Structural and Productivity Changes in the European Countries During COVID-19 Pandemic

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Abstract:

Purpose: This article aims to analyze structural and productivity changes for EU-27 in the period 2018-2020, just before and at the beginning of the Covid-19 pandemic.
Design/Methodology/Approach: The study is based on Eurostat data for EU-27 countries from 2018-2020, containing total employment and gross value added by sectors. The primary method used is Shift-Share analysis.
Findings: Results of the analysis confirm that two-fold changes in productivity were noted in both within and structural components. Only a few countries obtained a 2020 increase in overall productivity. The highest percentage decrease in productivity was noted by sector Arts, entertainment, and recreation, other service activities, household activities and extra-territorial organizations and bodies, wholesale and retail trade, transport, accommodation, and food service activities. In terms of employment changes, the highest decrease was noted in wholesale and retail business, transportation, housing, and food service activities and the highest increase in public administration, defense, education, human health, and social work activities, which was strictly related to anti-Covid actions introduced by governments.
Practical Implications: The article provides information about productivity and employment changes during a difficult period of economic performance caused by the Covid-19 pandemic, which is crucial for policymakers responsible for establishing assistance and support programs for the most disadvantaged sectors.
Originality/Value: Analysis concerning the economic impact of the Covid-19 pandemic is relatively new, and the presented paper will provide new empirical findings, which will contribute to existing knowledge.
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1. Introduction

In 2020, the global economy was shaken by the Covid-19 pandemic. The introduced restrictions affected both households and enterprises from various sectors of the economy, causing a global downturn. The pandemic has triggered not only shifts in financial performance but also significant shifts in employment between industries.

Productivity is a crucial determinant of a country's competitiveness and a trigger of long-term economic growth. Productivity improvement is enhanced by competition, innovation, investment, entrepreneurship, and skills, which may be strengthened by membership in the European Union (EU). In the case of Central and Eastern European (CEE) the Member States of the EU, as a result of the collapse of the Soviet Bloc, structural reforms and the transformation from centrally planned to a market economy was initiated, including privatization which enhanced productivity growth and relocation of production factors from inefficient public to the private sector (Dobrzanski and Grabowski, 2019). Both the pre-accession period and membership in the EU since 2004 proved to be an essential trigger of productivity convergence across CEE countries (Bouckaert *et al.,* 2011). At least since the Single Market Program and Lisbon Agenda in 2000, the EU has launched structural labor and capital market reforms to transform into a more competitive and knowledge-based economy by stimulating labor productivity, employment, and potential output growth (Cincera and Galgau, 2005).

2. Literature Review

The Single Market of the EU, based on the free movement of goods, services, capital, and people, encourages increased competitiveness and efficiency of industries and enterprises across the Member States while stimulating investment flows (Carmin and Vandeveer, 2004). International investment flows, significantly those close to the technological frontiers may enhance productivity improvement within-host economy spill-over effects. The EU membership translates into access to the more significant, more competitive market and R&D funds, which, in turn, impact productivity improvement at the micro-, meso- and macro-level across the Member States.

There is a broad literature on productivity convergence across the EU Member States, including CEE countries. Determinants, as well as the intersection of labor productivity across the EU Member States, were studied using DEA methodology (Färe *et al.,* 2006), cluster analysis (Baróg, 2017), multi-level analysis (Bruno *et al.,* 2019), non-parametric methods (Martino, 2015), sigma- and beta-convergence estimations (Jaroszewska and Pietrzykowski, 2017), total factor productivity estimations (Młynarzewska-Borowiec, 2018). Dedicated literature on productivity in CEE countries includes, among others, shift-share analysis by Ezcurra and Pascual (2007), Havlik (2015) and Dobrzanski (2019), total factor productivity estimations by Bah and Brada (2009), and Stojcic *et al.* (2019).

Aside from numerous studies on structural changes and productivity across selected EU Member States, there is also abundant literature addressing the impacts of individual factors on productivity, e.g., information and communication technology (ICT) capital (Skorupinska and Torrent-Sellens, 2015), FDI, and technology spill-overs (Stojcic and Orlic, 2019), technology upgrading (Radosevic, 2017), competition (Friesenbichler and Peneder, 2016), trade liberalization (Stojcic *et al.,* 2018), human capital, intellectual property rights, and research and development expenditures (Habib *et al.*, 2019). Relatively rare studies combining structural changes and productivity in CEE were conducted by, among others, Ezcurra and Pascual (2007), Bah and Brada (2009), Kutan and Yigit (2009), Havlik (2015), and Stojcic *et al.* (2019).

