The e-motion of car manufacturing in CESEE: the road ahead

Tomáš Slačík[1]

Central, Eastern and South-Eastern European (CESEE) countries have benefited considerably from the grand-scale relocation of car production sites to emerging markets over the last two decades. On the back of strong foreign direct investment, the automotive industry has thus become a major economic pillar in several countries and firmly integrated into global, predominantly European, value chains. More recently, the automotive industry has seen some challenging times, though. Global and particularly European car production has been losing steam, and the industry has been hit by major black swan events, most painfully the coronavirus pandemic and Russia's invasion of Ukraine. What is more, the global automotive industry has been undergoing unprecedented structural shifts on the demand and supply side, such as autonomous driving, shared mobility, connectivity and, most notably, the transition to electric vehicles.

Against the background of these great changes and challenges, the present paper explores the emergence of the largely foreign-owned automotive industry in CESEE and its level of preparedness for managing the risks and uncertainties and seizing the opportunities implied by the ongoing development of the automotive industry. After collecting and analyzing relevant qualitative information we find that the CESEE car industry will be walking a thin line between adopting new technologies and sticking to the internal combustion engine for longer than Western countries. For CESEE countries to maximize the benefits and minimize the risks of the technological transformation in the car industry the key priority is to preserve close links with Germany, stay tuned for battery production and focus on activities and promising industries with higher value added.

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Keywords: automotive, electric, battery, transformation, CESEE

Over the last two decades, the frontiers of automotive manufacturing have been shifting toward emerging markets worldwide. The relocation of production from advanced countries has been a big asset for Central, Eastern and South-Eastern European (CESEE) countries in particular. The automotive industry has thus come to play an important role in several countries in the area, particularly Czechia, Slovakia, Slovenia (now among the top countries in terms of car production per capita worldwide), Hungary, Poland and Romania. Backed by strong inflows of foreign direct investment (FDI) in recent decades, the industry has been integrated into European and global value chains, and the sector has become a key growth driver for these economies.

However, the automotive industry has been hit hard by the COVID pandemic globally and in Europe in particular. In Europe, motor vehicle production plummeted by nearly a quarter year on year in 2020 (–13% worldwide) and dropped by

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another 4% from a record low base in 2021 (+3% worldwide).[2] Aside from subdued demand and the impact of numerous lockdowns and (cross-border) mobility constraints, this collapse was the result of major supply chain disruptions. In particular, semiconductor shortages have been slowing down car production significantly since late 2020. Meanwhile, Russia's invasion of Ukraine and the ensuing economic sanctions have added to the strain on already battered automotive supply chains. Disruptions stem from the suspension of car production by several manufacturers, including Czech Skoda, and from manufacturers being cut off from key supplies of automotive inputs by Russian and Ukrainian firms such as wire harnesses and raw materials. In addition to the real ramifications, the war in Ukraine has put further upward pressure on already elevated prices of crucial raw materials and energy.

The pandemic- and war-triggered shocks to the automotive industry arrived amid a cyclical slowdown as car production had stagnated or even contracted for several years even before the pandemic across the globe, including Europe (especially Germany). Nonetheless, CESEE countries with a strong automotive focus largely defied these developments and navigated the challenges comparatively well. On top of these cyclical trends, the global automotive industry has been undergoing a fundamental transformation driven by unprecedented structural shifts on the demand and supply side. These include, in particular, autonomous driving, shared mobility, connectivity, new players entering the automotive arena and, last but not least, electrification as the most widespread means to address the ever-stricter CO_2 emission targets. The COVID-19 crisis as well as the war in Ukraine are likely to accelerate many of these trends reflected in, inter alia, changes in supply chains, more rapid digitalization as well as acceleration of the electrification process to fast-track independence from fossil fuels.

Indeed, the automotive sector's future is very much oriented toward electric mobility, at least in Europe. Apart from mounting peer and market pressures, this trend is largely driven by strengthening global efforts to address climate change and regulate carbon emission. With respect to the latter, Europe has been the world's trend setter and frontrunner. Since the ever-stricter CO_2 emission regulation standards refer to tailpipe emissions only, electric vehicles are carbon-neutral by definition. As a result, all major traditional automakers keep announcing ambitious electrification targets and time schedules. With car producers expanding and accelerating the provision of new electric vehicle models, their adoption has gained pace and the European market has moved into the driving seat regarding electrification. While pure electrics, plug-in hybrids and hybrids[3] accounted for some 4.5% of all new passenger car registrations across the EU in 2017, this share climbed to

[2] *See International Organization of Motor Vehicle Manufacturers (2021 Statistics | www.oica.net).*

[3] *Electrification can take different forms: pure battery electric vehicles (BEV); plug-in hybrid electric vehicles (PHEV) powered by petrol and/or a battery pack that can be plugged in to an external electric power source for charging; and hybrid electric vehicles (HEV) in which an internal combustion engine is aided by a battery that is charged through regenerative braking. A different avenue of electrification are fuel cell electric vehicles (FCEV). Instead of a battery, these rely on an electrochemical cell that converts the chemical energy of a fuel (typically hydrogen) and an oxidizing agent (often oxygen) into electricity. While several automakers view the fuel cell technology as very promising and keep developing it (long-term advocates have been above all Toyota and Hyundai-Kia), others (e.g. Volkswagen Group or Tesla) have ruled out this option. In fact, since hydrogen-powered cars are still costly and lack the necessary infrastructure, they only serve a niche market.*

about 40% in 2021.[4] However, despite the recent boom of electric cars sales, internal combustion engine vehicles will not vanish overnight and will continue to play a role. Especially in CESEE and other emerging countries, the transition to electric vehicles is expected to be much slower than in advanced markets.

Given the advancing powertrain transformation, the development of battery technology and battery production will play a crucial role in the future. Battery packs and their main features such as size, weight and driving range are not only set to become the most important performance component of electric vehicles, creating differentiation among competitors, but also the key cost determinant. With China accounting for about three quarters of the Li-ion battery[5] production capacity, the European automotive industry needs to develop a competitive and innovative battery industry with all up- and downstream stages. To cover the rising battery demand, it will likely take some 20 battery pack production sites (so-called gigafactories) in Europe in 2030 and about 35 in 2040 (Deloitte, 2021).

