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PRODUCTIVITY: CORONAVIRUS CRISIS AND STRUCTURAL CHANGE

This is a translated version of the original German-language chapter 'Produktivität: Corona-Krise und Strukturwandel', which is the sole authoritative text. Please cite the original German-language chapter if any reference is made to this text.

KEY MESSAGES

↘ Unlike in previous recessions, job losses and the number of business closures fell during the coronavirus crisis, leading to a decline in reallocation dynamics. A substantial catch-up effect is currently not anticipated.

↘ To support structural change, the business environment for start-ups, orderly market exits and labour mobility should be improved.

↘ A coherent strategy and the setting of priorities, such as steps to secure access to data and technologies, are required in order to unlock the potential of accelerated digitalisation.

SUMMARY

The **reallocation of production factors** from firms and economic sectors with low productivity to those where it is higher **makes a substantial contribution to overall productivity growth** and structural change. The establishment of new viable businesses and the market exit of less productive firms play an important role here, as does the movement of employees between individual firms, economic sectors and regions.

In previous recessions in Germany, there has typically been an increase in the **reallocation rate**. **However, since the onset of the coronavirus pandemic**, the trend in Germany has been **atypical**. A wide range of government measures, such as the suspension of the obligation to file for insolvency, support measures for firms and the extension of the short-time working scheme were put in place to bridge the temporary coronavirus shock, with the aim of maintaining viable firms and jobs. This is likely to have contributed to the fall in the number of businesses exiting the market and the number of jobs lost, compared with previous recessions. An increase in business exits when the support measures end is to be expected, if at all, primarily among small and micro-enterprises, but this is likely to be limited in terms of numbers and only have a minor effect on the economy as a whole.

It is still too early to tell to what extent the pandemic will lead to lasting structural change or changes in productivity growth. To promote productivity growth, however, it is important to support the efficiency of the **market-based reallocation mechanism**. This requires improvements to the business environment to enable the establishment of viable firms and the orderly market exit of firms with low productivity. It also makes sense to strengthen the continuing professional development and reallocation of workers, while putting in place measures to cushion potential social hardship.

The **coronavirus pandemic** has brought about **advances in digitalisation** and has significantly boosted demand for data-driven services. In Germany, the development of digital platforms and their widespread use is hampered in particular by a shortage of staff to develop digital business innovations and by security concerns regarding the storage of sensitive content by external cloud providers. The promotion of the **development of a data-driven economy** requires a coherent strategy with milestones for the business environment created by the government. In particular, secure data access and trading and – in view of the growing trend towards market concentration – effective and fair competition on digital marketplaces need to be ensured, as is intended with the Digital Markets Act. To strengthen technological sovereignty, the digital single market should be deepened, the data infrastructure further developed in accordance with European standards and digital skills and innovation should be promoted.

I. EFFECTS OF THE CORONAVIRUS CRISIS ON PRODUCTIVITY

382. The coronavirus crisis hit the developed economies during a phase of **historically low productivity growth** (GCEE Annual Report 2019 items 157 ff.; GCEE Annual Report 2020 items 88 ff.). Due to the stabilisation measures introduced in Germany last year, the number of people in employment and the volume of work initially decreased at a slower rate than gross value added, ↘ GLOSSARY which meant that labour productivity declined for a time. Although this decline was only **temporary**, ↘ CHART 100 the pandemic could still have a number of **permanent effects** on the structure of the economy and on productivity growth. In its role as National Productivity Board, this year the German Council of Economic Experts has analysed the short and medium-term effects on productivity growth of the **coronavirus crisis** and of the mitigation measures implemented in response. The **reallocation** ↘ BACKGROUND INFO 10 of production factors ↘ GLOSSARY such as labour and capital plays an important role here, i.e. the change in the distribution of production factors **within and between economic sectors**. ↘ ITEM 387 Positive impetus for future productivity growth is expected to come from **data-driven value creation**, which is likely to have received a boost from advances in digitalisation achieved during the coronavirus crisis. ↘ ITEM 438

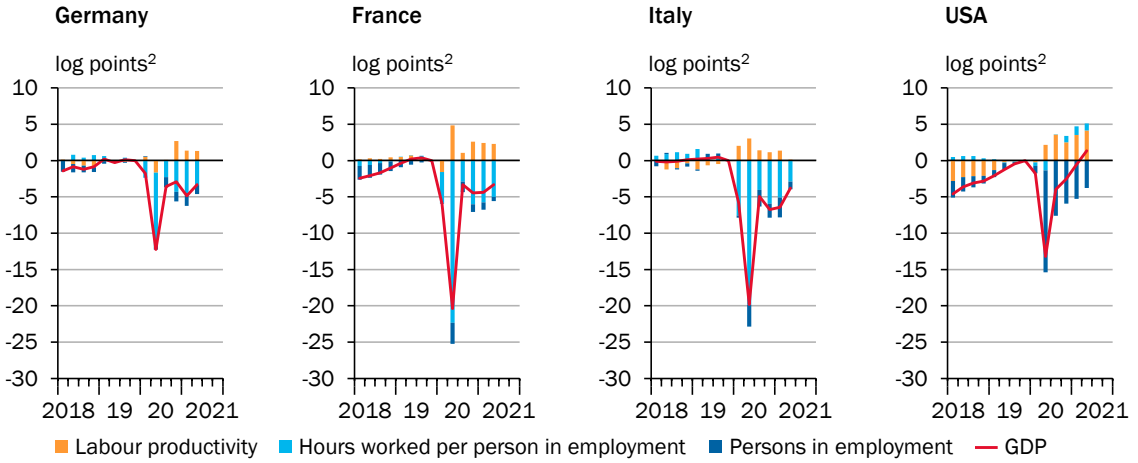
383. The recession triggered by the **coronavirus crisis** is unlike previous recessions. ↘ BOX 5 ↘ ITEMS 197 FF. There were unexpected simultaneous **shocks** to **supply** and **demand** resulting from factors such as supply chain disruptions and government-mandated business shutdowns on the one side, and pandemic-related changes to consumer behaviour and loss of income on the other. These shocks **affected** different **sectors of the economy to varying degrees** (Gourinchas et al., 2020). ↘ ITEM 388 While real-term gross value added fell by a total of some 4.9 % in 2020 compared with 2019, the decline was far greater in sectors such as hospitality (down by more than 40 %) and for other service providers (down by more than 10 %). Retail/wholesale and construction actually grew slightly. A similarly mixed picture across different economic sectors was also seen in other countries (Conseil National de Productivité, 2021; David, 2021).

384. **The coronavirus pandemic** could have **permanent effects** as a result of lasting changes in consumer behaviour, changed hygiene standards, new production technologies introduced during the pandemic and a reassessment of risk in supply chains. Like these changes, the **structural change** brought about by the digital transformation and the need for carbon-neutral energy sources will affect individual firms and economic sectors differently. ↘ ITEM 538 The **reallocation of production factors** from firms and economic sectors that are negatively impacted by these changes to those that are able to benefit from them is a **significant factor for macroeconomic productivity growth**. ↘ ITEM 387 This process is largely driven by new business formation ↘ GLOSSARY and closures, and by the growth of existing firms. During the pandemic, however, the reallocation rate was dampened. There was a decrease in the number of business

↘ CHART 100

Coronavirus pandemic led to a decrease in hours worked per person in employment in Europe and to a decrease in employment in the USA

Contributions of volume of labour and labour productivity to changes in GDP relative to 2019Q4 (pre-crisis)[1]



1 – The relation between the variables examined is as follows: dlog(GDP) = dlog(persons in employment) + dlog(hours worked per person in employment) + dlog(labour productivity). 2 – Difference to 2019Q4 in log points.

Sources: BLS, OECD, own calculations

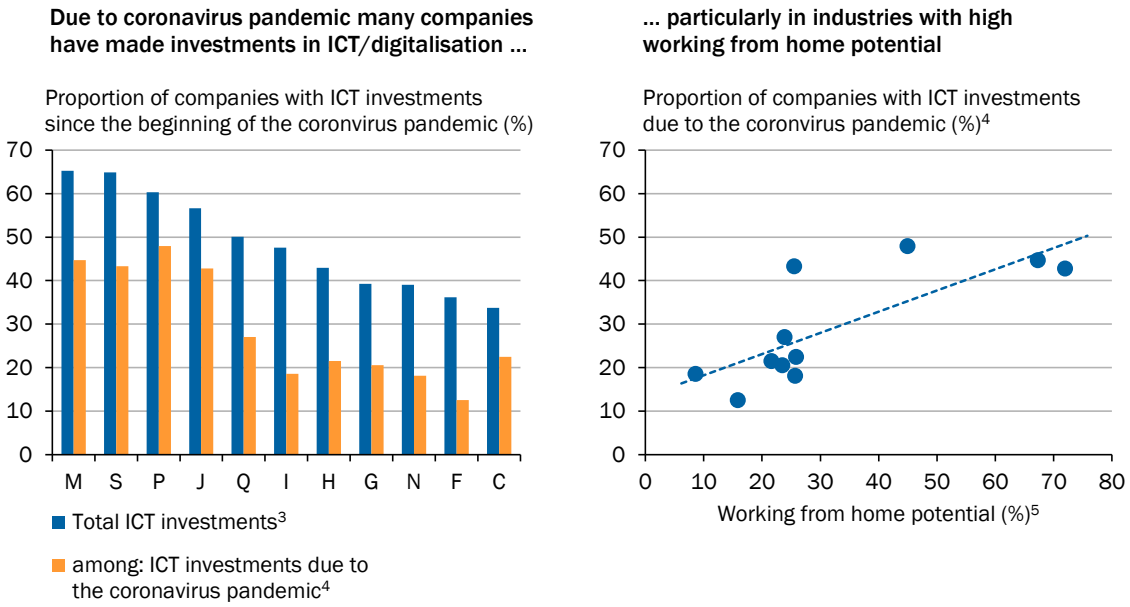
exits, insolvencies ↘ ITEM 396 and businesses entering the market ↘ ITEM 406 as well as in terminations of employment relationships. ↘ ITEM 410 FF.

385. Through the slump in consumer-oriented services (GCEE Annual Report 2020 item 29), restriction of social contacts and voluntary behavioural changes, the pandemic has **increased the demand for digital and data-driven products and services**, ↘ ITEM 438 a change that is reflected, for example, in the increased use of digital platforms. ↘ ITEM 447 FF. It is to be assumed that digitalisation played a central role in cushioning the decline in economic output during the lockdowns and in accelerating the economic recovery when restrictions were lifted. At the same time, the pandemic also exposed weaknesses and showed that Germany has a lot of ground to make up in terms of its digital transition (GCEE Annual Report 2020 items 524 ff.). In addition to potentially longer-term adjustments in consumer behaviour, there were also many changes in production processes as a result of the switch to working from home and investment in digital technologies (Bellmann et al., 2021; Zimmermann, 2021; GCEE Annual Report 2020 items 545 ff.). ↘ CHART 101 This is likely to have a long-term impact on the use of digital technologies in many firms.

386. Information and communication technologies (ICT) are general purpose technologies that are used in many economic sectors. Innovations in ICT therefore have particular potential to increase productivity and growth across the whole economy. In the United States in particular, they have been drivers of growth in labour productivity since the 1990s, although in Europe the role played by ICT in boosting productivity has been lower (Gordon and Sayed, 2020; GCEE Annual Report 2020 items 562 ff.). The extent to which the **data economy** ↘ GLOSSARY **contributes to increased productivity** in the wake of the coronavirus

↘ CHART 101

Investments in ICT/digitalisation[1] since the beginning of the coronavirus pandemic in selected industries[2]



1 – According to the IAB establishment survey (BeCovid study). 2 – According to the statistical classification of economic activities in the European Community (NACE Rev. 2). M-Professional, scientific and technical activities, S-Other service activities, P-Education, J-Information and communication, Q-Public administration and defence; compulsory social security, I-Accommodation and food service activities, H-Transportation and storage, G-Wholesale and retail trade; repair of motor vehicles and motorcycles, N-Administrative and support service activities, F-Construction, C-Manufacturing. 3 – Proportion of companies which have made investments in ICT/digitalisation since the beginning of the coronvirus pandemic (as of: February 2021). 4 – Proportion of companies which have made investments in ICT/digitalisation due to the coronvirus pandemic (as of: February 2021). 5 – Proportion of employees who could potentially work from home.

Sources: IAB, OECD (2021a), own calculations

pandemic will depend on the right conditions being in place in Germany and the rest of Europe and on the efforts made by firms to increase their use of digital technologies.

II. REALLOCATION AND PRODUCTIVITY GROWTH

387. The **reallocation of production factors** from firms or sectors of the economy with low (marginal) productivity to those where it is higher makes a substantial contribution to overall productivity growth (Foster et al., 2001, 2006, 2008). Business start-ups, the growth of young firms and business closures play an important role in the reallocation process (Haltiwanger, 2017; Garcia-Macia et al., 2019; Klenow and Li, 2021). Frictions that inhibit efficient reallocation can thus significantly slow productivity growth.

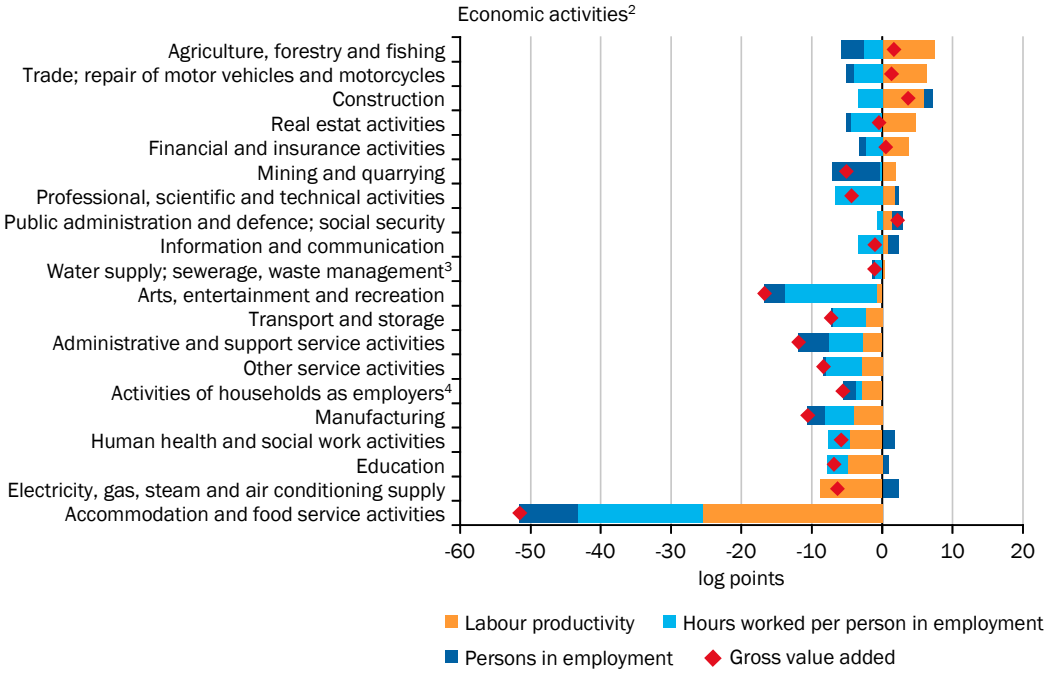
388. The recession triggered by the **coronavirus pandemic differs from previous recessions in several dimensions**, which also makes the reallocation dynamics associated with the recession different. Unlike the financial crisis of 2008 and 2009, for instance, this recession was not caused by a structural misallocation of resources, but by an **exogenous supply and demand shock** (Gourinchas et al., 2020; Conseil National de Productivité, 2021). In addition, the impact of the coronavirus pandemic has been quite different across firms and economic sectors, and accordingly has affected their productivity in very different ways. ↘ CHART 102 Because of the structural changes to consumer behaviour and production technologies, for example through increased online shopping or working from home (GCEE Annual Report 2020 items 557 ff.), **differences in the impact of the coronavirus pandemic on individual firms and sectors of the economy** are expected to persist.

In many areas of the economy, economic output initially suffered a massive slump, ↘ BOX 6 although in most sectors this sharp decline was only temporary. In the short term, state support for viable firms ↘ GLOSSARY with temporary liquidity problems is likely to have helped to retain productive firm-specific capital and human resources. Firms that are able to generate sufficient income to service their liabilities in the long term are considered to be viable. In the medium term, positive effects of the **reallocation process** for productivity growth will depend

↘ CHART 102

Heterogeneous evolution of gross value added, volume of labour and labour productivity across economic sectors in Germany during the coronavirus pandemic[1]

Difference in annual figures for 2020 and 2019 in log points



1 – The relation between the variables examined is as follows: dlog(gross value added) = dlog(persons in employment) + dlog(hours worked per person in employment) + dlog(labour productivity). 2 – According to the classification of economic activities, 2008 edition (WZ 2008). 3 – Including remediation activities. 4 – Including undifferentiated goods- and services-producing activities of private households for own use.

Sources: Federal Statistical Office, own calculations

in particular on whether production factors move to firms with higher relative demand or lower relative costs.

1. The role of recessions in the reallocation process

389. Experience from previous recessions may help to gauge the medium-term impact of the coronavirus pandemic on productivity growth. One positive effect of **recessions** discussed in the literature is that they increase the **pressure** on low-productivity businesses **to adapt**. These businesses cut jobs or exit the market completely, thereby freeing up production factors that can be used by more productive businesses (Schumpeter, 1939; Caballero and Hammour, 1994; Clementi and Palazzo, 2016). In addition, the cost of recruiting new staff can fall during periods of high unemployment, making it easier for productive businesses to hire employees. Furthermore, when demand is low, revenue losses resulting from production plant upgrades are less severe.

390. The literature also discusses **barriers** that can increase reallocation costs during a recession and thus can inhibit the **reallocation process**. For example, an increase in financing costs or a greater reluctance among workers to change jobs can cause reallocation costs to rise in times of recession (Barlevy, 2002, 2003). Economic policy responses to a fall in economic output, such as the expansion of short-time work schemes, can also affect reallocation incentives (Boeri and Brücker, 2011). From a theoretical perspective, it is therefore unclear how the reallocation of production factors and the contribution of such reallocation to productivity growth vary over the course of the economic cycle.

391. In recent years, an extensive body of empirical literature has emerged which examines the **cyclical nature** ↘ GLOSSARY of various reallocation components, particularly the **reallocation of workers and jobs**, ↘ BACKGROUND INFO 10 and their **impact on productivity growth**. In the United States, the contribution to productivity growth of reallocation between existing firms increased during previous recessions, in other words was slightly countercyclical (Foster et al., 2016; Haltiwanger et al., 2021). However, this correlation became very slight during the financial crisis (2007 to 2009). Bartelsman et al. (2019) also show that productivity-enhancing reallocation increased in a number of EU member states during recessions between 2007 and 2015, but that this correlation was reversed during the period from 2009 to 2011, i.e. in the wake of the financial crisis.

↘ BACKGROUND INFO 10

Measuring the reallocation of labour

The reallocation of labour can be measured in a variety of ways, depending on the focus of the analysis. To examine the **intersectoral reallocation** of labour between economic sectors, the sum of the absolute changes in employment shares of the economic sectors is used (David, 2021). ↘ ITEM 413 However, it is not only the reallocation between economic sectors that is important for productivity growth: the reallocation between firms and between establishments within the same economic sector is also key. The change in size of firms and establishments, i.e. the creation and cutting of jobs, represents the sum of the intrasectoral and intersectoral

reallocation. ↘ BOX 24 The **rate of job reallocation** is calculated by adding together the rate of job creation and the rate of job destruction. Business start-ups and closures are responsible for roughly 20 % to 25 % of job reallocation in Germany (GCEE Annual Report 2019 item 183). The **rate of start-ups and closures** is therefore also highly relevant. Even if firms or establishments remain the same size, the allocation of labour can change if individual workers move between firms or establishments. This can increase productivity through better matching of workers to firms and establishments. This type of reallocation is measured by the **rate of worker reallocation**, which is calculated by adding together the rates of hirings and separations. ↘ ITEM 411 As an increase in the rates of job or worker reallocation can also reflect high levels of movement into or out of the job market, the **excess reallocation rate** is an additional measure that quantifies the reallocation that takes place exclusively between firms. ↘ ITEM 411 The excess reallocation rate is the reallocation rate (the sum of the hiring and separation rate or the job creation and destruction rate) less the absolute net change rate (difference between the hiring and separation rate or the job creation and destruction rate) of employment. So if there were only hirings or only separations, the sum of the hring and separation rates would be equal to the net rate of change and there would be no surplus reallocation. However, if both the hirings and separations were high at the same time, there would be a significant difference between the sum of the hiring and separation rate and the net rate of change and thus the rate of excess reallocation would be high.

392. Research on the **reallocation of capital** over the economic cycle shows that in the United States, such reallocation **falls during recessions** (Eisfeldt and Rampini, 2008; Di Nola, 2015; Eisfeldt and Shi, 2018; Lanteri, 2018; Dong et al., 2020). In a recession, the productivity differences between firms increase (Kehrig, 2015) and so too does the benefit that would be gained from the reallocation of capital. In addition, the price of used capital goods falls (Lanteri, 2018) along with the costs of switching to new production processes (Eisfeldt and Rampini, 2006). However, financial frictions that hinder a reallocation of capital, such as more restrictive lending conditions or adverse selection, are more pronounced in recessions than during an upturn. Combined with search frictions in the market for used capital goods, countercyclical financial frictions can explain why the reallocation of capital falls in recessions despite greater productivity differences (Dong et al., 2020).

393. **Business start-ups and closures** are an important reallocation component, and are particularly relevant for longer-term productivity growth. In the United States, start-up activity and the growth potential of new businesses has tended to fall during recessions (Moreira, 2016; Sedláček and Sterk, 2017). This may well be due to less favourable financing conditions in recessions (Smirnyagin, 2020) and fewer prospects of securing another job if a start-up fails (Garcia-Trujillo, 2021). The findings concerning the cyclicality of business closures are less clear-cut and depend on whether the growth in gross domestic product (GDP), ↘ GLOSSARY the GDP gap or the unemployment rate is chosen as the cycle indicator (Tian, 2017, 2018). While business closures are slightly countercyclical in some specifications, in others they are acyclical, i.e. neither procyclical nor countercyclical. One of the reasons for this is that the probability of a young business closing is significantly

higher than that for an older firm. Thus the business closure rate for the economy as a whole is heavily influenced by business start-ups in previous years, which are procyclical (Tian, 2017).

394. **Lasting reallocation effects** that amplified secular trends such as the decline in employment in manufacturing in the United States were observed in the United States in previous recessions, particularly in the shift of value added and jobs between economic sectors. For example, past recessions in the United States have been associated with a particularly strong and sustained reduction in jobs in manufacturing (Howes, 2020). If the rate of decrease during recessions had been the same as that during upturns, employment in the manufacturing sector would only have fallen from 29 % in 1960 to 16 % in 2019 and not, as is actually the case, to just over 8 %. Furthermore, previous recessions in the United States have been accompanied by a sustained reduction in routine jobs (Jaimovich and Siu, 2020).

395. **Analyses of the reallocation of labour over the course of the business cycle** are also available for **Germany**. Bachmann et al. (2021) show that the **reallocation of workers** ↘ BACKGROUND INFO 10 between establishments has been higher during periods of strong economic growth because of direct movements between operations. Garnadt et al. (2021), in contrast, show in their analysis of **job reallocation** in Germany that economic downturns and recessions in particular have been phases of higher reallocation rates since the mid-1970s. ↘ BOX 24 The **increase** in the rate of job reallocation ↘ BACKGROUND INFO 10 **in past recessions** was caused by greater job losses, although the simultaneous fall in job creation depressed the reallocation rate. Similarly, the rate of business closures ↘ GLOSSARY rose during recessions, while there was little change in the rate of business start-ups during these periods. If the recession sparked by the coronavirus pandemic ↘ BOX 5 were to follow the pattern of past recessions, we could expect an increase in business closures and an increase in job reallocation that would be driven in particular by an accelerated loss of jobs. ↘ ITEM 396

↘ BOX 24

Job reallocation over the course of the business cycle – an analysis for Germany

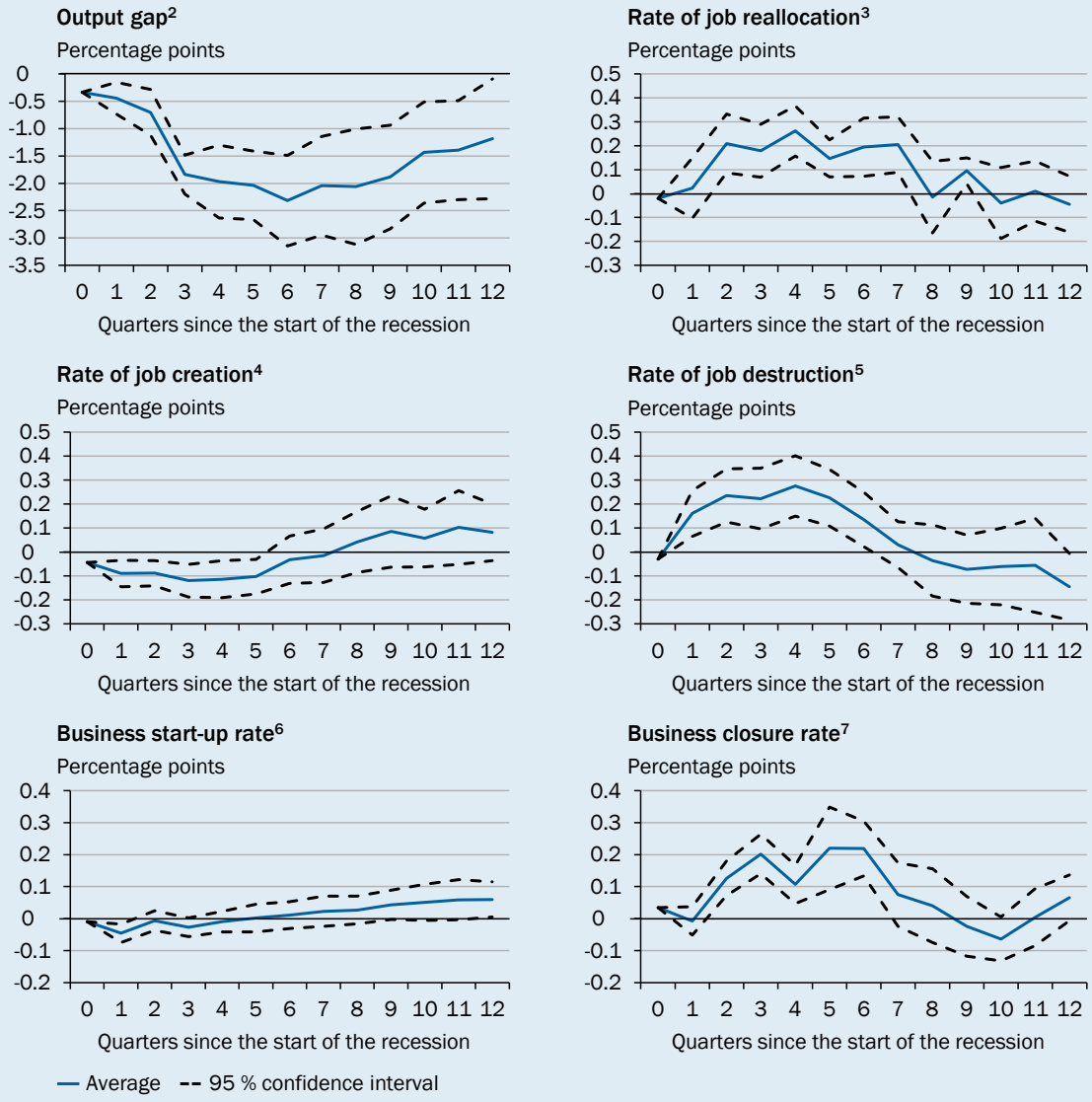
To assess reallocation dynamics during the coronavirus pandemic in Germany, Garnadt et al. (2021) **document how various reallocation indicators behave in different phases of the business cycle in West Germany from 1976 to 2013**. The reallocation indicators ↘ BACKGROUND INFO 10 are calculated on the basis of the publicly available version of the Administrative Wage and Labor Market Flow Panel (AWFP), which provides aggregated quarterly data on jobs created and lost at the level of individual operations and on worker mobility (Stüber and Seth, 2019). The AWFP also enables an approximate calculation of the number of new establishments opened and existing establishments closed. ↘ ITEM 409

To examine the behaviour of reallocation indicators over the business cycle, Garnadt et al. (2021) calculate the correlation between the relevant indicator and GDP. ↘ TABLE 22 APPENDIX To analyse the lead and lag characteristics, the correlation with leading or lagging h-quarter GDP is calculated in addition to the correlation at time t. The **rate of job creation** is procyclical in Germany and leads the economic cycle by three quarters. The **rate of job losses**, in contrast, is countercyclical, showing the strongest negative correlation at a lead of two quarters. At time t, both indicators are strongly positively or negatively correlated respectively with the cyclical

↘ CHART 103

Increase in job reallocation in previous recessions driven by increase in job destruction

Reallocation rate over the course of previous recessions in Germany[1]



1 – Impulse response of each variable to a recession shock that causes the recession indicator to change from 0 to 1. Based on an indicator that assumes the value 1 if a quarter falls in a recession as dated by the GCEE. Calculated on the basis of quarterly figures for the period 1976–2013 in West Germany. 2 – Deviation of GDP from the Hodrick-Prescott trend in percentage points. 3 – Number of jobs created and destroyed between t–1 and t in relation to the total number of all jobs in t. 4 – Number of jobs created between t–1 and t in relation to the total number of all jobs in t. 5 – Number of jobs destroyed between t–1 and t in relation to the total number of all jobs in t. 6 – Number of establishments that had no employees earning above the threshold for social insurance contributions at time t–1 and a positive number of such employees at time t, in relation to the total number of all establishments that had employees earning above the threshold for social insurance contributions at time t. 7 – Number of establishments that had a positive number of employees subject to social insurance contributions at time t–1 and no such employees at time t, in relation to the total number of all establishments that had employees subject to social insurance contributions at time t.

