of capital formation.

However, Kozlowski et al. (2020) point out how a tail risk – here with reference to the Corona pandemic – that has so far been assigned only a very low probability can change long-term investment behavior. In the version of Kozlowski et al. (2020), such tail events lead to "scarring effects" among investors. The occurrence of the Corona pandemic – even if it will be fought by a vaccine – will thus be taken into account by companies in their future investment decisions. If the pandemic leads to a lower return on capital in the short term, then future returns on capital will also be forecast against the background of this tail event. This "scarring of beliefs" would then dampen the propensity to invest in the long term and thus the development of the production potential.

High levels of uncertainty can affect not only companies' propensity to invest but also their financial resources. This applies to both equity financing and debt financing. Declining turnover and falling profits or rising losses directly eat away at companies' equity resources. Rising debt in the crisis years 2020 and 2021 will increase medium-term repayment burdens. Rising insolvency risks will inhibit the granting of loans by banks and make investment costs more expensive through higher risk premia. Although the

German government's economic stimulus package includes measures to stabilize corporate financing (see Section 2), it cannot be ruled out that the efforts required in the coming years to improve companies' balance sheets („deleveraging") will dampen investment activity (Demary et al., 2021).

Impact on technological progress: With the abrupt, in some cases even complete, suspension of normal operations in the second quarter of 2020, new technological fallback options – such as working or studying from home – were practiced at high speed. Some of the earlier technological resistance has apparently been overcome, and the lasting effect may be a greater openness to innovation in business and social life. Such behavioral changes can permanently increase both human capital and the stock of technological knowledge, and possibly also bring about stronger growth in the future. Last but not least, this can also be reinforced by influencing young people's educational decisions and risk awareness in a positive way. One could think, for example, of a higher affinity for technical or scientific careers, which could be reflected in a higher rate of technological progress in the future.

The digitization of economies is likely to have experienced an additional and lasting boost as a result of the pandemic (Klös, 2020). To compensate for the restrictions on labor input as a result of the lockdown, companies and private households have invested in technical equipment. This capital stock and, in particular, the intangible components such as the organizational capital that has been created (see Grömling, 2020a) continue to be available. To some extent, individual measures of the German government's economic stimulus package are also fostering technological progress in Germany. Experience from the financial market crisis of 2008/2009 indicates that some of the research staff underemployed as a result of the crisis had used their working time to improve existing production and organizational processes to a greater extent. This permanently increases intangible assets and the level of technical knowledge.

Technical progress, as well as capital formation, also depend on the creation of new companies. The Corona pandemic has made this very clear, for example, for the field of biotechnology. Venture capital is of great importance for the development of modern production potentials. Overall, the Corona crisis has not only raised the need for a rapidly effective stabilization policy, but has also fostered the call for industrial policy. The goal is to actively shape the sectoral structure of an economy. Security policy arguments are put forward in this regard. In strategic areas (e.g. military, health) and in critical infrastructures (e.g. communications networks, energy supply), economic dependencies on other countries – and possibly on their state monopolies – are to be prevented. In this context, there is also a call for technological sovereignty. This is intended to avoid political dependencies and ensure state sovereignty. Sectoral structural policy could be justified because of allocative market failure: Basic research – for antibiotics or a Corona vaccine, for example – can be understood as a public good. Accordingly, private-sector research has positive externalities for other firms, and thus government funding of research can prevent undersupply by the market. In addition, structural policy in the meaning of promoting "industries of the future" is cited as a justification for research and technology policy.

However, the list of arguments against governmental structural and industrial policy is just as long (Grömling, 2020b). Subsidizing certain industries to improve their production conditions always discriminates against industries that do not benefit. Moreover, distortions of competition occur internationally, possibly provoking reactions (tariffs or import quotas) from other countries and, as a result of rising transaction costs, affecting overall welfare. Sectoral structural policy presupposes information asymmetries – in order to avoid long-term structural and allocative distortions because the factors of production are not used in the most efficient way: The state should therefore have to have better knowledge of the socially desired supply of goods than private-sector companies. The current discussion on the automotive technologies of the future may illustrate the problem. The long-term effects of an industrial or structural policy on a country's factor stocks ultimately depend on whether the economic structures it promotes are competitive and viable in the long term. In any case, industrial policy interventions always entail the risk of structural conservation, which in turn can inhibit innovation and the associated structural changes.

7. Shaping the structural change inclusive

The German manufacturing sector was initially the most affected sector by the Corona pandemic in spring 2020. After that, however, a remarkable recovery set in. Some manufacturing companies will still not fully return to pre-crisis levels in 2021. Above all, this recovery process will also be accompanied by the structural adjustments that have been effective for some time. Digitalization, demographic change, climate change and decarbonization as well as geopolitical changes pose permanent challenges. The Corona pandemic will possibly accelerate those structural changes. In the present paper, some considerations have been made as to what changes in the production potential may occur as a result of the Corona crisis. Against this background and the risk of structural unemployment (see Section 6 and Grömling, 2020b), the openness of labor markets and the education system will play a central role in the coming years (Grömling/Klös 2019). Such institutional choices will be crucial in determining whether the upcoming structural changes, possibly forced by the Corona pandemic, will be inclusive or not.

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