This article aims to analyze structural and productivity changes for EU 27 in the period 2018-2020, so just before and at the beginning of the Covid-19 pandemic (Grima *et al.,* 2020). The analysis concerns two main categories of labor productivity growth, pure labor productivity growth and structural labor productivity growth. The analysis allows us to point out which economic sectors gain the most and which lose the most, both in terms of technological advancement and the movement of employment. The paper's novelty is the analysis of the productivity across the EU Member States from the perspective of the impact of the COVID-19 pandemic in 2020, which resulted in disruptions in cross-border supplies induced by lockdowns and restricted labor mobility and consumers' access to retail markets. Papers concerning the economic impact of the Covid-19 pandemic are relatively new, and such analysis undoubtedly requires further attention (Khan *et al.,* 2020). The presented paper will contribute to knowledge about pandemic effects on the economy.

This paper is organized as follows. The second section presents the research methodology. The third section contains research results and findings. The final section concludes the research.

3. Research Methodology

The primary research method used in this article is shift-share analysis, which allows reconstructing the changes in aggregate into two components: changes in the composition of the total and changes within the individual units (Fagerberg, 2000). Fabricant (1942) firstly applied the shift-share model to measure the reallocation of labor between sectors. There are two of the most popular extensions of the shift-share model. First was introduced by Esteban-Marquillas (1972), which identified an additional allocation effect, isolating a regional shift component not correlated with the industrial mix. Arcelus (1984) extended Esteban-Marquillas's model even further and used the concept of homothetic employment to exemplify the degree of specialization. Arcelus also underlines that the population quotient method is a more reliable measure than employment for evaluating changes in market size. Barff and Knight (1988) implement dynamic shift-share models, which assume continuous

changes in the size of the employment base and the regional industrial mix, and therefore are more accurate than static models.

The most significant advantage of the shift-share methodology is its technically simple procedure, making it fast and reasonably accurate (Stevens and Moore, 1980). Also, the model does not require detailed data (Barff and Knight, 1988). The most frequently mentioned limitation of this method is its static nature. Nevertheless, this limitation can be diminished by applying time-series data (Sirakaya *et al.*, 2002). Knutsen (2000) also emphasizes the limited predictive power of this method. Even though the shift-share analysis methodology has some limitations, it is popular to analyze structural changes and their impact on productivity in literature. Labor productivity growth can be achieved twofold. Firstly, an increase in pure labor productivity (also called in the literature 'within productivity') results from technological changes and improvements in production processes. Secondly, an increase in structural productivity results from labor force movement from low-productivity sectors to high-productivity sectors. Below equation introduced by McMillan and Rodrik (2011) deconstructs the change in aggregate productivity into a pure and structural change effect:

$$\Delta APt = \Sigma \varphi j, t-k \ \Delta SPtj + \Sigma SPtj \ \Delta \varphi j, tjj \qquad (1)$$

APt represents the aggregate labor productivity, $SPtj$ is the labor productivity level of sector j at time t, and $\varphi j, t$ characterizes the employment share of sector j at time t in overall employment. In this aggregate productivity growth equation, the first component denotes the 'pure' productivity growth, and the second component represents the structural productivity growth. Pure labor productivity growth is a weighted sum of productivity growth within individual sectors, where weights are shares of each sector in total employment. Structural labor productivity growth measures changes in productivity achieved by reallocations of jobs across industries. It will be increasing economy-wide productivity growth when engagement is moving to higher-productivity sectors.

4. Results and Discussion

In the empirical part, analysis is performed for data concerning gross value added and level of employment in the EU economies in the following 11 sectors: A - Agriculture, forestry and fishing; B-E - Industry (except Construction); C – Manufacturing; F – Construction; G-I - Wholesale and retail trade, transport, accommodation, and food service activities; J - Information and communication; K - Financial and insurance activities; L - Real estate activities; M_N - Professional, scientific and technical activities; administrative and support service activities; O-Q - public administration, defense, education, human health, and social work activities; R-U - Arts, entertainment and recreation; other service activities; activities of the household and extra-territorial organizations and bodies. Productivity and employment change between different sectors in EU countries from 2019 to 2020 have been presented in Table 1. It is worth noting that in all EU countries, except Malta, Finland, and Sweden,

negative productivity percentage changes were recorded in the Covid-19 period in sector 11 (R-U - Arts, entertainment, and recreation sector; other service activities; activities of the household and extra-territorial organizations and bodies).