Sources: Administrative Wage and Labor Market Flow Panel (AWFP), Garnadt et al. (2021), Stüber and Seth (2019), own calculations

component of GDP. As the rates of job creation and job destruction are inversely correlated with the business cycle, the **rate of job reallocation** produced by the sum of the two rates is significantly less correlated with the business cycle than the individual components and is slightly countercyclical. The cyclicality of **business start-ups and closures**, ↘ GLOSSARY which are procyclical and countercyclical respectively and which lead the economic cycle by five quarters and three quarters respectively, also fits this picture.

In addition to the correlation of the reallocation indicators with the cyclical component of GDP, Garnadt et al. (2021) also examine how the indicators have behaved in past recessions. For this purpose, **the impulse response functions of the reallocation indicators to a recession indicator** are estimated using the local projection method (Jordà, 2005). The recession indicator indicates whether the German economy is in a recession according to the dating of the German Council of Economic Experts ↘ BOX 5 ↘ CHART 103 The findings of this analysis are consistent with those of the analysis of the cyclicality of reallocation indicators. The rate at which jobs are created falls during a recession by up to 0.14 percentage points and recovers after six to eight quarters. At the same time, the rate at which jobs are destroyed increases by up to 0.42 percentage points and remains slightly elevated until the end of the analysis horizon. In total, the rate of job reallocation during past recessions rises by up to 0.35 percentage points. Past recessions were thus characterised by a higher rate of job reallocation. The analysis also shows there was no significant change in the number of establishments being opened in past recessions. Closures of establishments, in contrast, increased significantly in past recessions with a time-lag of one quarter and returned to the starting level by the end of the analysis horizon.

2. Market exits during the coronavirus crisis

Current market exit rates

396. Based on the experience of past recessions, the massive economic slump in 2020 would have been expected to lead to a sharp rise in **business insolvencies and business shutdowns** ↘ GLOSSARY. In actual fact however, in many economies the number of insolvencies fell (IMF, 2021). In Germany, business insolvencies have declined by an average of 5.3 % per year since 2010, with an even sharper year-on-year decrease since March 2020 when compared with pre-pandemic year 2019. This trajectory became even steeper in the summer months from July 2020 onward. ↘ CHART 104 LEFT In total, there were 15.5 % fewer insolvencies in 2020 than in 2019. Apart from one outlier in March 2021, the insolvency figures for 2021 remained well below their pre-crisis levels in 2019.

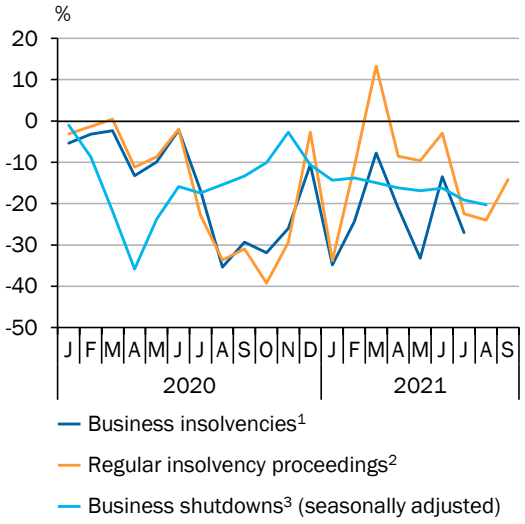
397. However, business insolvencies only account for a portion of the **market exits**. Many businesses do not file for insolvency and instead repay their debts before they exit the market. These market exits can be identified on the basis of the figures for the complete shutdown of the head office of businesses of greater economic importance as recorded in the business notification statistics. These figures do not include micro-enterprises with no employees that are not listed in the commercial register. The number of such business shutdowns is, on average, more than four times higher than the number of business insolvencies. From March 2020 onwards, there was also a clear fall in the number of these business

↘ CHART 104

Decline in market exits during the coronavirus crisis

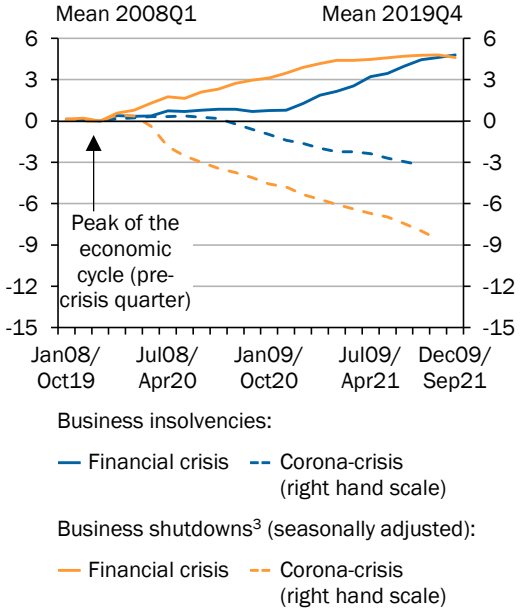
Business shutdowns and business insolvencies since March 2020 significantly below pre-crisis level

Change in % on the same month in 2019



Contrasting market exit trends during coronavirus crisis (decrease) and financial crisis (increase)

Cumulative gap to the pre-crisis average in thousand



1 – Business insolvency requests. 2 – Regular insolvencies filed. In addition to business insolvencies, regular insolvencies also cover individuals who are partners and former self-employed persons whose financial circumstances are categorised as not assessable. 3 – Complete cessation of operations of the main establishment according to business notification statistics.

Sources: Federal Statistical Office, own calculations

shutdowns compared to the corresponding months in 2019, before the onset of the pandemic.

Overall, the indicators show that market exits broadly declined in 2020 and then remained at a low level in 2021. ↘ CHART 104 LEFT **The coronavirus crisis is thus significantly different from the financial crisis**, when both business shutdowns and business insolvencies rose sharply. ↘ CHART 104 RIGHT

Reasons for a decrease in market exits

398. One possible reason **for the decline in business insolvencies and business shutdowns** is the suspension of the duty to file for insolvency under the COVID-19 Insolvency Suspension Act (CovInsAG). The suspension applied from March 2020 to September 2020 where the reason for filing was illiquidity or overindebtedness, until December 2020 for overindebtedness only, and until April 2021 for businesses that had applied for government support during the period from November 2020 to February 2021. Due to the time taken by the courts to process cases, there is typically a time lag of around two months between the date of filing for insolvency and the court decision on the opening of insolvency proceedings (Müller, 2021). Accordingly, the increases in the number

of insolvency proceedings instituted in December 2020 and in March 2021 ↘ CHART 104 could be evidence of a rise in insolvency applications in October 2020 and January 2021 respectively as a result of the partial rollback of the suspension of the duty to file for insolvency.

399. In comparison with the financial crisis, many businesses, especially smaller ones, had **higher equity ratios before the coronavirus crisis** and were thus better protected against insolvency (Peichl et al., 2021). ↘ ITEM 405 In addition, expectations of rapid and very strong catch-up effects resulting in a V-shaped trajectory of recovery following the coronavirus crisis may have enabled businesses to get through this period (Müller, 2021). This was probably made easier by the **state support packages** for firms and the expanded access to short-time work schemes, which are likely to have had a dampening effect on the number of insolvency applications and business shutdowns in general. ↘ BOX 25 Many of the support measures put in place during the coronavirus pandemic, starting with emergency aid, were explicitly targeted at smaller firms. ↘ BOX 11 In contrast, the economic policy measures during the financial crisis, such as the scrappage bonus and the bailout fund (Deutschlandfonds), were aimed more at large firms. This may help to explain the difference between the pattern of business shutdowns and business insolvencies in the two recessions. ↘ ITEM 397

↘ BOX 25

An assessment of coronavirus business support

The primary aim of the **state support measures** introduced during the coronavirus crisis and those that existed beforehand ↘ BOX 11 was and is to support firms experiencing **temporary liquidity and solvency problems**. If these firms are viable in the long term, despite these temporary problems, then temporary support measures can help them to hold on to firm-specific assets such as human resources and intangible assets. Once the temporary problems have been overcome, these firms could play a part in getting the economy back on track. However, if the support is insufficiently targeted, funds may go to firms that would have left the market even without the pandemic, or to firms that are no longer viable in the long term as a result of the pandemic. In the long run, the retention of non-viable firms would most likely translate into **lower productivity growth** and lower overall investment activity. Even if support went only to viable firms, there could be a negative impact on macroeconomic productivity if the support measures distort the allocation of production factors between firms. Fixed thresholds above which firms are entitled to apply for support could lead to firms that are just over the threshold benefiting at the expense of those who are just below it (GCEE Annual Report 2020 item 126). If the measures are too restrictive, however, there is a risk of large numbers of firms leaving the market that have good long-term prospects and whose liquidity or solvency problems are merely temporary.

The absence of insolvencies among small businesses with poor pre-crisis credit ratings documented by Dörr et al. (2021) ↘ ITEM 402 suggests that **in Germany**, the many businesses supported included a number of businesses – in particular **small businesses** – **that already had financial problems prior to the coronavirus crisis.** At the start of the coronavirus crisis, when there was still a great deal of uncertainty about the duration and long-term impact of the pandemic and the focus was on stabilising the economy, it was important to ensure that support was generous and could be accessed easily. **But as economic output normalises**, the concern now is to structure the measures so that **businesses without future prospects** are no longer

supported and **exit the market**.

However, the problem of **asymmetric information** means it is often difficult to identify viable businesses, especially in the case of **smaller businesses**. Larger businesses have to comply with more detailed reporting requirements, and for these businesses a case-by-case assessment including a business forecast is worthwhile because the support payments are higher in absolute terms. In addition, insolvency law, particularly the sections on restructuring procedures, tend to be designed for larger businesses. ↘ ITEM 420 A detailed individual assessment can seem disproportionate for smaller businesses. For these businesses, **the support** is therefore based **on standardised metrics**. In Germany, these include revenue loss at the individual business level and, in some cases, a business' fixed costs. ↘ BOX 11 Because of this structure, to date the support measures have had an individual stabilisation function that cushions not only the coronavirus shock but also individual shocks. Basing support on metrics that are more closely correlated with the coronavirus shock might have been a more targeted way of addressing the temporary liquidity and solvency problems. Because the impact of the pandemic has varied from sector to sector, ↘ ITEM 388 the measures could have been based for example on average revenue losses for a specific sector (Felbermayr and Kooths, 2020; GCEE Annual Report 2020 item 126). This would probably have had a less dampening effect on the reallocation within economic sectors.

Linking the level of support – such as the proportion of fixed costs reimbursed – to **fixed thresholds for revenue loss was also problematic** (GCEE Annual Report 2020 item 126). A sliding scale with no cliff-edge effect might have avoided the hardship cases of firms whose revenue loss was just below the threshold. However, the support was probably designed in this way at least in part because of the requirements of the European Commission's temporary framework for state aid (2020a). This framework has been adjusted several times since March 2020 and for example specifies a revenue loss of at least 30 % as a precondition for the extended fixed costs subsidies. There were further problems with regard to the disbursement of the support payments, with assistance not being received until well after the period of decreased revenue. ↘ BOX 11 In a survey by the ifo Institute of Economic Research, more than 80 % of the businesses surveyed said that **funds from the support packages came too late** (Demmelhuber and Wohlrabe, 2021). This may be due in no small part to the amount of coordination required between the federal ministries and those at regional level. While the support measures were designed centrally, it was the individual states that were responsible for their actual implementation. It may therefore only have been possible to make any necessary adjustments to the support measures with a certain time lag.

Assessing the efficiency of the support measures during the coronavirus crisis **would have required** data to be collected that enabled **the measures to be evaluated promptly**. In France, for example, when the support measures were introduced, a committee that included independent experts was immediately set up to monitor and evaluate the pandemic support measures for businesses (Cœuré, 2021). Its work included analysing the accuracy with which the support measures were targeted, for example with regard to the pre-crisis profitability of the businesses that received support payments. Such analyses should also be made possible in Germany by improving the **availability of data**. It should also be made possible to link data from ministries to data from official statistics. In particular, the availability of linked data on support measures and business characteristics for research purposes would allow economists to better understand the macroeconomic implications of such measures. The resulting **opportunity to strengthen the evidence base for policy measures** would help to ensure that policies can be formulated and implemented in a more targeted and efficient way.

Possible consequences of the current evolution of market exits

400. The **number of business shutdowns and business insolvencies that did not materialise** can be estimated using the relationship between changes in revenue and employment and the business shutdowns and business insolvencies seen in the past. This figure should be seen as the maximum estimate of the **business shutdowns and business insolvencies that may potentially still occur**.

To take account of the **different degrees** to which different sectors in the economy were affected by the pandemic (GCEE Annual Report 2020 box 3; Economic Outlook 2021 item 9) ↘ ITEM 388 and of the differential decrease in the number of business shutdowns and insolvencies **across the various economic sectors**, Garnadt and Other (2021) estimate these relationships in a time series model disaggregated by economic sector. ↘ CHART 126 APPENDIX The number of business shutdowns and business insolvencies is forecast for each economic sector on the basis of the estimated relationships. These are then aggregated to form the total number of business shutdowns or business insolvencies that would have been expected, based on the changes to revenue and employment. By including business shutdowns, this assessment provides a more comprehensive picture of the market exits than an estimate based on business insolvencies alone.

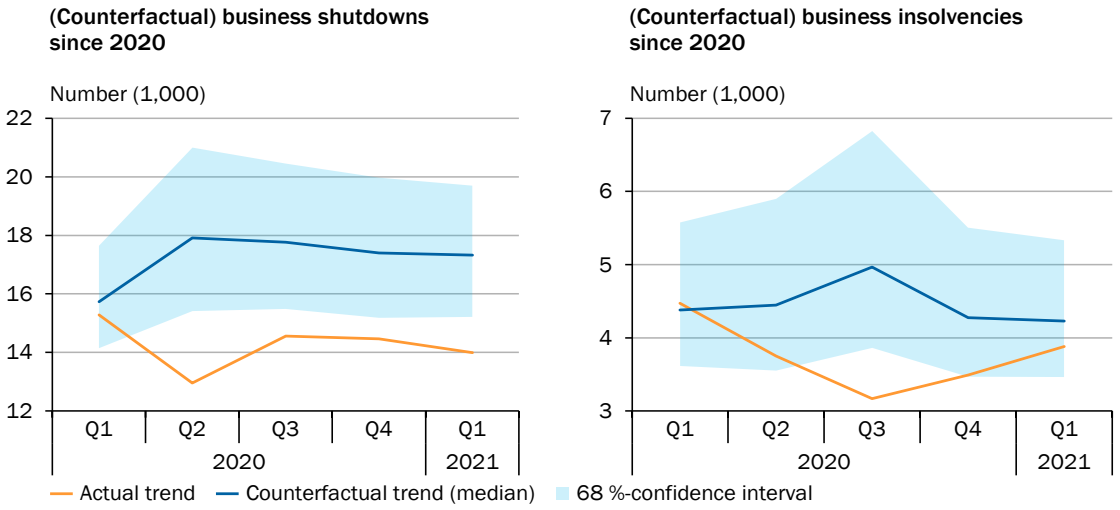
401. In view of the dramatic slump in economic output in 2020, ↘ ITEM 55 ↘ BOX 5 **according to this analysis** a **stable or rising number of business shutdowns and business insolvencies** would have been expected in almost all sectors of the economy. In hospitality, for example, the fall in revenue and employment should have led to an increase in business shutdowns in the second quarter of 2020 and a rise in business insolvencies in the third quarter of 2020. ↘ CHART 126 APPENDIX BOTTOM However, this is not what actually happened. Both figures either remained stable or decreased. Aggregated across all economic sectors, there is an estimated difference of around 3,500 business insolvencies and around 15,000 business shutdowns between the actual figures and the estimated figures for the period from the first quarter of 2020 up to and including the first quarter of 2021. ↘ CHART 105 The estimate of business insolvencies that did not materialise is at the lower end of the insolvency gap estimated in other studies. For example, Dörr et al. (2021) estimate a gap of around 25,000 business insolvencies in 2020. Röhl and Vogt (2020) estimate a gap of between 15 % and 30 % for 2020, depending on economic growth, which would mean 2,400 to 4,800 additional business insolvencies.

When interpreting these figures, it should be borne in mind that the number of **business insolvencies** that **do actually materialise at a later date** is likely to be **lower**. This is because, as intended, the government support measures are likely not only to have delayed business insolvencies but in some cases also prevented them.

402. An analysis of insolvency data differentiated by the size of businesses shows that last year there were fewer insolvencies than would have been expected among **small and micro-enterprises with revenue below €5 million** in

↘ CHART 105

Decline in market exits during the coronavirus pandemic was atypical for an economic downturn[1]



1 – The counterfactual trend of business shutdowns and business insolvencies has been estimated individually for each economic sector using Bayesian vector autoregression (BVAR) models based on the algorithm of Giannone et al. (2015). The models include nominal revenues and employment numbers plus either the complete cessation of operations of the main establishment or insolvencies filed. Depending on the availability of data, the time series are either on a quarterly or monthly basis and the estimation period ends in 2019Q4. Due to presumed delays in the processing of insolvency applications, the figures are shifted by two months.

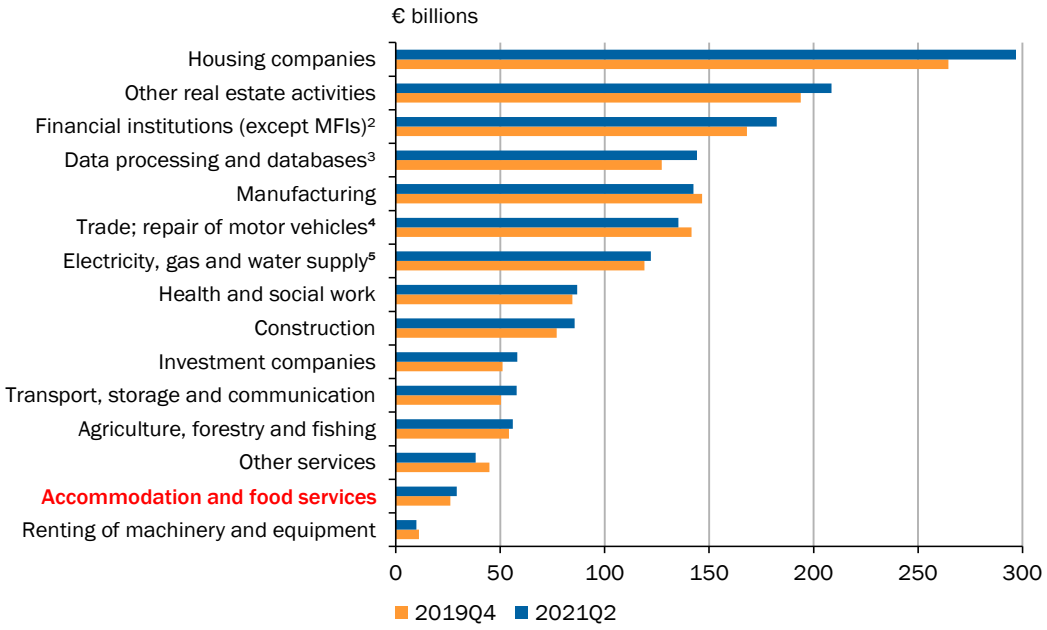
Sources: Federal Statistical Office, Garnadt and Other (2021), own calculations

particular (Creditreform, 2020). Using data on pre-crisis credit ratings, Dörr et al. (2021) show that insolvencies have been avoided in particular by businesses with few employees and weak pre-crisis credit ratings. This suggests that even if the avoided business insolvencies were to occur later, the direct **macroeconomic effects** would probably remain **modest** as the increase in insolvencies would mainly be expected among small and micro-enterprises. Dörr et al. (2021) estimate that any future wave of insolvencies would affect around 25,000 small and micro-enterprises with fewer than ten employees. A rough calculation thus suggests that a maximum of 250,000 jobs would be directly affected by such a wave, which, in a labour force of 46.5 million, equates to a rise in unemployment of just over 0.5 percentage points. As the estimate of the number of business insolvencies that have failed to materialise is at the upper end of the scale, ↘ ITEM 401 the estimate of the resulting effects on the labour market is also an upper estimate. The actual direct labour market effects are therefore likely to be lower.

403. In addition to the direct labour market effects, there could potentially be **indirect effects** that could have a detrimental impact on related **suppliers, customers and banks** if insolvent businesses are no longer able to service their liabilities. This could affect liabilities for inputs procured but not paid for, as well as liabilities to banks. Within the hospitality sector, which has been particularly badly affected by the coronavirus crisis, the trade payables of the smallest businesses included in the statistics (those with revenue of less than €2 million) account for 8.4 % of total equity and liabilities. This equates to approximately €42,500 per business (Deutsche Bundesbank, 2021). However, this statistic only

↘ CHART 106

Low volume of outstanding loans to the accommodation and food services industry[1]



1 – Volume of outstanding loans of all financial institutions in Germany by economic sector according to the classification of economic activities, 1993 edition (WZ 93). 2 – MFIs-monetary financial institutions. 3 – Including research and development. 4 – Wholesale and retail trade; repair of motor vehicles and motorcycles. 5 – Including mining and quarrying.

Source: Deutsche Bundesbank

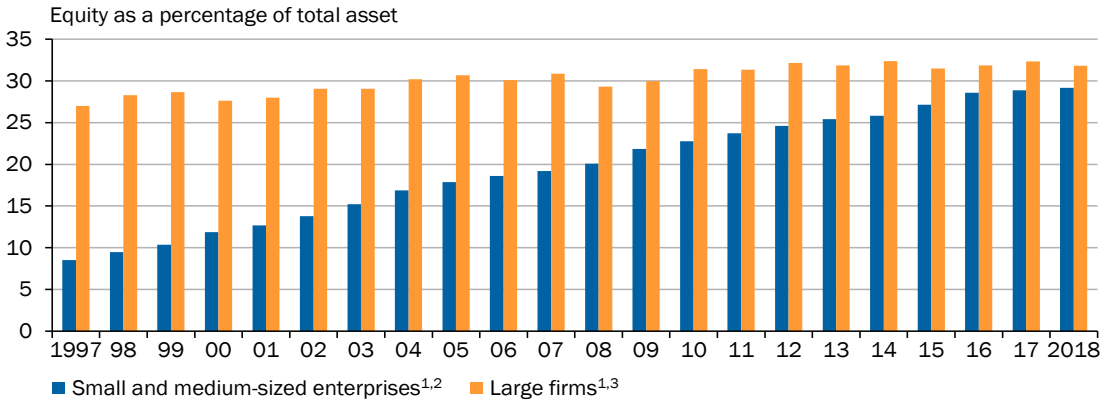
includes businesses that are required to file annual accounts. These tend to be larger and only make up a small proportion of the businesses within the hospitality sector. For this reason, trade payables per firm are likely to be significantly lower in absolute terms for smaller businesses. In addition, the economic sectors worst hit by the coronavirus crisis such as hospitality and in-person services account for only a small part of the banks' credit portfolio. ↘ CHART 106

3. Changes in equity during the coronavirus crisis

404. For many firms, a slump in revenue and profits is likely to have led not only to liquidity problems but also to an **increase in debt** and **a reduced equity base**. In France, for example, an increase in debt has been observed, particularly among firms that were unable to access state support (Doucinet et al., 2021). In a survey by Germany's KfW, around 40 % of German SMEs report a worsening of their equity ratio in 2020. In 2019, the year before the crisis began, this figure was around 15 %. 30 % report an improvement in the equity ratio in 2020, compared with 44 % in the year before the onset of the pandemic (Gerstenberger, 2020, 2021). A decline in the equity ratio can increase the costs of external financing and could lead to many firms initially wanting to strengthen their equity base again once the coronavirus crisis ends, rather than making investments. ↘ ITEMS 542 FF.

