

Repurposing Slovakia's Automotive Industry for a New Era of Geo-Economics

Harnessing New Geo-Economic Realities to Unleash
a Greener, Globally Competitive, and More Resilient
Automotive Industry in Slovakia

Soňa Muzikářová
Viliam Ostatník

**Adapt
Institute**



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Authors

Soňa Muzikářová

Political Economist focused on Central and Eastern Europe and Consultant

Viliam Ostatník

Senior Analyst, Adapt Institute

■ Adapt Institute
Na vršku 8
811 01 Bratislava
Slovak Republic

■ www.adaptinstitute.org

■ CIPE Europe Office
Strakova 228/1
811 01 Bratislava
Slovak Republic

■ www.cipe.org

**Adapt
Institute**



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Foreword

The automotive industry is central to the prosperity, competitiveness, and even the economic security of Central Europe. The failure of the industry to adapt to emerging trends, challenges, and opportunities could threaten not only the future prosperity of the region but also its democratic resilience and stability.

The Center for International Private Enterprise (CIPE) commissioned this report in partnership with the Adapt Institute to understand how the automotive industry in Slovakia perceives the challenges to its future and areas in which it hopes to strengthen cooperation with the public sector in achieving the goal of becoming greener, globally competitive, and more resilient. We hope that this report can stimulate more collaborative approaches to enhancing the competitiveness of Slovakia's economy. We also hope that its findings and recommendations might stimulate similar conversations among economic and public officials in Czechia, Slovakia, and Hungary.

A second goal of this report is to stimulate a wider debate about democratic resilience and economic security within Slovakia and Central Europe as a whole. Past research by the Central European Institute of Asian Studies commissioned by CIPE has shown that Central Europe is more dependent on China for exports than previously realized due to indirect demand exposure. China's use of direct and indirect import sanctions against Lithuania in 2021—including in the automotive supply chain—served as a wake-up call for Europe about the risks of economic coercion by authoritarian regimes and spurred the development of the European Union's Anti-Coercion Instrument. China's dominance in the supply chain for electric vehicles (EVs) and its growing market share in EV exports poses a stark challenge to Europe's automotive industry. It is up to European nations to figure out how best to respond to these emerging realities, but governments and industry should debate how to respond with a full-sight picture of the challenges, risks, and opportunities. This report intends to enrich and inform that debate in Slovakia and the wider Central European region.

I am grateful to Soňa Muzikářová and Viliam Ostatník for their hard work, dedication, and excellent efforts in making this report possible and to Matej Kandrik from the Adapt Institute for serving as CIPE's partner in the creation of this project. We are particularly grateful to the 30 representatives from the automotive industry and related associations, chambers, and suppliers who shared their time and insights to inform the substance of this report.

Jeff Lightfoot
Program Director, Europe
Center for International Private Enterprise
Bratislava, Slovakia

Executive Summary

The global automotive industry, particularly in Slovakia, has been a key driver of economic growth, with factors such as a legacy of mechanical engineering, a skilled workforce, and strategic geographical location contributing to its success. The industry, dominated by leading manufacturers like Volkswagen, Stellantis, Kia, Jaguar Land Rover, and Volvo, has made Slovakia the world's largest producer of cars per capita.

However, the automotive industry in Slovakia faces significant risks, including the fragility of global supply chains (exemplified by the COVID-19 pandemic and Russia's war in Ukraine), the green transition mandated by the European Union's (EU's) ban on internal-combustion engines after 2035, subsidy competition from the United States and China, and intense global competition, especially from China, which has become the world's largest auto exporter.

In order to assess the challenges and opportunities facing Slovakia's automotive industry, we interviewed key stakeholders, including representatives of original equipment manufacturers (OEMs), suppliers, government experts, and financiers. The study revealed that the Slovak automotive industry is undergoing a multidimensional transition, with actors acknowledging and preparing for risks to varying extents. This paper outlines the strategies and preparations of OEMs for the transition to battery electric vehicles (BEVs) and the corresponding changes in supply chains.

The automotive industry in Slovakia also faces challenges in its transformation, with historical issues of political continuity and implementation hindering progress. The government's approval of an Action Plan for Development of Electromobility in 2023 signals a positive step, but concerns persist regarding the effective implementation of strategies. The shortage of skilled workers, regional disparities in unemployment, and declining education standards pose additional obstacles.

The reliance on foreign workers, particularly from non-European countries, has increased, highlighting the need for a comprehensive migration policy to attract and retain skilled workers. The inadequacy of e-mobility infrastructure, coupled with high and volatile energy prices, poses risks to the industry. The government's role in attracting private investment for infrastructure development and stabilizing energy prices is crucial.

Furthermore, the lack of focus on research and development (R&D) within the country, with only a small percentage of companies conducting R&D domestically, raises concerns about innovation and competitiveness. The dependency on Chinese supply chains in the electric vehicle (EV) sector is noted, necessitating efforts for supply chain de-risking and diversification.

EU initiatives, such as the Critical Raw Materials Act, aim to strengthen supply chain resilience. However, joint EU foreign policy and collaboration with partners like the United States are seen as essential for effective implementation. The EU's Free Trade Agreements and the Global Gateway initiative provide opportunities for reconfiguring supply chains and fostering mutually beneficial arrangements.

The analysis highlights several key findings:

1. **Economic vulnerability:** Slovakia is particularly susceptible, ranking among the highest-risk economies in Europe due to its heavy dependence on automotive manufacturing, an undiversified economy, and a lack of consistent political vision and key policy foundations.

2. Foreign investment dynamics: While Slovakia attracts foreign investment, neighboring countries like Czechia, Poland, and Hungary tend to secure more robust and higher-quality investments in the automotive industry.
3. Decision-making dynamics: Parent companies retain strategic decision-making power, leaving Slovak OEMs and suppliers as decision-takers rather than decision-makers, impacting their adaptability to the evolving automotive landscape.
4. Transition strategies: OEMs in Slovakia exhibit varied strategies in response to the green transition, ranging from a complete shift to BEVs to offering models across fuel variants. Fierce competition among plants within the same OEM also influences production decisions.
5. Supply chain challenges: Supply chain bottlenecks in the past years have affected production and profitability. Diversification of supply chains is deemed crucial for resilience and security, necessitating public-private cooperation and alignment with EU initiatives.
6. Workforce challenges: A skills gap in the existing talent pool requires innovative solutions, such as deploying foreign workers, establishing dual learning academies, and specialized vocational schools. The state's role in addressing these challenges, particularly in terms of education and infrastructure, is emphasized.
7. Energy and charging infrastructure: Concerns about the inadequacy and inconsistency of energy and charging infrastructure underscore the need for state intervention to ensure capacity, suitability, and the transition toward a balanced energy mix.
8. Long-term solutions for China's market share: Import tariffs, subsidies, and domestic content requirements are considered short-term solutions to limit China's market share. A more sustainable approach involves enhancing domestic competitiveness including through stepped up and strategic state support for research, development, and innovation.
9. Competitive advantages: Incumbent OEMs and suppliers can leverage usability, service networks, brand recognition, and heritage as competitive advantages over newcomers, especially from China. Europe's leadership in data regulation and comprehensive policies further strengthens the competitive position by fostering trust and transparency.

Finally, the paper emphasizes the importance of a holistic approach involving economic, political, and technological strategies to ensure the resilience and competitiveness of Slovakia's automotive industry in a rapidly changing global landscape.

Addressing issues related to political continuity, workforce development, infrastructure, energy policy, R&D, and supply chain resilience is crucial for the successful transformation of the automotive industry in Slovakia. Collaboration between the government, private sector, and international partners is essential to overcome these challenges and ensure long-term sustainability and competitiveness.

1. Introduction

The global automotive industry is on the cusp of major change. In Slovakia, automotive manufacturing has played a crucial role in the country's transitional development trajectory and as a driver of economic growth. Several factors have contributed to the industry's success, including Slovakia's post-communist legacy of mechanical engineering, cheap and skilled workforce, and its geostrategic location at the heart of Europe. The close integration with Europe's western clubs—including NATO, the European Union (EU), and the eurozone—has helped underpin Slovakia's security; a degree of economic, legal, and institutional convergence with Western Europe; as well as Slovakia's inclusion in global value chains. Today, the automotive industry provides the largest share of gross domestic product (GDP), exports, and job creation in Slovakia, buttressed by global partnerships. With four leading original equipment manufacturers (OEMs) (Volkswagen, Stellantis, Kia, and Jaguar Land Rover) and Volvo incoming, as well as almost 400 local suppliers, Slovakia is the world's leader in car production on a per capita basis. Given the centrality of the auto industry to the Slovak economy, its continued competitiveness is crucial not only to the region's economic future but also its political, social, and democratic stability.