Against this background, the present paper seeks to sketch out where the largely foreign-owned automotive industry in CESEE is coming from and where it is heading in light of the current dynamics and high uncertainties in the sector. By collecting and analyzing relevant qualitative economic arguments we aim to shed some light on what these historical structural and cyclical developments in the automotive industry imply for the CESEE economies and how they will walk the thin line between seizing the opportunities and managing the risks associated with electrification on the one hand and continuing to meet demand for (not) outgoing internal combustion engines on the other.[6] The paper is structured as follows. While the next section recapitulates the development of the automotive industry in CESEE over the last 30 years, section 2 collects evidence to assess how the car industry in the region is braced for the big trends of the near future. Section 3 complements the macroeconomic view with a firm-level perspective based on rather unique firm survey data collected by the European Investment Bank. Section 4 discusses the potential future impact of the big trends in the automotive sector, particularly of car electrification, on major macroeconomic variables in CESEE before last section concludes.

1 Dawn and heyday of the automotive industry in CESEE during transition

Building on the long tradition in mechanical engineering and a well-educated workforce, Western automotive companies grasped the historic opportunity brought about by the collapse of communism in 1989. They thus not only revitalized local brands such as Skoda (Czechia) or the Dacia (Romania) but also shifted their own production eastward. The largest share of CESEE automotive production is held by Volkswagen, which allocates almost a third of its European manufacturing to the region, closely followed by Stellantis[7] and Renault. In addition, some Korean

[4] *ACEA (2022).*

[5] *Li-ion batteries are expected to stay the dominant battery technology used in electric vehicles in the foreseeable future.*

[6] *At this stage we abstain from any quantitative analysis as in light of the dynamics and complexity of the topic any such analysis – unavoidably based on widely distributed assumptions about a large set of possibly (un)known unknowns – can cover only a very limited subarea of the matter and is subject to a high level of uncertainty.*

[7] *Stellantis was formed in 2021 through a merger between the Italian-American conglomerate Fiat Chrysler Automobiles (FCA) and the French PSA Group (Peugeot S.A.).*

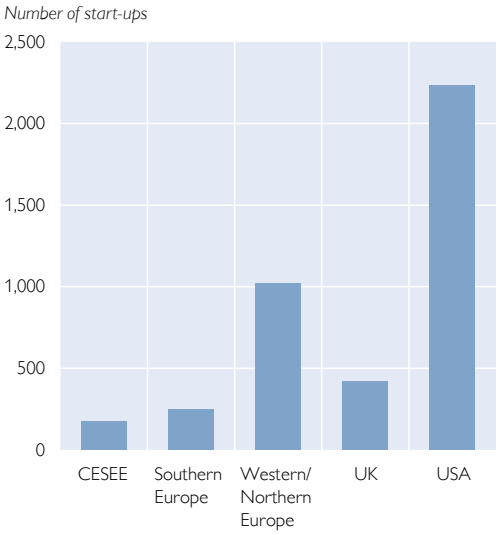
and Japanese automakers have a substantial presence in the region. Altogether, more than every fifth motor vehicle factory in the EU is located in CESEE. Along with the automakers, a whole myriad of their suppliers shifted their production eastward. Furthermore, while the absolute number of start-ups in the automotive sector in Europe and in the CESEE region in particular is well below the number of US start-ups (chart 1), CESEE countries are home to several young and innovative automotive companies. Indeed, in relative terms the share of automotive start-ups is not only higher in CESEE than in other European regions but also higher than in the USA (chart 2). One of the most prominent examples of a successful automotive newcomer is Rimac, the Croatian producer of electric hyper-cars, which recently took over the iconic brand Bugatti.

1.1 The presence of CESEE start-ups in the automotive sector

The automotive industry thus gained an important role in several CESEE countries over the last three decades. The combined value added by the sector in the ten CESEE countries represents more than 12% of the total automotive value added in the EU. Some CESEE countries have come to be highly specialized in automotive manufacturing. Indeed, in Czechia, Hungary and Slovakia, motor vehicle manufacturing is the lead manufacturing industry, like in Germany, generating about one-fifth of the manufacturing gross value added. In terms of aggregate output and employment, the automotive sector in CESEE is also comparable to Germany with which

Chart 1

Number of start-ups in the automotive sector[1]



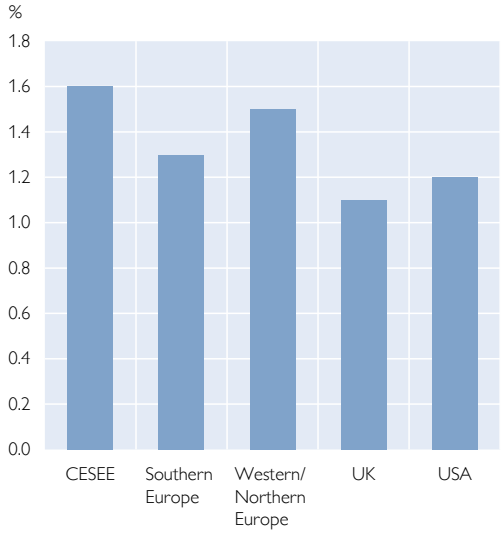
Source: Crunchbase, Eurostat, US Census Bureau, authors' calculation.

Note: CESEE: Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Southern Europe: Cyprus, Greece, Italy, Malta, Portugal and Spain. Western/Northern Europe: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, the Netherlands and Sweden.

[1] The figures relate to firms that were founded between January 2008 and June 2021 and are still active in the automotive sector.

Chart 2

Share of start-ups in the automotive sector[1]



Source: Crunchbase, Eurostat, US Census Bureau, authors' calculation.

Note: CESEE: Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Southern Europe: Cyprus, Greece, Italy, Malta, Portugal and Spain. Western/Northern Europe: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, the Netherlands and Sweden.

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the industry in CESEE is closely intertwined. The sector thus employs about 1 million people in the CESEE region, some 37% of total EU automotive employment, despite the dramatic increase in robotization in recent years.

The automotive sector in particular and manufacturing in general has been the main target of the FDI flows that started pouring to CESEE countries in the 1990s, with Hungary having attracted the highest manufacturing share (43% of FDI stocks). Over the last two decades, the investment rate in the automotive sector measured as the share of gross fixed capital formation relative to gross value added averaged more than 36% in CESEE, nearly twice as much as in the rest of the EU.