↘ CHART 107

Small and medium-sized enterprises experienced a particularly strong rise in equity ratios before the crisis



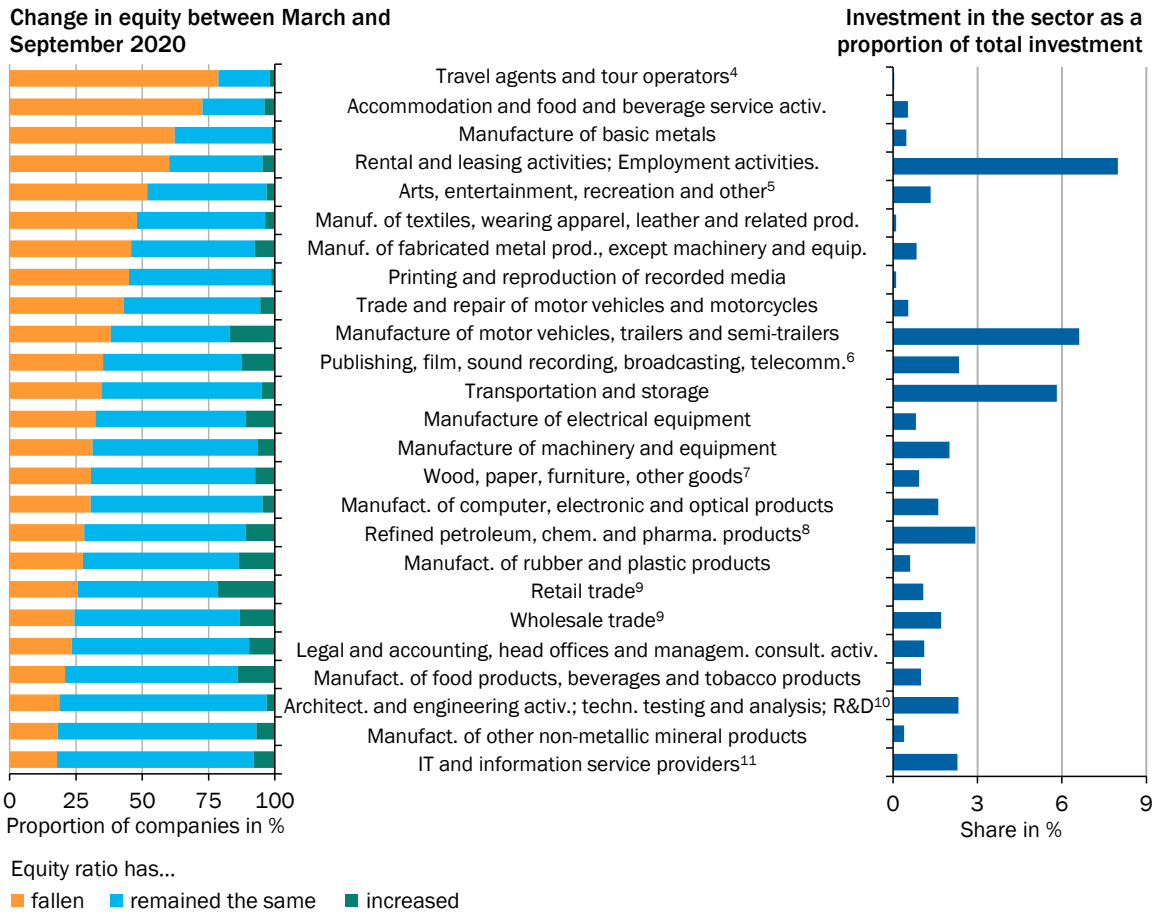
1 – Mining and quarrying, manufacturing, energy and water supply, waste disposal, construction, wholesale and retail trade, transport and storage, accommodation and food service activities, information and communication, and professional services. 2 – Companies with revenue below €50 million. 3 – Companies with revenue of €50 million or more.

Source: Deutsche Bundesbank

405. From a theoretical perspective, the problem of a **debt overhang** could mean a firm not going ahead with profitable investment projects because of its high debt ratio (Myers, 1977). Reduced investment would dampen productivity growth. However, the equity ratio of German firms, especially of small and medium-sized enterprises (SMEs), has gradually improved since the end of the 1990s, which meant that they went into the coronavirus crisis with a **comparatively high level of equity**. ↘ CHART 107 Moreover, it was economic sectors such as travel agents and tour operators that were most likely to see a weakening of their equity position, and these sectors are responsible for only a small proportion of total investment within the economy. One exception is the economic sector involved in the leasing of goods and labour. ↘ CHART 108 The risk of a **strong negative impact on overall investing activity appears** to be **low**. The proportion of firms that are unable to generate enough operating profit to cover their interest payments over the longer term, also known as zombie firms, ↘ GLOSSARY was low in Germany before the coronavirus pandemic, despite the low interest rate environment, and has been on a downward trend since the financial crisis (Deutsche Bundesbank, 2020). These firms also accounted for a very small proportion of economy-wide investments.

↘ CHART 108

Decline in equity[1] most pronounced in sectors[2] accounting for a low proportion of total investment[3]



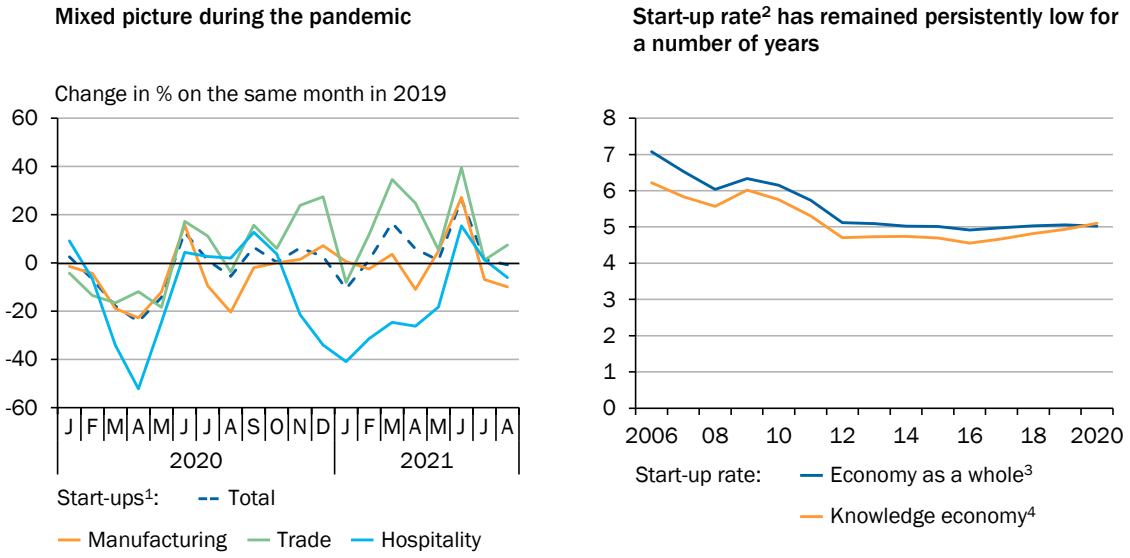
1 – Change in equity ratio according to ifo economic surveys. 2 – According to the classification of economic activities, 2008 edition (WZ 2008). 3 – Share of gross fixed capital formation (new equipment) of the sector in that of all sectors in 2019. 4 – Travel agency, tour operator and other reservation service and related activities. 5 – Art and culture, gambling; sport, entertainment and recreation. 6 – Publishing; audiovisual and broadcasting activities; telecommunications. 7 – Manufacture of wood and of products of wood and cork, except furniture; manufacture of paper and paper products; manufacture of furniture and other products. 8 – Manufact. of coke and refined petroleum products, chemicals and chemical products, basic pharmaceutical products and pharmaceutical preparations. 9 – Except of motor vehicles and motorcycles. 10 – R&D-research and development. 11 – Computer programming, consultancy and related activities; Information service activities.

Sources: Federal Statistical Office, ifo, own calculations

4. New business formation during the coronavirus crisis

406. **The formation of new businesses** is important for job creation, for innovation and for productivity growth (Criscuolo et al., 2014; Acemoglu et al., 2018). Because of their **important role in the innovation** (GCEE Annual Report 2020 items 518 ff.) **and reallocation process** (Dent et al., 2016), start-ups are a core element of both the digital transformation and the transition to a zero-carbon economy. ↘ ITEM 543

↘ CHART 109
Start-up dynamics in Germany



1 – New establishments of a headquarter according to the business notification statistics. According to classification of economic activities, 2008 edition (WZ 2008). 2 – Number of start-ups in relation to existing businesses according to the Mannheim Enterprise Panel. The figures for new businesses established in 2020 are provisional. 3 – Economically active companies in the business economy. 4 – Classification in accordance with the 2012 NIW/ISI/ZEW list (Gehrke et al., 2013). Includes the research-intensive high-tech sector of manufacturing and knowledge-intensive services.

Sources: Federal Statistical Office, ZEW, own calculations

407. Information on the number of start-ups in Germany is provided by data from the statistics of business notifications by the Federal Statistical Office and the enterprise panel of the Centre for European Economic Research (ZEW). Data on business registrations from the business notification statistics show a clear short-term decrease in start-ups at the start of the pandemic in April 2020. The overall number of start-ups subsequently recovered, but the rate varied greatly from sector to sector. ↘ CHART 109 LEFT Hospitality suffered particularly sharp downturns during the various lockdown phases. In contrast, business registrations in retail/wholesale recovered particularly well from July 2020 onwards, and were above the corresponding figures for 2019 in most of the subsequent months. Overall, **in 2020** there was a **moderate decrease in business registrations** of around 3.8 % in comparison with the prior year.

408. The start-up rate, i.e. the number of new businesses in relation to existing businesses, declined in Germany in the 2000s and has remained at a relatively low level for several years (GCEE Annual Report 2019 items 184 ff.; GCEE Annual Report 2020 items 518 ff.). This is true both of the business economy ↘ GLOSSARY as a whole, and for the knowledge economy, ↘ GLOSSARY i.e. research-intensive areas of manufacturing and knowledge-intensive services. ↘ CHART 109 RIGHT In **contrast** to the trend seen so far during the **coronavirus crisis**, the ZEW statistics for start-ups in 2009, i.e. during the **financial crisis**, show an increase in the number of new businesses. However, this was mainly driven by necessity-based start-ups, in other words new businesses started due to a lack of better income alternatives (ZEW and Creditreform, 2021). Many of these newly established businesses were shut down again in the years that followed. During

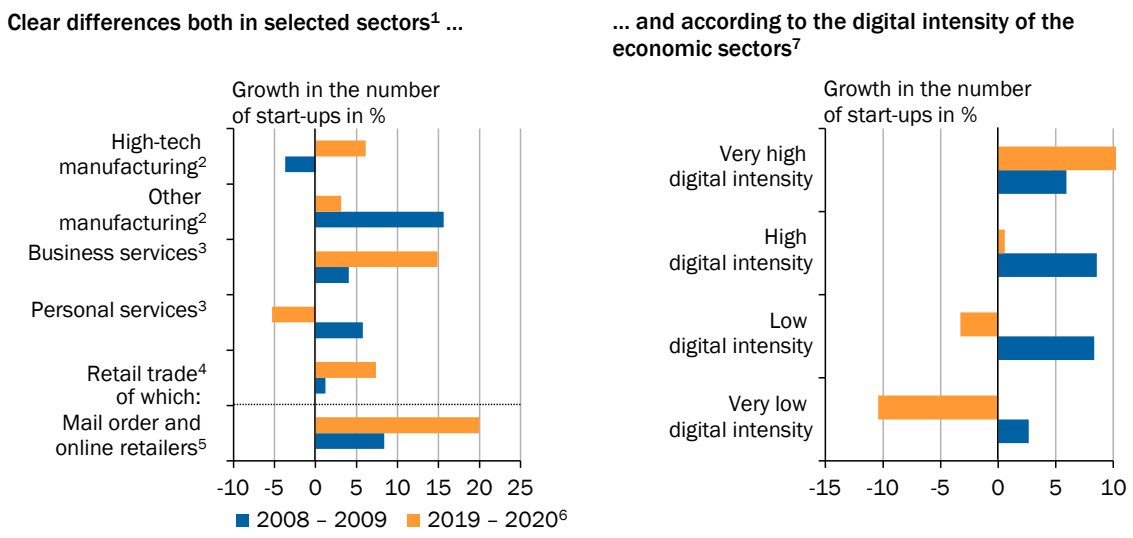
the financial crisis, these necessity-based start-ups frequently occurred in less capital-intensive consumer-oriented services. However, during the pandemic these were precisely the sectors that were especially badly affected by lockdown measures. Accordingly, data on German entrepreneurship ↘ GLOSSARY shows that **in 2020**, the **proportion of necessity-based start-ups declined** relative to the prior year, from 23 % to 16 % (Metzger, 2021a). Conversely, the proportion of **opportunity-based start-ups** – businesses started in order to seize new opportunities – **grew** from 73 % to 80 %.

409. While start-ups in the research-intensive high-tech sector of manufacturing fell during the financial crisis, they increased in 2020. ↘ CHART 110 LEFT Overall, **economic sectors in which the coronavirus pandemic triggered demand growth**, such as in the manufacture of chemical and pharmaceutical products or in mail order and online retail, saw an **increase in business start-ups** (ZEW and Creditreform, 2021). A sharp increase in start-ups in non-bricks and mortar retail during the pandemic was also observed in the United States and reflects the way in which interaction between businesses and consumers has moved online (Haltiwanger, 2021). **Sectors of the economy** that have been particularly **badly affected by the coronavirus crisis**, such as consumer-oriented services, however, saw a **decline in the number of start-ups**.

It can also be seen that **during the coronavirus crisis, business start-ups in digital-intensive sectors of the economy increased** in comparison with the prior year, while they declined in less digital-intensive sectors. ↘ CHART 110 RIGHT For example, one of the highest rises in business start-ups in comparison with the prior year was in the software and games sector (ZEW and Creditreform, 2021).

↘ CHART 110

Start-up activity during the coronavirus crisis in comparison with the financial crisis



1 – According to the classifiaction of economomic sectors, 2008 edition (WZ 2008). 2 – Classification in accordance with the 2012 NIW/ISI/ZEW list (Gehrke et al., 2013). High-tech includes sectors with an R&D ratio above 3 %. 3 – Classification according to Bersch und Wagner (2017). 4 – Except of motor vehicles and motorcycles. 5 – Retail trade not in stores, stalls or markets. 6 – The figures for new businesses established in 2020 are provisional. 7 – According to Calvino et al. (2018).

Source: ZEW

5. The reallocation of workers during the coronavirus crisis

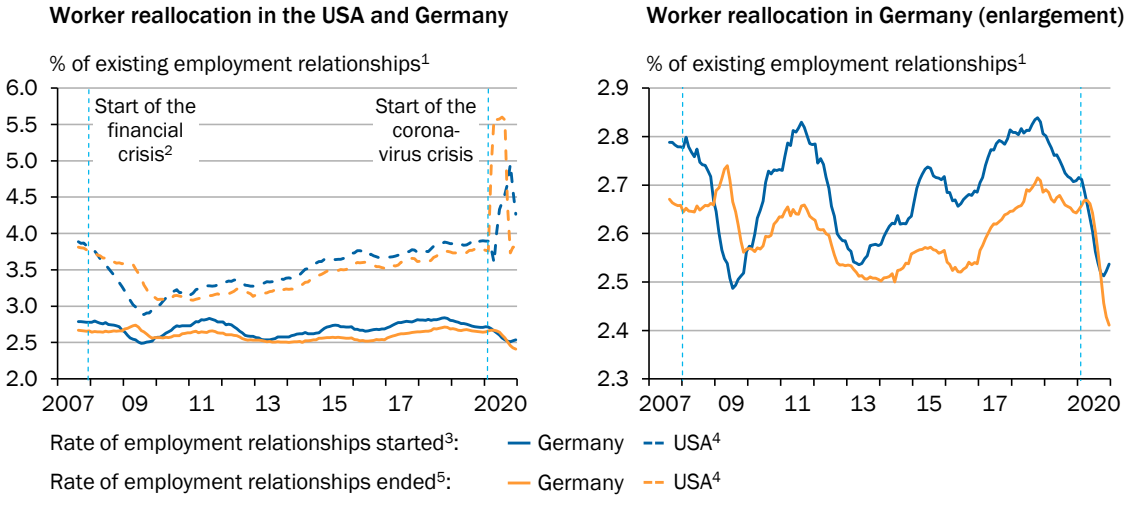
The reallocation of workers at the current juncture

410. Changes to the structure of the economy can also be measured by movements of employees between firms and economic sectors. At the aggregate level, this is shown by the **rate of job reallocation rate**. ↘ BACKGROUND INFO 10 A certain level of reallocation is desirable if it reflects the movement of workers away from less productive economic sectors or firms to more productive ones (Lentz and Mortensen, 2005). In most developed economies, the reallocation of jobs between firms within an economic sector has contributed far more to productivity growth in the last two decades than the reallocation between economic sectors, as the latter was due to the growth of the relatively unproductive service sectors (Dieppe, 2021, Chapter 1; GCEE Annual Report 2015 item 602; GCEE Annual Report 2019 item 184).

411. Moreover, the **reallocation of workers** plays an important role if it improves the matching between employees and firms. ↘ BACKGROUND INFO 10 An analysis of the overall worker reallocation since the start of the coronavirus pandemic shows that in Germany, unlike in the United States, the **trend has been atypical for a recession**. Although there is no recent data for the number of jobs created and lost at the firm level for Germany, an analysis of the employment status of workers

↘ CHART 111

Worker reallocation during the coronavirus crisis rises in the USA and falls in Germany



1 – Six-month moving average. The series are seasonally and calendar adjusted using X-13-ARIMA-SEATS. 2 – Start of the financial crisis dated at December 2007 in the USA and at January 2008 in Germany. 3 – Ratio of the number of jobs above the earnings threshold for social insurance contributions begun between t–1 and t to the number of jobs subject to social insurance contributions existing at t–1. 4 – Excluding employees in agriculture, domestic staff, employees at non-profit organisations and non-civilian employees of the military (nonfarm payrolls). 5 – Ratio of the number of jobs above the earnings threshold social insurance contributions ended between t–1 and t to the number of jobs above the threshold for social insurance contributions existing at t–1.

Sources: BA, BLS, Garnadt et al. (2021), own calculations

earning above the threshold for paying social insurance contributions points to a **sharp fall in the number of employment contracts terminated** between March 2020 and December 2020, which reflects a decrease in the pace of reallocation. ↘ CHART 111 LEFT In addition to the suspension of the duty to file for insolvency and the provision of various state support measures, this unusual development is likely to reflect easier access to short-time working and the expansion of state payments for short-time working (GCEE Annual Report 2020 item 131).

412. In comparison, there was a sharp rise in the number of employment contracts terminated in the **United States labour market** at the beginning of the coronavirus crisis, although evidence of a strong bounce-back emerged as early as the second quarter of 2020. ↘ CHART 111 RIGHT At the same time, a decline in the United States labour force participation rate was recorded during the pandemic. Some economists attribute this to the reduction in job security, although closed schools and nurseries, and the fear of catching the virus at work were also thought to be contributing factors (Look et al., 2021).

Labour reallocation within and between economic sectors

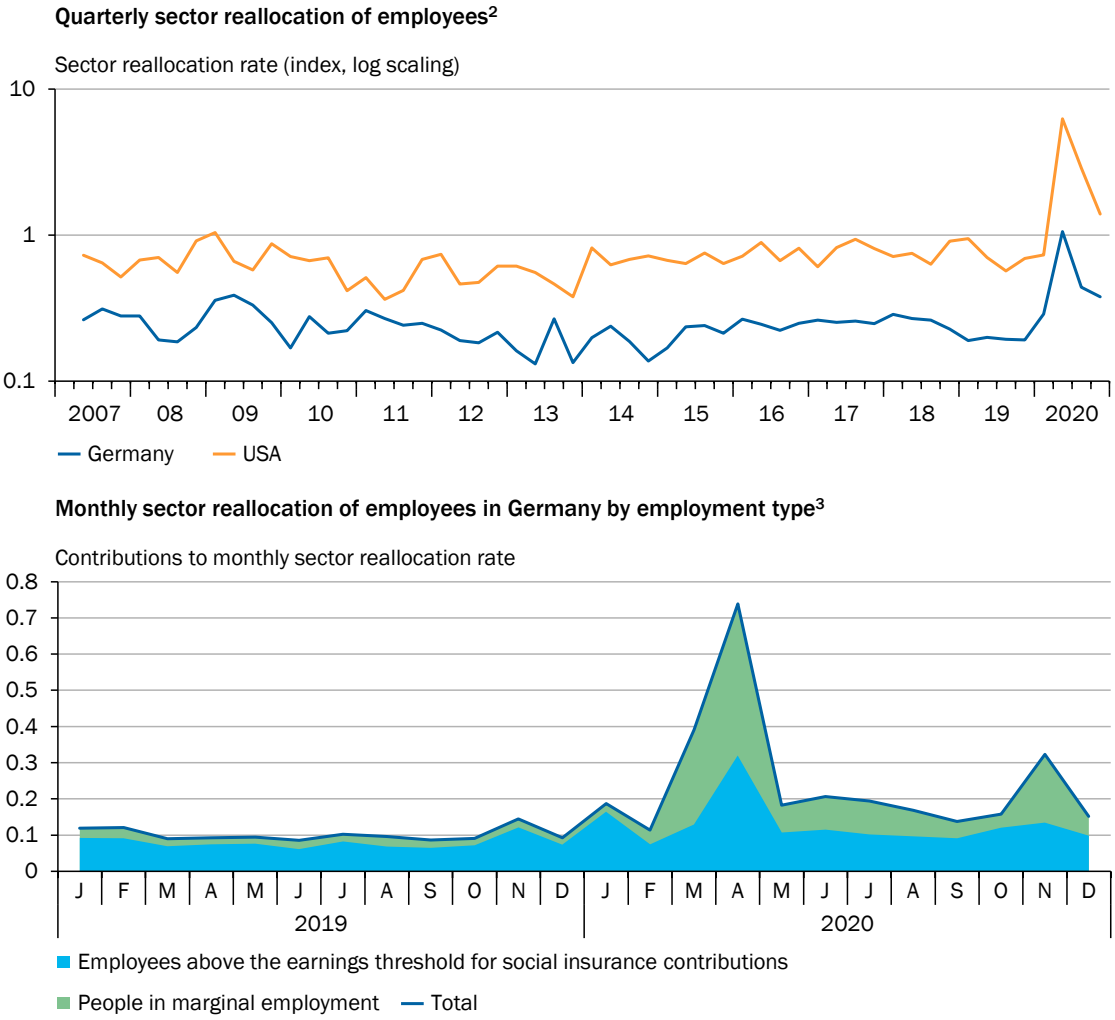
413. To determine the reallocation of workers **between economic sectors**, Garnadt et al. (2021) analyse the relative change in employment shares of individual economic sectors as a proportion of the total volume of employment in Germany, applying a similar methodology to that used in the United States study by David (2021). ↘ BACKGROUND INFO 10 If employment is growing or declining in all sectors equally, the intersectoral reallocation rate remains unchanged. If, however, the employment figures vary from sector to sector, the intersectoral reallocation rate also rises.

The trajectory of the pandemic is accompanied by a strong increase in the pace of intersectoral reallocation up to the end of 2020, which underlines the heterogeneity of the economic shock. This dynamic is particularly pronounced **for those in marginal employment**, who were especially affected by job losses within the impacted economic sectors and were not entitled to the short-time working allowances. ↘ CHART 112 ↘ ITEM 287 The United States economy basically followed a similar trajectory, although the lack of comparable social welfare programmes, such as short-time working, led to a significantly higher reallocation rate during the crisis.

414. So far, the data does indicate which economic sectors individual employees have moved to. However, an examination of the relative **change in employment** reveals which sectors of the economy have contracted and which have grown, measured by the number of people employed in them. ↘ CHART 113 While hospitality and the cultural sector show sharp declines, for example, a significant increase in employee numbers was registered in energy supply and public administration. The major shift of workers between economic sectors over the past year could lead to shortages of skilled labour in some sectors. The number of people employed in the food service industry, for example, has fallen significantly and there is now an

↘ CHART 112

The sector reallocation rate[1] of employees rose sharply during the pandemic



1 – The sector reallocation rate shows how much movement of the workforce there is between sectors of the economy. Sum of the absolute change in share of the workforce employed in the economic sectors. According to the International Standard Industrial Classification of All Economic Activities (ISIC Rev. 4). Seasonally adjusted. 2 – Calculated on the basis of economic sections (one letter). 3 – Calculated on the basis of economic divisions (two digits).

Sources: BA, David (2021), Garnadt et al. (2021), ILO, own calculations

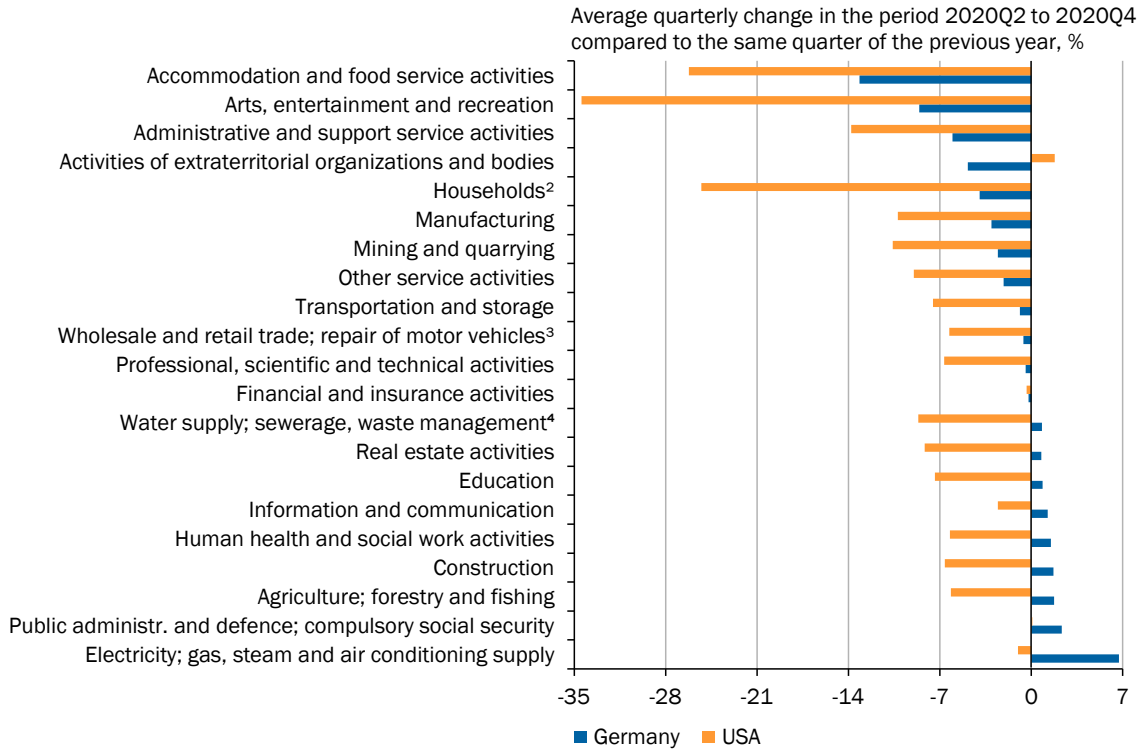
increasing number of vacancies. ↘ ITEM 80 Sectoral developments in the United States look equally mixed but are almost exclusively negative.

415. Finally, the **reallocation rate within economic sectors** also provides information about employment trends. More productive firms that have weathered the recession better may be able to attract skilled workers who were previously employed at less productive firms within the same economic sector. In the absence of up-to-date firm-specific productivity data, Garnadt et al. (2021) analyse the relationship between employment growth and the size and degree of digitalisation at firm level, as a positive correlation can be assumed between these factors and productivity (Berlingieri et al., 2018; Gal et al., 2019).

Based on analysis of the 'Businesses in the COVID-19 crisis' panel survey by the Institute for Employment Research (IAB), Garnadt et al. (2021) find that between

↘ CHART 113

Changes in employment by sector in 2020 were highly heterogeneous[1]



1 – According to the International Standard Industrial Classification of All Economic Activities (ISIC Rev. 4). 2 – Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use. 3 – And motorcycles. 4 – And remediation activities.

Sources: Garnadt et al. (2021) based on BA data, ILO, own calculations

August 2020 and March 2021, **larger firms** were **significantly more likely to hire new staff** than SMEs. This suggests a shift of workers towards larger firms, possibly accompanied by productivity growth. Interestingly, however, the authors do not find **any statistically significant correlation** between the **degree of digitalisation**, measured by the use of remote working, and the **hiring and firing rate**. This may be partly due to the high correlation between the degree of digitalisation and the size of the firm, making it hard to separate the influence of the two factors from one another.

The role of short-time working in the reallocation process

416. To contain job losses, **short-time work** was used far more widely in Germany during the coronavirus crisis than in earlier recessions (GCEE Annual Report 2020 item 131). ↘ ITEM 285 At the peak of the financial crisis, 1.4 million workers in Germany were on short-time work, whereas in April 2020 the equivalent figure was six million.