However, being increasingly subject to geopolitical convulsions and shifts in the structure of the global economy, the industry is at risk of major disruption in the coming years. This paper focuses on four main risks: the fragility of global supply chains, the green transition, subsidy competition, and global competition. These risks are detailed in Box 1.

In order to better understand the strategies, priorities, and concerns of the automotive industry, we interviewed representatives of leading OEMs, suppliers, business associations, government experts, and financiers to understand the opportunities and challenges facing the Slovak automotive industry. The interviews sought to identify strengths, weaknesses, risks, and opportunities that the auto industry faces in the context of the changes mentioned, as well as identify gaps in public-private collaboration, addressing which might better enable the Slovak auto industry to sustain and thrive in a period of disruptive change.

Our findings indicate that the automotive industry in Slovakia is undergoing a multi-vectoral transition, and individual actors are typically alert to all four risks as presented in Box 1, albeit to different degrees. Section 2 details how the OEMs operating in Slovakia have been gradually getting ready for the transition toward manufacturing battery electric vehicles (BEVs) in terms of their production plans, strategies, and research & development (R&D);¹ the security of supply; and global and subsidy competition. It also notes how OEM's suppliers and subcontractors have been investing significant resources in the changes necessary to stay relevant in the new value chain. Section 3 discusses the involvement of the public sector and the role of policy. Section 4 presents key takeaways for decisionmakers, policymakers, and the automotive manufacturing community more broadly. It recommends priorities for action for enhanced public-private cooperation as the basis for business-government dialogues designed to strengthen the resilience of the Slovak auto industry and economy going forward.

¹ Given European Union (EU) regulation that will require new cars sold from 2035 to have zero CO2 emissions, our focus is on battery electric vehicles (BEVs).

Box 1. Main Risks to the Automotive Industry in Slovakia

Security of Supply

The COVID-19 pandemic demonstrated the fragility of global supply chains and the impact of shortages of key supplies from East Asia, notably semiconductors, on Central Europe's auto industry. Additionally, there is a potential risk of an escalated trade war between major world economies, resulting, among other things, in export controls concerning materials and/or products vital for the auto industry. Supply chains can also be disrupted by sanctions imposed between major economies following, for instance, a deterioration of the political-security situation. Moreover, in relation to electric vehicles (EVs), supply chains are dominated by one country—China—which has a track record of weaponizing trade dependencies to advance its wider policy goals.

Green Transition

The EU will ban the sale of new automobiles with internal-combustion engines after the year 2035,² requiring manufacturers and suppliers to adopt new strategies and technologies, invest in R&D, and upskill their workforces. The transition to EVs puts the European auto industry in a situation of potentially lower global competitiveness, as well as higher vulnerability and greater dependency on East Asian markets, predominantly China, for battery technology, semiconductors, and critical mineral processing.

Subsidy Competition

The European auto industry faces challenges of a level playing field as a consequence of the United States' 2022 \$430 billion Inflation Reduction Act (IRA) and an estimated \$57-billion worth of subsidies between 2016 and 2022 from China to Chinese companies to support EV growth.³

Global Competition

In 2023, China became the world's largest auto exporter, overtaking Japan. China's dominance in battery technology and the key components of EV manufacturing creates the risk that Europe's auto industry of the future will be both highly dependent on a country that the EU has termed as a "partner, competitor, and systemic rival" and in a vulnerable and uncompetitive position vis-à-vis EVs made elsewhere.

² The law has a notable exception enabling original equipment manufacturers (OEMs) to continue selling internal-combustion engine (ICE) cars after 2035 if they run "exclusively on CO2 neutral fuels," so-called e-fuels. Some signals about the future of the EU automotive industry are mixed. For instance, EU Commissioner for the Internal Market Thierry Breton has been vocally supporting OEMs in the EU to continue manufacturing ICE vehicles should they wish to do so. Breton has also been preparing for the "review process" of the 2035 ban that is scheduled for 2026 (Jakob Hanke Vela and Joshua Posaner, "Top EU commissioner calls for 'no taboos' review of 2035 car ban," Politico, November 4, 2022, <https://www.politico.eu/article/breton-says-u-turn-on-eus-2035-car-engine-ban-isnt-taboo/>). However, the political and procedural way toward reform or reversal of the 2035 ban is unclear. People interviewed for the purpose of this paper did not count on the 2026 review to substantially change or reverse the ban, only to assess the pace of the adoption of BEVs in the EU, probably relying on aggregate data.

³ Philip Blenkinsop, "EU to investigate 'flood' of Chinese electric cars, weigh tariffs," Reuters, September 13, 2023, <https://www.reuters.com/world/europe/eu-launches-anti-subsidy-investigation-into-chinese-electric-vehicles-2023-09-13/>.

2. The Impact of Geo-Economic Challenges on Slovakia's Automotive Industry

The automotive industry is undergoing profound changes globally.

A. The Security of Supply

The market is recreating the relevant supply and value chains with the battery alone making for around 39 percent of the total value of the BEV.

- A standard BEV drivetrain uses more than 100 fewer moving parts than the standard ICE vehicle.⁴ Grounded in this new reality, new supply chains that rely mainly on the (processed) materials and minerals relevant to BEV manufacturing, such as lithium, cobalt, nickel, or graphite, are being solidified. China controls most of the BEV supply chains—most critically in the mineral refining phase of the process.
- Moreover, cell component (cathode and anode) manufacturing as well as final battery production are dominated by China, which has over 60 percent of control over those processes.⁵

B. Green Transition

As a result of the EU's decision to pass landmark regulation effectively banning the sale of new ICE vehicles on the EU market from 2035,⁶ the Slovak automotive industry faces an imminent transition toward manufacturing BEVs to retain its market shares.

- Slovakia is a top car producer in per capita terms globally, with high reliance on car exports. With four major OEMs (Volkswagen, Stellantis, Kia, and Jaguar Land Rover) already operating in the country and one OEM (Volvo) incoming, trends and regulations toward a green transition are having a multi-vectorial impact on the automotive industry, including the network of suppliers.

C. Subsidy Competition

The automotive industry in Slovakia (and the rest of the EU) is currently operating on an uneven playing field, facing a subsidy competition:

⁴ See Interplex, Electric Vehicle Drivetrains Only Have 20 Moving Parts Compared to Over 200 in Conventional Automobiles, accessed on January 9, 2024, <https://interplex.com/resources/electric-vehicle-drivetrains-only-have-20-moving-parts-compared-to-over-200-in-conventional-automobiles/>. For more detailed comparison between BEVs and ICEs see, for instance, Ibhram Veza et al., Electric vehicle (EV) and driving towards sustainability: Comparison between EV, HEV, PHEV, and ICE vehicles to achieve net zero emissions by 2050 from EV, November 2023, <https://www.sciencedirect.com/science/article/pii/S1110016823009055>.

⁵ Juraj Kotian, Katarzyna Rzentarzewska, and Jakub Cery, EVs to shape CEE automotive sector, Erste Group, September 5, 2023, <https://www.erstegroup.com/en/research/report/en/SR347870>.

⁶ Although with a notable exception negotiated by, primarily, Germany, granting the OEMs the possibility to continue selling ICE cars after 2035 if they run "exclusively on CO2 neutral fuels," so-called e-fuels. It remains to be seen how this exception might impact the market, competitiveness of the OEMs, their exports, as well as related research & development (R&D) and innovation [see "Regulation (EU) 2023/851 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2019/631 as regards strengthening the CO2 emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition," Official Journal of the European Union, April 25, 2023, <https://eur-lex.europa.eu/eli/reg/2023/851>]; Euractiv, "The EU's 2035 Fossil-Fuel Car Ban Explained," April 14, 2023, YouTube video, <https://www.youtube.com/watch?v=uXJTJBuevE>.]

- The United States' IRA, in the amount of \$430 billion, offers a mix of subsidies and tax incentives, including a \$7,500 tax credit for EVs if 40 percent of battery metals are sourced from the United States and half of all battery components are made in North America. Cars using Chinese minerals are not eligible for EV subsidies under the IRA.⁷
- China subsidized its domestic EV sector with an estimated \$57-billion worth of subsidies between 2016 and 2022. The cost advantage of Chinese OEMs is estimated to be as much as 20 percent over rivals as a result of China's grip on the supply chain and raw materials. Moreover, Chinese producers benefited from BEV battery prices of \$130 per kilowatt hour against a global price of \$151 in 2022.⁸

Box 2. Methodology

Our study included 30 semi-structured interviews with representatives from private companies in Slovakia's automotive industry, associations, consulting firms, advocacy groups, private equity, and the policy space, ensuring a holistic examination of the country's automotive industry. Data collection involved one-on-one interviews and crowdsourcing insights through engagements with stakeholders, which provided a unique dataset that captured individual and collective industry dynamics.