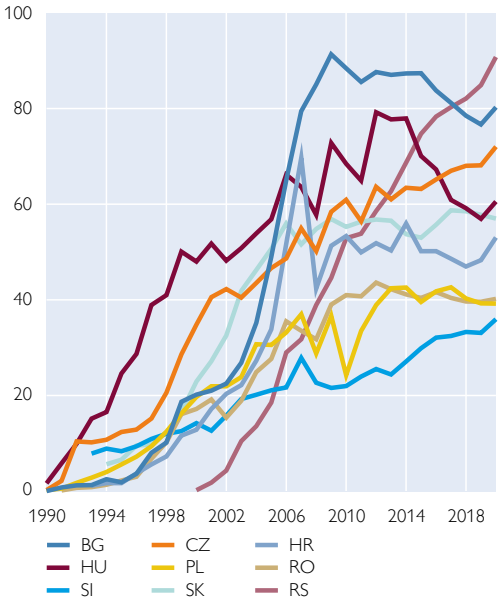
However, as chart 3 shows, FDI stocks have remained rather flat in most CESEE countries since the global financial crisis in 2009. This echoes the fact that the strong relocation of automotive production to the CESEE region slowed down substantially after the global financial crisis. As a result, in contrast to the EU as a whole, the automotive industry in most CESEE countries experienced a markedly higher growth in value added between 2000 and 2008 than in the period after the financial crisis (chart 4). In the wake of strong FDI inflows, the automotive sector in CESEE countries has become one of the region's key export drivers. Automotive exports thus accounted for a record high of 34% of total exports in Slovakia in 2019 and for more than 20% in Hungary, Czechia and Romania.

1.2 Growth of FDI stocks and value added by the automotive sector in selected CESEE countries

Moreover, FDI inflows were crucial in integrating the CESEE automotive sector into global and regional value chains, as a result of which the share of foreign value

Chart 3

Growth of inward FDI stocks

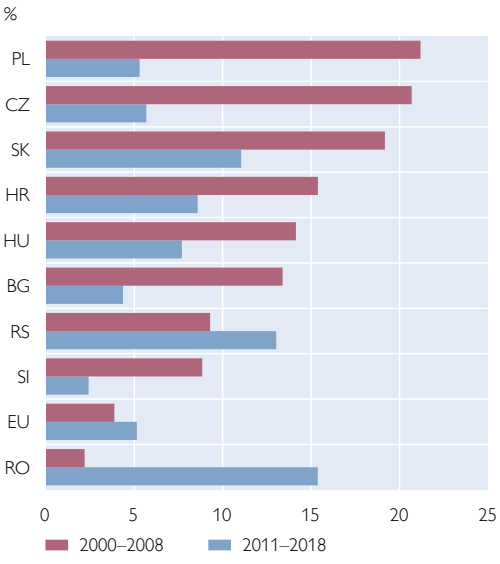


Source: wiiw FDI-database.

Note: Special-purpose entities excluded.

Chart 4

Annual average growth rates of value added by the automotive sector

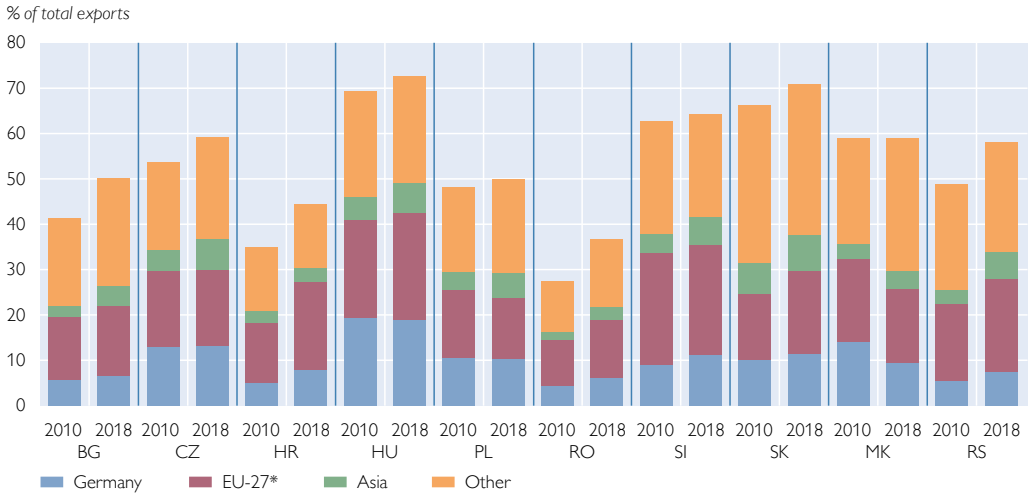


Source: Eurostat.

Note: Automotive sector defined as NACE rev. 2, C29 (motor vehicles, trailers and semi-trailers). The data for the EU include the EU-27 and the UK.

Chart 5

Foreign value-added content of exports of transport equipment in selected CESEE countries



Source: wiiw multi-country input-output database (wiiw MC-IOD).

Note: EU-27 denotes EU-27 without domestic manufacturing and Germany. Asia includes China, South Korea and Taiwan. Transport equipment comprises NACE rev. 2, CL, C29 (motor vehicles, trailers and semi-trailers) and C30 (other transport equipment).*

added in exports of transport equipment has risen to levels as high as 70% in Hungary, Slovenia and Slovakia, compared to less than 30% in Germany (Reiter and Stehrer, 2021). While the automotive sector has some of the longest value chains of any industry, it is, at the same time, organized into three main blocks that generally source within their respective regions: the EU, North America and Asia (OECD, 2012). In line with this stylized fact, the lion's share of the foreign value added in CESEE countries' exports of transport equipment comes from the EU, particularly Germany (chart 5). The German value added content constitutes a major share of exports in Hungary (19%) and Czechia (13%). The EU value added share in automotive exports is highest in Slovenia (24%) and Hungary (23%).

The deep integration of the CESEE automotive industry in global and particularly regional value chains and the high interlinkages with Germany notwithstanding, it has to be borne in mind that the automotive sector has a very different functional profile in Germany than in CESEE countries. The latter tend to specialize in value chain functions with lower value added and serve as factory economies in the European production networks (Stöllinger, 2021). Hence, the sector in CESEE typically shows a revealed comparative advantage in production while other more skill- and knowledge-intensive pre- and post-production functions – including headquarter services and R&D, but also sales and business services – are underrepresented. Conversely, Germany's automotive industry has a comparative disadvantage in production, but substantial comparative advantages in headquarter services, R&D and business services, i.e. functions which tend to generate higher value added and pay higher wages.