417. Although the aim of reducing job losses was achieved (IAB, 2020; Aiyar and Mai Chi, 2021), there is a growing fear in the international literature that keeping **short-time working** in place for **too long** will **inhibit the productivity-enhancing reallocation process** (Boeri and Brücker, 2011; Aiyar and Mai Chi,

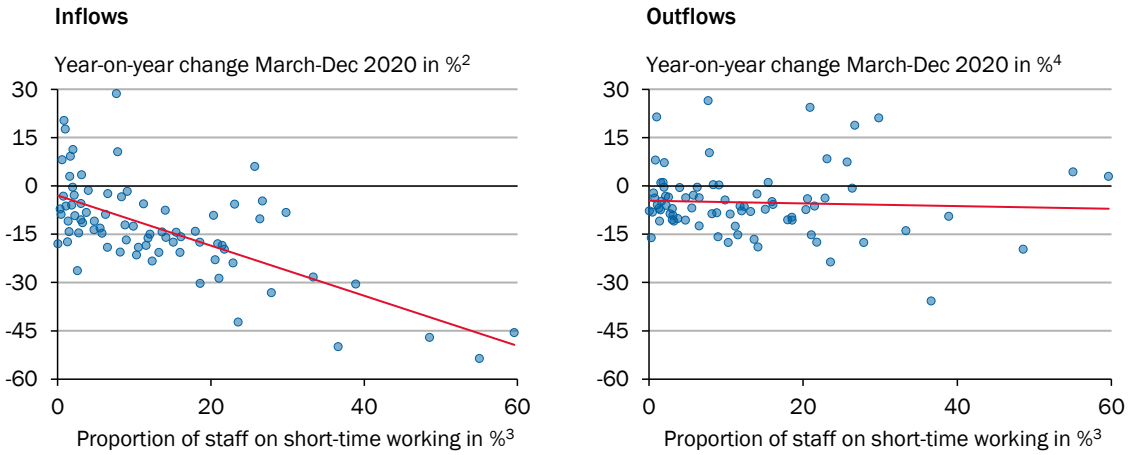
2021; Andrews et al., 2021). In the short term, short-time work was an important instrument for enabling productive firms to retain intangible capital, including firm-specific knowledge, that could have been lost as a result of job cuts caused by temporary liquidity squeezes. However, the longer short-time work schemes continue, the more likely it is that they prevent the transfer of employees to more productive firms.

In fact, the **structure** of the **short-time work scheme** during the coronavirus pandemic makes a **reallocation-inhibiting effect** likely, as it reduces the individual incentive to look for a new job. This is because the amount of the short-term working allowance increases with time (GCEE Annual Report 2020 item 213). Until month four, employees receive 60 % of the net pay lost during the short-time working (or 67 %, if they have at least one child). However, this sum rises to 80 % by month seven (or to 87 % for employees with children; Federal Employment Agency, 2021).

418. To examine the extent to which short-time working affects the **productivity-enhancing reallocation** of jobs, Andrews et al. (2021) calculate the difference in employment growth between high-productivity and low-productivity firms under the Australian short-term work programme JobKeeper. The study finds that the productivity-enhancing reallocation was **particularly strong** in the local job markets with a higher share of short-time workers **at the start** of the pandemic, and attributes this to the large number of productive but illiquid firms that were supported by the short-time working arrangements. As the economy recovered, however, firms with low productivity also increasingly benefited from

↘ CHART 114

In sectors with a high proportion of short-time working, labour inflows have dropped more sharply but labour outflows have not risen more sharply[1]



1 – According to the classification of economic activities, 2008 edition (WZ 2008). The divisions (two-digit) shown here are 10 to 18 and 20 to 99. 2 – Average of the monthly year-on-year changes in hiring rate of employees earning above the threshold for social insurance contributions per sector in the period March to December 2020. 3 – Average number of employees on short-time work as a proportion of the total number of employees earning above the threshold for social insurance contributions in the period March to December 2020. 4 – Average of the monthly year-on-year changes in outflow rate of employees earning above the threshold for social insurance contributions per sector in the period March to December 2020.

Source: Garnadt et al. (2021) based on BA data

the programme, so that **by the end of 2020** in the local job markets in which a high proportion of employees were still receiving short-time working allowance, **hardly any productivity-enhancing reallocation** was measured.

Garnadt et al. (2021) show for **Germany** that in economic sectors with a high proportion of short-time workers, fewer hires of employees earning above the threshold for paying social insurance contributions were registered, while the number of workers leaving employment remained roughly the same. ↘ CHART 114 This correlation illustrates the desired effect of the **short-time work scheme**, which was to **preserve jobs**. However, it also shows that even in economic sectors in which the proportion of short-time workers was 20 % or higher, there were hardly any departures of employees who were earning above the threshold for paying social insurance contributions, who could potentially have been used in other, more productive businesses.

III. SUPPORTING EFFICIENT REALLOCATION AND STRUCTURAL CHANGE

419. The **coronavirus pandemic** has created extremely challenging conditions for the German economy. However, it may also be a **catalyst for a transition process** towards greater use of digital technologies to create added value. In addition, in the context of the pandemic-related EU support programmes, there has been a greater focus on the political objective of a digital and green transformation in Europe (European Commission, 2020b). The reallocation of production factors between businesses and economic sectors has an important role to play in reviving productivity growth in the aftermath of the coronavirus crisis and in the ongoing transformation process. There are a number of measures that could be considered in order to harness the impetus provided by the coronavirus pandemic and **support** a **productivity-enhancing reallocation**.

1. Enabling orderly market exits: the need for reform in insolvency and restructuring law

420. As a result of the recession triggered by the coronavirus pandemic, some businesses suddenly found themselves in financial difficulties through no fault of their own, and some went into insolvency. The aim must be to support firms that remain fundamentally viable even under the changed post-pandemic conditions, while at the same time enabling non-viable firms to exit the market in an orderly manner. This requires an efficient **insolvency and restructuring law**. In Germany, this legislation was modernised as recently as January 2021 through the Act on the Update of Restructuring and Insolvency Law (Gesetz zur Fortentwicklung des Sanierungs- und Insolvenzrechts, SanInsFoG). However, this update does not take account of the needs of small and micro-enterprises, which were particularly hard hit by the pandemic (Madaus, 2021).

421. In Germany, as in most developed economies, the current **insolvency and restructuring framework** is **inadequate for small and micro-enterprises** (Díez et al., 2021; Madaus, 2021). This is partly because insolvency proceedings are often not even initiated for small firms due to a lack of assets; instead, entrepreneurs have to file for personal insolvency due to personal liability or, typically, joint liability for business debts. According to the current law, a discharge of residual debt, that opens the opportunity for an entrepreneurial re-start, occurs at the earliest after a good conduct period of three years that begins with the initiation of the insolvency proceedings. Further applications for a discharge of residual debt can only be filed after an 11-year retention period, starting with the date of the last residual debt discharge, has passed. The repeated discharge of residual debt then requires a good conduct period of at least five years.

422. To assess possible options for reforming the German insolvency and restructuring law, the GCEE has commissioned an Occasional Report (Madaus, 2021) analysing the proposals of international organisations and experts in insolvency law in a German context. The focus is on expanding the current law to include **simplified access to insolvency proceedings** by means of a procedural regime that takes account of the **special features of small and micro-enterprises** (lower restructuring value, paucity of external advice, little interest on the part of creditors in keeping the business going) and contains a restructuring option that is practical for these firms (Díez et al., 2021). This could be modelled on the UNCITRAL model law, which the Federal Ministry of Justice and Consumer Protection (BMJV) had a hand in drafting.

423. The success of these legislative efforts to improve support for small and micro-enterprises requires **public authority creditors** to be given greater **capacity to act** in the relevant decision-making processes (Madaus, 2021). When confronted with a restructuring plan, representatives of authorities such as health insurance providers or tax offices often do not know whether and in accordance with what criteria they are allowed to agree to a debt rescheduling arrangement that involves waiving or deferring repayment. According to Madaus (2021), **legally secure standards for the consent of public creditors** would thus provide further incentives for restructuring the debt of small businesses. For example, statutory approval requirements developed on the basis of the ECJ standards for the waiving of VAT debt could give public authorities clearer scope within which to act.

424. Madaus (2021) also stresses that entrepreneurial potential could be protected more effectively through a **reform of residual debt discharge**. According to Madaus (2021), experience from the United Kingdom showed that rapid debt forgiveness has not led to a deterioration in payment practice, but rather to an increase in entrepreneurialism. The reform could enable **immediate discharge of residual debt** upon liquidation of the attachable assets without a further period of good conduct. Special provisions are required for exceptional cases, such as when relevant income is available or where there has been criminal activity on the part of the business owner (Díez et al., 2021; Madaus, 2021).

2. Reducing debt of small firms by transforming existing liquidity support

425. In order to prevent a weakening of investment activity and facilitate a return to economic normality, the debt level of **viable small and micro-enterprises**, which has risen during the pandemic, should be contained **by strengthening the equity ratio**. ↘ ITEM 404

Existing measures to secure liquidity that do not increase the level of debt on firms' balance sheets include, for example, the option of **loss carryback**. This allows firms to offset this year's losses against the taxable profit of the previous year, provided that the business had a viable business model in the previous year. When the coronavirus pandemic first began, the upper limit for loss carryback for income tax and corporation tax payments was increased from €1 million to €5 million (€10 million for joint assessment) (GCEE Annual Report 2020 item 121). This ceiling was extended with the Third Coronavirus Tax Assistance Act for the 2020 and 2021 tax-assessment periods to €10 million (€20 million for joint assessment) (Federal Government, 2021a). This temporary increase is welcome, but it would be helpful to extend the period over which losses can be carried back in order to provide additional relief for smaller firms that only have small taxable profits (Koch and Langenmayr, 2020; GCEE Annual Report 2020 item 121). **Loss carryforwards**, allowing firms to offset today's losses against future tax payments where they have not already been offset by the loss carryback, would also boost liquidity, especially as the economy enters the recovery phase. These should therefore also be temporarily extended, particularly in terms of the period in which they can be applied (GCEE Annual Report item 121).

426. The **conversion of tax assets into subordinated loans** with a standardised term and interest rate could produce a similarly liquidity-boosting effect (Díez et al., 2021; Madaus, 2021). Subordinated loans are loans that are not recognised as borrowing on the balance sheet because of their agreed subordinate ranking. Consequently, they do not increase the level of debt on a firm's balance sheet. This would primarily concern tax receivables that have been **forborne** under the simplified procedure due to the pandemic or whose enforcement has been postponed and whose timely payment poses a problem for the firm. In the case of shared taxes administered by the federal states on behalf of the federal government, tax deferrals worth €29 billion had been claimed by June 2021 (Federal Ministry of Finance, 2021a). One considerable advantage of the model would be that financial vulnerability tests on the relevant business would already have been carried out by the tax office in connection with the decision on the enforcement deferral or forbearance. The provision of capital to small and micro-enterprises by the state should however only be a **temporary liquidity support measure** and exit scenarios should be sketched out in advance (Special Report 2020 item 158). It should also be borne in mind that this kind of assistance requires the approval of the European Commission as it qualifies as state aid within the meaning of Article 107 of the Treaty on the Functioning of the European Union (TFEU) (Madaus, 2021).

3. Better support for innovation- and growth-oriented start-ups

427. **State interventions** to support new businesses and start-ups ↘ GLOSSARY **during the pandemic** were aimed in particular at securing **better access to venture capital**. Venture capital is very important for the financing of innovative growth-oriented firms (GCEE Annual Report 2019 items 285 ff.) and thus has a significant influence on the establishment of new businesses and on economic growth (Samila and Sorenson, 2011). The **start-up shield** of the federal government has provided a total of €2 billion in venture capital since May 2020. Under the first pillar, venture capital funds were able to supplement their investments with up to 50 % state funding in individual financing rounds. By November 2020, venture capital firms had applied for a total of €1.17 billion in funding and €855 million had been granted (Deutscher Bundestag, 2020). This pillar ended at the end of June 2021, as planned. Under the second pillar, funding was made available via the development banks of the federal states for start-ups and small SMEs that did not yet have access to venture capital providers. This pillar has been extended until the end of 2021.

The total volume of German venture capital investment in 2019, the year before the coronavirus crisis, is estimated at €1.9 billion (Metzger, 2020a), which illustrates the vast scale of the state funding provided during the coronavirus crisis. It was therefore important to provide the funds of the start-up shield for venture capital firms in the form of a **co-financing model** to **prevent private investment from being crowded out** (GCEE Annual Report 2019 item 287), particularly since in Germany, government investment still accounts for a relatively large share of venture capital financing. After a brief slump in confidence in the German equity capital market at the start of the pandemic (Metzger, 2020b), sentiment is currently at an all-time high (Metzger, 2021b). The government assistance is likely to have played an important role in this.

428. The **German venture capital market** has grown in recent years, particularly in early-stage financing. However, it is still **underdeveloped by international comparison**, especially when it comes to the **realisation of high-volume funding rounds for** subsequent **growth stages** (Metzger, 2020a; GCEE Annual Report 2019 item 285). Due to the less significant role played by large institutional investors such as pension funds and insurance companies, there is a shortage of anchor investors that could attract private and international backers (EFI, 2019).

429. This year, the federal government's **equity fund for technologies of the future** ('Future Fund') started promoting the German venture capital market. The fund has a volume of €10 billion for the next ten years, consists of various building blocks and is aimed primarily at the underdeveloped area of growth financing. This will further increase the importance of the state within the German venture capital ecosystem from an already high baseline. So the objective of **mobilising additional private finance** is vital. In particular, conditions should be created to attract institutional anchor investors. One successful example of the involvement of institutional investors is provided by the Danish

programme Dansk Vækstkapital, a joint project between the government and Danish pension funds that invests as a fund of funds in large venture capital funds (EFI, 2019). Under this programme, pension funds can invest a portion of their investment volume at fixed interest rates while the remaining funds are invested directly in the fund of funds. The balance of risk and return provided by this model makes it easier for pension funds to invest in venture capital. A programme is currently being developed on similar lines as a building block of the Future Fund (BMF, 2021b). This fund of funds will also contain components in which senior shares for institutional investors are combined with subordinated shares for the public sector (Deutscher Bundestag, 2021a). The resultant fund of funds forms an important element of the Future Fund for the mobilisation of private finance and should be implemented rapidly. In addition, the **European capital markets union** could create more liquid markets in Europe and thereby provide improved support to young firms beyond early-stage financing and into the capital-intensive growth phase, while also energising the market for IPOs for small and medium-sized enterprises (GCEE Annual Report 2019 item 288).

430. The **tax conditions** for start-ups were improved this year with the **Fund Jurisdiction Act** (Fondsstandortgesetz, FoStoG) (Federal government, 2021b). The conditions for employee share ownership were improved and the tax allowance was raised from €360 to €1,440. The exemption from VAT of venture capital funds' management fees removes a tax disadvantage compared with other European countries (EFI, 2019) and should make venture capital funds more attractive to investors in Germany.

431. Finally, young firms in Germany still struggle with inefficient bureaucratic processes while trying to get off the ground (GCEE Annual Report 2018 item 137). In 2020, as in previous years, **bureaucracy** was named by entrepreneurs as **one of their biggest obstacles** (Metzger, 2021a). Measures to simplify procedures and ensure greater digitalisation of the start-up and registration process include the **Online Access Act** (Onlinezugangsgesetz, OZG), which came into force in 2017. Although financial support for this was provided in the coronavirus economic stimulus package, **implementation** remains slow (NKR, 2021) and **should be stepped up** (GCEE Annual Report 2020 item 553).

4. More targeted support for the reallocation of workers

432. Under normal circumstances, the reallocation of workers is a major contributor to productivity growth, but this was greatly reduced during the coronavirus pandemic. ↘ ITEM 411 In addition to the provision of various government support measures and the suspension of the duty to apply for insolvency, which have temporarily reduced the exit of unproductive firms, this decrease is likely to be due to the expansion of the **short-time work allowance**. The special arrangements for short-time working were an important tool, especially at the start of the crisis, to prevent job losses in firms that found themselves in difficulties because of the pandemic, not because of structural problems or inadequate business models. This was intended to enable firms to retain

employees whose services were expected to be only temporarily not required for their full contracted hours.

However, as the crisis recedes, this rationale is becoming less and less important, so medium-term policy measures should be aiming to increase productivity growth instead. It therefore **no longer appears necessary** to **extend** the **special arrangements for short-time workers** beyond 31 December 2021. Stronger incentives for **training and development during short-time working** should be offered instead. ↘ ITEM 307

433. To facilitate the **regional reallocation of workers**, it would be helpful to improve inter-regional mobility (GCEE Annual Report 2017 item 688). In the past, structural change has presented major challenges to some individual regions while others have enjoyed favourable conditions for the establishment of growing economic sectors (GCEE Annual Report 2019 item 333). German coal regions, for example, and regions heavily dependent on the value chain for internal combustion engines, are currently likely to face such challenges. The reallocation of workers from these regions is therefore important for efficient structural change.

434. However, regional reallocation towards growth regions is often hampered by a shortage of housing and by rising property prices and rents. ↘ ITEM 114 If this impedes regional labour mobility, it can significantly reduce economic output (Hsieh and Moretti, 2019). Policies that **increase housing supply in and around metropolitan areas**, such as increased urban density, less stringent building requirements or the designation of more building land, would help to counteract this misallocation (GCEE Annual Report 2018 item 770).

435. In addition, the severing of the tie between firm's location and place of work resulting from the trend towards **working from home** could also increase the efficiency of the reallocation process between regions by making the **regional distribution of employment opportunities more flexible** (Garnadt et al., 2020; GCEE Annual Report 2020 item 560). Employees could choose to live somewhere that is further away from the firm's location if flexible home-working arrangements meant they did not have to go into the office as frequently. Better coordination and comparability between the different school systems and curricula of the federal states would also make it easier for employees with school-age children to move between regions. ↘ ITEM 378

436. Attempts are often made to promote reallocation within the affected regions through regional **support programmes**, in order to mitigate the negative effects of structural change. For example, the recently adopted future fund for the automotive industry will provide support to overcome the regional challenges associated with the transition of the automotive industry from the internal combustion engine to new drive technologies, as one of its three funding priorities. Training is a particular focus here (BMWi, 2021a). For example, €40 billion has been made available to cushion the negative effects of structural change for Germany's coal-mining regions as coal production is ended. Under the Structural Development Act (Strukturstärkungsgesetz, StStG), this money is earmarked, among other things, for the establishment of new research centres

and innovative industries (Special Report 2019 box 2). However, it remains unclear whether these regions are particularly suitable as locations for new research centres or for the establishment of innovative industries (GCEE Annual Report 2019 item 339). Such measures also risk delaying the necessary adjustment, or even preventing it altogether, which can permanently entrench regional structural weaknesses (GCEE Annual Report 2009 items 323 ff.; GCEE Annual Report 2017 item 293). It is crucial to ensure that there is coordination between the different support measures and the actors, which include both actors external to the administration (business, science, civil society) and actors internal to the administration (federal, state, local government), in order to effectively utilise the potential of regional support programmes (Partnerschaft Deutschland, 2020).

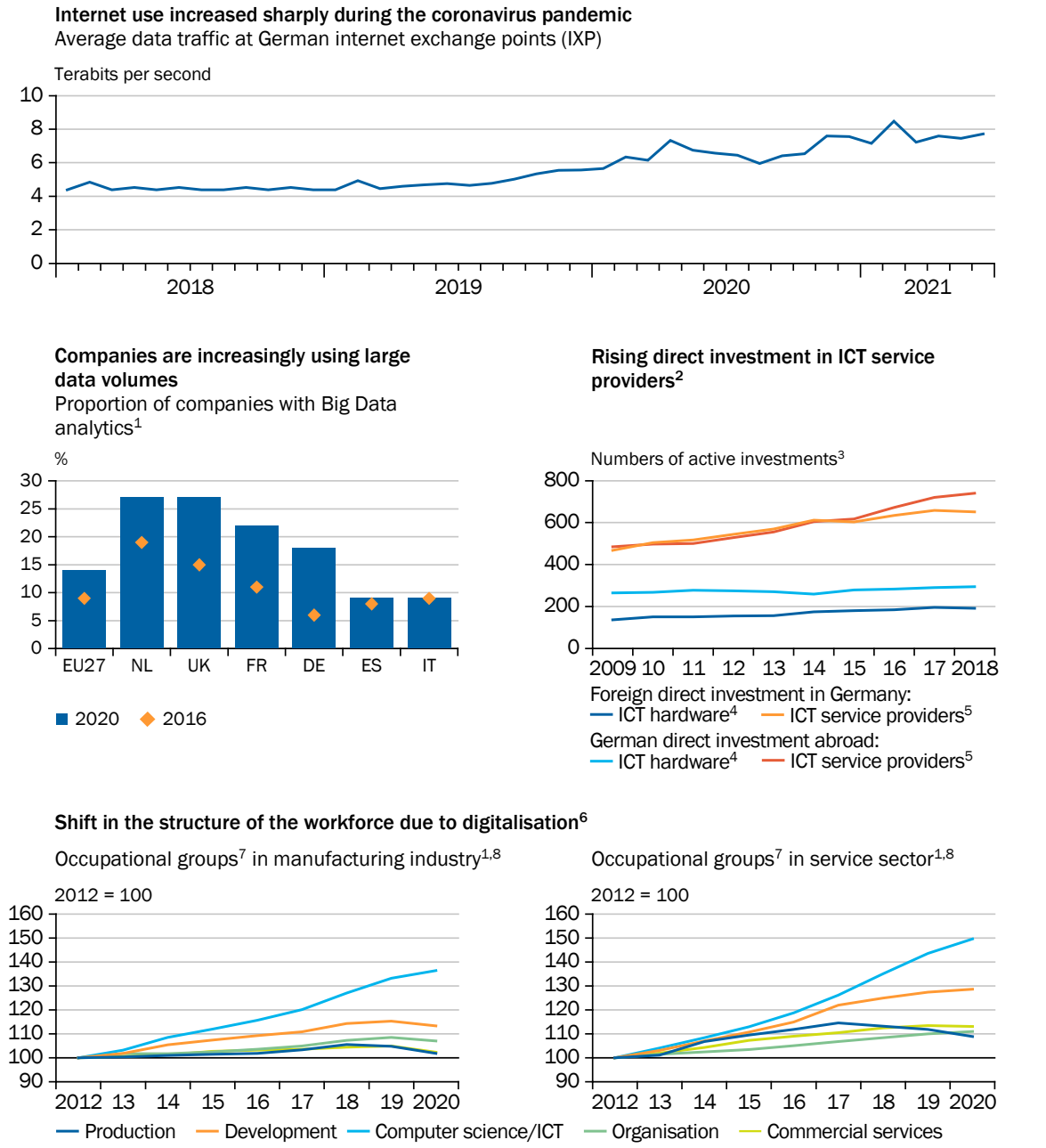
437. In addition to regional reallocation, the possibilities for **sectoral reallocation of workers** should also be improved. It would make sense in this respect to provide more support for **continuing professional development and retraining options that combine work and study**. ↘ ITEM 300 For example, workers whose jobs have already been affected by changes to the employment market or will be affected in future should be able to retrain more quickly and take advantage of professional development courses. A well-functioning system of further training helps to **cushion potential social hardship** caused by structural change. Through targeted offers for affected economic sectors, further training can also help to counteract **shortages of skilled workers**. The **lifting of the requirement to hold specific professional licences** can also help to improve reallocation (Bambalaite et al., 2020; GCEE Annual Report 2019 box 16). Particularly in areas where professional licensing restrictions no longer serve to reduce the asymmetry of information between service providers and customers, for example because such information is also available elsewhere, a switch to alternative certification measures should therefore be considered.

IV. GROWTH POTENTIAL THROUGH BUSINESS MODELS IN THE DATA ECONOMY

438. The coronavirus pandemic has accelerated the pace of digitalisation and has drastically increased businesses' and households' demand for data-based services (GCEE Annual Report 2020 items 545 ff.). The stronger demand for digital services was reflected not least in the sharp **rise in data traffic over the internet** in Germany during the lockdowns. ↘ CHART 115 TOP It remains to be seen to what extent the greater importance of the **data economy** in the wake of the pandemic can **improve productivity growth**. In many areas the digitalisation process had, after all, already begun long before the pandemic while, at the same time, macroeconomic productivity growth in the advanced economies had been slowing for several decades – a phenomenon often referred to as the **productivity paradox** (GCEE Annual Report 2019 items 175 to 180). The data-

↘ CHART 115

Growing importance of data in value added



1 – Companies (excluding monetary financial institutions) with at least ten employees. EU27-European Union, NL-Netherlands, UK-United Kingdom, FR-France, DE-Germany, ES-Spain, IT-Italy. 2 – Economic activities according to the statistical classification of economic activities in the European Community (Nace Rev. 2). 3 – New and existing investments. 4 – ICT manufacturing: manufacturing of electronic components and boards, manufacturing of computers and peripheral equipment, manufacturing of communication equipment, manufacturing of consumer electronics, manufacturing of magnetic and optical media. 5 – ICT services: wholesale of information and communication equipment, software publishing, telecommunication, computer programming, consultancy and related activities, data processing, hosting and related activities, wep portals, repair of computers and communication equipment. 6 – Development of employment in the industry and service sector. 7 – Activities based on the classification of occupation 2010 (KldB 2010) by the Federal Employment Agency. Main occupational groups (2 digits): Production (21-26, 28-29), development (27), computer science/ICT (43), organisation (71-73), commercial services (61-62). 8 – Manufacturing industry (section B-F), service sector (section G-S).

Sources: Federal Employment Agency, Eurostat, Falck et al. (2021), Deutsche Bundesbank's Research Data and Service Centre (FDSZ), Microdatabase Direct Investment (MiDi, DOI: 10.12757/Bbk.MiDi.9918.06.07), research project 2021\0072, work as a visiting researcher in September 2021, IDC, own calculations

based and digital value creation has especially benefited highly productive frontier firms in recent years, whereas other firms in Germany are still hesitant to use the relevant technologies and develop data-based business models (GCEE Annual Report 2020 items 540 ff.). The extent to which the surge in digitalisation triggered by the coronavirus pandemic can boost productivity throughout the economy will largely depend on the **economic policy framework**, which especially influences firms' individual digitalisation efforts. ↘ ITEMS 473 FF.

439. Rapid advances in information and communication technology (ICT) and especially in key technologies such as big data analytics, artificial intelligence (AI), the Internet of Things (IoT) ↘ GLOSSARY and blockchain technology ↘ GLOSSARY mean that the evaluation and **commercial use of data** are becoming increasingly important in the value-added process. Data-based business models offer disruptive potential in many areas of the economy. Digital innovations are impacting not just on the real economy but also on the financial sector, for example in the form of fintechs, automated financial advice and app-based insurance products (GCEE Annual Report 2019 items 415 ff.). Digital and cryptographic currencies also pose challenges for monetary policy (GCEE Annual Report 2019 box 11). However, the following analysis of the data economy focuses on the data-driven business models and the commercial use of data in industry and services. In recent years we have seen digital **platforms** emerge as the commercially **most successful business model** ↘ ITEM 447 and **cloud computing** ↘ GLOSSARY become the **most important infrastructure in the data economy**. ↘ ITEM 464

1. Changing value-added processes in the data economy

440. The data economy, in which the collection and analysis of data enables the creation of economic value, has become increasingly important in recent years. The commercial use of data covers all sectors of the economy and also offers the potential to improve production processes and introduce new business models in many areas of industry, such as the automotive sector (Czernich et al., 2021). The growing significance of data in the value-creation process in recent years is evident f from the **increasing proportion of firms that analyse Big Data** for their business operations in many European countries and across all sectors of the economy. ↘ CHART 115 CENTRE LEFT The growth of inward and outward foreign direct investment in Germany's ICT services sector also indicates the growing importance of data-based products and, in particular, services. ↘ CHART 115 CENTRE RIGHT Survey data from the IW Future Panel suggests that more than a quarter of German firms were already offering data-driven products and services in 2019 (Azkan et al., 2020).