The largest drops in this sector could be recorded in Ireland, Poland, and Greece. These changes were accordingly 49,13%, 48,24%, 25,27%. The analysis presented in Table 1 shows that the more developed countries, e.g., France, Italy, Spain, and Belgium, have strongly felt the change in productivity in the following sectors: B-E - Industry (except Construction); C – Manufacturing; F – Construction; G-I - Wholesale and retail trade, transport, accommodation, and food service activities.

Interestingly, we can observe an increase in productivity in sector 1 (A - Agriculture, forestry, and fishing) for many EU countries. These countries include, among others: Belgium, Bulgaria, Denmark, Ireland, Greece, Spain, France, Croatia, Cyprus, Lithuania, Austria, Finland. Analyzing the above statistics, it can be concluded that during the COVID-19 pandemic, we had far more declines in both sector productivity and changes in employment. However, there is no specific pattern that can show these changes. Different countries responded differently to the changes triggered by the COVID-19 pandemic.

The cross-country comparisons demonstrate a similar pattern of the direction of employment reallocation within the EU. In all EU countries, sustained decrease in employment can be noted in Wholesale and retail trade, transport, accommodation, and food service activities; (-1.7 mln employees for EU27); Industry (except Construction); (-0.8 mln employees for EU27); Manufacturing; (-0.8 mln employees for EU27); Professional, scientific and technical activities; administrative and support service activities; (-0.5 mln employees for EU27); Arts, entertainment and recreation; other service activities; activities of the household and extra-territorial organizations and bodies. (-0.4 mln employees for EU27). Simultaneously employment slightly increased in Public administration, defense, education, human health, and social work activities (0.3mln employees for EU27); Information and communication (0.1 mln employees for EU27) and Construction (0.1 mln employees for EU27). Unemployment slightly increased average for 2019 6,7% to 7% in 2020.

Structural productivity and pure productivity change are calculated based on formula 1. Table 2 presents a deconstruction of productivity growth in the UE into two periods: 2019 and 2020. The highest labor productivity growth occurred in Romania in the first period, which obtained 18.1%; a very high score was also brought in Estonia (12.6%). The decline in 2019 could only be observed in Croatia (-3.0%). It is worth emphasizing that thanks to the shift-share analysis, we could distinguish pure labor productivity growth and structural labor productivity growth. The research shows that the values of pure productivity growth are higher than labor productivity growth in most EU countries in 2019. There were declines in structural productivity in 8 out of 27 EU countries (Ireland, Spain, Croatia, Latvia, Lithuania, Netherlands, Slovakia, Finland). However, in 7 countries, the overall labor productivity growth was positive

in this first period examined due to the higher values obtained in pure productivity. In 2020, it was expected that these values would be lower due to the COVID-19 pandemic. The analysis below confirms this hypothesis. Labor productivity growth was negative in 17 of the 27 countries. The most significant declines can be seen in Malta (-6.9%), Greece (-5.7%), and Cyprus (-5.7%). However, the analysis shows that there are also countries that coped relatively well with the COVID-19 pandemic. The highest increase in labor productivity growth can be recorded in Ireland, which amounted to 11.9%.