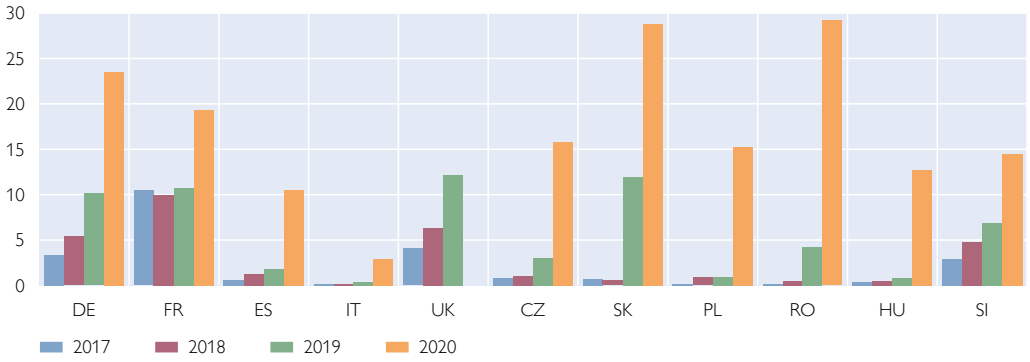
2 Automotive industry in CESEE in e-motion?

Turning to electrification, the picture across the region is somewhat varied, and automotive players in CESEE are largely dependent on decisions taken at their mostly foreign headquarters. Nonetheless, in general, CESEE countries are to a large extent involved in the electrification process. Moreover, many appear to have the potential to reap significant benefits from the electrification trend or even to become its key focal points, at least when it comes to the projected production of electric vehicles. For instance, Slovenia, Slovakia and Czechia are expected to have the highest level of battery electric vehicle production per capita in Europe in 2030 (Transport & Environment, 2021). Moreover, vehicle production in some countries in the region is projected to become exclusively (Slovenia) or predominantly (Poland for instance) focused on battery electric vehicles by 2030. In contrast, battery electrics will account only for about 50% of car production in Germany and for about 30% in Romania where the shift to electric vehicle production will be less significant and/or happen at a slower pace. In most of the CESEE countries, we see an emerging shift toward electric vehicles. In Czechia, all automotive players producing in the country (Skoda, Hyundai and Toyota) have launched at least some full electric vehicle or hybrid production. Particularly Skoda (Volkswagen Group) – which is investing EUR 2 billion in e-mobility – wants to turn Czechia into an e-mobility hub. In Slovakia, Stellantis has EUR 180 million in investment plans with the aim of gradually launching mostly hybrid and electric vehicles. Volkswagen has been producing its electric e-Up in Slovakia since 2013. Jaguar Land Rover is adding plug-in hybrid electric cars to its production portfolio in Slovakia. Stellantis' FCA is investing EUR 165 million in its Polish plant to produce new hybrid and electric vehicles. Moreover, Volkswagen and MAN produce electric vans in the country and Poland is already the leader in manufacturing of electric buses. Furthermore, in 2020 the Polish government announced plans to create a state-owned electric vehicle company, ElectroMobility Poland, which is expected to launch its e-car production in fall 2024. In Hungary, the BMW plant to be opened in 2025 will exclusively produce electric cars, making it the key focal point of BMW's strategy for e-mobility. Daimler announced plans to invest EUR 141 million in Hungary to add fully electric vehicles to its Hungarian production. The electric drives for the Audi e-tron have been manufactured in Hungary since 2018. The electric models for the Premium Platform Electric (PPE), developed jointly with Porsche, are also to be assembled at the Hungarian plant. In Slovenia, the Renault Twingo EV accounted for one-third of the Revoz plant's output in 2021. In addition, the Slovenian plant also manufactures the Smart Forfour EV under a partnership with Daimler. While Romanian Dacia (Renault Group) has unveiled its first 100% electric model (Dacia Spring), the market's most affordable electric vehicle will not be made in Romania but rather at the parent company Renault's facility in China. Ford has announced plans to invest USD 300 million in Romania, aiming to electrify the entire commercial vehicle range from 2024 on. The Bulgarian manufacturing facility (EUR 143 million investment) of German electric car manufacturing startup Next.e.Go Mobile is scheduled to begin operations in 2024. Rimac, the Croatian e-hyper-car producer, takes on a special role in the CESEE region, contributing to innovation in the electric vehicle branch and producing supplies for already established producers.

Chart 6

Exports of electric and hybrid cars

Export share of total cars in %



Source: Eurostat Comext.

Note: Total cars denotes motor cars and other motor vehicles principally designed for the transport of less than ten persons (CN8703). Alternative cars include hybrid cars, plug-in models and pure electric cars. 2020 data for the United Kingdom not available.

Going hand in hand with the strengthening production of electric vehicles in CESEE has been the rising significance of electric powertrain technologies in the region's exports in recent years. The year 2020 saw a particularly strong jump, with the share of electric and hybrid vehicle exports in total car exports climbing as high as 30% in Slovakia and Romania (see chart 6).

In addition to the production of electric vehicles, CESEE countries are making significant efforts to secure a role in battery production. On the back of the strongly rising demand for batteries, Deloitte (2021) estimates that 16 to 22 gigafactories will have to be built in total in Germany, Czechia, Hungary, Poland and Slovakia to keep electric vehicle assembly in this region. This is because the heavy weight of batteries renders long-distance logistics and shipping costly so that it is reasonable to place the production of batteries close to the assembly of electric vehicles. Against this background, Poland, Hungary, Slovakia and Czechia have already taken action to attract investment in gigafactories. While there has been a gigafactory in operation in Poland since 2017 and there are two in Hungary, one more is currently planned in each of these two countries. In addition, one gigafactory is planned in Slovakia and (up to) two in Czechia. Poland, whose exports of Li-ion batteries already amount to 2% of total exports, has attracted investments in gigafactories by means of direct financial support, free land transfer and tax incentives. Similarly, the Hungarian government has incentivized investments in its two existing gigafactories and planned future ones via direct financial support as well as free provision of the enabling infrastructure or some utilities. In addition to some financial support in favor of a planned gigafactory, Slovakia has set up the Slovak battery alliance, an independent advocacy group, to kick-start its battery industry. In Czechia, the government has so far only signed a memorandum of understanding with the electricity company CEZ concerning support for a gigafactory project.