441. The transformation process initiated by the data economy is also reflected in a **shift in the employment structure**, as evidenced by the strong growth in employment in computer science and ICT-related occupations in both the manufacturing and services sectors. ↘ CHART 115 BOTTOM This rising demand has led

to a shortage of skilled workers and experts in ICT professions in Germany (GCEE Annual Report 2020 item 567).

Specific features of data-based business models

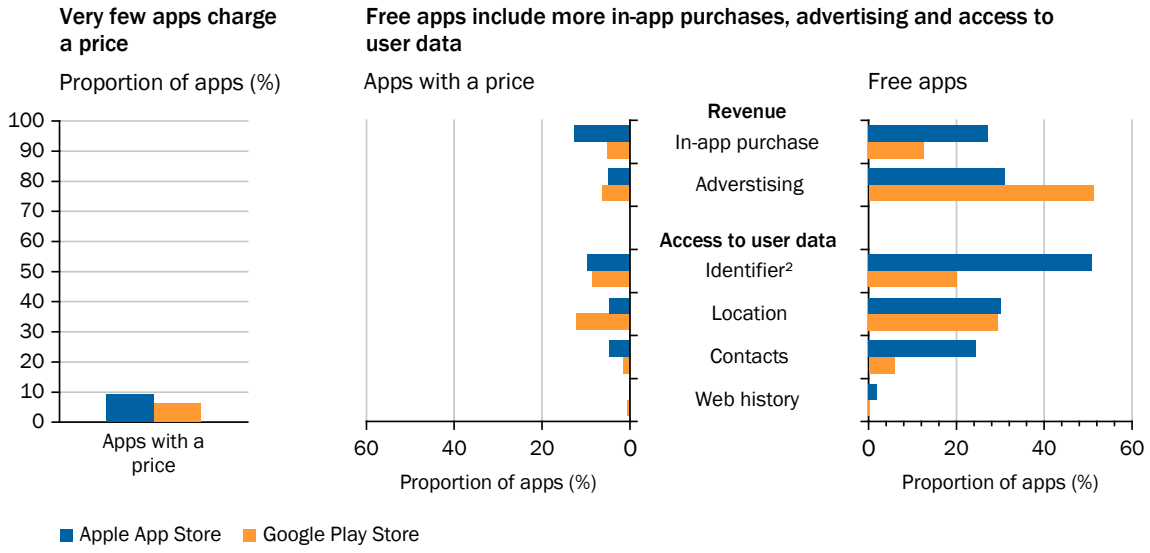
442. The potential of the data economy to add value derives from **the specific economic characteristics of data as a factor of production** (GCEE Annual Report 2020 item 537). Unlike many other goods, data is an **intangible asset** whose **use is non-rival**. It can, theoretically, be used by various actors and whenever needed. The considerable social benefit that can arise when firms share data is partly offset by data owners' incentive to use data exclusively, thereby gaining a competitive advantage (Jones and Tonetti, 2020). Data can, for example, be used to innovate, which attracts new customers and, in turn, generates further data. This can create self-reinforcing **positive feedback loops**, which give rise to a process of **continuous innovation** (Schepp and Wambach, 2016).

443. Firms that use data-based production processes often benefit from **positive returns to scale**, which derive from the low marginal costs involved in conjunction with the high fixed cost of building the necessary technical infrastructure (Brynjolfsson et al., 2006). In addition, the value of data is increased by combining several data sources, which arise from the use of various products and services (Bourreau and De Streel, 2019). Such **economies of scope** enable firms to create **ecosystems consisting of software, services and physical products**. Economies of scope in data use also enable digital-intensive firms to expand into new markets. Firms with data-based business models are increasingly challenging established rivals in a number of sectors ranging from fintechs in financial services and e-health applications such as fitness watches and trackers in the healthcare sector to online reservation systems in hospitality and mobility service providers in the automotive industry.

444. Digital **platforms** have so far proved to be the **most commercially successful business model** in the data economy, as illustrated, for example, by the rapidly growing market capitalisations of American and Chinese platform firms. ↘ ITEM 447 Platforms are **multi-sided markets** in which various actors meet (Rochet and Tirole, 2003). ↘ BACKGROUND INFO 11 They typically give rise to **network effects** both within and between the groups of market participants. The benefit of direct network effects increases in line with the number of other users on the same side of the platform, as is the case with social media. Multi-sided markets are especially characterised by positive indirect network effects, where the benefit for market participants is determined by the number of participants on the other side of the platform. One example of these is operating systems that bring app developers and users together. Users benefit from the wide range of apps on the platform. For app developers, on the other hand, the platform's appeal increases in line with the number of users that they can reach on the platform (Belleflamme and Peitz, 2021). On digital platforms these network effects interact with the specific characteristics of digitalised data. Low communication and transaction costs enable a large number of market participants to take part, thereby creating strong network effects. The non-rivalry of data and its importance for innovation allow

↘ CHART 116

Monetisation of, and access to, user data in digital business models based on the example of the app market[1]



1 – Cross-section of the app market; as of: July 2021. 1.03 million apps in the Google Play Store and 178,000 apps in the Apple App Store that display privacy labels such as use of location. 2 – User IDs, for example.

Source: Kesler (2021)

digital platform operators themselves to benefit considerably from large numbers of participants.

445. Data-based business models also differ from traditional ones in terms of **how they generate revenue**. As is the case with many multi-side markets, digital platforms too often pursue a strategy of offering goods and services **free of charge** to one side of the market, or even subsidising this side, while generating revenue from the other side of the market (e.g. advertisers). What is special about digital platforms is that the use of such platforms generates data that the platform operators can use as an input for personalised advertising, AI applications or the development of innovations. In the two major **app markets**, for example, a purchase price is only charged for less than 10 % of apps. ↘ CHART 116 Free apps generate revenue from in-app purchases and advertising and are more likely to access user data. At present it is not customary for users to benefit from the value of the data that they generate. Instead, it is said that they **pay** for the services they use **by providing their data**. The economic value generated by user data in this way – especially that obtained from individual users – is difficult to quantify because this value only arises from large quantities of data and when it is processed further (Acemoglu et al., 2019; Kühling et al., 2020).

Another particular feature of data-driven business models compared with traditional ones is that, instead of products being sold, their use **is paid for** through options such as **subscriptions** (as is the case with Spotify and Netflix) or licences (for cloud services and software use). Even traditional industries offer examples of such a fundamental transformation of business models. Major car producers such as Volkswagen and Tesla, for example, plan to sell autonomous

driving functions of their vehicles as bookable additional digital services in future (Reuters, 2021; Zwick, 2021).

446. Because of their data-based production process, digital intensive firms are able to achieve considerable value added despite investing very little in physical capital (**scale without mass**) and, consequently, the nature of their business operations means that they are less tied to a particular location than traditional firms are (Brynjolfsson et al., 2006). This makes it easier for large digital companies to base their tax domicile in the most favourable tax jurisdiction and to take advantage of the **tax optimisation arrangements available under the current corporate taxation system**. ↘ BOX 26 Small and, above all, not very highly digitalised firms, whose business models require them to maintain a physical presence, are often unable – or are, at least, not easily able – to take advantage of such tax optimisation arrangements. There has therefore been a debate about the introduction of a **digital services tax**. An alternative option for meeting these taxation challenges more comprehensively would be to introduce a **global effective minimum tax** like the one currently being negotiated under the auspices of the Organisation for Economic Cooperation and Development (OECD). ↘ BOX 26

↘ BOX 26

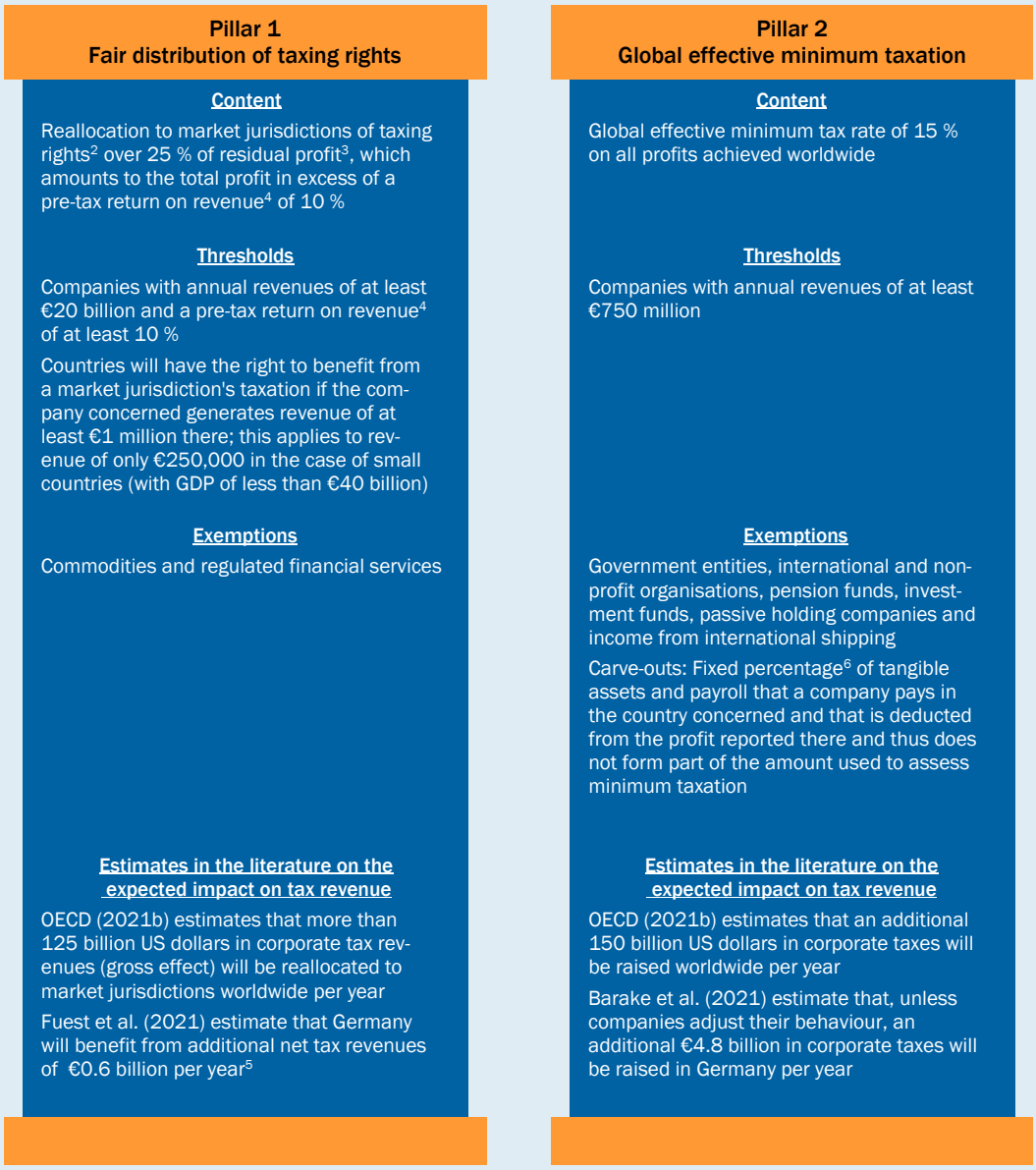
Digital services tax and global effective minimum tax

The current corporate taxation system is based on the principle of a **firm maintaining a physical presence in the form of a domestic permanent establishment as defined under tax law**. However, it is **easier for digital services firms to get around this principle than it is for other firms**, and this enables them to base their domicile in the most favourable tax jurisdiction. This problem is compounded by the fact that it is easier for digital services firms to take advantage of tax optimisation arrangements (GCEE Annual Report 2018 items 615 ff.). To address these problems with the taxation of digital services firms there are unilateral measures, such as national digital services taxes, and multilateral instruments, such as the global effective minimum tax currently being negotiated under the auspices of the OECD. Although this latter tax was conceived against the backdrop of the digitalisation of the economy, it would reform taxation more comprehensively and would also affect non-digital services firms.

In 2018 the European Commission submitted a **proposal** to introduce **an EU-wide digital services tax** (European Commission, 2018; GCEE Annual Report 2018 items 619 ff.). This proposal was, right from the outset, only intended to be an interim solution until the system of corporate taxation could be more comprehensively reformed, and it was not implemented back then owing to the multilateral negotiations that were still ongoing at the time (European Commission, 2018). The European Commission revisited the idea of a digital services tax in 2020 in order to finance the Multiannual Financial Framework for the years 2021 to 2027 and the Recovery and Resilience Facility. ↘ ITEM 190 In the meantime some EU member states have implemented their own **national digital services taxes**. In 2019, for example, France introduced a digital services tax of 3 % on certain types of revenue. Similar arrangements are now in place in countries such as Austria, Italy, the United Kingdom and Spain. The revenue projected to be raised by such digital services taxes is modest so far, with France expecting to raise €400 million per year. Amazon has reacted to France's digital services tax by raising its prices for third-party providers that offer products on the French subsidiary of Amazon's Marketplace platform (Reuters, 2019). One problematic aspect of an EU-wide digital services tax would be that this could trigger **trade conflicts with the United States**, which might see this tax as a

↘ CHART 117

The „Inclusive Framework“ international taxation reform concept of the OECD's BEPS initiative for multinational companies is based on two pillars[1]



1 – Base Erosion and Profit Shifting (BEPS) initiative. As of: October 2021. 2 – Countries will have the right to benefit from a market jurisdiction's taxation if the company concerned exceeds certain revenue thresholds there (see section on Thresholds). 3 – Amount A. 4 – Pre-tax profits as a percentage of revenue. 5 – Estimates are based on assumptions that differ slightly from the OECD's concept (as of: October 2021). 6 – The percentage applicable to both factors will be 5 % after a transitional period of 10 years.

Sources: OECD (2021b), Barake et al. (2021), Fuest et al. (2021), own presentation

protectionist measure and, in response, could introduce or raise tariffs on goods from European countries. The OECD estimates that the harm expected to be caused by such conflicts could reduce GDP by as much as 1 % (OECD, 2020a).

A multilateral instrument for combating tax avoidance – not only that of digital services firms – has been devised in parallel with the developments taking place around digital services taxes. This instrument – the Inclusive Framework – is being introduced as part of the OECD's

Base Erosion and Profit Sharing (BEPS) initiative. These negotiations have been ongoing since 2013 and currently involve 139 countries. Implementation is due to be completed by the end of 2023 (OECD, 2021b). This approach proposes a **two-pillar solution.** ↘ CHART 117 Most of these countries agreed on a basic understanding to this effect in July 2021 (OECD, 2021c). The remaining EU countries – Ireland, Hungary and Estonia – then agreed to the detailed implementation plan in October 2021 (OECD, 2021b). This agreement stipulates that Pillar One – the redistribution of taxation rights – would affect roughly 100 firms worldwide (OECD, 2021b), a single-digit number of which would probably be in Germany (Devereux and Simmler, 2021). The high return-on-revenue threshold specified in Pillar One constitutes a particularly demanding hurdle and could, as things currently stand, mean that Amazon, for example, which reported a return on revenue of around 5.5 % in 2020, would not be covered by the stipulations in Pillar One. Pillar Two – global effective minimum taxation – stipulates a much lower annual revenue threshold than Pillar One. Consequently, significantly more firms – both worldwide and in Germany – would probably be affected by it, although the OECD has not yet published any more precise figures on this. An approximation of this figure is offered by the OECD's country-by-country reports, on the basis of whose data Pillar Two is to be applied. Based on the second wave of data from 2017, which involved 38 countries, including the United States and China, Pillar Two would apply to roughly 6,000 firms, including 379 from Germany (OECD, 2021d). There remain a few uncertainties as to how exactly the two pillars are to be structured from a technical perspective. These are due to be resolved by the end of November 2021 in the case of Pillar Two and by February 2022 in the case of Pillar One (OECD, 2021b). In particular it is still unclear how the tax base is defined. Until these technical details have been clarified it will be necessary to consider studies on the exact consequences and the country-specific impact of the Inclusive Framework's implementation with some caution.

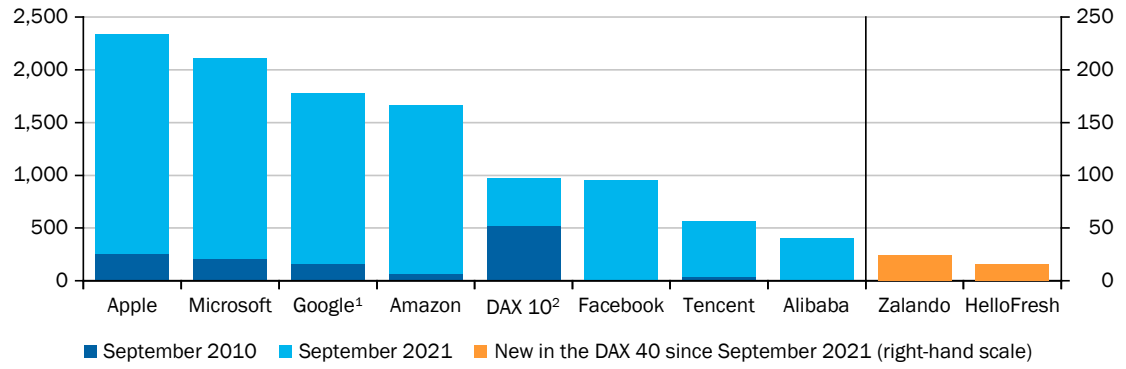
Given the progress made on multilateral negotiations, the European Commission decided in July 2021 to once again postpone its plans to introduce an EU-wide digital services tax. France has already announced its intention to withdraw its own national digital services tax as soon as an international agreement is reached (BMF, 2021c). The agreement reached in October 2021 contains the provision that the member states intend to sign a multilateral convention in 2022, under which all existing digital services taxes and any other unilateral measures will be blocked and rescinded when the multilateral convention is implemented but, in any event, no later than 31 December 2023. This also means that no new digital services taxes will be allowed to be introduced during this period (OECD, 2021b). No new digital services taxes are therefore to be expected in Europe for the time being at least. This is to be welcomed because **coordinated action to combat tax avoidance** – not only that of digital services firms – and to promote tax justice **appears to be more effective than unilateral action in the form of digital services taxes** (GCEE Annual Report 2018 item 624). Although the reform package proposed by the Inclusive Framework of the OECD's BEPS initiative will not be able to prevent all tax avoidance, it would nonetheless go some way towards enabling the corporate taxation system at a global level to meet the challenges posed by digitalisation and by multinational firms' tax avoidance.

2. Platforms as the dominant business model in the data economy

447. The majority of the world's currently most valuable listed companies operate platform-based business models. For example, four of the five most valuable US platform-based technology companies – Google (Alphabet), Amazon, Facebook, Apple and Microsoft (**GAFAM companies**) – have a larger market

↘ CHART 118

The success of the largest platform companies is illustrated in the growth of their market capitalisation
Billion US dollars (nominal)



1 –New name Alphabet from October 2015 after restructuring. 2 – The 10 most valuable DAX companies as of 14.4.2021: Allianz, BASF, BMW, Daimler, Deutsche Post, Deutsche Telekom, Merck, SAP, Siemens, Volkswagen. Source: Capital.

Source: Refinitiv Eikon, Capital

capitalisation individually than the ten most valuable DAX-listed companies put together. ↘ CHART 118 Although two digital platforms (Zalando and HelloFresh) entered Germany's DAX index in September 2021 (Deutsche Börse Group, 2021), today's data economy is largely dominated by US and Chinese platforms, which benefit from their substantial domestic markets.

↘ BACKGROUND INFO 11

Types of digital platform

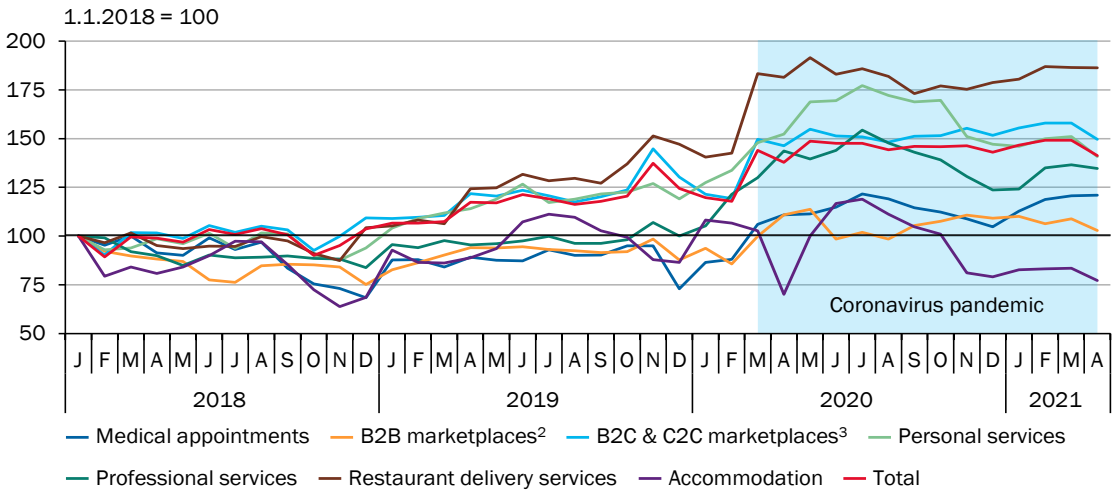
Based on their use, digital platforms can be divided into marketplaces for transactions in goods and services, industrial data marketplaces, and platforms that do not directly mediate commercial transactions between market participants – such as social media platforms – but which are certainly monetised by their operators. IoT platforms perform a special role among data marketplaces. They act as the infrastructure for the networking of physical objects and the collaborative use of industrial data (BDI, 2020a; Koenen and Falck, 2020). Marketplaces that do not directly mediate any commercial transactions with users include attention markets such as social media platforms, whose business model is based on the fact that advertisers pay for users' attention (Evans, 2020). The various types of platform also differ according to where in the value chain they are used. Business-to-consumer (B2C) platforms are aimed directly at end-customers, business-to-business (B2B) platforms settle transactions between firms, and private individuals interact on consumer-to-consumer (C2C) platforms.

Potential of the commercial use of platforms

448. Online platforms have made a substantial contribution to the **digital transformation** taking place during the coronavirus pandemic, such as by providing online marketplaces and videoconferencing systems used for teleworking (OECD, 2020b). This is reflected, for example, in the sharp increase

↘ CHART 119

Use of transaction platforms in Germany increased significantly during the coronavirus pandemic[1]



1 – Growth in internet traffic on transaction platforms. 2 – Transaction between two or more companies (business-to-business). 3 – Transaction between companies and consumers (business-to-consumer) or between private persons (consumer-to-consumer).

Sources: Hildenbrand et al. (2021), Semrush

in the use of digital platforms. Analysis of selected marketplaces used to conduct transactions in goods and services in Germany during the coronavirus pandemic reveals growth in all areas with the exception of the accommodation sector (Hildenbrand et al., 2021). ↘ BACKGROUND INFO 11 In particular the increase in online delivery services, B2C and C2C marketplaces as well as medical appointment booking platforms confirms the currently available anecdotal evidence (The Economist, 2020). ↘ CHART 119

449. Today's digital platforms provide firms with **a number of business functions** that can be especially beneficial (OECD, 2021e) for small and medium-sized enterprises (SMEs), which are often late adopters in the use of digital technologies (GCEE Annual Report 2020 item 541). ↘ TABLE 19 In doing so, they can help to **reduce transaction costs, information asymmetries and search costs**, for example by using evaluation systems and ensuring greater price transparency (Belleflamme and Peitz, 2018; OECD, 2019a). Digital platforms make it especially straightforward for **SMEs** – whose suppliers and customers are often restricted to the local or national level – to gain access to **new** suppliers, **distribution channels**, customer groups and markets (Busch, 2019; OECD, 2019a), thereby **making it easier for them to participate in regional and global trade** (González, 2017; OECD, 2019b). In many cases such firms actually rely on digital platforms when contacting customers (European Commission, 2019). Additional services offered by platform providers in the form of logistics systems, insurance policies or business analysis enable firms to **lower their operating costs** by outsourcing these services. The increasingly widespread use of digital platforms heightens the competitive pressures on non-digital providers and can **create positive productivity effects** that are greater for SMEs than for larger firms (Bailin Rivares et al., 2019; Costa et al., 2021).

450. Digital platforms can also improve the **matching and allocation of resources** and, in doing so, can help to utilise unused or under-used resources more efficiently (OECD, 2019a). The numerous job portals and social networks for skilled workers enhance the recruitment offering and can reduce the amount of time needed to find a job (Kuhn and Mansour, 2014; Stanton and Thomas, 2016). A more sophisticated matching process can also lead to higher wages and improve the quality of matching firms with employees.

↘ TABLE 19

Benefits of using transaction platform für small and medium-sized enterprises (SMEs)[1]

SME business areas	Main benefits for SMEs	Examples of platforms
Marketing, advertising, brand building, customer service, external communication	Positive indirect network effects, access to (global) markets, advanced analytics/AI (e. g. targeting/market segmentation, impact assessment)	Google, Facebook YouTube
E-commerce (online marketplaces)	Positive indirect network effects, access to (global) markets, advanced analytics/AI (e. g. targeting/market segmentation, impact assessment), lower business costs (e. g. payment, delivery, logistics), stronger customer trust (e. g. as a result of rating systems, insurance)	Amazon, eBay
Performance of services (more effective access to customers of existing companies)	Positive indirect network effects, access to (global) markets, lower business costs (e. g. payment, delivery, logistics, customer service), stronger customer trust (e. g. as a result of rating systems, insurance)	Deliveroo, DoorDash Uber Eats, Booking.com Netflix, Spotify, Accommodation and food services
Performance of services (opening up new markets)	Positive indirect network effects, standardisation of contracts, reduced information asymmetry, access to (global) markets, stronger customer trust (e. g. as a result of rating systems, insurance)	Airbnb, TaskRabbit
Financing	Positive direct network effects, access to global markets, lower financing costs, reduced information asymmetry	GoFundMe, Kick-starter, Lending Club, Funding Circle, COMPEON We.trade
Payment	Positive direct network effects, fewer payment arrears, reduced information asymmetry	PayPal, Square, Revolut
Communication, teleworking, videoconferencing	Positive direct and indirect network effects, lower or no implementation costs	WhatsApp, ZOOM, Microsoft Teams, Google Meet
Research and development (R&D), design, investigation	Positive direct network effects, lower production and dissemination costs (e. g. common standards, open-source code)	Apple App, GitHub Google Play

1 – Companies with fewer than 250 employees, annual revenue of no more than €50 million and total assets of no more than €43 million.