Table 1. *Employment and productivity changes by sectors in EU-27*

		A - Agriculture, forestry and fishing	B-E - Industry (except construction)	C - Manufacturing	F - Construction	G-I - Wholesale and retail trade, transport, accommodation and food service activities	J - Information and communication	K - Financial and insurance activities	L - Real estate activities	M_N - Professional, scientific and technical activities; administrative and support service activities	O-Q - Public administration, defence, education, human health and social work activities	R-U - Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies
Belgium	A	8,06%	-4,59%	-3,82%	-5,13%	-10,72%	-0,62%	0,16%	1,77%	-5,77%	-3,61%	-19,85%
	B	0,74%	-0,35%	-0,57%	0,98%	-1,09%	0,78%	-1,75%	1,74%	-0,48%	1,13%	0,50%
Bulgaria	A	4,62%	9,26%	7,77%	10,05%	-14,32%	-0,58%	4,88%	-0,58%	-3,81%	16,51%	-12,02%
	B	2,58%	-1,64%	-2,21%	1,01%	-3,93%	8,88%	3,16%	1,21%	2,66%	4,03%	2,06%
Czechia	A	-3,60%	-2,68%	-3,79%	0,57%	-7,37%	-1,35%	-4,26%	-1,03%	-5,10%	2,77%	-9,85%
	B	0,60%	-1,34%	-1,44%	3,41%	-1,14%	5,41%	-0,09%	2,23%	-2,78%	4,01%	1,58%
Denmark	A	2,80%	0,19%	4,45%	-1,15%	-1,83%	-0,19%	-2,23%	1,64%	6,00%	1,77%	-14,74%
	B	0,60%	-1,71%	-2,05%	2,43%	-1,43%	2,69%	3,07%	1,84%	0,08%	1,75%	-2,93%
Germany	A	-5,04%	-6,28%	-7,48%	9,51%	-2,72%	0,17%	0,85%	2,26%	-3,74%	0,26%	-6,23%
	B	-1,98%	-1,07%	-1,32%	2,07%	-0,93%	2,56%	0,40%	1,02%	-1,21%	2,75%	-1,13%
Estonia	A	-17,74%	-1,83%	-2,14%	-4,09%	-0,60%	15,22%	13,38%	0,08%	-0,32%	4,81%	-8,90%
	B	-6,22%	-0,11%	0,18%	4,39%	-5,96%	-1,39%	-3,18%	-5,14%	1,27%	4,10%	9,95%
Ireland	A	5,32%	13,18%	15,99%	-4,88%	-11,31%	5,96%	-7,62%	-21,38%	-11,65%	-0,55%	-49,13%
	B	0,98%	3,22%	4,30%	-5,52%	-5,34%	8,70%	9,22%	31,71%	-3,57%	3,96%	-11,73%
Greece	A	8,51%	-1,78%	-0,99%	14,29%	-21,87%	2,00%	-8,83%	3,25%	-12,49%	-0,54%	-25,27%
	B	-7,98%	-0,64%	-0,04%	-2,08%	-0,50%	-0,93%	1,70%	-2,44%	1,18%	4,69%	0,67%
Spain	A	17,76%	-3,08%	-4,35%	-10,93%	-17,13%	-9,14%	7,58%	-0,15%	-10,72%	3,42%	-17,94%
	B	-3,49%	-1,36%	-1,48%	3,51%	-3,92%	6,71%	2,07%	3,36%	2,76%	4,63%	-2,94%
France	A	1,40%	-8,81%	-10,28%	-14,29%	-12,78%	-2,96%	-3,73%	0,58%	-3,79%	1,12%	-10,96%
	B	0,78%	0,15%	0,08%	2,46%	-0,07%	1,49%	0,15%	1,05%	-2,11%	0,51%	-1,21%
Croatia	A	2,83%	-5,53%	-6,24%	-1,86%	-21,48%	5,78%	-5,13%	-10,40%	-7,74%	4,25%	-4,57%
	B	-0,08%	0,74%	-0,06%	6,74%	-0,29%	-0,49%	1,19%	12,22%	-0,79%	-0,46%	-11,17%
Italy	A	-3,82%	-7,16%	-7,32%	-6,46%	-10,39%	-0,50%	-2,29%	-0,37%	-8,86%	-0,27%	-9,39%
	B	1,88%	1,35%	1,26%	3,29%	-2,91%	1,44%	-0,73%	0,23%	0,10%	1,54%	-2,48%
Cyprus	A	1,70%	-8,90%	-6,72%	-10,18%	-12,80%	-0,35%	-0,94%	3,49%	-4,20%	0,86%	-8,48%
	B	0,05%	1,38%	1,36%	3,23%	-3,51%	2,02%	0,25%	0,80%	1,59%	1,85%	0,19%
Latvia	A	-2,83%	0,53%	1,81%	8,85%	-5,53%	-6,75%	-5,72%	-0,03%	0,43%	2,34%	-15,30%
	B	2,97%	-0,48%	-0,92%	-2,06%	-2,35%	5,50%	-1,02%	1,44%	-0,32%	3,27%	-2,25%