Industry/sector	Numbers of subjects interviewed
Tier 1—3 suppliers	4
Public sector/government	9
Business or advocacy association	2
Industry association	5
Consulting	2
Other (private equity, education, car dealership, BEV infrastructure operator)	4

The questionnaire covered areas integral to understanding the dynamics of Slovakia's automotive industry, addressing market trends, technological advancements, regulatory challenges, economic impacts, strategic planning as well as supply chains security. The semi-structured approach deployed in interviews allowed for flexibility while ensuring coverage of predefined key topics.

Questions included:

- How well are automotive companies in Slovakia prepared for changes brought by the EU's 2035 ban on ICE vehicles?
- How are companies planning to maintain their competitiveness in light of fierce market competition, especially with China?
- In what ways do the current changes in the market affect the automotive business in Slovakia?
- What factors hinder and, on the other hand, help the industry transition and to maintain (or increase) competitiveness and resilience?
- Does the transition require help from the government? If so, in what form would the companies imagine state intervention (national and/or EU level) to support the industry?
- To what extent are the critical supply chains mapped from the level of material inputs to processing capacities to distribution? Are these realities considered a risk?
- Do the OEMs have various contingency/diversification plans prepared for a potential change/deterioration of the economic, security, and/or political situation in relation to selected third countries (namely China, Russia, but also others)?

⁷ Numerous start-ups and large vehicle manufacturers from the EU are attracted by the Inflation Reduction Act (IRA) and are considering moving to or opening facilities in the United States because of the IRA (for instance, Audi).

⁸ Blenkinsop, "EU to investigate 'flood' of Chinese electric cars."

This research distinguishes itself from existing studies by offering nuanced micro perspectives of key industry actors in a bottom-up fashion, frequently lacking in conventional approaches based on aggregate macroeconomic statistics. As such, it complements existing empirical findings. For example, a recent study⁹ finds that should the Slovak auto industry fail to adapt to the impending transition toward BEVs, Slovakia's GDP would be 10 percent lower compared to the baseline, while total employment would drop by 4.5 percent compared to 2020 levels. On the contrary, in the best-case scenario, the output losses and employment cuts would be offset by new EV-related capacities and job creation, provided that required investments in reskilling, EV production, and battery capacities occur. Such scenario modeling is useful in generally quantifying the cost of "doing nothing," but lacks contextual understanding behind the data. By adopting a granular approach, we capture the intricacies of individual experiences, motivations, and behaviors and uncover opaque dynamics at play, as participants may share unique perspectives, experiences, or local conditions that impact their daily operations but are not reflected in broader economic indicators. Finally, interviews allow for a deeper exploration of attitudes, opinions, and emotions, which can be particularly useful when trying to understand the human dimension of the transition or the impact of policies on individuals and communities. In this way, we hope that our qualitative approach fills a key gap in the existing literature at a critical juncture in Slovakia's socioeconomic development.

D. Global Competition

EU car manufacturers grapple with two main challenges in the face of a rising China:

- Global market penetration of Chinese BEVs, reinforced by their vertically integrated supply chains and minimal capital constraints. The United States imposes a 27.5 percent tariff on Chinese-made cars, which makes U.S. market access three times more expensive for the vehicles than the EU.¹⁰ Meanwhile, Chinese BEV exports are rising significantly. In October 2021, China became a net auto exporter, and since mid-2022, Chinese exports have continuously outperformed imports.¹¹ Although BEVs represent only one-third of China's overall automotive exports in terms of volume, they contribute 52 percent of the value of China's car exports, making them the primary driver of the reversal in China's car trade deficit.¹² In the last five years, EU imports of Chinese cars have quadrupled.¹³
- The EU's reliance on Chinese capacities and capabilities in supply chains relevant to BEV manufacturing. More than 80 percent of EU imports of manganese, magnesium, and cobalt ore come from China. China dominates, in particular, the refining, manufacturing, and assembly processes. For instance, 94 percent of lithium from Australia and 99 percent of cobalt from the Democratic Republic of the Congo (which accounts for 75 percent of cobalt mining globally) goes to China for refining.¹⁴ The key point here is that the main risk lies not in the absolute (monetary) value of multiple critical imports, but in the high degree of market concentration.¹⁵ (See Box 3 for an analysis of the dependencies of the Slovak economy on China.)

⁹ See Globsec, Slovakia Automotive Industry 2.0: The time is now to retool for the e-mobility era,

<https://www.globsec.org/what-we-do/press-releases/slovakia-automotive-industry-20-time-now-retool-e-mobility-era>

¹⁰ For Slovakia, discussions on the imposition of higher tariffs on Chinese-made vehicles, including BEVs, have double importance: First, the risk of an escalating trade war with China could hurt Slovak exports (directly and indirectly, through Germany (see Martin Šebeňa, Thomas Chan, and Matej Šimalčík, Hidden links: V4's final demand exposure toward the Chinese market, Central European Institute of Asian Studies, October 18, 2023, <https://ceias.eu/hidden-links-v4s-final-demand-exposure-toward-the-chinese-market/#authors>). Second, if the discussions were to lead to higher tariffs for all non-EU manufactured vehicles, including BEVs, this would have a direct impact on Jaguar Land Rover and Kia as non-EU OEMs producing in Slovakia. The impact could be positive in the sense that these OEMs would be, essentially, forced to manufacture more vehicles in Slovakia for the EU market in order to avoid costly tariffs that come with importing vehicles from the United Kingdom or South Korea, but it could also hurt exports (mainly to the United Kingdom).

¹¹ Iaria Mazzocco and Gregor Sebastian, Electric Shock: Interpreting China's Electric Vehicle Export Boom, Center for Strategic and International Studies, September 14, 2023, <https://www.csis.org/analysis/electric-shock-interpreting-chinas-electric-vehicle-export-boom>.
Mazzocco and Sebastian, Electric Shock.

¹² Laura He, "China's automakers take the world by storm with electric vehicle push," CNN, September 8, 2023,
¹³ <https://www.cnn.com/2023/09/07/cars/china-evs-global-intl-hnk/index.html>.

¹⁴ Marie Le Mouel and Nicolas Poitiers, "Why Europe's critical raw materials strategy has to be international," Bruegel, April 5, 2023,
¹⁵ <https://www.bruegel.org/analysis/why-europes-critical-raw-materials-strategy-has-be-international>.

Le Mouel and Poitiers, "Why Europe's critical raw materials strategy."

China's control over these strategic aspects is facilitated by government support, leading to an uneven competitive landscape—an aspect currently under scrutiny in an EU investigation.¹⁶ The European Commission launched an anti-subsidy investigation into the import of BEVs from China in October 2023, investigating whether BEV value chains in China benefit from illegal subsidization and whether such subsidization causes economic injury to EU OEMs that produce BEVs. At the end of the investigation, the commission could decide to impose an anti-subsidy duty on BEVs imported from China. Beyond material dependency and intense market competition, characterized by state-subsidized Chinese manufacturers, there exists an ongoing competition in technology (R&D). Notably, Chinese capital has also penetrated EU OEMs such as Geely in Volvo/Polestar, Smart, Lotus, and Aston Martin; BAIC in Mercedes-Benz; and Dongfeng in PSA (now Stellantis).

Box 3. The Dependency of the Slovak Economy on China

Based on an analysis conducted by the European Commission in its October 2023 European Economic Forecast, Slovakia has the third-highest trade exposure as a share of economic output in the EU, measured in exports to China as a percentage of GDP, after Germany and Ireland.¹⁷

In addition to these direct links, Slovakia's exposure to China occurs via multifaceted, and often underappreciated, indirect ties, particularly:

- through intermediary countries whose import demand from the EU might be influenced by their exposure to Chinese spending
- via the profitability of EU companies operating in China

A recent Central European Institute of Asian Studies study finds that due to the characteristics of the automotive manufacturing industry of the Visegrád region—Czechia, Hungary, Poland, and Slovakia—and their placement in the value chain, export-related exposure to the Chinese market is frequently underestimated and may account for most of their overall exports to China.¹⁸ In fact, the difference between China's share of the V4 countries—their direct exports and China's share of their indirect exports—can amount to as much as 250 percent, according to the study. Neglecting these indirect links may then lead to significant misjudgments of the actual risk exposure.

Consequently, there might be a lack of awareness and urgency among public authorities to support the automotive transition through well-coordinated trade diversification policies, both within the EU and in collaboration with third countries and fleshing out effective economic de-risking strategies.

At the same time, the industry remains dependent on foreign battery supplies to enable the transition toward BEVs, which is why Slovakia recently embraced foreign direct investment (FDI) by China's Gotion High-tech in partnership with Slovak battery start-up InoBat.¹⁹ Their goal is to build an EV battery plant in the town of Šurany, 93 kilometers (58 miles) east of the Slovak capital. The plant should start production in Q2 2026 and create up to 1,500 jobs.