Source: OECD (2021e)

Obstacles to the commercial use of digital platforms in Germany

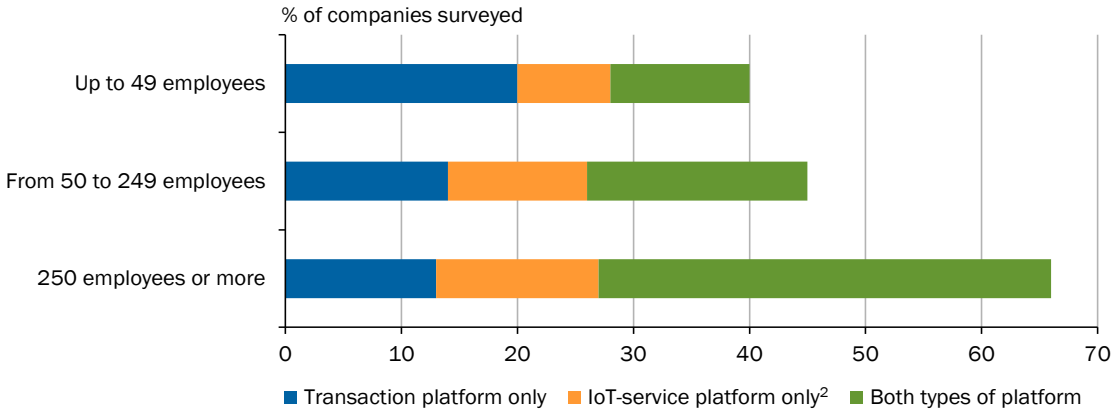
451. Although the online platform economy offers a number of opportunities to add value, the **proportion of German firms** that **use platforms** – i.e. that are active participants on one side of these markets – remains **low** in the case of **SMEs** in particular. In 2018, for example, only 21 % of SMEs in the manufacturing sector used digital B2B platforms to sell products or provide data-based services using IoT service platforms. The proportion of large firms that are active on platforms, by contrast, was 52 % (Lerch et al., 2019). In 2018 this discrepancy was also reflected in firms' projections for 2021, which suggested that although the use of digital platforms was expected to increase, SMEs would continue to lag far behind, especially where the use of technically more complex IoT service platforms is concerned. ↘ CHART 120

This reluctance is often interpreted as **insufficient awareness of the tangible business opportunities created by the use of digital platforms** as well as a lack of compatibility with SMEs' corporate culture (Busch, 2019). However, it is also the case that the **shortage of workers with the necessary ICT skills** and a lack of staff with knowledge of digital business innovations and the legal framework around the use of data usually affects SMEs more than large firms and can therefore discourage the use of digital platforms.

452. In surveys firms also increasingly mention **security concerns** about the use of data-fed and data-generating products and services from external providers, which include digital platform (Busch, 2019; Lerch et al., 2019). Although these concerns have certainly been justified for some years now, they have intensified considerably over the course of the COVID-19 pandemic (Franco et al., 2020). Jamilov et al. (2021) show, for example, that **cyber threats are becoming more frequent** over time and have actually tripled worldwide since 2013. The Federal Office for Information Security found in 2021 that cyber threats in

↘ CHART 120

SMEs are expected to use platforms less than larger firms in 2021[1]



1 – Percentage of users expected in the manufacturing sector according to the findings of the „Modernisation of production" survey by the Fraunhofer ISI in 2018. SME: small and medium-sized enterprises. 2 – Internet of Things service platform.

Source: Lerch et al. (2019)

Germany had increased over the period from June 2020 to May 2021 as a result of factors such as the more widespread use of ransomware and new malware variants. Individual cyber risks and cyber attacks can have an adverse impact on the revenue growth, credit ratings and share prices of firms affected. There is also evidence of negative spill-over effects on firms within the same industry or value chain (Crosignani et al., 2020; Jamilov et al., 2021; Kamiya et al., 2021).

453. A further major obstacle can be concerns about **unfair competition on a platform**. In the case of **hybrid platforms** – which, on the one hand, operate the platform market and set its rules but, on the other, themselves act as providers of products and services on the platform – it is often feared that they could use **data arising from transactions** (such as payment data, customer preferences and purchasing histories) to the detriment of other providers on the platform. ↘ BOX 27 Platforms could, for example, optimise their own products and services by analysing such data or they could highlight them by configuring their own rankings or recommendation algorithms. This is how, for example, AmazonBasics conquered the battery market within just a few years (Creswell, 2018). It is also increasingly being reported that platforms are using their customer data to copy products that are sold on their platform (Committee on the Judiciary, 2020; Mattioli, 2020).

454. The dominant market position occupied by some platforms also enables them to charge **substantial fees for commercial access** or to tie commercial providers in to certain pricing arrangements. **Best-price clauses** and **exclusivity agreements**, for example, prohibit commercial providers from offering their products and services on other platforms or from selling them more cheaply there. ↘ BOX 27 This policy prevents price competition and deprives firms of the opportunity to introduce flexible pricing in their other distribution channels. Price dumping by platform operators is another competition-related problem on platforms.

↘ BOX 27

Current examples of competition-distorting practices used by platform operators

Best-price clauses prohibit providers from offering their products and services more cheaply on other websites – including their own – than on the platform concerned. Such clauses are often used by hotel booking platforms and other transaction platforms such as Amazon. However, they are likely to become less widespread after Germany's Federal Court of Justice reviewed the use of best-price clauses by Booking.com and banned them in May 2021 (BGH, 2021).

Platform operators that offer their own products and services on their platforms may be tempted to give them preference. Google has been accused, for example, of favouring its own price comparison service Google Shopping over rivals' comparison sites when displaying search results. The European Commission confirmed in June 2017 that this **self-preferencing** constitutes abuse of a market-dominant position and imposed a fine of €2.4 billion (European Commission, 2017).

Platform operators can use **competition-related data** on other firms and the purchasing behaviour of these firms' consumers to their detriment in order to **develop their own products** or make them more competitive. They can also **exclude rivals from their own platform**. In the case of AliveCor versus Apple, platform operator Apple was accused of having used both

mechanisms to distort competition. AliveCor argued that Apple had copied its watches for monitoring heart palpitations as well as the related apps, which were available in Apple's app stores, and had then removed AliveCor's apps from these app stores (AliveCor, 2020, 2021). These legal proceedings are still ongoing.

Price dumping, i.e. setting prices below one's own cost of production in order to undercut competitors and price them out of the market, is especially problematic for small competitors that do not possess sufficient financial resources. The US Committee on the Judiciary (2020) argued that Amazon had engaged in price dumping in order to price a rapidly growing rival, Diapers.com, out of the market for nappies (diapers). The aggressive price war caused Amazon to suffer monthly losses of more than 200 million US dollars in its nappy segment. Amazon subsequently bought its rival and closed it down in 2017 (Committee on the Judiciary, 2020).

Exclusivity agreements restrict the ability to offer products and services outside the scope of a platform. In the case of ticketing agent Eventim, the Bundeskartellamt – Germany's competition authorities – ruled that exclusivity agreements with event organisers in the entertainment industry and with ticket presale outlets constitute an anti-competitive practice (Bundeskartellamt, 2017).

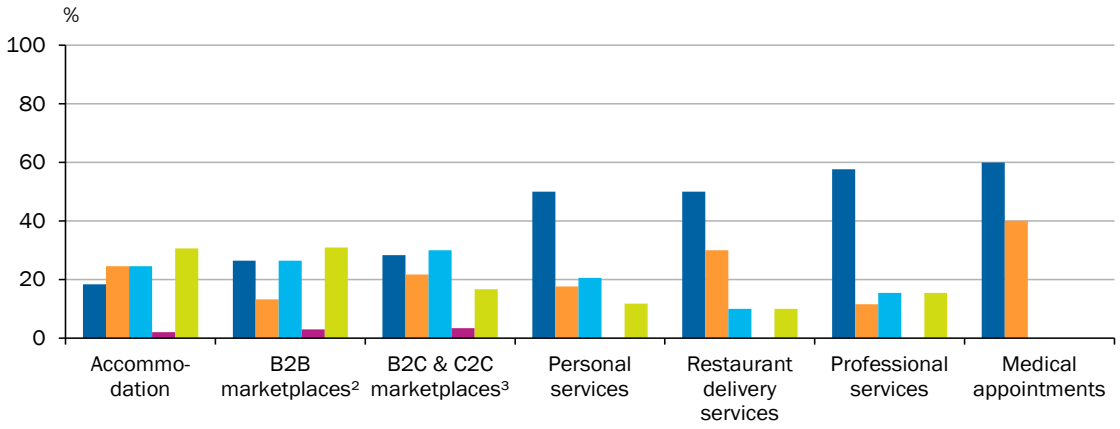
Obstacles to developing platforms in Germany

455. In addition to the fact that platforms are not used very much by firms – especially SMEs – a further matter of concern is the **small number of successful platforms headquartered in Germany**. Especially in the often commercially used X2C marketplaces, which mediate business relationships between firms and end-customers (B2C) or between private individuals (C2C), the proportion of transaction platforms used in Germany that are also headquartered in Germany is less than one-third. The proportion of data traffic emanating from German platform providers in these areas is even lower. ↘ CHART 121 Areas in which platforms have been established for only a short time, such as personal and business-related services, in which language skills can play a key role, are faring much better by comparison, presumably because the market-specific expertise that they require makes them less easily scalable. Although the proportion of B2B transaction platforms frequently used in Germany (such as Mercateo) and also headquartered in Germany is still low, various actors reckon that German platforms offer significant potential in B2B marketplaces, especially in IoT applications (Lerch et al., 2019; BDI, 2020a; BMWi, 2020a; European Commission, 2020c). ↘ BOX 28

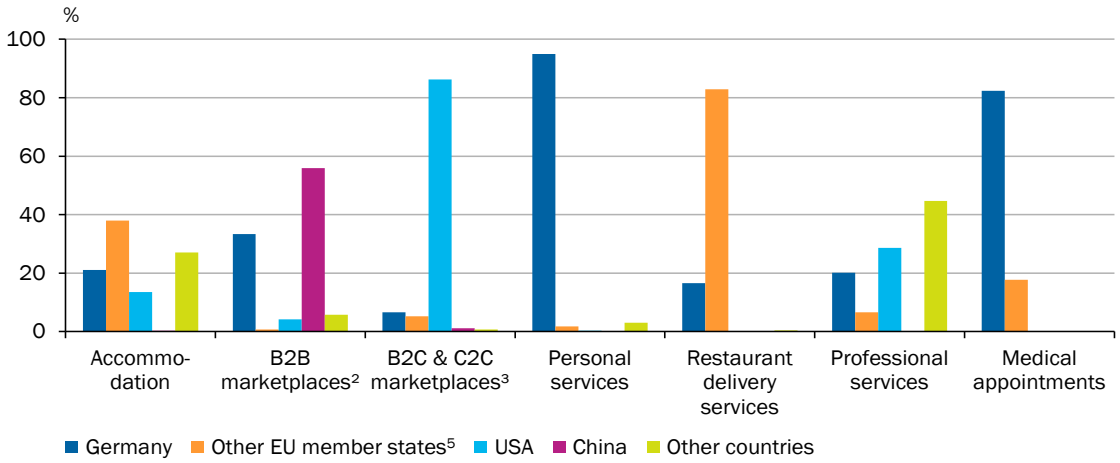
↘ CHART 121

Although there are many German transaction platforms, they are used less frequently[1]

Transaction platforms used in Germany as a proportion of the total number broken down by location of headquarters



Transaction platforms used in Germany as a proportion of total traffic broken down by location of headquarters[4]



1 – Number of underlying transaction platforms per sector: accommodation 98, B2B marketplaces 68, B2C and C2C marketplaces 60, personal services 34, restaurant delivery services 10, professional services 26, medical appointments 5. 2 – Transaction between two or more companies (business-to-business). 3 – Transaction between companies and consumers (business-to-consumer) or between private persons (consumer-to-consumer). 4 – Average traffic per month measured in terms of monthly website visits; based on monthly data from January 2018 to May 2021. 5 – The composition of countries varies because data is not available für all EU member states.

Sources: Hildenbrand et al. (2021), Semrush

↘ BOX 28

B2B platforms in the industrial data economy

The rise of platform-based firms – measured, for example, in terms of firms' market capitalisation – has **so far largely** taken place **on B2C markets**. Companies from the United States and China dominate these markets. The market for B2B platforms, by contrast, is relatively young. In industrial locations such as Germany, in particular, significant **growth potential of digital B2B platforms** is expected for industrial applications on both the providers'

side and the users' side of the market (European Commission, 2020c). Surveys conducted by the Fraunhofer Institute for Systems and Innovation Research (Fraunhofer ISI) reveal, however, that in 2018 they still played a minor role in German manufacturing industry as a distribution channel or in product-related IoT services (Lerch et al., 2019).

B2B platforms' substantial and, so far, insufficiently exploited **value-adding potential** results from the fact that various firms such as suppliers and buyers **share the same data**, **utilising positive network effects and economies of scope** and **developing new applications** as part of an ecosystem (Van Alstyne et al., 2016; Haucap et al., 2021). In the case of IoT platforms for product-related services, however, German firms are still primarily focusing on proprietary solutions (Lerch et al., 2019), and most German platforms are configured as closed ecosystems that are not accessible to third-party providers (Adari et al., 2019). This limits the creation of positive network effects and economies of scope.

There are several **structural differences between B2C and B2B platforms** (Haucap et al., 2021). B2B platforms, especially IoT platforms, require specialist offerings that are geared to individual sectors and applications and are partly based on in-depth sectoral expertise. This greater degree of differentiation and specialisation limits the scalability and growth of B2B platforms compared with the B2C market. In addition, actors tend to conclude individually negotiated agreements, which increases transaction costs compared with standardised contracts. Moreover, B2B applications pose particular challenges for data security. In addition to personal data, as with B2C platforms, these applications generate and use internal corporate and competition-related data (European Commission, 2020c). The participating firms' confidence in the B2B platform therefore plays a key role.

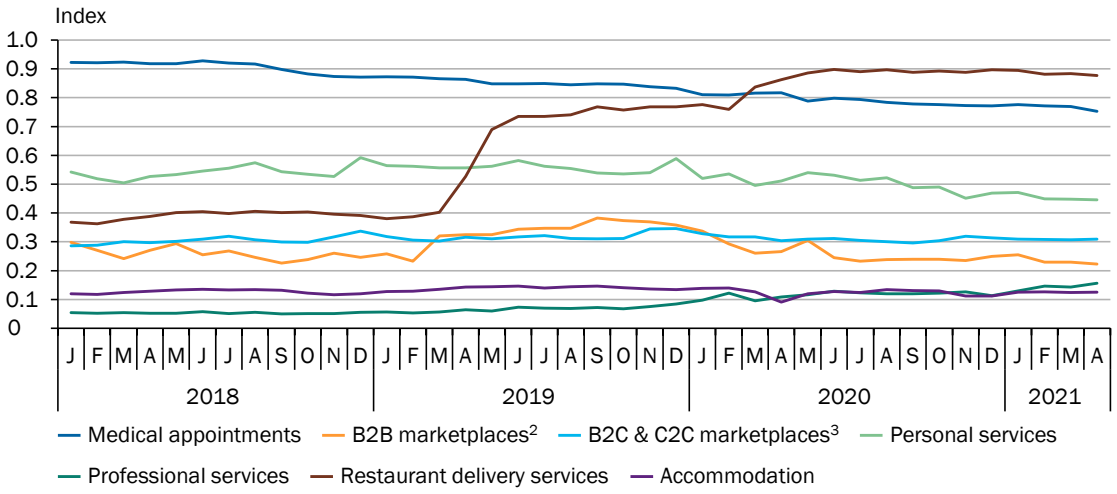
B2B platform providers are currently subject to **less market concentration and more intense competition** than B2C markets are (Koenen and Falck, 2020). This might be due to structural differences compared with B2C platform markets, but also because the market for B2B platforms is younger and growing concentration will not materialise until some time in the future, as has happened with B2C platforms. Opinions differ as to how much B2B platforms will need to be regulated compared with the B2C market. While some see little need for regulation here (BDI, 2020b; Hoffmann et al., 2021), others such as Haucap et al. (2021) emphasise that B2B platform markets too pose a risk of abusive behaviour and dependency on individual platforms.

456. One of the reasons why there are so few successful German platforms is likely to be the high barriers to market entry facing new platform operators. Platform markets have a tendency towards **concentration** as a result of network effects, economies of scope, and increasing marginal returns on the use of data (Furman et al., 2019). Because of these network effects and economies of scale they are more prone to '**tipping**' than one-sided markets that offer little data-based value added. Although this can theoretically be efficient (Jullien, 2005), it is difficult for new providers to enter the market in this environment; this is especially because of indirect network effects, which arise when platforms only become attractive to one side of the market once the other side of the market has achieved sufficient scale ('chicken-and-egg situation'; Caillaud and Jullien, 2003).

457. **Because such markets have a tendency to tip**, the dynamics of platform markets can change rapidly, so firms bear a greater business risk. One example of such tipping in Germany happened in the platform market for delivery services, where – following significant consolidation – the provider Deliveroo withdrew from the German market in 2019, which left the Dutch delivery service Just Eat,

↘ CHART 122

Market concentration in delivery services has increased significantly[1]



1 – Hirschman-Herfindahl index measured in terms of traffic on the transaction platforms. 2 – Transactions between two or more companies (Business-to-Business). 3 – Transactions between companies and consumers (Business-to-Consumer) or between private persons (Consumer-to-Consumer).

Sources: Hildenbrand et al. (2021), Semrush

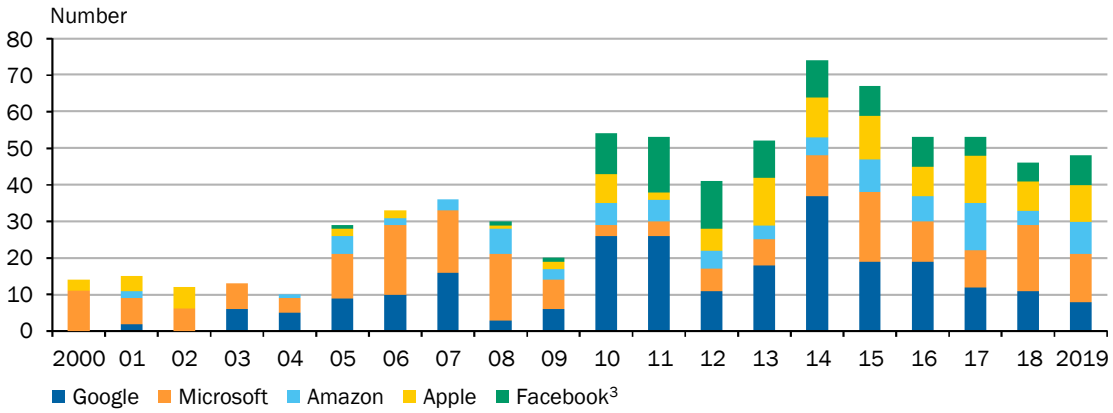
with its Lieferando brand, as the last major competitor in the market. This tipping was accompanied by a sharp increase in market concentration in terms of the volume of internet traffic on the platforms in this market. ↘ CHART 122

458. Platforms that have a market-dominant position are often called **gatekeepers**. The market power enjoyed by gatekeepers effectively enables them to **set the rules of the market concerned** and to exclude individual firms from markets. The dominant market position of some platforms is stabilised by the fact that it is made difficult for users to switch between platforms and to simultaneously participate in several platforms (**multihoming**). The lack of ability to switch easily between platforms or to engage in multihoming can create **lock-in effects** ↘ GLOSSARY for users, which make it virtually impossible for competitors to enter the market and generate the network effects needed to make a competitive offer. Switching platforms or multihoming without significant loss of utility – as, for example, in the case of social media platforms – presupposes that users can take their personal data with them in a commonly used electronic format and can transfer it to other platforms (**data portability**). **Interoperability** of different platforms – for example in the form of open standards and interfaces – is necessary as well to ensure that users can continue to access their old networks even if other users switch platforms without coordinating with them first. Users can, for example, send messages between interoperable messenger services.

459. **Mergers and acquisitions** (**M&A**) support the growing market power of dominant platforms. Mergers are used here as a strategic means of **strengthening existing market positions** within the same market (horizontal M&A) or within the value chain (vertical M&A) or to **tap new markets** (conglomerate M&A). Parker et al. (2021) reckon that the GAFAM companies have been involved in a total of 855 M&A since they were first formed.

↘ CHART 123

GAFAM[1] mergers and acquisitions have increased significantly since 2010[2]



1 – GAFAM stands for the five US companies Google (Alphabet), Amazon, Facebook, Apple and Microsoft. 2 – The chart shows publicly announced mergers and acquisitions that have been researched by the authors. 3 – Company formed in 2004.

Source: Parker et al. (2021)

The authors document a particularly sharp rise in M&A activity since 2010. ↘ CHART 123

460. **M&A** – especially those involving well-established and potential rivals – can **significantly reduce competition**. Some of the M&A transactions involving GAFAM companies in the past, for example, have been targeted at direct competitors (Parker et al., 2021). Germany, too, has witnessed such competition-inhibiting trends resulting from takeovers, as illustrated by the example of the delivery service sector. ↘ ITEM 457 One particularly problematic aspect appears to be that the targets of GAFAM-related mergers and acquisitions have often been young and small growth businesses, which means that most of these transactions have remained below the regulatory M&A scrutiny threshold and were therefore able to be completed without being scrutinised by the competition authorities. In the United States this was the case with roughly 85 % of GAFAM-related mergers and acquisitions completed between 2010 and 2019, as an investigation by the Federal Trade Commission (FTC) revealed (2021).

461. The extent to which platform providers' high M&A activity impacts on the formation and continuation of rival providers remains a subject of economic research. In digital-intensive industries, in particular, M&A are often a means of technology transfer, and the prospect of being acquired can provide a positive incentive for start-ups to innovate (Cabral, 2021). The phenomenon of so-called **killer acquisitions** (Cunningham et al., 2021) has attracted particular interest. In the context of platform markets this refers to the acquisition of **start-ups** which offer technologies or platforms that compete with one's own products and are discontinued after the acquisition in order to prevent any potential future competition. Gautier and Lamesch (2021) find, for example, that GAFAM-related M&A activity between 2015 and 2017 was largely accompanied by the closure of the firms acquired – an observation that is in line with the theory of killer acquisitions. Affeldt and Kesler (2021) show in the case of the Google Play Store

that roughly half of the apps acquired by GAFAM companies are discontinued. Although continued apps are frequently offered free of charge, they increasingly harvest user data.

462. If users hesitate to use a new product or service owing to network effects or lock-in effects, this can reduce the acquisition price of the respective start-up (Kamepalli et al., 2020). In markets where large platform companies conduct acquisitions this can create **kill zones** in which it is more difficult to finance innovation and market entry. Koski et al. (2020) find accordingly that market entry and venture capital financing in product markets decrease after big tech companies (GAFAM and IBM) complete acquisitions.

463. M&A can, on the other hand, have a positive impact if new firms developing innovations are subject to funding restrictions that are removed by an acquisition (Fumagalli et al., 2020; Motta and Peitz, 2021). Positive innovation incentives also arise if the technology developed by new firms for the existing platform is of greater value as a result of having been integrated into the ecosystem (Cabral, 2021). This can, however, lead to a situation whereby start-ups gear their innovation activities to market leaders, which disadvantages existing competitors (Bryan and Hovenkamp, 2020). The theoretical literature on **M&A** suggests, on the whole, that the **effect on competition** is largely **determined by prevailing conditions** such as market structure and innovation costs (Letina et al., 2020), which poses challenges for the competition authorities' scrutiny. Many competition economists are of the view that the competition authorities have not been sufficiently proactive on a number of M&A transactions conducted by GAFAM companies (Crémer et al., 2019; Furman et al., 2019; Motta and Peitz, 2021). ↘ ITEM 480

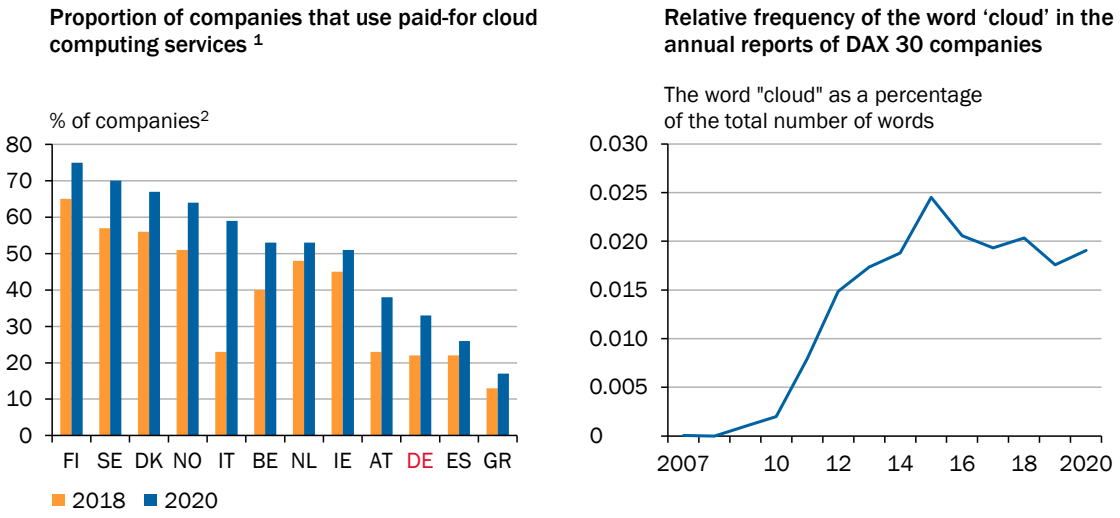
3. Cloud ecosystems as the technological basis of the data economy

464. Business models in the data economy – including platforms – are made possible by new technological developments in the storage and processing of large amounts of data. **Cloud computing** in particular increasingly provides the technological basis for the data economy. Cloud computing enables firms to use computer resources made available on the internet (cloud) as a service – instead of maintaining their own ICT infrastructure – and iprovides them with access to a pool of configurable computer resources. These include virtual server performance, memory, networks and computing power (**Infrastructure as a Service**, IaaS), a cloud environment on which a platform for developing applications on the internet is made available (such as the development of apps; **Platform as a Service**, PaaS), and the provision of software applications on the internet (such as Google Workspace and Microsoft Office 365; **Software as a Service**, SaaS; Eurostat, 2021).

465. The use of cloud computing services by German firms has grown significantly in recent years ↘ CHART 124 LEFT and is being mentioned increasingly frequently in the annual reports of German DAX companies. ↘ CHART 124 RIGHT A major advantage of

↘ CHART 124

Relevance of cloud computing services for German companies has increased significantly in recent years



1 – FI-Finland, SE-Sweden, DK-Denmark, NO-Norway, IT-Italy, BE-Belgium, NL-Netherlands, IE-Ireland, AT-Austria, DE-Germany, ES-Spain, GR-Greece. 2 – All companies (ten or more employees), excluding the banking sector.

Sources: Annual reports of the DAX 30 companies, Eurostat, own calculations

cloud computing lies in the **variable scalability** of its services. Unlike a firm's proprietary ICT infrastructure, cloud capacity can be increased or reduced at short notice, for example in response to brief changes in the number of users or the memory required. Because cloud services over the internet are available everywhere and independently of individual devices, they can be retrieved from remote devices (Mittelstand Digital, 2015). At the beginning of the coronavirus pandemic in particular, when the number of individuals remotely accessing resources and applications increased dramatically, cloud systems often made it possible to **work remotely** at all. Providers' high security standards, the constant availability of specialists to resolve issues, and the considerable reliability of the main cloud providers can help to **strengthen** firms' **resilience**. SMEs in particular are not always able to meet the requirements for a self-managed infrastructure system owing to a lack of financial resources and a shortage of suitably qualified staff (Lerch et al., 2019).