Lithuania	A	15,86%	-0,94%	-1,79%	5,77%	0,63%	1,51%	-20,61%	22,36%	-8,20%	9,22%	-6,27%
	B	-10,41%	0,45%	0,19%	-3,57%	-3,05%	7,44%	29,48%	-15,36%	8,77%	1,95%	0,18%
Luxembourg	A	-2,53%	-11,81%	-15,75%	0,38%	-3,87%	18,68%	-4,29%	0,77%	0,95%	1,33%	-2,00%
	B	-2,85%	-2,12%	-2,66%	1,76%	-1,32%	0,98%	-0,10%	1,99%	-1,17%	3,20%	-0,42%
Hungary	A	-2,45%	-1,99%	-1,59%	-11,41%	-8,93%	-5,76%	1,65%	-7,98%	-7,75%	-1,49%	-10,92%
	B	1,65%	-1,06%	-1,17%	6,04%	-1,54%	8,60%	-1,54%	2,06%	-0,88%	0,51%	-0,29%
Malta	A	-6,29%	-1,65%	1,20%	-8,99%	-35,88%	9,84%	6,04%	-4,05%	-9,05%	1,05%	3,09%
	B	-1,40%	-2,02%	-2,71%	8,20%	-0,79%	-2,74%	-1,93%	-0,05%	2,07%	-0,31%	1,97%
Netherlands	A	-2,61%	-2,35%	-0,74%	6,73%	-3,07%	-2,18%	-3,40%	4,34%	0,60%	-0,84%	-21,14%
	B	-1,41%	0,24%	0,21%	1,39%	-0,90%	4,69%	2,53%	1,92%	-4,35%	3,09%	1,06%
Austria	A	0,44%	-5,53%	-7,56%	2,68%	-9,14%	-1,13%	-2,18%	-0,42%	-7,27%	1,73%	-8,34%
	B	3,58%	0,48%	0,37%	1,72%	-3,39%	3,68%	1,20%	6,22%	-0,80%	2,14%	-2,20%
Slovakia	A	-11,53%	-6,36%	-6,89%	-5,41%	12,11%	-7,57%	-11,13%	-1,66%	-1,78%	4,42%	-6,59%
	B	-0,85%	-1,88%	-2,05%	2,14%	-0,31%	3,45%	-0,17%	1,88%	1,91%	2,79%	-0,88%
Finland	A	4,27%	-5,72%	-5,22%	6,82%	1,02%	-1,31%	6,61%	-0,71%	-3,31%	1,41%	-0,58%
	B	-3,97%	1,37%	1,17%	0,63%	-5,99%	4,50%	1,35%	5,57%	2,89%	1,43%	-2,48%
Sweden	A	-4,52%	-4,71%	-3,17%	4,03%	-1,21%	-0,92%	11,63%	0,87%	-0,72%	3,02%	0,90%
	B	4,84%	-0,37%	-1,07%	0,62%	-2,51%	6,39%	3,79%	3,00%	-0,03%	0,70%	-1,78%

Source: *Authors' own study based on the OECD database;* Note: A - % Productivity change 2020/2019 B - % Employment change 2020/2019.

Table 2. *Labour productivity growth, pure and structural productivity in EU-27*

	Pure productivity	Structural productivity	Labor Productivity Growth % (Component due to: Pure and Structural productivity)	Pure productivity	Structural productivity	Labor Productivity Growth % (Component due to: Pure and Structural productivity)
		2019			2020	
Belgium	3,20%	0,60%	3,80%	-3,80%	0,60%	-3,20%
Bulgaria	5,30%	1,10%	6,40%	0,40%	1,60%	2,00%
Czechia	3,50%	0,80%	4,30%	1,40%	1,30%	2,80%
Denmark	3,60%	0,70%	4,40%	-4,00%	0,80%	-3,30%
Germany	3,30%	0,20%	3,40%	-2,40%	0,50%	-2,00%
Estonia	3,90%	8,60%	12,60%	-1,20%	-2,30%	-3,50%
Ireland	3,80%	-2,70%	1,10%	-3,00%	14,90%	11,90%
Greece	4,60%	2,80%	7,30%	-4,60%	-1,10%	-5,70%
Spain	3,80%	-0,10%	3,70%	-5,70%	2,20%	-3,50%
France	3,60%	0,00%	3,60%	-4,40%	0,70%	-3,80%
Croatia	3,80%	-6,80%	-3,00%	-0,30%	4,70%	4,50%
Italy	3,60%	1,70%	5,30%	-4,30%	0,70%	-3,50%
Cyprus	3,70%	0,90%	4,70%	-6,80%	1,10%	-5,70%
Latvia	4,60%	-1,10%	3,50%	-2,20%	1,20%	-1,00%
Lithuania	3,90%	-2,30%	1,60%	-1,40%	-2,90%	-4,30%
Luxembourg	3,40%	0,60%	4,00%	-5,30%	0,20%	-5,20%
Hungary	3,80%	1,20%	5,00%	-0,90%	1,80%	0,90%
Malta	3,50%	6,40%	9,80%	-5,80%	-1,10%	-6,90%