¹⁶ European Commission, "Commission launches investigation on subsidised electric cars from China," press release, October 4, 2023, https://ec.europa.eu/commission/presscorner/detail/en/ip_23_4752.

¹⁷ European Commission, "Spillover effects to the EU from a potential sharp slowdown in China" in European Economic Forecast, Autumn 2023, Institutional Paper 258, November 2023, https://economy-finance.ec.europa.eu/system/files/2023-12/ip258_en.pdf.

¹⁸ Šebeňa, Chan, and Šimalčík, Hidden links.

¹⁹ Reuters, "Chinese-Slovak venture signs deal for battery plant in Slovakia," November 23, 2023, <https://www.reuters.com/business/autos-transportation/chinese-slovak-venture-signs-deal-battery-plant-slovakia-2023-11-23/>.

Volkswagen (VW) is the largest single shareholder in Gotion, owning 26.47 percent of shares, through its Chinese subsidiary. Gotion would deliver supply chain and technology assistance as it expands production of BEV batteries, while the Slovak government has pledged to provide subsidies, arrange for the land, prepare the construction site, and secure the connection to the electrical grid.²⁰

For ICE automotive-reliant countries like Slovakia the infusion of foreign capital and technological innovations is essential for effectively managing the shift toward BEVs and, more broadly, escaping the middle-income trap associated with low-value-added activities. However, the landmark FDI from the Chinese comes at a time when the EU is growing increasingly wary about economic ties with Beijing, especially when it comes to strategic industries. At the same time, it comes in the midst of an anti-subsidy investigation into Chinese-made EVs, reflecting Brussels' growing fears while it may additionally contemplate trade defense actions in other areas, for example, against Chinese steel and wind turbines.

As the V4 strengthens its capabilities in battery manufacturing, the source of foreign investments will become increasingly significant within the current fragmented geopolitical landscape. Poland, Hungary, and Czechia's combined market share for new battery manufacturing reached 36 percent of EU battery demand in 2021, up from 7 percent in 2017, according to the Rhodium Group. But while in Czechia and Poland investment into battery manufacturing largely driven by investment from South Korea (Samsung, SK Innovation, and LG Energy Solution), in Hungary they have come pervasively from China—including the likes of CATL's €8 billion factory. As Europe endeavors to establish a domestic battery industry, the presence of Chinese-owned mega-factories on the continent could be perceived as a challenge to Europe's strategy of minimizing risks associated with China and pose a threat to the nascent European battery industry champions.

Key findings

Each of the four OEMs operating in Slovakia—VW, Jaguar Land Rover (JLR), Kia, and Stellantis—has its own approach to the transition to BEVs, with strategies ranging from a full switch toward manufacturing BEVs to investing in battery modules and premier ateliers for battery manufacturing. Moreover, the fifth incoming OEM, Volvo, owned and controlled by Chinese Geely through 82 percent of its shares, has communicated a plan to manufacture only BEVs at its plant in Valaliky, Slovakia.

Parent companies heavily influence these strategies, with Slovakia's OEMs/suppliers often being the decision-takers, not the decision-makers. Local OEM leaders are at times apprehensive about openly sharing information about their strategy and plans.

VW Slovakia currently produces the all-electric VW e-up! and plug-in hybrid versions of sport utility vehicles like the Porsche Cayenne in Bratislava. The company recently disclosed plans to manufacture the future all-electric Cayenne at this location, expected to roll out in the second half of this decade. Simultaneously, VW's Martin plant, responsible for manufacturing diverse components supplied to the company's main facilities in Slovakia and Germany, is gearing up for the BEV transition. Porsche has invested €1 billion in its factory in Horná Streda, where it plans to assemble battery modules from battery cells supplied "from Asia."²¹

²⁰ Reuters, "Chinese-Slovak venture signs deal."

²¹ We were not able to clarify what this means exactly—whether the suppliers are Chinese or South Korean. It is said that there is a change in supplier to be expected, possibly turning away from suppliers "from Asia," but this information, again, could not be verified.

Whereas the internal competition among VW's plants remains fierce, Bratislava's complex manufacturing experience (with it being the only automotive plant for VW and, in fact, in the whole world that produces various types of vehicles from four brands under one roof)²² and some unique capabilities (e.g., in industrial pressing)²³ set it apart. However, the ultimate decisions on the future lie with the parent company—whether certain models, including the BEVs, will also be manufactured in Slovakia, or elsewhere, and when. This impacts the suppliers, too. If the parent company decides to produce certain models (BEVs) in their home country, for instance, the Slovak-based suppliers can decide to compete with the suppliers from that country in supplying the plants there. Alternatively, they need to rely solely on producing components that are necessary for the Slovak plants.

Plans for the full electrification of Kia's Žilina plant remain unclear. The Slovak management competes with Kia's plants in South Korea, China, Mexico, the United States, and India. The Slovak plant's systemic advantage lies in being Kia's sole manufacturing plant in the EU, supplying half of all Kia cars for the EU market. Currently, the OEM is not sharing information on its plans to manufacture BEVs in Slovakia and focuses on plug-in hybrids, which constitute only one-tenth of total production, which is dominated by ICE cars. However, while the automaker has not avoided supply chain bottlenecks entirely, it is said to harbor a supply chain advantage since its supply chains boast a high degree of vertical integration and are underlain by long-term business relations rooted in loyalty, which help alleviate stress along the chain.

JLR in Nitra, sharing the advantage of being the parent's sole manufacturing plant in the eurozone, is clearer about its future plans. Its goal is to start producing BEVs (specifically the electric Defender model) in Nitra by the end of this decade.

In Trnava, Stellantis is already producing the electrified Peugeot 208 (e-208). The parent company has established a premier atelier for battery manufacturing, a first within the entire Stellantis Group, and the site serves as a training center for the entire group. The plan is to produce an additional 400,000 cars annually in Trnava by the end of the decade, with 50 percent being pure BEVs and over 70 percent being plug-ins. The development strategy focuses on offering a vehicle that can be chosen as a BEV, hybrid, or ICE. The parent company wants to continue focusing on the production of smaller and cheaper models. The recently unveiled Citroën ë-C3, utilizing the Smart Car platform, symbolizes this strategy, aiming to be the basis for at least six other BEVs from two other marques under the Stellantis Group. Some consider this a market offensive against China due to the Citroën ë-C3's relatively low price and small battery.²⁵ Production of the Citroën ë-C3 in Trnava is set to commence in Q1 2024, with all prototypes produced and tested at the facility, enabling Stellantis to gradually adapt the production process accordingly.

22 Moreover, Volkswagen (VW) focuses mainly on the higher-end and thus higher-margin models, such as Porsche Cayenne or Audi Q7, which help compensate for the loss of profits as a result of the COVID-19 crisis.

23 That said, there are also some structural disadvantages or constraints: for instance, in comparison to the Czech Skoda chief executive officer, the head of VW's Bratislava plant has lower competences and decision-making power over R&D and the production process. Moreover, VW is said to be heavily influenced by the German labor unions, which have influence even over the Slovak labor unions. VW has a public shareholder, the federal state of Niedersachsen, and thus is also heavily influenced by German politics.

24 The Stellantis Group has a bold approach to electrification of its products. Within the EU10, which is about 80 percent of the European market, it is number one for BEV and light electric vehicle (LEV) sales. It is number two in the EU30 and number three in the United States for LEV sales. In France, it is number one for LEV sales, especially with the Peugeot brand. In Italy, it is number one in BEV sales with the Fiat brand and number one in LEV sales with the Jeep brand.

25 Tomáš Andrejčák, "Stellantis odštartoval protičínsku ofenzívu. Začína v Trnave" [Stellantis launched an anti-Chinese offensive. It starts in Trnava], Pravda, October 19, 2023, <https://auto.pravda.sk/magazin/clanok/685468-stellantis-odstartoval-proticinsku-ofenzivu-zacina-v-trnave/>.

3. In the Pursuit of Public-Private Tandem

The previous section discussed how the private sector—OEMs and Tier 1–3 suppliers—is,²⁶ to varying degrees and with varying speeds, adapting to the realities of the emerging automotive landscape. Those interviewed for this report also underscored the importance of the state’s role in the transition toward BEVs, particularly with regard to public goods, such as education and infrastructure. Table 1 provides the interviewees’ “wish list.” This section then discusses the specific policy areas where interviewees would welcome greater public sector involvement and teases out some priorities for action as to how to address the challenges faced by the automotive industry in Slovakia.