Yet despite the strong involvement of the CESEE region in electrification, the implications are far more complex. The shift in production toward electric vehicles entails risks and opportunities for CESEE and the respective firms. Car manufacturers will need to find a right balance between electric and internal combustion

engine vehicles, depending on the market they serve. This entails not only large investments in new and possibly also still in outgoing technologies but in light of the high uncertainty also optimization challenges when it comes to organizing R&D and production. Hence, some car producers in the CESEE region such as Skoda and Dacia are planning a much slower transition to electric vehicles, as they have been and will be serving markets where the onset of e-mobility will be slower. Skoda for instance has been mandated to manage activities and to strengthen the position of the entire Volkswagen Group in India and South-East Asia. This involves the launch of a slew of competitively priced mass-market cars with an internal combustion engine. Moreover, Skoda has also been charged with developing cars on a common platform (MQB-A0) for the entire Volkswagen Group. Based on this platform, individual car brands in the Volkswagen Group will produce vehicles destined in particular for India, Russia, South America and Africa. Overall, the reasons why internal combustion engine production will stay longer in CESEE are mainly the following: (i) the tendency of older technologies to persist longer in peripheral locations; (ii) the CESEE automotive industry's relatively weak innovation capacities and (iii) its continued (labor and energy) cost advantage in the more labor-intensive internal combustion engine production (see Pavlínek, 2021; and CLEPA/PwC, 2021).

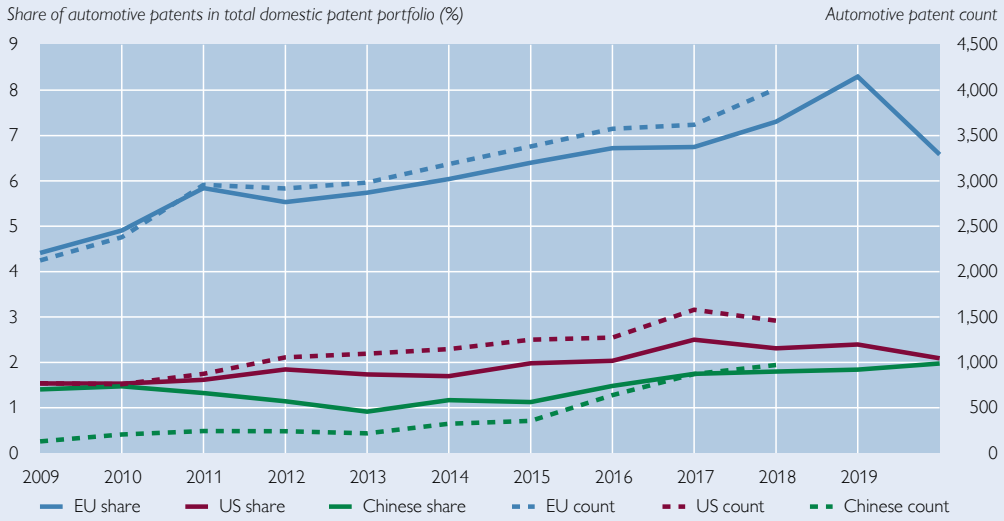
Box

CESEE's relatively limited innovative power strongly focused on the automotive sector, especially electric vehicles

Europe is a global leader in R&D investment in the automotive industry. One euro out of three spent in R&D in the EU goes to the automotive sector. However, R&D expenditures by car manufacturers are heavily concentrated in some EU countries, notably Germany and France. As a result, the EU is in pole position for innovative development in the automotive sector, as the steady upward trend for automotive patents – well ahead of the USA and China – suggests (chart B.1).

Chart B1

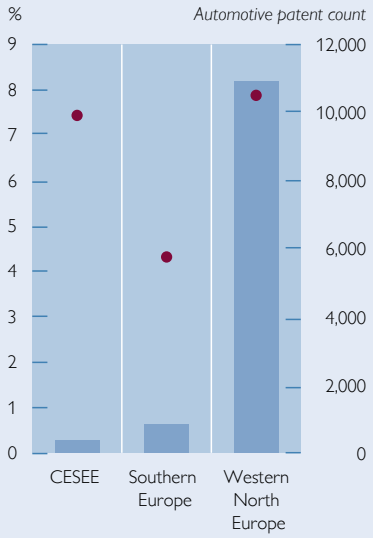
Evolution of automotive patents in the EU, the USA and China



Source: Authors' calculations based upon PATSTAT (PCT) data in collaboration with ECOOM (Centre for R&D Monitoring, Leuven, Belgium).

Chart B2

Number and share of automotive patents in Europe



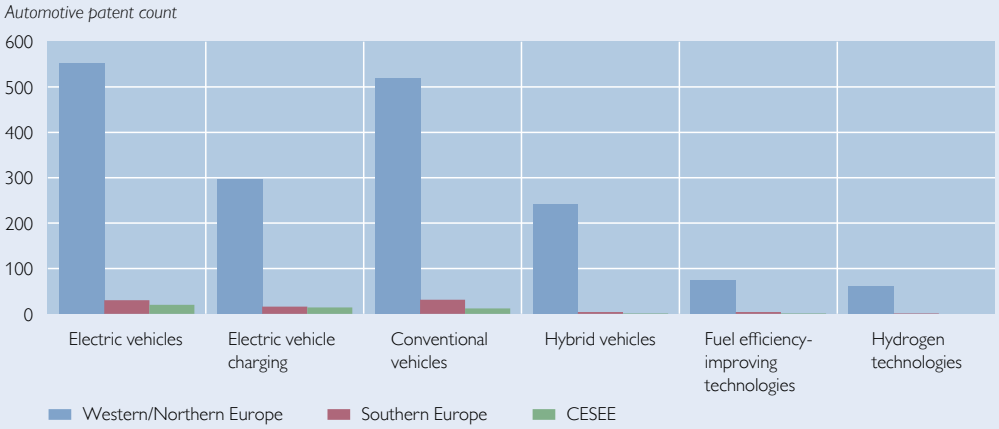
Source: Authors' calculations based upon PATSTAT (PCT) data in collaboration with ECOOM (Centre for R&D Monitoring, Leuven, Belgium).

Yet in line with the above-mentioned functional specialization, the innovative power of the CESEE region's automotive sector is limited. The absolute number of patents related to automotive innovation in the region is rather low compared to the other European regions. However, in relative terms, automotive patents account for close to 8% of all patents in CESEE, which is in line with the rest of Europe and points to an important relative specialization in this area (chart B.2). In particular, the CESEE region has seen a major uptake of climate-friendly patents in the automotive sector over the last 15 years. These patents are mainly related to the development of electric vehicles and electric vehicle charging (see charts B.3 and B.4). This relative specialization in electric vehicles is stronger than in other European regions. However, while the CESEE region has evolved into a significant knowledge center for vehicle electrification, it noticeably lags behind with respect to innovation in renewable energy and the related supportive technologies which are indispensable to making the electrification of vehicles truly climate-friendly. To sum up, CESEE countries do have a strong relative presence in innovation in the automotive sector as the region engages in cutting-edge research, development and innovation in addition to basic car assembly and part manufacturing. However, the large players in Western and Northern Europe clearly remain the technological leaders.