Netherlands	3,70%	-0,20%	3,50%	-4,80%	1,60%	-3,20%
Austria	3,60%	0,80%	4,40%	-2,30%	3,20%	0,80%
Poland	4,10%	3,70%	7,80%	0,70%	-3,50%	-2,80%
Portugal	4,10%	2,80%	6,90%	-2,20%	0,00%	-2,20%
Romania	5,70%	12,40%	18,10%	1,30%	0,50%	1,80%
Slovenia	4,00%	0,90%	4,90%	0,20%	1,90%	2,10%
Slovakia	3,50%	-0,80%	2,70%	0,30%	0,80%	1,00%
Finland	3,80%	-0,70%	3,00%	-2,40%	3,30%	0,90%
Sweden	3,60%	0,80%	4,30%	-2,90%	2,20%	-0,70%

Source: *Authors' own study based on the OECD database.*

Ireland was making such an increase thanks to considerable changes in structural productivity, where the percentage was almost 15%. Results of the analysis confirm that two-fold changes in productivity were noted in both within and structural components. Croatia significantly improved productivity, which, despite the slightly negative value of pure productivity (-0.3%), achieved a labor productivity growth of 4.5%.

Descriptive statistics illustrate that, in 2019, all the UE countries improved in terms of both pure and most of them in structural productivity. The impact of pure labor productivity, however, was ultimately much higher. This means that the main change in productivity was due to changes in the modernization of technological processes rather than employment among sectors. In 2020, we can observe the opposite situation. The impact of pure labor productivity, however, was ultimately much smaller. This means that the main change in the productivity level was due to changes in employment among sectors rather than the modernization of technological processes.

5. Conclusion

This study aimed to analyze structural and productivity changes for EU 27 for 2018-2020. Results of the investigation confirm that two-fold changes in productivity were noted in both within and structural components. Structural productivity both in 2019 and 2020 is two-fold. Some countries obtained positive value in 2019 and negative in 2020 and vice versa. In terms of pure productivity, it was positive for all 27 EU countries in 2019. However, in 2020 only a few countries noted positive value, which resulted in negative overall productivity growth. This means that the main change in the productivity level was due to changes in employment among sectors rather than the modernization of technological processes.

In terms of employment changes, a slight increase in unemployment can be observed. The highest decrease was noted in Wholesale and retail trade, transport, accommodation, and food service activities; Industry (except construction); and Manufacturing. Simultaneously employment slightly increased in Public administration, defense, education, human health, and social work activities, which was strictly related to anti-covid actions introduced by governments.

In most EU countries, negative productivity percentage change was recorded in sector Arts, entertainment and recreation sector; other service activities; activities of the household and extra-territorial organizations and bodies. Also, a significant decrease could be noted in sector Wholesale and retail trade, transport, accommodation, and food service activities. The highest increase in productivity was noted in Public administration, defense, education, human health, and social work activities.

The aforementioned negative percentage changes of productivity across the sectors observed in the EU result from lockdown measures and related restrictions regarding conducting economic activities and consumers' access to retail markets. The Covid-19 pandemic caused a significant drop in world trade and halted global value chains in February and April/May 2020, disrupting supplies of numerous goods and services worldwide. Even though in the shorter perspective the pandemic crisis, which appears to be temporary, may not enhance reshoring and deglobalization of production, in the medium- and longer-term view, future location decisions in respect of conducting manufacturing activities and providing services may include the aspect of spatial distance and related health risk.

Thus, future economic activities related to manufacturing and providing goods and services may become more regional or local, enhancing supply security at the expense of productivity and efficiency (McKinsey, 2020; Shih, 2020). In this respect, however, there is also an institutional and political uncertainty related to effects of cooperative programs and responses, e.g., the EU' Recovery Fund, distribution of vaccines across the globe, as well as investigation of the Covid-19 genesis, that might result in another tension among the economic powers, such as the EU, US, and China, and lead to isolationism (Antràs, 2020).

There are a few limitations associated with this study. The shift-share analysis technique is a descriptive method and does not consider the impact of business cycles, actual comparative advantages, and industrial detail. Moreover, a more detailed analysis at a lower level of regional aggregation could bring more general conclusions and patterns, which could be used for policymakers' recommendations.

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