Table 1 | Interviewees’ “wish list” with regard the involvement of the public sector

Public domain	Problem solution	# of times interviewee mentioned this issue
Agenda ownership and continuity	Successive Slovak governments have been passive and reactive when it comes to the transformation of the automotive industry and slow to implement existing plans; some policy decisions at the national and/or EU level have enabled an advantageous position for non-EU OEMs and suppliers	14
Education & workforce	Lack of qualified workforce being prepared for a) the future of the industry (possessing relevant skills) and b) incoming investors like Volvo	20
Migration policy	Lack of coherent, proactive policy that would help alleviate pressures regarding the future of the qualified workforce	6
Infrastructure	Underdeveloped BEV-relevant infrastructure, slow pace of development impacting consumers’ choices (negatively for the BEVs)	11

²⁶ Tier 1 suppliers are companies that supply parts or systems directly to OEMs. Firms that supply parts that wind up in cars, even though these firms themselves do not sell directly to OEMs, are Tier 2 suppliers. Tier 3 refers to suppliers of raw, or close-to-raw, materials like metal or plastic.

Public domain	Problem solution	# of times interviewee mentioned this issue
Energy policy	High energy prices severely endangering the future of the automotive industry in Slovakia and the EU (production)	16
Systemic support for R&D/innovation	Reliance on production with less R&D activities, low systemic and sustainable support for innovation (between the state, industry, and universities) which is necessary to stay competitive and resilient	17
Supply chain dependency and uneven playing field	China has a dominant and controlling position in the supply and value chains relevant to the BEVs, subsidized by the state, leading to a disadvantage particularly for EU OEMs and the whole ecosystem of Slovak-based suppliers	16

While successive Slovak governments have been perceived to fall short or outright fail the transformation of the automotive industry, the majority of automotive companies operating in Slovakia in liaison with third-party entities, such as the Slovak Electric Vehicle Association (SEVA), have come to the rescue and drive the underlying processes from both market and policy perspectives. SEVA, for example, works on a consortium focused on transforming the automotive industry in Slovakia, emulating the successful German approach in Baden-Württemberg known as ARENA2036.²⁷ Designed to serve as a platform connecting OEMs, Tier 1 suppliers, and other stakeholders with relevant public actors such as universities and regional governments, the primary goal of the consortium is to facilitate the successful transformation of the industry through strategic planning, effective cooperation, and streamlined pooling of resources for innovation, R&D, and necessary infrastructure. ARENA 2036 provides advisory support to this initiative.

a. Ownership and continuity

The interim Slovak technocratic government of Ľudovít Ódor took an encouraging step toward owning the transformation of the automotive industry in June 2023 when it approved the Action Plan for Development of Electromobility, acknowledging the industry's needs in the face of the transition, as well as the public sector's role in the quest to preserve its international competitiveness and automotive market shares.

²⁷ ARENA2036 or Active Research Environment for the Next generation of Automobiles is one of nine research campuses of the funding initiative "Research Campus — Public-Private Partnership for Innovations" in Germany. It is supported by the Federal Ministry of Education and Research (BMBF). Its members include universities as well as private companies. The main goal is establishing and linking the industrial sector with the sciences (see ARENA2036's website at: <https://arena2036.de/en/>).

The BMBF launched the initiative in 2011 to support large-scale and long-term approaches toward single-site cooperation between science and industry under the Federal Government's High-Tech Strategy (see "Research Campus — Public-Private Partnership for Innovation," Federal Ministry of Education and Research, accessed December 31, 2023, https://www.bmbf.de/bmbf/en/research/hightech-and-innovation/research-campus/research-campus_node.html).

ARENA2036 makes use of state, regional, as well as EU funds (European Regional Development Fund).

However, private actors were cautious, emphasizing the importance of the strategy's effective implementation, given Slovakia's longstanding track record of producing industrial and economic strategies, and failing to implement them. The quest for a "knowledge economy," which would drive Slovakia's competitiveness and productivity, dates back to then Slovak prime minister Mikuláš Dzurinda's second administration (2002 to 2006); it was coined Minerva under the leadership of Martin Bruncko at the Ministry of Finance. The Modernization Program Slovakia 21 implemented during Slovak Prime Minister Robert Fico's first administration superseded Minerva in 2008,²⁸ focusing on reaping benefits of eurozone integration in an equitable manner and sustained real convergence gains. In the early 2010s, the cabinet of then prime minister Iveta Radičová (2010 to 2012) resurrected Minerva 2 with the overarching goal of fast-tracking the conceptualization of reforms and their implementation in the areas of education, research and development and innovation (R&D&I), and business regulation in close liaison with the Ministry of Education and the Ministry of Economy.²⁹ In 2012, Radičová's government collapsed prematurely paving the way for Fico's return. Since then, public authorities have put forward several additional strategies, including the National Strategy for Global Education 2012–2016³⁰ under the auspices of the Ministry of Foreign and European Affairs and the 2030 Digital Transformation Strategy for Slovakia overseen by then digitalization leader Peter Pellegrini. The EU-backed 2030 Digital Transformation Strategy for Slovakia³¹ and the Action Plan for Smart Industry represent further efforts to upgrade digital infrastructure and adoption, improve education outcomes, and implement Industry 4.0 technologies, among other goals.³² Today, the EU's post-pandemic Recovery and Resilience Facility and resultant national Recovery and Resilience Plan have stimulated the creation of yet another strategic document, the National Strategy for Research, Development and Innovation 2030, under the auspices of a newly created Research and Innovation Authority (VAIA). The plan boasts ambitious goals, such as, "moving Slovakia up 10 places in the European innovation ranking, increasing investment in research and development to 2 percent of GDP (of which 1.2 percent from private sources), and attracting 25,000 highly qualified individuals from abroad."³³ Yet, the immediate priorities of Fico's fourth administration lie elsewhere, or at a minimum, the innovation imperative will be pursued in alternative ways, underlain by the impending changes in the competence law.

This background illustrates that in the Slovak context, "having a plan" has seldom translated into real-world benefits due to, primarily, the lack of political continuity. The problem is further aggravated by the rampant shortage of experienced mid-senior to senior capacity/leadership at the relevant ministries that would carry out the reforms. Exchange schemes and secondments with international organizations, such as the Organisation for Economic Co-operation and Development (OECD) or the International Monetary Fund, to train public sector officials exist and were thought to provide some relief. However, they are taken up in too small numbers to fill the whole-of-public-sector void, and for too short periods of time to provide a meaningful learning experience. This may be because under many of these schemes, secondees receive subpar remuneration that barely covers their basic living costs in world capitals where the organizations are headquartered, and, frequently, they are even discouraged/unable to take their families along, making their value proposition all around questionable. Furthermore, interministerial cooperation frequently falters, as ministries tend to compete for budgets and other resources and are not incentivized to unite behind a shared mission, identity, and purpose.

²⁸ "Modernizačný program Slovensko 21" [Modernization program Slovakia 21], Ministry of Finance of the Slovak Republic, press release, June 27, 2008, <https://www.mfsr.sk/sk/media/tlacove-spravy/modernizacny-program-slovensko-21.html>.

²⁹ SITA, "Vedomostnú ekonomiku zastreší Martin Bruncko" [The knowledge economy will be covered by Martin Bruncko], February 2, 2011, <https://sita.sk/vedomostnu-ekonomiku-zastresi-martin-bruncko/>.

³⁰ "Národná stratégia pre globálne vzdelávanie na obdobie rokov 2012 — 2016" [National Strategy for Global Education 2012–2016], Ministry of Foreign and European Affairs of the Slovak Republic, accessed December 31, 2023, <https://www.mzv.sk/documents/30297/2649510/National+Strategy+for+Global+Education+for+2012+-+2016>.

³¹ 2030 Digital Transformation Strategy for Slovakia, Ministry of Investment, Regional Development and Informatization of the Slovak Republic, accessed December 31, 2023, <https://mirri.gov.sk/wp-content/uploads/2019/10/SDT-English-Version-FINAL.pdf>.

³² 2030 Digital Transformation Strategy.

³³ "National strategy for research, development and innovation 2030," VAIA (Research and Innovation Authority), accessed December 31, 2023, <https://vaia.gov.sk/sk/narodna-strategia-vyskumu-vyvoja-a-inovacii-2/>.