Green patents in the transport sector in 2018

Chart B3

Number of green transport patents

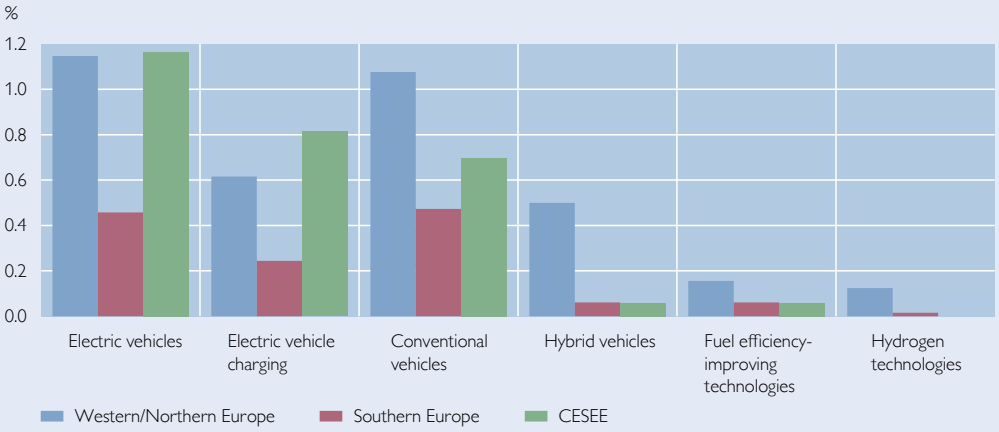


Source: Authors' calculations based upon PATSTAT (PCT) data in collaboration with ECOOM (Centre for R&D Monitoring, Leuven, Belgium).

Note: The classification of "green" domains is broadly based upon the methodology of Haščič and Migotto (2015). CESEE: Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia. Southern Europe: Cyprus, Greece, Italy, Malta, Portugal and Spain. Western and Northern Europe: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, the Netherlands and Sweden.

Chart B4

Share of green transport patents in total patents



Source: Authors' calculations based upon PATSTAT (PCT) data in collaboration with ECOOM (Centre for R&D Monitoring, Leuven, Belgium).

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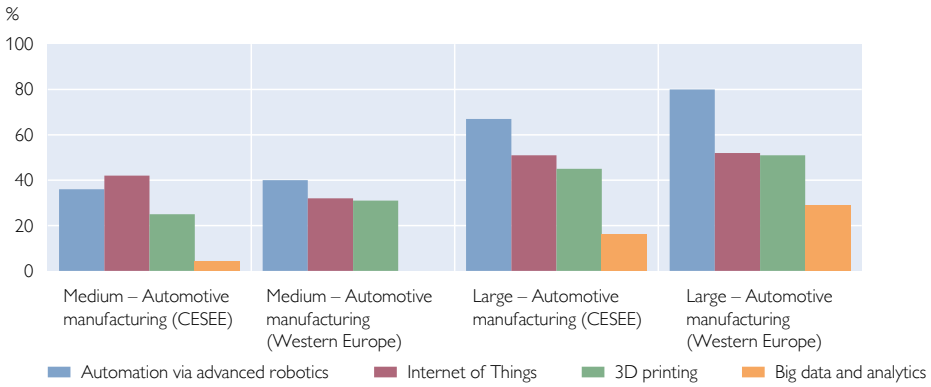
3 Transition in the automotive sector through firms' lens

The European Investment Bank's Investment Survey (EIBIS)[8] provides a unique opportunity to look at some aspects of the transition in the automotive sector – particularly those related to investment and investment financing issues – from the firms' perspective. This gives us a chance to better understand the firms' ability to undergo these changes. Automotive firms invest about two-thirds of their funds in tangible assets. Machinery and equipment take the largest share of investment (over 50%). Intangible assets such as capitalized R&D expenditures, software and patents account for 29% of automotive investment expenditures in CESEE, somewhat less than in the rest of the EU (33%) but more than in other industries in CESEE (24%). Automotive firms innovate and make substantial use of digital technologies, especially those more related with manufacturing processes, for instance in advanced robotics. Large firms, which are less common in CESEE, innovate

[8] *EIBIS is an EU-wide survey that gathers information mostly on investment and investment finance of SMEs and larger corporates. The survey covers approximately 12,000 firms across the EU-27, 600 in the United Kingdom and 800 firms in the United States. (The latter was covered only in the last two waves, which results in a rather small sample of US automotive firms. This is why the US observations are omitted from the analysis here). The sample used in the present paper contains 143 automotive firms from CESEE countries, 150 automotive firms resident in other EU countries or the United Kingdom (Western Europe) and 1,206 heavy manufacturing firms from CESEE. These firms were interviewed from 2016 to 2020 in five survey waves, some more than once. All firms in the sample have more than 50 employees, and about half of them have more than 250 employees. About 80% of firms from CESEE and about 60% of firms in the rest of the EU and UK supply automotive parts and components to car producers.*

Chart 7

Use of digital technologies in the automotive sector



Source: EIBIS 2016-20 and EIB staff calculations.

Note: The columns reflect the combined shares, in per cent, of the answers "Implemented in parts of your business" and "Organised entire business around it."

Q42c: Can you tell me for each of the following digital technologies if you have heard about them, not heard about them, implemented them in parts of your business, or whether your entire business is organized around them?