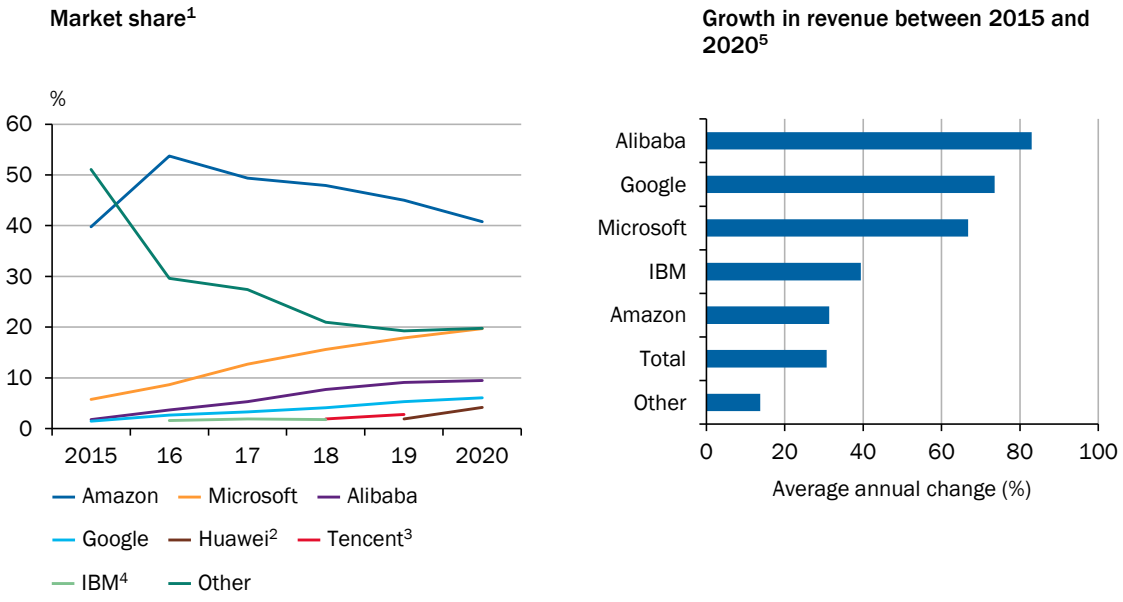
466. Nonetheless, the **percentage of users of public cloud computing services** in Germany remains **low** compared with other European countries. ↘ CHART 124 LEFT One major factor here is concerns about the storage of sensitive data. A survey conducted by Bitkom e.V., the association for the German information and telecommunications industry, reveals that 70 % of firms that do not use a public cloud worry about unauthorised access to sensitive corporate data. 60 % of those surveyed are unclear about the legal position with respect to the storage of personal data in public clouds. ↘ ITEM 469 And 43 % of survey respondents complain of a shortage of staff suitably qualified to integrate public cloud solutions (Bitkom, 2020a).

467. Cloud computing is increasingly being combined with **edge computing**. Edge computing enables large quantities of data to be processed locally – in other words at the periphery of the network – with minimal delays, which allows IoT applications or autonomous driving, for example, to operate in real time. Because many functions can then be sustained even if the network or parts of the network fail, edge computing also helps to strengthen resilience. In addition, edge computing enables sensitive data to remain in a specially protected area so that it does not have to be shared over networks (Luber, 2019).

Hyperscalers dominate the cloud computing market

468. The cloud computing market is dominated by five providers, which are referred to as **hyperscalers** and together accounted for roughly 80 % of the IaaS market in 2020. ↘ CHART 125 All five of these providers come **from either the United States or China**. What especially distinguishes hyperscalers from other cloud providers is their high degree of scalability, which is based on the computing power of several thousand data centres, and the gradual expansion of their IaaS offering through the addition of PaaS and SaaS services. This **breadth of offering** often persuades firms to rely on just one provider. At the same time, hyperscalers' specific standards (such as file formats, interfaces and application logic) create technical dependencies that make it more difficult to switch to other providers and can stifle innovation (lock-in effects; Opara-Martins et al., 2016; Bitkom, 2020b; Handelsblatt, 2021). Because substantial amounts of investment

↘ CHART 125
The Infrastructure-as-a-Service market is dominated by a few providers



1 – Market share in terms of annual revenue. The companies shown here are those with the five largest market shares in the years concerned. The remaining companies are combined under Other, including Rackspace, which was among the top five in 2015. Huawei, IBM and Tencent were not among the top five for the entire period. 2 – Included under Other until 2018. 3 – Included under Other until 2017 and 2020. 4 – Included under Other in 2015, and from 2019. 5 – From 2016 to 2018 for IBM. Huawei and Tencent are included under Other as only one annual change is available for each.

Sources: Gartner, own calculations

are required to build IaaS infrastructure platforms, which are difficult for new market participants to finance, it is virtually impossible for new actors to catch up (Obermaier, 2019; Hoffmann et al., 2021).

469. Since 2018, data processing by US cloud providers, which account for 66 % of the hyperscaler's market, has been governed by the **US Cloud Act**. This law enables US authorities to access data that is in the possession, in the custody or under the control of a US business or its subsidiaries, even without a court ruling. Theoretically, this also applies even if the data is stored in European data centres or if such access contravenes the EU's General Data Protection Regulation (GDPR) with respect to personal data (Haar, 2018; IT-Business, 2020). The European Court of Justice therefore clarified in its **Schrems II ruling** of July 2020 that personal data is only allowed to be transferred to third countries if it is equally effectively protected there. The United States was not deemed, however, to provide an equally effective level of protection (EuGH, 2020). It is therefore only possible to **transfer personal data to the United States** if the party responsible (such as the German business intending to utilise a US cloud provider's services) can demonstrate **appropriate guarantees to this effect**, which can, for example, be provided in the form of EU standard contractual clauses (Deutscher Bundestag, 2021b, p. 10). However, the existing standard contract clauses were inadequate at the time of the above ruling and were not renewed by the European Commission until June 2021 (European Commission, 2021a). Despite the unclear legal position, many European businesses have increasingly been using US cloud services since the beginning of the pandemic owing to the lack of European alternatives (Bitkom, 2020b; Handelsblatt, 2021).

Gaia-X: A European ecosystem for strengthening digital sovereignty

470. Given the market power of, and legal concerns about, non-European hyperscalers, calls for **technological sovereignty** in cloud computing have become increasingly loud. ↘ ITEM 496 The **Gaia-X** initiative was launched in 2019 and is intended to help strengthen the EU's technological sovereignty. It proposes data infrastructure that will guarantee data security, sovereignty and portability within the EU by interconnecting **open, uniform interfaces and technical standards** (BMWi, 2020b; GCEE Annual Report 2019 item 324; GCEE Annual Report 2020 items 584 ff.).

Rather than being just **another cloud provider**, Gaia-X therefore acts as a **seal of quality** that is designed to ensure the agreement of, and compliance with, a regulatory framework and uniform technical standards on issues such as sharing data. This is intended to ensure that users can switch more easily between a number of cloud providers (and even hyperscalers) without having to fear **lock-in effects**. This will enhance European users' resilience and strengthen their technological sovereignty (Kagermann et al., 2021b).

471. The Gaia-X project's track record to date, however, is mixed. According to Röhl et al. (2021), only 6.5 % of the more than 500 firms surveyed in 2020 had even heard of this project. It appears that the project is being particularly hampered by the **considerable amount of bureaucracy** caused by the time-consuming process

of coordination between the hundreds of firms involved, the EU member states and the European Commission (Hoppe and Neuerer, 2021). It also **took far too long to develop key basic technical requirements**. It was not until May 2021 that those responsible completed the specification for the first Gaia-X federation services, which are needed in order to develop specific products for processing data in accordance with Gaia-X standards (eco, 2021).

472. In order to boost the Gaia-X project and encourage the development of applications based on it, the **Federal Network Agency is supporting eleven selected lighthouse projects** worth up to €15 million between September 2021 and December 2024 (BMWi, 2021b). At the same time, Germany and France have been working with eleven other European member states since autumn 2020 to establish an Important Project of Common European Interest on Next Generation Cloud Infrastructure and Services (**IPCEI-CIS**), which is based on Gaia-X. The aim of this initiative is to encourage industry to develop new technologies that enable **huge amounts of data to be shared and processed** by remote systems in real time (BMWi, 2021c).

Support from the private sector is being provided by actors such as the **Catena-X** alliance, whose aim is to develop an open B2B platform based on Gaia-X, which will create **common standards** for sharing information and data **throughout the automotive value chain**. In addition to its founding members (BMW AG, Deutsche Telekom AG, Robert Bosch GmbH, SAP SE, Siemens AG and ZF Friedrichshafen AG) the initiative includes a growing number of diverse carmakers, automotive suppliers, dealers' associations and equipment suppliers.

V. REMOVING BARRIERS TO THE DEVELOPMENT OF THE DATA ECONOMY

473. The COVID-19 pandemic has accelerated the process of structural change towards data-based value creation. ↘ ITEM 438 This structural change continues to be hampered by general reallocation obstacles such as bureaucratic hurdles for business start-ups, low availability of venture capital compared with other countries, and an inadequate legal framework for insolvencies and restructuring – especially for small and micro businesses ↘ ITEM 419. There are also further major obstacles to the development and use of data-based business models – especially in platform markets ↘ ITEM 451 AND 455 – and with access to the necessary resources and technologies such as cloud computing. ↘ ITEM 464 These obstacles need to be removed so that – in the wake of the coronavirus pandemic – market participants can exploit the full potential of data-based value-added processes by offering and using such business models in Germany and Europe, thereby increasing technological sovereignty. ↘ ITEM 496

1. Encouraging data access and data sharing in Germany and the EU

474. Exploiting the full potential of the data economy will require an appropriate legal framework governing data access, data sharing and collaboration on the use of data in Germany and the EU. These factors should **optimise** the potential trade-off between exploiting the **productivity potential of data** and complying with **data protection rules**. Although the EU's high standards on the protection of personal data compared with other parts of the world can constitute a potential strength, they can also reduce the availability of data for purposes such as the training of AI systems (Groth and Straube, 2021). Current data protection requirements represent a major obstacle for German firms looking to share data (Azkan et al., 2019). The protection of personal data in Germany and the EU under the GDPR is mainly governed by the principle of consent on the part of the individual affected by the data's processing. Past experience of the GDPR has shown that its implementation imposes considerable costs on SMEs in particular (GCEE Annual Report 2020 item 587). The large number of consents that need to be obtained by users also place practical limits on the GDPR. ↘ ITEM 495 Because there is no equivalent to the GDPR for non-personal data, firms have to rely on individual contractual solutions in practice (Krotova, 2020). There are currently no instruments that would allow data users to provide large numbers of actors with a joint offer to use their data subject to contractually agreed conditions. Likewise, there are no instruments that data donors could use to communicate decisions on the transfer and processing of data for specific purposes subject to previously stipulated conditions (Commission on Competition Law 4.0, 2019).

475. The **EU data strategy** adopted in 2020 could provide guidance and support for the use and re-use of data ↘ TABLE 20. This strategy is designed to promote the integration of the European single market for data and, at the same time, aims to ensure data protection in accordance with European standards by setting clear rules on data access and use. One example of the regulation of data use is the Open Data Directive adopted in 2019, which regulates the re-use of public-sector information (European Parliament and Council of the European Union, 2019).

476. A key part of the EU's data strategy is the creation of **sector-specific common European data spaces** in areas such as industrial production, mobility and health (common European data spaces; European Commission, 2020d; GCEE Annual Report 2020 item 584). These data spaces are to set rules on data use as well as sector-specific standards for the technical infrastructure commonly used for data sharing. These defined data spaces will enable data donors such as firms and public administrations to use standardised interfaces to make their data available remotely, while at the same time retaining sovereignty and control over their own data.

477. The new concept of **data trustees** is also being discussed. Following the data owners' instructions, trustees can manage and anonymise their personal data and make it available in the form of pooled access. An initial example of such data intermediary trustees already exists in the form of personal information

↘ TABLE 20

Selected current strategies for using data in the EU and Germany

Level	Strategy	Presented	Objective/content
EU	EU's data strategy	2020	– Create a single European market for data – Four areas of activity 1. Governance framework 2. Infrastructure and interoperability 3. Competences 4. Data spaces
German government	German government's data strategy	2021	– Make Germany the leader in the innovative use and sharing of data across Europe – More than 240 individual measures in four areas of activity: 1. Configure data structures efficiently and sustainably 2. Increase innovative and responsible use of data 3. Strengthen data competence and establish a data culture 4. Ensure that the federal government takes the lead
	Open Data Strategy	2021	– Expand the German government's open-data ecosystem – The Open Data Strategy is the implementation plan for the German Data Use Act (DNG), which transpose the EU Open Data Directive (2019) into national law
	Cyber security strategy	2021	– Set the long-term direction of the German government's cyber security policies in the form of guidelines, areas of activity, and objectives
	German government's „Shaping Digitalization“ implementation strategy	2019	– Produce a regularly updated summary and progress report on the German government's strategies and measures (currently 147 projects planned)
	Blockchain strategy	2019	– Investigate and exploit the potential of blockchain technology – Prevent any potential abuse
	Artificial intelligence (AI) strategy	2018	– Encourage and support the diverse potential applications of AI in all sections of society; ensure that Germany remains a top location for research – Strengthen the competitiveness of the German economy
	Digital Strategy 2025	2016	– Build a gigabit fibre optic network for Germany by 2025 – Support start-ups and ecourage collaboration between young and well-established companies – Create a regulartory framework that encourages investment and innovation – Drive „intelligent connectivity“ in key infrastructure areas of the economy – Strengthen data security and develop data sovereignty – Facilitate new business models for SMEs, artisan trades, and services – Modernise Germany as a manufacturing location by implementing the Industry 4.0 strategy – Raise the standards of research, development and innovation in digital technologies to world-beating levels – Introduce digital education into all areas of life – Set up a digital agency as a state-of-the-art centre of excellence

Sources: Federal Ministry of Economic Affairs and Energy, German government, EU, own presentation

management services (PIMS), with which users can manage their data protection preferences and enforce them across all services (Data Ethics Commission, 2019).

The proposal submitted by the European Commission in November 2020 for a **Data Governance Act** constitutes the first draft legislation as part of a European data strategy. This proposal aims to harmonise conditions for the re-use and sharing of data throughout the EU and is intended to create the legal basis for common European data spaces and data trustee models (European Commission, 2020e). In particular it will specify conditions for the provision of data-sharing services. The **data strategy** presented by the **German government** in January 2021 ↘ TABLE 20 also aims to create new data spaces and establish data trustees (Federal government, 2021c).

478. The **data spaces and data trustee models** planned under these strategies do not yet exist. Their potential **design is the subject of intense debate** (Data Ethics Commission, 2019; Kühling et al., 2020; Blankertz and Specht, 2021; Federal government, 2021c). A potential blueprint for industrial data spaces could be the International Data Spaces Initiative reference architecture developed since 2015, which originates from a Fraunhofer-Gesellschaft research project funded by Germany's Federal Ministry of Education and Research (BMBF) (Otto et al., 2016). This architecture also forms the basis for the Mobility Data Space in Germany project funded by Germany's Federal Ministry of Transport and Digital Infrastructure (BMVI) (Pretzsch et al., 2020). Participants such as public transport firms, weather forecasting services, citizens and carmakers will be able to share their data remotely in this data space. This is intended to create innovations such as traffic flow management, parking management systems and end-to-end intermodal navigation solutions for citizens (Otto and Burmann, 2021).

The development and trialling of such models is a stated objective of Germany's recovery and resilience plan and should be expeditiously pursued (BMF, 2021d; GCEE, 2021). Given the diverse data protection and data security requirements stipulated in various areas, the **sector-specific data spaces** mentioned in these strategies can **reduce transaction costs for data sharing** and strengthen the **effective implementation of data protection**. **Data trustees** could help individuals to exercise their data protection rights and, by pooling the interests of many data owners, exercise **greater negotiating power in dealings with service providers** when enforcing data protection policies (Commission on Competition Law 4.0, 2019).

479. And, last but not least, public administrations themselves should encourage the sharing of data. At present, however, the potential offered by public data for science, research and business innovation in Germany is hardly being exploited at all (GCEE Annual Report 2020 items 538 ff.). The **Open Data Strategy** adopted by the German government this year ↘ TABLE 20 aims to significantly improve the quality and quantity of public data made available and to enhance its visibility and traceability (BMI, 2021a). This strategy **should be fully implemented** in order to mitigate deficits and improve access to public administrative and research data.

2. Strengthening competition in the online platform economy

480. The pronounced tendency towards concentration in digital platform markets has triggered a heated debate about the extent to which this concentration can be attributed to abusive behaviour by market-dominant platforms and inadequate scrutiny of mergers or whether these markets constitute natural monopolies that should be regulated. ↘ ITEM 456 A number of antitrust proceedings have recently been initiated against major platform companies in places such as the United States, South Korea, Australia and the European Union. ↘ TABLE 23 APPENDIX In addition, numerous commissions have made **proposals** on how the legal framework should be redesigned in order to **strengthen competition in digital markets** (German Monopolies Commission, 2015; ACCC, 2019; Crémer et al., 2019; Furman et al., 2019; Commission on Competition Law 4.0, 2019; Stigler committee on digital platforms, 2019; Committee on the Judiciary, 2020; Haucap and Schweitzer, 2021).

When regulating digital markets, it is important to bear in mind that strict regulation can interfere with businesses' entrepreneurial autonomy and the usual market adjustment mechanisms (Kronberger Kreis, 2017). However, the aforementioned commissions all agree that legislative action is required and the differences between the proposals relate mostly to the institutional structures required. Inherent in all proposals is the attempt to ensure **competition for the (platform) market** by, for example, introducing rules on other platforms' ability to use market-dominant platforms' user data. The proposals also aim to protect **competition on the platform** by, for example, by rules prohibiting self-preferencing by platforms. In addition, the proposals seek to strengthen competition by making it easier to switch between platforms without losing any of the benefits of network effects and economies of scale by, for example, introducing rules on data portability and interoperability of services. ↘ ITEM 458 A range of countries is currently debating draft legislations on strengthening competition in digital markets based on these proposals. ↘ TABLE 21

481. One key aspect which all commissions referred to and which several legislative initiatives have adopted is dealing with mergers and acquisitions (M&A). One of the reasons for the **large number of M&A transactions in the data economy** ↘ ITEM 460 that take place without being subjected to the usual merger control procedures – or are not prevented by it – is that the M&A targets are often young businesses that are below the regulatory revenue thresholds for M&A scrutiny (Crémer et al., 2019). Germany made several amendments to its antitrust regulation back in 2017. Among other things, these amendments adjusted the regulatory threshold for M&A scrutiny in such a way that acquisitions of businesses that had so far generated very little or no revenue, but whose purchase price exceeded €400 million, were now subject to such scrutiny (**ninth amendment to the German Act against Restraints on Competition (GWB)**).

↘ TABLE 21

Legislative proposals to regulate digital platforms in the EU and the USA

Legislative proposals	Content	Status
GWB Digitalisation Act (tenth amendment to the German Act against Restraints on Competition (GWB))	**Main objective: modernise the control of abusive practices and bring it into line with the challenges posed by the digital economy and platforms** Most important amendment: section 19a. This amendment specifies that the Bundeskartellamt (Germany's competition authority) can adopt a regulation ascertaining wether a company's strategic position or its resources confer on it a particular cross-market importance for competition. If this is the case, the Bundeskartellamt can preemptively ban certain types of behaviour. Examples of such types of behaviour are the self-preferencing of a corporate group's own services, preventing third parties' market access by processing competition-relevant data, or limiting interoperability of products and services or data portability. The legal process has been accelerated in order to shorten the duration of legal proceedings. Complaints about decisions taken by the Bundeskartellamt on the basis of section 19a will be directly adjudicated by Germany's Federal Court of Justice. Further amendments include an extension of the way in which market power is assessed. In future, such assessments must also take account of access to competition-relevant data as well as the question of wether a platform possesses intermediary power.	Came into force on 19.01.2021
Digital Markets Act	**Main objective: regulate gatekeeper platforms** so that end-users and commercial users can take advantage of the benefits of the platform economy and the digital economy in a contestable and fair competitive environment – 18 self-executing rules, which sometimes need to be specified in more detail when applied in specific cases; that include: – a ban on processing of data arising from commercial users' activities on the platform in order to compete against these commercial users – a ban on exclusivity clauses – a ban on the self-preferencing of platforms' own goods and services – an obligation to ensure data portability and, in certain contexts, interoperability	The Commission's draft are being discussed by the member states and the EU Parliament as part of the regular legislative process
Digital Services Act	**Main objective: protect consumers on online platforms, combat illegal online content, create a uniform legal framework for online platforms' liability, and ensure greater transparency around online advertising and any algorithms used** – rules on the moderation of content on social media platforms – an obligation to set up complaints management systems to handle complaints about the removal of information, suspension of accounts etc. – rules on disclosure of information about algorithms, recommendation systems criteria, and advertising	
American Choice and Innovation Online Act of 2021	**Main objective: restrict anti-competitive, discriminatory practices by platforms** – ban self-preferencing – ban the restriction of interoperability – ban the use of data generated on the platform in order to develop proprietary products	The drafts have been approved by the US House Committee on the Judiciary and have been submitted to the House of Representatives for the adoption of further resolutions
Platform Competition and Opportunity Act of 2021	**Main objective: ban mergers and acquisitions that could increase the market power of dominant platforms** – ban takeovers of companies that already compete or could compete with the platform – ban takeovers that could increase market power, reversing the burden of proof	
Ending Platform Monopolies Act of 2021	**Main objective: prevent conflicts of interest whereby dominant platforms use their control of several markets to the detriment of competitors** – platform owners are not allowed to offer services that compete with other offerings; for example, the owners of a platform on which competitors operate are not allowed to offer products or services themselves on this platform	
ACCESS[1] Act of 2021	**Main objective: encourage competition by reducing barriers to market access and the cost of switching for consumers and businesses online** – oblige platforms to allow application programming interfaces (APIs) ensuring data portability and interoperability	
Merger Filing Fee Modernization Act of 2021	**Main objective: increase the registration fees for planned M&As to ensure that the competition authorities can function properly**	
Open App Markets Act	**Main objective: restrict the market power of app store operators** – ban the practice of making apps store access conditional on the use of certain payment systems – ban best-price clauses	

1 – Augmenting Compatibility and Competition by Enabling Service Switching.

Source: own research

No such **adjustments** have been made at **EU level** to date. Rather, the European Commission (2021b) has instructed the relevant authorities in the member states to refer any mergers in the data economy to the Commission for scrutiny – even if they are below the regulatory EU reporting threshold – in cases where the mergers could potentially restrict competition. In addition, the EU has proposed that large online platform which qualify as 'gatekeepers' report all mergers and acquisitions in the digital economy to the EU (European Commission, 2020f). In the United States, the Federal Trade Commission has opened an investigation to examine the GAFAM companies' acquisitions of smaller firms during the period from 2010 to 2019. Its main objective is to try to understand what impact these smaller acquisitions have on competition (FTC, 2020).

482. An even more comprehensive amendment to the German Act against Restraints on Competition (GWB) came into force in January 2021 (tenth GWB amendment). This amendment specifies that the Bundeskartellamt, Germany's competition authority, can adopt a regulation ascertaining whether a company's **strategic position or its resources** confer on it a **paramount significance for competition across markets**. If this is the case, the Bundeskartellamt can **pre-emptively prohibit certain types of behaviour** (section 19a GWB). ↘ TABLE 21 Such ex-ante regulation accelerates the control of abusive practices significantly, which is intended to counter the dynamic nature of developments in the data economy (Furman et al., 2019; Haucap and Schweitzer, 2021). Acting on this new legal basis, the Bundeskartellamt has now initiated several legal proceedings against major digital companies (Facebook, Google, Amazon and Apple) in order to ascertain whether these companies are of significance for competition across market (Bundeskartellamt, 2021a, 2021b, 2021c, 2021d). ↘ TABLE 23 APPENDIX

483. In December 2020, the **European Commission** submitted **Digital Markets Act (DMA),** which is its legislative proposal for regulating gatekeepers – the large online platforms that have the potential to impair competition. Based on the principles of fairness and contestability of markets, the DMA seeks to impose specific obligations on gatekeeper platforms and to **ban some anticompetitive practices ex ante** (European Commission, 2020f; Crémer et al., 2021). This draft legislation is currently within the EU's regular legislative process and is due to be passed as early as next year. During this process the EU Parliament's rapporteur submitted **proposals for amendments** (Schwab, 2021), which would strengthen the draft in some places – for example with respect to the imposition of structural remedies – and would weaken it in other places – for example with respect to the threshold above which a firm is deemed to be a gatekeeper and must therefore comply with the rules. The German Monopolies Commission has proposed that self-preferencing by platform operators should be more widely banned and that the provisions of the DMA should be expanded specifically to include the particular characteristics of ecosystems (German Monopolies Commission, 2021). Accordingly, an ecosystem criterion would be included in the definition of gatekeepers. ↘ ITEM 443 A compromise proposed by the Slovenian Council presidency is currently with the EU Council. It is hoped that an agreement on the DMA legislative process will be reached in the first half of 2022.

484. **In the United States, five pieces of draft legislation** were put before Congress in June 2021. This legislation would oblige dominant platform companies to adopt certain types of behaviour and would ban them from applying some of the anticompetitive practices. In addition, further draft legislation aimed at regulating app stores was presented in August. ↘ TABLE 21 The general terms and conditions applicable in app stores had previously been the subject of a number of anti-trust cases. ↘ TABLE 23 APPENDIX

485. The **pieces of draft legislation presented in the EU and the United States** are similar in their intention to strengthen competition in digital markets. There are, however, **significant differences** (Schnitzer et al., 2021). Whereas the US drafts tend to formulate general rules that need to be interpreted by the courts, the DMA favours a comprehensive list of very concrete rules that are intended to be self-enforcing.

There are also differences in terms of content. The measures contained in two of the US pieces of draft legislation aimed at ensuring **interoperability**, ↘ ITEM 458 for example, are much more comprehensive than those specified in the DMA (Scott Morton et al., 2021). The European regulation contained in the DMA should be worded more comprehensively in order to effectively improve competition conditions in platform markets by means of interoperability.

486. There are also **significant differences** between the US and European regulatory approaches when it comes to **M&A and business divestitures.**. In the United States, for example, greater restrictions are to be imposed on mergers involving market-dominant platforms (Platform Competition and Opportunity Act of 2021), while forced unbundling of vertically-integrated platforms and spin-offs are to be made easier (Ending Platform Monopolies Act of 2021). Any tightening of merger scrutiny in the EU would require unanimity among the member states and is not included in the DMA, which can be passed by a majority of votes on the part of the member states. The option of breaking up large digital companies is only seen as a last resort in the DMA and can only be considered in cases where such companies have repeatedly failed to comply with previously imposed behavioural remedies.

487. Given the stiff resistance being mounted by the US platform companies, it is currently unclear whether any of the US draft legislation will ultimately be passed and, if it is, which parts of it will be adopted (Financial Times, 2021). Irrespective of this, and in view of the transnational nature of the Big Tech companies' operations, it would seem advisable to **strengthen the coherence of regulation** on both sides of the Atlantic. It would therefore make sense to collaborate closely on the **continued development of the regulatory proposals** currently being drafted in the **EU and the US and to coordinate them more effectively** (Schnitzer et al., 2021).

488. Some past experience suggests that the DMA's preferred approach of imposing **behavioural remedies** can **often have limited success** in the data economy. So, for example, the remedies that Google agreed with the European Commission in the Google Shopping and Android cases have not dented Google's monopoly, nor have they increased market access and competition in the online search

market (Heidhues et al., 2021). Rather, Google has managed to successfully circumvent the European Commission's behavioural remedies. In the Android case, for example, the remedy prevented Google from forcing device manufacturers using the Android operating system to simultaneously offer the Google search app exclusively as a pre-installed search engine on its devices. After Google had waived the relevant licensing terms and conditions, however, it started to charge licensing fees in the EU for a collection of its apps (Google Play Store, Gmail, Maps and YouTube). These fees were waived, however, if the device manufacturers offered Google Search exclusively as a pre-installed search engine. By amending its licensing terms and conditions, therefore, Google created an incentive for manufacturers to continue offering Google Search as the exclusive search engine on Android devices without itself contravening the remedies imposed by the European Commission.