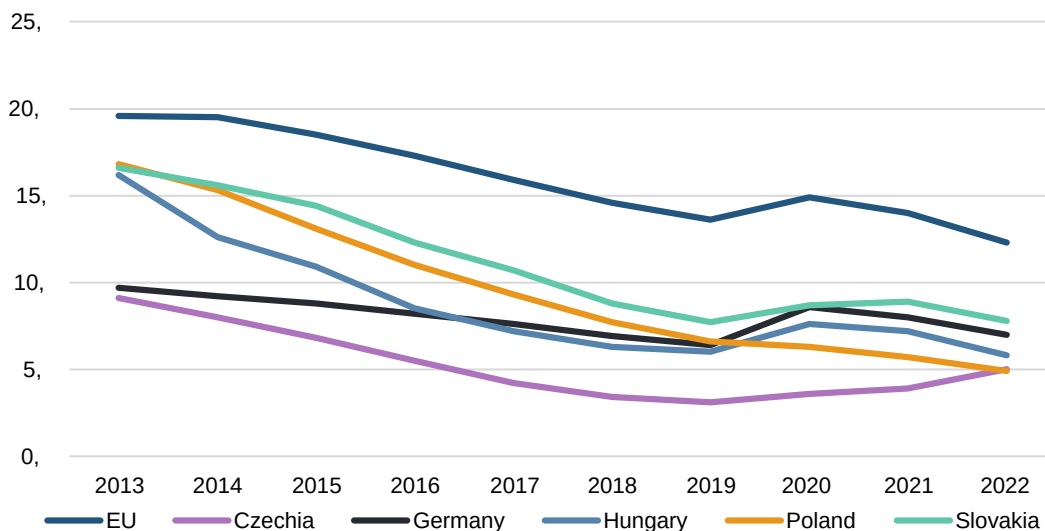
All in all, structural reform implementation requires clear ownership, innovation, collaboration, and coordination across sectors and stakeholders, without which it tends to suffer from duplication; fragmentation of roles and tasks; lack of accountability and responsibility; absent direction, focus and problem-solving; and the loss of trust and buy-in of partners, funders, and beneficiaries, leading to poor performance, inefficiency in public resource deployment, or outright failure.

b. Education and workforce

All interviewees highlighted the looming challenge of securing a qualified and competitive workforce. Several factors are at play here, as pointed out by interviewees and corroborated by data. One, Slovakia's labor market has grown tighter in recent years, as evidenced by responses collected and, for example, the reduced labor market slack measure (Figure 1). Second, while the overall rate of unemployment has been on a clear downward trend, coming in at 4.7 percent in October 2023 (1.9 percent long term), according to the Slovak Statistical Office, sizable regional differences remain. While in the capital Bratislava and Nitra, Trenčín, and Malacky districts the rate of unemployment hovers at or below 2.5 percent, in Rimavská Sobota, Revúca, Kežmarok, and Rožňava this number exceeds 10 percent. The labor markets are the tightest in Nitra and Skalica districts, and Bratislava, where there are almost two vacancies for every job seeker. However, the willingness to relocate or to commute has a major impact on the chances of taking up work and constitutes another hurdle for talent-strapped OEMs, propelled by one of the highest home ownerships in Europe,³⁴ above 90 percent, and de facto nonexistent supply of affordable rental housing units, based on latest Eurostat data.

Figure 1 | Slovakia's labor market slack has been on a downward trend (percent of extended labor force)

Labour market slack (% of extended labor force)



Source: Eurostat.

Note: The labor market slack is the total sum of all unmet supply of employment.

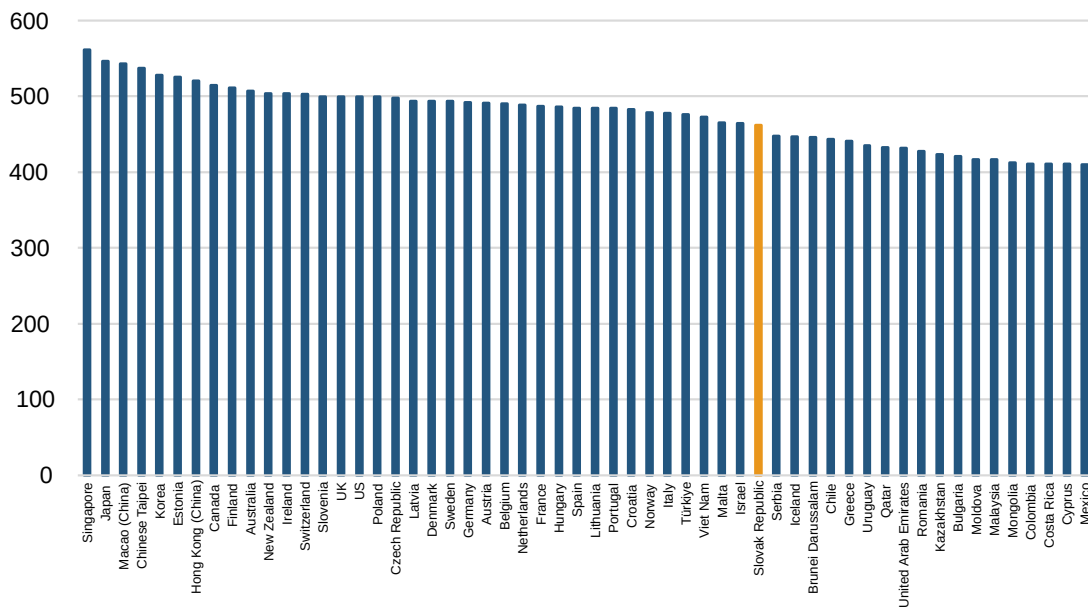
In addition to a labor market makeup marked by tightness, regional disparities, and the unwillingness of workers to relocate for a job, latest PISA scores, which measure 15-year-olds' ability to use their reading, mathematics, and science knowledge and skills to meet real-life challenges, are a further source of concern. According to the most recent measurements published in December 2023, Slovak students' performance has markedly deteriorated in all three disciplines: reading, science, and mathematics.

³⁴ Various studies corroborate the negative cross-country association between homeownership and residential mobility, see, e.g., Orsetta Causa and Jacob Pichelmann, "Should I stay or should I go? Housing and residential mobility across OECD countries?", October 27, 2020, [https://one.oecd.org/document/ECO/WKP\(2020\)34/En/pdf](https://one.oecd.org/document/ECO/WKP(2020)34/En/pdf)

Moreover, Slovakia finds itself well below the OECD average in relative terms, too, when it comes to automotive-relevant disciplines, such as science (Figure 1), while the in-between variation of performance is among the highest in the OECD (for math, shown in Figure 2), demonstrating that large deviations exist even at such low average levels. Slovakia's new minister of education, Tomáš Drucker, designated the result “a national tragedy.” Nevertheless, when assuming office, Drucker signaled his tenure would focus on “stabilizing,” not reforming, the system.³⁵

Figure 2 | Slovakia's science education performance remains lackluster, according to the latest PISA scores (mean scores, 2022)

PISA Science performance at national levels (mean scores)



Source: OECD.

Note: The Program for International Student Assessment (PISA) is an international assessment that measures 15-year-old students' reading, mathematics, and science literacy.

The uncertainties surrounding Slovakia's labor market, and the failure of the public sector to address the shortcomings, pose a large risk to the future of the industry and its evolving supply chain. Being intensely aware of this, several OEMs pursue parallel approaches to sourcing talent, for example, in the form of private secondary vocational schools with an emphasis on practical skills in state-of-art training centers, which educate workers for modern industry. The main leg up of these facilities—often funded by industrial consortia in cooperation with the state—vis-à-vis more conventional state schemes is their flexibility, as there is a direct link between the curricula and employers' demands. To keep the curricula up to speed with fast-moving trends in the automotive industry, modularity of curricula³⁶ shortens the reaction function of embedding new skill demands, which typically takes two to three years, compared to six to eight years outside this framework (at best). As such, the present curricula already cover auto informatics, connectivity, and cybersecurity, among other disciplines, but at the same time teaches timeless skills such as creativity, communication, and teamwork that cannot be automated. Upon completion of four years of study, students receive an internationally valid certificate, on par with standards in parent companies (OEMs).