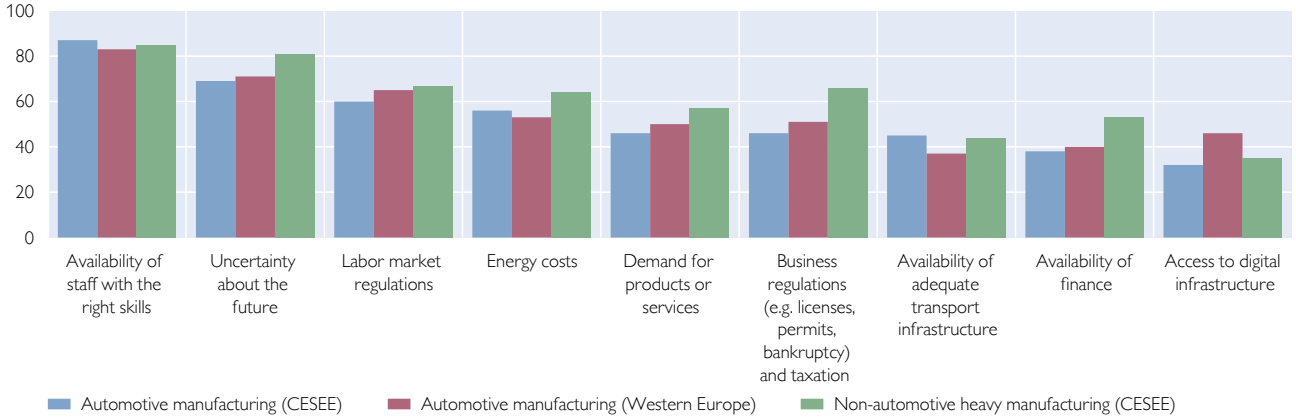
more and tend to make more use of digital technologies and other intangible assets (chart 7).

The survey also unveils that about two-thirds of investment finance comes from own funds, and the rest from external finance. While this distribution is similar in both CESEE and Western European automotive firms, there are significant differences in the structure of external investment finance. Nearly three out of four automotive firms in Western Europe source their external finance from bank loans, compared with only 62% in CESEE. About a quarter of external funding comes from leasing or factoring, both in CESEE and the rest of Europe. For the remainder in CESEE, grants are a significant source of funding. This is most likely

Chart 8

Investment barriers

% of respondents perceiving obstacles to investment



Source: EIBIS 2016-20.

Q38: Thinking about your investment activities, to what extent is each of the following an obstacle? Is it a major obstacle, a minor obstacle or not an obstacle at all? The columns reflect the combined shares of "a major obstacle" and "a minor obstacle."

related to more common eligibility for European Structural and Cohesion Funds (ESIF).

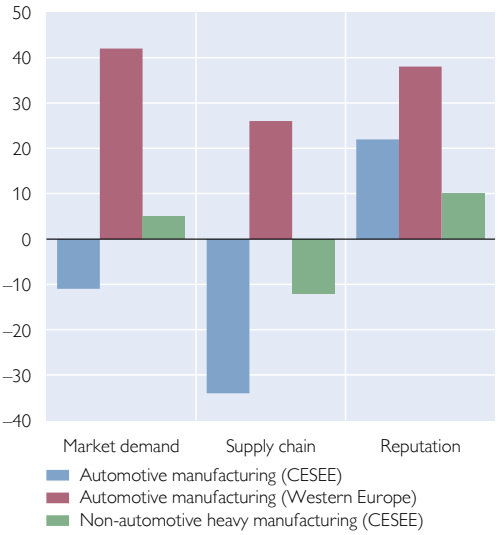
Lack of suitably qualified staff and uncertainty are the largest investment barriers all over Europe. In CESEE this holds true for both manufacturing firms in general and automotive firms in particular. However, companies are concerned also about the elevated uncertainty as well as the high energy costs (chart 8). Both in CESEE and Western Europe, the concerns expressed about uncertainty refer particularly to concerns related to (i) climate change impacts and new technologies to tackle that impact as well as (ii) regulatory conditions.

Indeed, climate change mitigation policies are having a substantial effect on the automotive industry. Most firms believe the transition towards more sustainable business may have a negative impact on demand and supply chains over the next five years, while their reputation might benefit. In this respect, CESEE auto firms are significantly more pessimistic than auto firms in the rest of Western Europe but also more than their peers in heavy industries (see chart 9). This pessimism probably derives from the fact that the automotive sector in CESEE is dominated by suppliers that are not as innovative as, and more financially constrained than, their peers in Western Europe. Furthermore, on their path toward climate transition they would need to not only reduce their production emissions but also change, in some cases significantly, their product line and business strategy.

Chart 9

Impact of climate transition over the next five years

Balance of positive and negative answers in %



Source: EIBIS 2020.

Note: The columns reflect the net balance of "positive impact" and "negative impact" answers.

Q58: What impact, if any, will this transition to a reduction in carbon emissions have on the following aspects of your business over the next five years?

4 Major macroeconomic impacts of car electrification on CESEE

The big trends in the automotive sector, car electrification in particular, are likely to have significant macroeconomic impacts on the CESEE economies, which have the potential to keep playing a significant role in the automotive industry. Structurally, the shift to e-mobility may not be driven exclusively by traditional automakers and well-established automotive firms but also by potential newcomers. These may be start-ups, big techs or firms from other geographical regions, particularly China whose firms are – with strong support from the Chinese government – eyeing massive expansion to Europe in terms of sales, production and R&D. Moreover, technological developments provide new opportunities for firms well beyond the automotive industry, such as those from the IT or chemical sectors.

Battery costs have declined significantly over the last decade on the back of economies of scale, innovation and improved production efficiency. On this ground they are largely expected to keep falling, but some experts also argue these factors have been all but exhausted (Michalek, 2021). Moreover, since the demand for raw

materials is set to increase sharply and outpace supply,[9] some caution regarding predictions about how fast and to what extent battery costs will continue falling is warranted as raw materials account for more than 50% of the battery costs. Hence, likely excess demand for raw materials, rising energy prices in the wake of efforts to combat climate change and geopolitical tensions as well as higher R&D expenditures are likely to make (real) prices of (both new and old) cars go up and thus less affordable for some consumers.

Fiscal costs of car electrification in the region have been limited so far but could rise noticeably. This is not only due to the large investment needs for infrastructure, energy production and transmission, but also possible fiscal support to nudge the uptake of electric cars among consumers on a mass scale. Furthermore, motor vehicles currently generate a significant share of governments' tax revenues,[10] the bulk of which comes from taxes on fuel and lubricants. Experience from pioneering countries in the realm of e-mobility thus suggests that putting the fiscal consequences of mobility electrification on a sustainable footing without jeopardizing the demand for electric vehicles turns out to be a rather tricky exercise for fiscal authorities.