The limited effectiveness of behavioural remedies is also illustrated by the example of the US telecommunications industry in the 1950s. The behavioural remedy imposed in 1956 on AT&T – which had a monopoly of the telecommunications market at the time – in order to force the company to license its technology free of charge (so-called compulsory licensing) did not produce the positive competition effect expected in the telecommunications markets. Competition was not stimulated until the Bell System – which included AT&T – was broken up in the 1980s (Watzinger et al., 2020; Watzinger and Schnitzer, 2021).

489. One advantage of **structural remedies** over **behavioural remedies** is that they are less expensive for the authorities to monitor. On the other hand, spin-offs and divestments involving digital firms pose **technical challenges**. The individual parts of the business that are to be spun off must be able to be effectively offered independently of each other (Tirole, 2020). This is relevant to aspects such as the data used and services offered. If Facebook, for example, allows the users of two of its services – Instagram and Facebook – to send direct messages to each other and it bundles these services together in terms of their technology, it will be more difficult to separate them. Moreover, it can be problematic finding a suitable buyer. Spin-offs of individual services can also impair positive network effects on platforms (Tirole, 2020). Appropriate remedies that encourage interoperability and data portability can, however, counteract this adverse effect of spin-offs and demergers. ↘ ITEM 485

490. Regulation approaches at both the German and European levels have, to date, mainly concentrated on B2C platforms. This is particularly evident in the case of the draft DMA, which focuses exclusively on a few 'central platform services' that have a very large number of end-users (more than 45 million), which probably excludes **B2B platforms**. The need for B2B platform markets to be regulated is currently the subject of public debate (BDI, 2020b; Koenen and Falck, 2020; Haucap et al., 2021). The competitive situation in the comparatively young B2B platform markets should continue to be monitored to enable timely interventions to be made.

3. Strengthening consumer protection in the data economy

491. **Informed and rational consumer decisions** form the basis for properly functioning competition and **efficient market outcomes**. In online retail, however, providers have a number of new ways of making informed decisions more difficult and can therefore prevent consumers from switching to a better offer (Fletcher et al., 2021).

492. The adept use of online markets requires, above all, **digital competence on the part of consumers**, which in Germany is still deficient in areas such as the use of consumer data and digital identities (German Advisory Council for Consumer Affairs [SVRV], 2021). The **training** of such **consumer competence should** therefore **be strengthened**.

493. The specific characteristics of online markets – such as the lack of physical interaction and the key role of website design (choice architecture), where there is often no clear distinction between paid-for and free content or there are unclear contractual terms and conditions combined with automatic subscription renewal ↘ ITEM 445 – make it **necessary** to introduce **additional or modified consumer protection standards compared with offline markets**. In December 2020 the European Commission submitted a proposal for a **Digital Services Act (DSA)**, which updates the E-Commerce Directive in force since 2000 (2000/31/EC). This proposal contains various transparency requirements – such as the need to disclose any algorithms used and to provide information on paid-for advertising – some of which, however, are directed solely at large platforms with more than 45 million users in Europe.

494. However, the **regulatory plans proposed in the DSA do not yet go far enough in some respects**. Quality indicators such as ratings and written reviews, for example, should be scrutinised more closely, and positive ratings provided in exchange for payment should either be banned or clearly flagged up as advertising. The process of cancelling subscriptions is currently often time-consuming and therefore exploits consumers' inertia. Such cancellations should be simplified in the form of standard links, for example, and should also include an obligation to regularly remind inactive users. Practices designed to influence purchasing decisions – such as displaying the total price at a late stage in the order process or conveying a false sense of urgency – should be banned.

495. Updated consumer protection regulations should also focus on data use consent because, as explained above, the 'currency' with which consumers 'pay' for many online services is their data or attention rather than cash. ↘ ITEM 445 **Experience of the GDPR** has shown that **data use opt-outs are not very effective** because they demand too much time of many consumers and it is often the case that important services cannot be used without consent. One potential solution here might be standard procedures that enable users to specify preferences (for example privacy levels 1, 2 or 3) and that, if desired, could be used across all service providers but could be adjusted at any time (Fletcher et al., 2021).

4. Technological sovereignty as a field of action for economic policy

496. Not least due to the dominance of US and Chinese platform companies and hyperscalers, the structural shift towards a digital economy is increasingly being accompanied by calls for greater **technological sovereignty** for the state and key actors within the state (for example BMWi, 2019; The White House, 2020). There is a particular focus here on key digital technologies such as cloud computing, ↘ ITEM 464 quantum computing, artificial intelligence and 5G networks (European Commission, 2020g). There is, however, **no common understanding** of what constitutes technological sovereignty.

What is meant by the objective of **technological sovereignty** is not a desire for technological autarky (Fraunhofer ISI, 2020; ZVEI, 2020; BMBF, 2021; Kagermann et al., 2021a) but that individuals, businesses and the state must be enabled to remain in control of technology and, in doing so, possess freedom of action in its development and use. This does not call into question the benefits of cross-border specialisation or the division of labour. Rather, **technological sovereignty requires European and international cooperation**. This is particularly clearly illustrated by the example of global value chains in the semiconductor industry, which have attracted attention owing to supply shortages ↘ BACKGROUND INFO 2 in the wake of the pandemic. ↘ BOX 29

↘ BOX 29

Global value chains in the semiconductor industry

Microchips (microprocessors and memory chips) are the **key hardware components of the data economy**. The digital economy has only been made possible by technological innovations and a reduction in the cost of microchips (Jorgenson, 2001). Microchip architectures determine not only computing power but also the energy efficiency and security of numerous economic activities. Disruptions to the global microchip value chain as a result of geopolitical conflicts (Kempf et al., 2021) and supply shortages in the German manufacturing sector – especially in the automotive industry (European Central Bank, 2021) ↘ BOX 6 – have recently fuelled a debate about the **importance of the local microchip industry** for the **resilience and digital sovereignty** of Germany and Europe (Kagermann et al., 2021a).

The manufacture of microchips is characterised by a high intensity of research and development (R&D) and a very capital-intensive production process that offers considerable economies of scale (Ernst, 2015). Over time this has resulted in a **high level of market concentration** in individual sections of the value chain. The **global value chain** in microchip production – from basic research and microchip design to manufacturing and, finally, use in electronic devices – is, however, complex and is not totally dominated by any one country or firm. While some firms cover the entire value chain from development and design to the production and marketing of microchips (integrated device manufacturers), other firms focus solely on microchip design (fabless foundries). In addition – in the wake of extensive outsourcing, especially to Asia – foundries and firms specialising in the assembly and testing of microchips have emerged as key business models in the microchip industry (OECD, 2019c).

Moreover, the complexity and resource intensity of microchip production has, over time, led to a **high degree of regional specialisation** and to interdependencies. The **production** of state-of-the-art microchips (feature sizes of 5 nm or less) is currently dominated by just two

companies (TSMC from Taiwan and Samsung from South Korea). Leading microchip manufacturers are, however, reliant on suppliers of production equipment from Europe and the United States especially. ASML from the Netherlands, for example, is the market leader in lithography systems, which are needed in the production process. These systems, in turn, use lasers and optical components manufactured by Trumpf and Zeiss in Germany. German firms are also key suppliers of chemicals, silicon wafers and specialist software used to design microchips (OECD, 2019c).

By far the greatest share of global **demand** for microchips comes from the production of smartphones and ICT hardware (PCs and servers), which is mainly based in China. The automotive industry accounted for only around 12 % of global demand in 2018. The application concerned determines the type of microchips required. Whereas mobile devices are based on the technologically most advanced microchips with small feature sizes and low energy consumption, the automotive sector manages with much larger feature sizes. Moreover, many of the latest technological advances such as 5G networks, artificial intelligence, edge computing and IoT applications do not require microchips whose performance alone has been optimised. What they do increasingly need is application-specific microchips that perform specialist functions (Kagermann et al., 2021c). The growing importance of application-related microchips could give rise to new forms of competition and new providers over the medium term. US technology giants such as Google, Amazon and Facebook have, for example, already invested heavily in the development of their own application-specific microchips (OECD, 2019c).

Because it is highly research-intensive and requires substantial amounts of capital in its production processes, the global semiconductor industry has always received large amounts of **state funding** (Thomas, 2011). The countries involved in the value chain are at present engaged in **intense subsidy competition** with the principal aim of supporting local production facilities. There are currently plans to provide significant tax incentives and direct funding to the semiconductor industries in countries such as South Korea, Taiwan and China (Congressional Research Service, 2021; Moon Jae-in, 2021; The White House, 2021a). Under its Innovation and Competition Act the United States plans to fund research and manufacturing in its semiconductor industry to the tune of 52 billion US dollars (The White House, 2021b). Although Germany and the EU – both as buyers of microchips and as suppliers of production equipment – can benefit from international subsidy competition, government support not aimed at pre-competitive R&D poses a particular risk of distorting the market and creating inefficiencies in the global value chain (OECD, 2019c).

In July 2021 the **European Commission** launched the European **Industrial Alliance for Processors and Semiconductor Technologies** with the intention of reducing strategic dependencies and designing and manufacturing state-of-the-art microchips in Europe. This alliance aims to expand Europe's production capacities, whose global market share is to be roughly doubled to 20 % by 2030. In particular, European production is intended to catch up with state-of-the-art technology (feature sizes of less than 5 nm) (European Commission, 2021c). This is to be achieved as part of an Important Project of Common European Interest (IPCEI) for microelectronics, which builds on a previous IPCEI launched back in 2018 with funding of €1.75 billion. These plans to support the European semiconductor industry were recently reinforced by the announcement of a European Chip Act (European Commission, 2021d).

The desire articulated in the EU's plans for **greater sovereignty and resilience** has been criticised by industry representatives for reasons of **efficiency and competitiveness**. Efforts to catch up with the production of microchips of the smallest feature sizes currently available will, for example, require a huge amount of time and investment. The cost of a state-of-the-art production facility that manufactures 5 nm microchips is estimated to be almost 20 billion US dollars (Kleinhans, 2021). Because Europe lacks manufacturing expertise in this field, the EU's strategy would initially rely on buying in external knowhow (Politico, 2021). There is also

considerable uncertainty about future local demand for microchips based on state-of-the-art technology. Although applications such as autonomous driving might boost local demand for high-performance microchips in future (Kagermann et al., 2021c), many future industrial applications (such as IoT, mobile phone transmitters, the automotive sector and the pharmaceutical industry) can, in the medium term, be realised using good-enough production processes (feature sizes ranging from 12 nm to 28 nm) (Kagermann et al., 2021a). There thus **appears to be little point** in investing in state-of-the-art manufacturing or in **attempting to cover all sections of the value chain locally** if the ultimate aim is to build competitive and entrepreneurially driven capacity over the long term. Many people have, on the other hand, often called for European initiatives to focus on strengthening the the design stage of production and development of application-specific microchips (for example Kleinhans, 2021). The ongoing process of digitalisation will require application-specific microchips in many areas in future. This will open up many niche markets in which Germany traditionally has a strong presence. Europe will only be able to participate successfully in the globally integrated value chain if it collaborates internationally – especially with the United States, which currently has the world's largest fabless industry and therefore possesses extensive expertise in microchip design (Kleinhans, 2021).

497. Any **strengthening of digital sovereignty** in Germany and Europe should adhere to the **principles of a market economy**. The process of market discovery will reveal the innovations that largely determine future competitiveness and productivity growth. Competition and innovation policies should create the appropriate framework to ensure the efficiency of this process (GCEE Annual Report 2019 items 250 ff.).

498. Sovereignty in the use of technology presupposes, first of all, that consumers are **free to choose between products**. Such freedom to choose relies crucially on the fact that **competition in product markets functions properly**, and this key principle must be guaranteed. ↘ ITEM 480 No firm or country alone is able to provide all the prerequisites required for data-based value creation. The **state needs to perform a coordinating role here**. This applies especially to the provision of technical infrastructure (GCEE Annual Report 2020 item 577). When participating in international standardisation processes, Germany is reliant on European cooperation if it wants to benefit from the advantages of being in a large economic area (BMBF, 2021).

Government support should mainly focus on **funding pre-competitive R&D** and the **transfer of knowledge and technology** (GCEE Annual Report 2020 items 588 ff.). The further expansion of the European Research Area could create synergies at the European level. Skilful mastery of technology will also require adequate **training** ↘ ITEM 300 FF. for developers and the teaching of the necessary key digital skills to users. ↘ ITEM 365 FF. And, finally, it is essential to continue **deepening the European digital single market** to encourage innovation and the scaling-up of innovative business models. Non-European actors should be involved on European terms and conditions (Kagermann et al., 2021a).

499. The Gaia-X project is also motivated by a desire for technological sovereignty within Europe's data infrastructure. ↘ ITEM 470 In order to raise the project's profile

and accelerate its development, however, more extensive use of the Gaia-X infrastructure will be needed. **Entities awarding public contracts** could help to achieve this goal by **using Gaia-X-compliant services** themselves or **supporting** further **project consortiums** that develop Gaia-X-compliant services for the public sphere. One of the consortiums that won the funding competition set up by the Federal Network Agency ↘ ITEM 472 suggests establishing an impartial data trustee for the financial services sector to enable firms, scientists, researchers and authorities to share data securely. A similar model would, however, also be feasible in other public spheres such as, for example, to improve the interconnectivity of Germany's tax offices.

5. Better coordination of initiatives to enhance cyber security

500. **Sovereign control over digital technology** and the **effective utilisation of any growth potential** resulting from digital technologies of the future require appropriate management of **cyber threats**. Negative externalities arising from cyber attacks ↘ ITEM 452 and the importance of cyber security for the provision of critical infrastructure mean that the state has a key role to play here. In Germany the Federal Office for Information Security (BSI) was set up at an early stage as a public-sector institution that is responsible for providing information and support in response to cyber attacks. Since last year the German government has been funding research and development in the field of cyber security via the Agency for Innovation in Cyber Security (Cyber Agency). In addition, there is a highly dynamic national and European regulatory environment, which in recent years has been enhanced by the EU Cyber Security Act (European Parliament and European Council, 2019) and the German IT Security Act 2.0 passed in April of this year (Federal government, 2021d).

501. Digital sovereignty requires the availability of secure and trusted products. Given the complexity of digital systems, however, it is not practicable for firms to test components in individual cases. Instead, certification can ensure transparent compliance with security requirements. The new German IT Security Act 2.0, which calls for certification of items such as mobile phone network components, follows this approach. As product markets for digital technologies are strongly internationally integrated, **the EU-wide standardisation of a certification system** for cyber security, such as that currently being drafted under the EU Cyber Security Act (European Parliament and European Council, 2019), **should be progressed as a matter of urgency**. **Multilateral infrastructure initiatives** such as Gaia-X will enhance cyber security in the digital single market and **are** therefore **to be welcomed**. Because defending against cyber attacks poses a significant challenge for individual actors, **firms benefit from coordination and cooperation when fending off cyber attacks**. One encouraging example here is provided by the German Cyber Security Organisation (DCSO), which was set up by an alliance of DAX companies and could serve as a template for further sector-specific and regional initiatives. **Ongoing education and training** should be provided to meet the growing demand for skilled

workers with the necessary technical and legal expertise in cyber security. ↘ ITEM 300

6. Coherent strategy and prioritisation needed

502. Given the multitude of government projects, there is a **lack of coherent measures** and **insufficient strategic prioritisation** with the implementation of initiatives aimed at improving the framework and conditions under which the data economy operates in Germany and the EU. So, for example, the European data strategy (European Commission, 2020d) and the German cyber security strategy (BMI, 2021b) both have the objective of improving coordination. ↘ TABLE 20 At the same time, however, they consist of a number of individual measures without any clear prioritisation or any **overarching strategy**.

503. For some time now we have seen political initiatives aimed at strengthening digitalisation in Germany, such as the Digital Strategy 2025 published in 2016 (BMWi, 2016). On the whole, however, **digital policy** requires **stronger coherence** and **prioritisation of measures**, as has been already identified in the context of the German government's 'Shaping Digitalization' implementation strategy (OECD, 2020c; Federal government, 2021e). ↘ TABLE 20 Although this provides an overview of the digitalisation strategies and policies available in Germany, it does not specify which areas and measures should be prioritised. The data strategies published by the German government and the EU hardly specify any concrete milestones – or a timetable for the steps to be taken by the public sector – which could act as a gauge of successful implementation. Apart from the coordinating function performed by the Federal Chancellery – for example through its management of the digital implementation strategy – the responsibilities held at national level in Germany are spread across several ministries. Although this approach takes account of the fact that digital policy is a shared task, this fragmentation of responsibilities causes duplication and makes it more difficult to ensure the effective coordination needed for an overarching digitalisation strategy. There are currently discussions about the possibility of setting up a ministry for digitalisation in order to pool such responsibilities more effectively. Unless there is agreement on a concrete digitalisation strategy – including milestones to assess its implementation – even a government ministry of this kind will not be able to achieve much.

APPENDIX

↘ TABLE 22

Cyclicality of selected reallocation variables in West Germany in the years 1976 to 2013

Variable h	Correlation with the output gap[1] at time t[2]										
	–5	–4	–3	–2	–1	0	1	2	3	4	5
Change of the unemployment rate $(t+h)$[3]	–0.45	–0.52	–0.56	–0.54	–0.48	–0.35	–0.16	0.03	0.23	0.38	0.48
Reallocation rate $(t+h)$[4]	0.00	–0.05	–0.09	–0.11	–0.18	–0.19	–0.16	–0.07	–0.01	0.07	0.12
Excess reallocation rate $(t+h)$[4]	0.05	0.01	–0.03	–0.07	–0.04	–0.08	–0.09	–0.08	–0.09	–0.07	–0.03
Rate of job creation $(t+h)$[4]	0.63	0.72	0.74	0.69	0.56	0.37	0.14	–0.08	–0.27	–0.43	–0.52
Rate of job destruction $(t+h)$[4]	–0.41	–0.51	–0.57	–0.58	–0.54	–0.41	–0.21	–0.01	0.18	0.33	0.43
Business start-up rate $(t+h)$[4]	0.61	0.58	0.50	0.38	0.22	0.06	–0.12	–0.27	–0.36	–0.43	–0.46
Business closure rate $(t+h)$[4]	–0.26	–0.31	–0.33	–0.29	–0.22	–0.15	–0.07	0.01	0.04	0.07	0.04

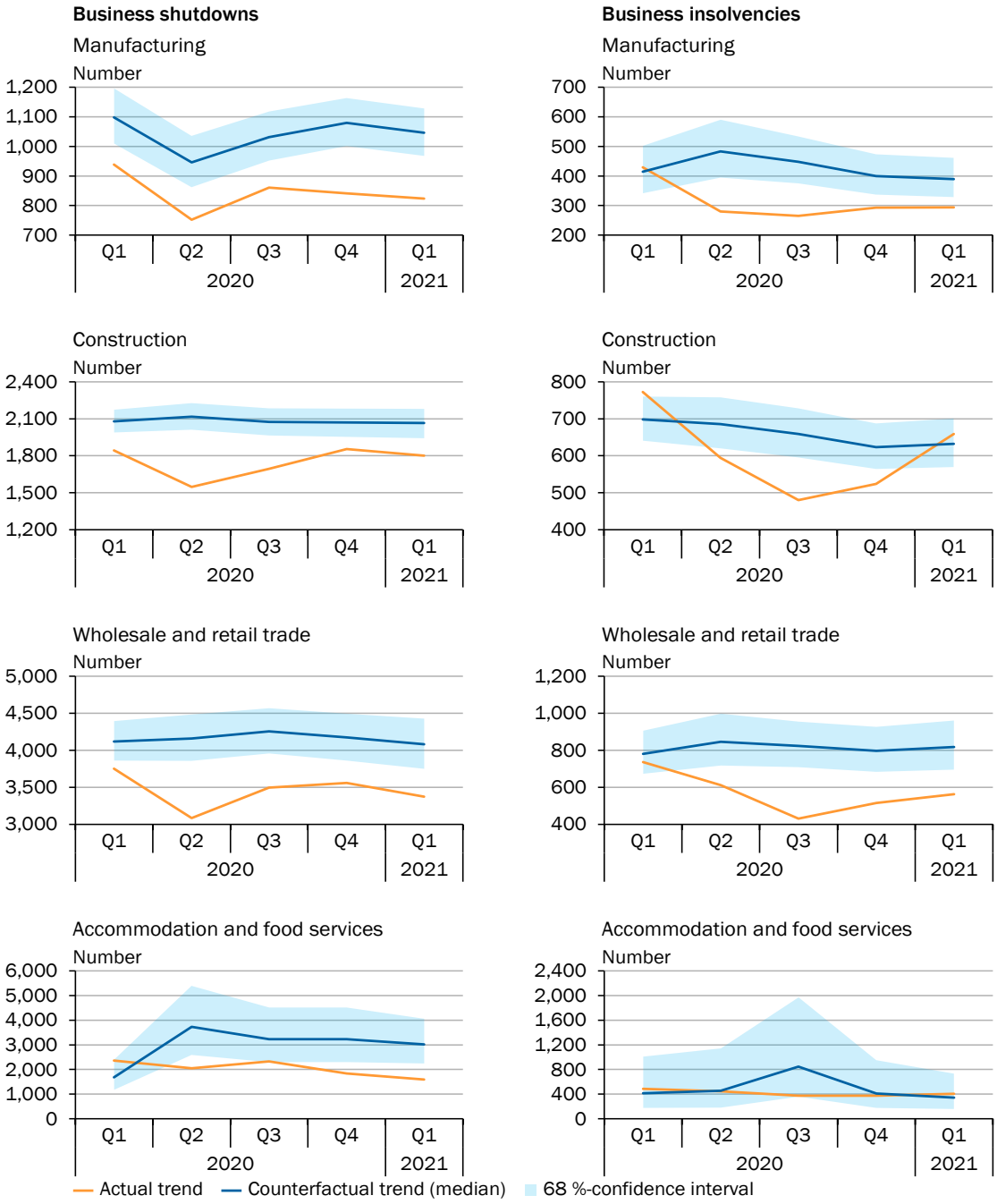
1 – Deviation of the real GDP from the with a Hodrick-Prescott filter calculated trend of the real GDP (in %).
2 – Observations on quarter basis. 3 – Difference between the unemployement in period $t+h$ and $t+h-1$ in percentage points. 4 – Deviation of the respective variable from the with a Hodrick-Prescott filter calculated trend of the respective variable (in %)

Source: Garnadt et al. (2021)

↘ CHART 126

Estimates of business shutdowns and business insolvencies in selected economic sectors that did not occur as a result of the state support measures[1]

Counterfactual trend since 2020



1 – The counterfactual trend of business shutdowns and business insolvencies has been estimated individually for each economic sector using Bayesian vector autoregression (BVAR) models based on the algorithm of Giannone et al. (2015). The models include nominal revenues and employment numbers plus either the complete cessation of operations of the main establishment or bankruptcies filed. Depending on the availability of data, the time series are either on a quarterly or monthly basis and the estimation period ends in 2019Q4. Due to presumed delays in the processing of bankruptcy applications, the figures are shifted by two months.

Sources: Federal Statistical Office, Garnadt and Other (2021), own calculations

↘ TABLE 23

Selected legal proceedings against digital platforms (part 1)

Claimant	Beginning of the proceedings	Platform	Description
Bundes-kartellamt	21.06.2021	Apple	Legal proceeding to determine wether the company is of paramount significance accross markets
Bundes-kartellamt	25.05.2021	Google	Legal proceeding to determine wether the company is of paramount significance accross markets as well as enquiry of the options when agreeing to data processing and of possible effects on competition
Bundes-kartellamt	18.05.2021	Amazon	Legal proceeding to determine wether the company is of paramount significance accross markets
Bundes-kartellamt	10.12.2020	Facebook/ Oculus	Legal proceedings on whether linking Oculus Virtual Reality products with company's social media constituted abuse of dominance
Bundes-kartellamt	29.11.2018	Amazon	Legal proceedings on abusive terms and conditions for traders with regard to domiciliary and choice of law clauses, rules on product reviews, intransparent dismissals and intransparente termination und suspension of trader accounts
Bundes-kartellamt	02.03.2016	Facebook	Legal proceedings into the whether the terms of service on the use of user data constituted abuse of dominant
Bundes-kartellamt	16.11.2015	Amazon/ Audible und Apple	Administrative proceedings on the exclusive delivery of Audible audio books to Apple's iTunes Store by Amazon
Bundes-kartellamt	09.12.2014	CTS Eventim	Legal proceedings on exclusive agreements between CTS Eventim event organisers and ticket agencies
European Commission	22.06.2021	Google/ Alphabet	Enquiry into whether Google has unlawfully favoured its own online ad services (so called "Ad Tech"-industry)
European Commission	04.06.2021	Facebook	Legal proceedings on the linking of Facebook's service for online classified ads (Facebook Marketplace) with the social network and the utilisation of advertisement data for own products
European Commission	30.11.2010	Google	Enquiry into whether Google favours its own products in its price comparison services
European Commission	10.11.2020	Amazon	Enquiry into whether and how the utilisation of data, that Amazon collects as retailer on the marketplace traders, is impairing the competition
European Commission	16.06.2020	Apple	Legal proceedings on the terms and conditions of the Store for vendors in general, for vendors of e- and audiobooks as well as music streaming services and on the potential anticompetitiveness of Apple's in-app buy-mechanism
European Commission	17.07.2019	Amazon	Enquiry into possible distortion of competition through the choice of traders for the „Buy Box“
European Commission	15.04.2015	Google	Enquiry into whether Google prevents competitors from using its operating system and from developing apps and service for mobile devices

Source: own research

↘ TABLE 23 CONTINUED

Selected legal proceedings against digital platforms (part 2)

Claimant	Beginning of the proceedings	Platform	Description
D.C. Attorney General	25.05.2021	Amazon	Enquiry into the anticompetititveness of the company's terms and conditions, that prevent independent vendors to sell their products cheaper on other platforms
38 US federal states	17.12.2020	Google	Enquiry into whether Google favours its own products and services in search results
10 US federal states	16.12.2020	Google	Enquiry into wether the company unlawfully achieved a monopoly position in online advertisement services through unfair treatment of competitors, e. g. through linking of products
United States of America	20.10.2020	Google	Legal proceedings into abuse of dominant position by discriminating against competitors in the search results and advertisement business
Federal Trade Commission (FTC)	09.12.2020	Facebook	Enquiry into wether the company unlawfully achieved a monopoly position through strategic aquisitions of competitors and anticompetitive conditions for software developers
Competition and Markets Authority (UK)	04.03.2021	Apple	Enquiry into possible anticompetitive effects of App Store terms and conditions for App vendors
Korea Fair Trade Commission	21.07.2016	Google	Enquiry into abuse of market power through provisions about preinstallation of Android and blocking of competing operating systems
AliveCor	25.05.2021	Apple	Lawsuit over abuse of market power by excluding competitors from the App Store
Hangens Berman Sobol Shapiro LLp	14.01.2021	Amazon	Class-action lawsuit of consumers due to anticompetitve price fixing for ebooks with the five largest book publisher in the USA
Genius Media Group und The Nation	20.10.2020	Google	Lawsuit over anticompetitive behaviour with online advertisement services
Epic Games	13.08.2020	Apple, Google	Lawsuit over removal of Epic Games' products from the stores after products have been offered cheaper on the Epic Games website

Source: own research

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