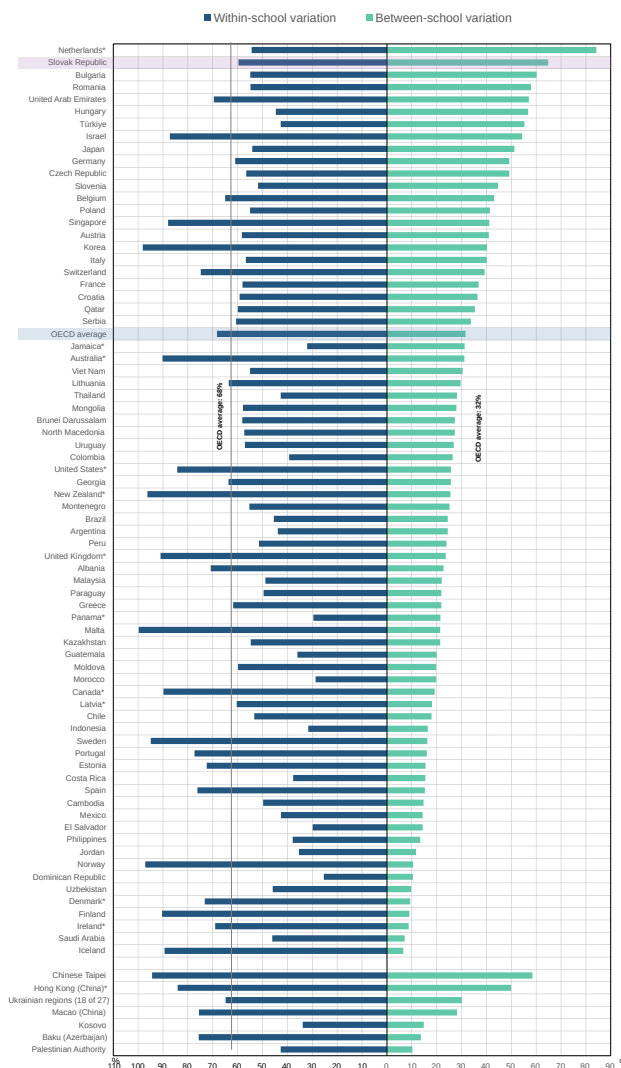
³⁵ Anton Adamčík, “Školstvo bez prevratných reforiem? Ak niekto očakával veľké zmeny, bude sklamaný” [Education without revolutionary reforms? If anyone was expecting big changes, they will be disappointed], Noviny, October 27, 2023, <https://www.noviny.sk/slovensko/850475-skolstvo-bez-prevratnych-reforiem-ak-nieкто-ocakaval-velke-zmeny-bude-sklamany>.

³⁶ Modularity in curricula refers to the organization of educational content into discrete, self-contained modules, with each focusing on a specific topic or skill, allowing for a more flexible and adaptable structure within a program.

Many graduates head to OEMs, large industrial players, or head to universities for further study. Electrotechnical and mechanical engineering are pillars of these private secondary vocational schools' curricula and can be used beyond just OEMs. Earnings are mandatorily reinvested to keep the schools' technologies, premises, and curricula cutting-edge. Despite these institutions proving effective in filling in for failed state function and easing some of the two-decade accumulated gap in engineering expertise, meaningfully involving state often falters. State support tends to be patchy, failing to sustain momentum, lacking continuity and an umbrella strategy that would secure continued progress.

Despite their high quality, these specialized academies frequently struggle to attract students en masse due to pervasive societal preferences for the generalist gymnasiums, or schools that provide secondary education, without regard for whether competencies learned there will find use in the labor market. A few interviewees pointed out the need to consolidate the unnecessarily large pools of gymnasiums and universities and work to increase the appeal of expert work, but also admitted that at the regional level such steps frequently fall prey to clientelism. All in all, the government, being the primary provider of education as a public good, holds a vital responsibility in developing systems that empower participants in the labor market with skills and qualifications aligned with Slovakia's emerging next-generation economic competencies but has largely failed in that regard. This is partly why V4 countries have been increasingly turning to foreign workers to fill employment gaps.

Figure 3 | The Slovak education system has the second-largest between-school variation in PISA mathematics performance among the OECD countries.



Source: OECD.

c. Migration policy

Central European countries have been known to face a common challenge of attracting and retaining skilled workers, especially in the sectors of industry, construction, and services, and against the trends of shallow local talent pools, unfavorable demographics, and rampant brain drain.³⁷ Among the OEMs operating in Slovakia, JLR and, to a lesser degree, Stellantis increasingly rely on foreign workers, according to responses obtained and corroborated by numbers for the whole economy. While in 2013, only 3,310 foreign workers worked in Slovakia, that number increased sevenfold to 22,000 in 2022.³⁸ Moreover, while a decade ago, these workers originated usually from the Balkan countries, Serbia, and Ukraine, lately workers from India, Kyrgyzstan, Georgia, and Kazakhstan have been joining the ranks. According to one source, the manufacturing of JLR's Defender model, in particular, relies heavily on foreign labor, while VW employs a pervasively local labor force (with the exception of VW intra-Group senior employee mobility between its global plants). According to a recent study by the Institute for Financial Policy, which serves as a policy arm of Slovakia's Ministry of Finance, foreign workers, especially those from Ukraine, have nicely bumped up employment growth last year, due to their willingness to take up low-skilled job positions that companies had struggled to fill over an extended period.³⁹ Despite this progress, the quantity of foreign workers is still not on par with the country's current and future economic needs, owing predominantly to its unwelcoming migration policies, bureaucratic immigration procedures, long wait times in issuing work permits and visas, and sporadic recognition of overseas qualifications.

Like education choices, the immigration paradigm is shaped by societal attitudes, which conventionally tend to be migrant-unfriendly, generating adverse ripple effects on social and cultural integration of migrants, and raising the odds of their exploitation and discrimination. Political leaders feel compelled to balance economic benefits with perceived or actual social costs of immigration, which erodes political momentum for meaningful reform in the quest for a coherent, transparent, and fair policy. Going forward, the government may want to actively target skilled workers in line with the country's economic needs, for example, by stepping up the use of its existing "national visa" tool.⁴⁰ As in other policy domains, public workflows require streamlining, with clear leadership and agenda ownership. This should be pursued in close liaison with employers in industry to alleviate talent shortages. Finally, legislation should enable immigrants to relocate to Slovakia permanently and with their families (which is most often not the case at present). The government could build on existing strategies in this regard, implementing the Magnet pre talent strategy proposed by VAIA in September 2023.⁴¹

d. Infrastructure

Slovakia faces a notable lag in e-mobility infrastructure, which has impacted consumer preferences for BEVs over ICE vehicles. Interviewees highlighted the need for the government to spearhead efforts to attract private investment, ensuring the electrical grid's capacity aligns with the transitioning energy landscape. The urgency is heightened, as Slovakia's electricity transmission is state-owned, requiring strategic planning for the future of electricity production, particularly focusing on nuclear power plants.

³⁷ European Commission, "Perpetual Temporariness - Situation of migrant workers in Hungary," European Website on Integration, September 30, 2020, https://migrant-integration.ec.europa.eu/library-document/perpetual-temporariness-situation-migrant-workers-hungary_en.

³⁸ Martin Odkladal, "Slovenská ekonomika sa stáva čoraz viac závislou od pracovnej sily z cudziny" [The Slovak economy is becoming increasingly dependent on labor from abroad], *aktuality.sk*, March 23, 2023, <https://www.aktuality.sk/clanok/O9sgjOB/slovenska-ekonomika-sa-stava-coraz-viac-zavislou-od-pracovnej-sily-z-cudziny/>.

³⁹ "Týždenný monitor" [Weekly monitor], Ministry of Finance of the Slovak Republic, accessed January 1, 2024, <https://www.mfsr.sk/sk/financie/institut-financnej-politiky/publikacie-ifp/tyzdenny-monitor/nova-web-stranka.html>.

⁴⁰ Public authorities have increased the quota to 2,000 persons annually beginning in 2024. However, this is still insufficient to meet the economy's needs.

⁴¹ "Magnet pre talent" [Magnet for talent], Office of the Government of the Slovak Republic, accessed January 9, 2024, <https://vaia.gov.sk/sk/2023/09/14/slovensko-magnet-pre-talent/>.

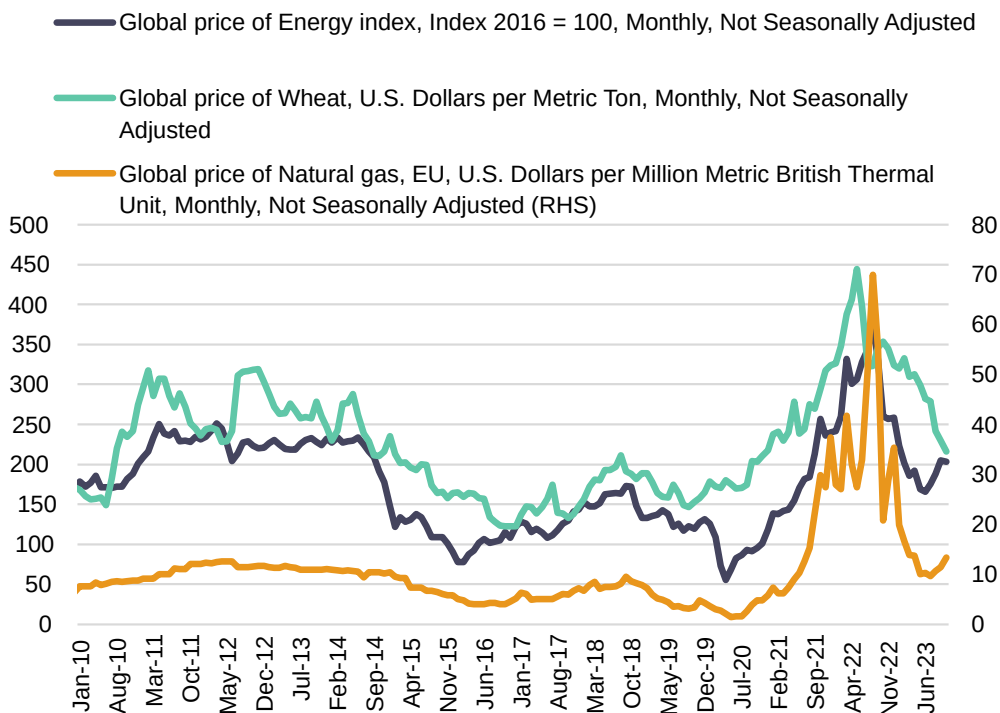
As BEVs become mainstream, the electrical grid is undergoing a revolution toward commoditization. Government involvement, either through state-owned entities like Slovenská elektrizačná prenosová sústava (SEPS) or majority-controlled entities like Západoslovenská energetika (ZSE), is vital for managing industry transformation and preventing delays due to inadequate infrastructure. Notably, industry actors cite cumbersome and slow permit processes, especially the Environmental Impact Assessment, as a hindrance to infrastructure development. Anticipated changes in legislation effective April 1, 2024, aim to streamline and digitize these processes, reducing unpredictability and cost barriers, thereby promoting private investment in critical infrastructure. Consolidation and digitalization of regulatory processes should be a priority for fostering an environment conducive to the development of essential infrastructure.