One of the most significant impacts of the transition to e-mobility will be felt in the labor market as electric motors are much less labor-intensive than internal combustion engines. There are only few available estimates for the net job balance of powertrain electrification in Europe, let alone for CESEE. Nonetheless, irrespective of the net job balance, there is an unchallenged consensus that big trends in the car product market will entail massive structural transitions in the labor market between industries, job profiles and regions. According to CLEPA/PwC (2021) – a recent and possibly most comprehensive estimate – in a baseline scenario aligned with the European Commission's Fit for 55 proposal there will be up to 270,000 net job losses between 2020 and 2040 in the European automotive industry (see table 1).[11] The impact on employment in CESEE is likely to be mitigated or delayed because the region is expected – as mentioned above – to remain reliant on the production of internal combustion engine vehicles and parts for some time. As a result of the concentrated internal combustion engine production and lower investments in the automation of the outgoing technology, Czechia, Poland and Romania are expected to increase their automotive employment levels until 2025–2030. While Romania's car industry is projected to suffer a major employment drop

[9] *By way of example, the IEA (2021) estimates that demand for lithium for use in batteries will swell by a factor of 30, demand for rare earth elements used for making electric vehicle motors is projected to expand by a factor of ten by 2030. The booming demand for these metals will be met by constrained supply as opening up new mining operations is a long-term process with uncertain and volatile cash flows. Moreover, it is increasingly difficult to comply with environmental, social, governance and other regulatory standards (Bloch et al., 2018). In addition, there is considerable market concentration both among mining companies (Schneyer, 2011) as well as at country levels.*

[10] *Motor vehicles generate tax revenues totaling nearly EUR 400 billion in 13 key European markets (ACEA, 2020), mostly by means of taxes on acquisition (VAT, sales tax, registration tax), ownership (annual circulation tax, road tax) and motoring (i.e. taxes on fuels and lubricants). Belgium raises the highest average total tax revenues per vehicle followed by Austria. Cars thus contribute about 9.4% to the Belgian general government's overall revenues, 8% in Austria.*

[11] *It has to be borne in mind that even in the absence of the transition to e-mobility, trends like automation and the shift from manual to automatic gearboxes would most likely reduce employment in the automotive industry between 2020 and 2040. Hence, instead of comparing employment under a vehicle electrification scenario in 2040 to actual employment in 2020 a possibly fairer comparison would be between employment in 2040 under the electrification scenario and a counterfactual scenario without the transition to e-mobility.*

Table 1

Projected employment of full-time equivalents by the electric vehicle and internal combustion engine sectors

		2020	2025	2030	2035	2040
Germany	Internal combustion engines	132.7	134.3	105.3	10.5	10.5
	Electric vehicles	17.9	34.6	39.6	50.4	57.3
	Total	*150.6*	*168.9*	*144.9*	*60.9*	*67.8*
Italy	Internal combustion engines	72.9	73.8	6.6	6.6	6.6
	Electric vehicles	1.1	3.7	5.0	7.4	8.2
	Total	*74.0*	*77.5*	*11.6*	*14.0*	*14.8*
France	Internal combustion engines	24.0	24.3	2.1	2.1	2.1
	Electric vehicles	3.8	12.0	15.7	27.0	29.4
	Total	*27.8*	*36.3*	*17.8*	*29.1*	*31.5*
Spain	Internal combustion engines	70.0	70.9	99.0	6.5	6.5
	Electric vehicles	2.0	18.9	28.1	37.4	39.4
	Total	*72.0*	*89.8*	*127.1*	*43.9*	*45.9*
Czechia	Internal combustion engines	37.0	37.5	25.4	33.3	16.9
	Electric vehicles	3.7	11.6	15.2	21.7	23.9
	Total	*40.7*	*49.1*	*40.6*	*55.0*	*40.8*
Poland	Internal combustion engines	51.7	52.3	68.8	49.7	25.3
	Electric vehicles	3.5	9.4	12.3	17.0	18.7
	Total	*55.2*	*61.7*	*81.1*	*66.7*	*44.0*
Romania	Internal combustion engines	54.0	54.7	71.2	4.6	4.6
	Electric vehicles	2.2	13.2	16.8	22.1	24.0
	Total	*56.2*	*67.9*	*88.0*	*26.7*	*28.6*
EU-27	Internal combustion engines	599.3	606.8	512.7	153.4	98.3
	Electric vehicles	46.2	139.9	179.6	247.9	272.2
	Total	*645.5*	*746.7*	*692.3*	*401.3*	*370.5*

Source: CLEPA/PwC (2021).

thereafter as a result of the shutdown of internal combustion engine production, Poland and Czechia will experience a more gradual decline. Moreover, Czechia in particular is expected to see a strong increase in electric vehicle-generated value added from 2030 on, to the extent that overall employment levels by 2040 could be broadly similar to those of today (see table 1).[12] While Hungary was not covered by the study, its internal combustion engine sector is also sizeable.

5 Conclusions and policy implications

CESEE countries have benefited a great deal from the eastward shift in the automotive industry over the last two decades, which has brought large investments and made several CESEE countries important parts of automotive production and supply chains. More recently, the automotive industry has suffered multiple parallel blows by cyclical and one-off shocks, which came on top of big structural trends on the demand and supply side, in particular the transition to electric vehicles. The latter brings significant opportunities for the CESEE region not only with respect to the production of electric vehicles but also in the associated crucial battery industry. While the CESEE countries are fully involved in these trends, they are

[12] *Estimates of the impact of the transition to electric vehicles on employment are sensitive to assumptions on the insourcing/outsourcing of batteries. All estimates by CLEPA/PwC (2021) have been made on the assumption that there will be a full battery value chain based in Europe, from the processing of raw materials to the final battery assembly. Battery production is thus expected to account for 70% of the electric powertrain value added and will as such be indispensable for employment in Europe.*

likely to trail behind the Western European countries when it comes to the adoption of the new technologies and thus the transition of the industry, bringing both advantages and disadvantages. The impact of mobility electrification on the future structure and macroeconomic performance of CESEE economies thus seems ambiguous.

For CESEE countries to maximize the benefit from the electric vehicle revolution, the key priority is to preserve close links with Germany – the emerging global e-mobility hub – and stay tuned for battery production. To overcome the functional specialization trap of CESEE economies in general and of their automotive industry in particular, it is vital to attract FDI and activities with higher value added. Hence, while keeping the importance of the automobile industry and its new trends in mind, it is essential for CESEE economies to diversify and address risks by refocusing their attention on other promising sectors and industries of the future. The IT and chemical sectors, digitalization and robotization are among the most promising areas. To address the businesses' major concerns and support future sources of economic growth, governments should concentrate on supporting the development of the required human capital and – in view of the rising electricity demand and costs – on the provision of affordable sustainable energy sources.

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