The European Automobile Manufacturers' Association also emphasizes the critical role of transmission and distribution-level grids in the new energy systems, highlighting the need for a functioning market and investment attractiveness for EV charging, heat pumps, and renewable energy industries.

e. Energy policy

Respondents in the industry underscored the challenge of high and volatile energy prices as well as the importance of the government's role in stabilizing them. The energy crisis, triggered by Russia's 2022 invasion of Ukraine, affects OEMs' profitability and international competitiveness, especially vis-à-vis global competitors such as the United States and China, which were not as affected. High energy prices through inflation weigh down consumer purchasing power and confidence throughout the economy, with negative knock-on effects on potential car buyers, and lower sales and revenues. Consumers may also be reluctant to switch to EVs if they face higher electricity bills, while the costs of raw materials, components, and finished products for automakers may be also affected, leading to production losses, delivery delays, and quality issues.

Figure 4 | Russia's invasion of Ukraine in February 2022 triggered an unprecedented price shock in the global energy markets, challenging European OEMs



Source: St. Louis Federal Reserve Economic Data.

While global energy prices have moderated since 2022, novel risks emanating from newly forged liquefied natural gas (LNG) links have emerged. With the EU's total share of LNG imports rising from 19 percent in 2021 to around 39 percent in 2022,⁴² geopolitical risks, such as from the raging conflicts in the Middle East which harbors strategic LNG routes,⁴³ or rising potential of conflicts elsewhere, continue to raise concerns. Most importantly, Slovakia still sourced most of its gas from Russia in 2022,⁴⁴ while it additionally lacks an immediate strategy on crude oil due to technical hurdles involved in processing non-Russian varieties. To this end, fully ending dependency on Russian fossil fuels, and simultaneously pursuing a balanced energy mix geared toward nuclear energy due to Slovakia's heavy industrial base and landlocked position,⁴⁵ should take precedence. Additionally, numerous Slovak water-water energetic reactors, or VVER, run on nuclear fuel from the Russian state nuclear company Rosatom. Weaning off Russian fuels is complicated by strict standards and safety demands, and the need for capital-intensive investments in technology to be able to use alternative supplies. Fast-tracking and solidifying Slovakia's nuclear decoupling and diversification agreements with French and U.S. partners will thus be important. Politically, Bratislava may be tempted to pursue an energy policy similar to that of Hungarian Prime Minister Viktor Orbán, leaving the country open to malign influence from the Kremlin and/or reversing some of the progress made on reducing dependencies on Russian energy. The Slovak government could explore strengthening energy resilience through EU-wide measures, such as decoupling electricity prices from volatile gas markets. In the absence of sustained government action, volatile and/or high energy prices may incentivize automakers to move parts of production to the United States to capitalize on subsidies offered under the IRA. VW, BMW, Daimler, and Volvo have expressed an interest in taking advantage of the scheme, according to a recent survey by the American Chamber of Commerce in Germany.⁴⁶

f. Systemic support for R&D

Despite Slovakia's clearly defined competency in automaking, the country remains underdeveloped on mobility R&D, as upheld by both interviews and macro data. In 2019, for example, only 40 percent of companies operating in Slovakia conducted any R&D domestically, of which the majority was for internal company use, not being dispersed throughout the ecosystem, according to a PricewaterhouseCoopers Automotive Supplier Survey.⁴⁷ Corroborating this situation four years later are industry representatives who expressed concern about foreign-owned companies in Slovakia often conducting major R&D activities outside the country, with notable exceptions of Continental, Matador, Schaeffler,⁴⁸ and a handful of others.

⁴² Michael Bradshaw, "Can we expect Gas price volatility and spikes this winter? Why?" [energypost.eu](https://energypost.eu/can-we-expect-gas-price-volatility-and-spikes-this-winter-why/), September 8, 2023, <https://energypost.eu/can-we-expect-gas-price-volatility-and-spikes-this-winter-why/>.

⁴³ "Potential economic repercussions of wider tensions in the Middle East: A stylised model-based scenario" in European Economic Forecast, Autumn 2023, https://ec.europa.eu/economy_finance/forecasts/2023/autumn/autumn_forecast-2023_box-1.3.1_en.pdf.

⁴⁴ See Veronika Oravcová, Energy Without Russia, <https://library.fes.de/pdf-files/bueros/budapest/20408.pdf>.

⁴⁵ Respondents' views as to what the energy mix should look like slightly differed. Many emphasized deployment of nuclear, while a few noted the absence of renewable deployment as being a foregone opportunity.

⁴⁶ Reuters, "US subsidies appealing to German companies, survey shows," March 1, 2023, <https://www.reuters.com/business/us-subsidies-are-appealing-german-companies-survey-2023-03-01/>.

⁴⁷ PricewaterhouseCoopers, Automotive Supplier Survey 2019, accessed January 1, 2024, <https://www.pwc.com/sk/en/assets/PDFs/automotive-supplier-survey-2019-en.pdf>.

⁴⁸ Schaeffler has built a new R&D center in the Kysuce region, focused on the development of car parts relevant to BEVs through modeling, engineering, simulation, etc. Dennik N, "Kysuce medzi svetovými lídrami v elektromobilite" [Kysuce among the world leaders in electromobility], July 20, 2022, <https://e.dennikn.sk/2933836/kysuce-medzi-svetovymi-lidrami-v-elektromobilite/>.

Continental boasts an R&D location in Slovakia, with a focus on the development of new tires and tire technology.⁴⁹ ZF Slovakia, a global technology company that supplies systems for passenger cars and commercial vehicles, conducts R&D but develops and tests its main new technologies in Germany. One of such inventions, the magnet-free and rare-earth-elements-free electric motor, makes for a particularly good example of how homegrown innovation might engender globally competitive, sustainable, and efficient products that could ultimately reduce dependency on conventional imports from third countries.

The problem is that the overall share of these innovating firms in the economy is extremely small. As Slovakia is confronted with unfavorable demographic trends, slowing productivity growth, and intensifying global competition, reviving its economy will require a blanket movement up the value chain toward a skills-based industry, with a particular focus on Industry 4.0. However, with R&D investment hovering at a lacklustre 0.84 percent of GDP,⁵⁰ as well as in related measures of digitalization,⁵¹ business technology, and e-government,⁵² the country now possesses few indigenous advantages for closing its innovation gap with the rest of the EU.

This lag is also mirrored at the level of individual OEMs, where innovation typically takes place outside Slovakia. **Kia** sees innovation—in liaison with its vertically integrated suppliers and partners—as a means to counteract dependence on China and thus dedicates substantial resources to the development of diverse technologies, including batteries⁵³ and BEV-related technologies, such as recycling. VW and Stellantis invest in different battery technologies for BEVs—PowerCo⁵⁴

49 Tires for BEVs have to be different than for ICEs, but the development and adjustment does not require vast amounts of new investments or changes. Most BEVs, for instance, use larger rims and lower-profile tires, unlike mass-produced lower- and mid-range ICE cars. Also, BEVs are generally significantly heavier and have a much lower center of gravity, requiring, again, different tires from the ICEs. Thus, tires represent one of three general categories of automotive products facing the challenge of the transition. There are, first, products and components that stay largely the same for ICEs and BEVs, or that require only minor adjustments (e.g., tires or brakes). Then there is the second category of components that are new for the BEV value chain (e.g., new software, or niche products such as sensors for monitoring the shocks received by the battery in a BEV). These require resources to be invested into innovation and development, potentially also changes required in the production process. Third, components that are relevant for the ICEs but are no longer needed for the BEVs (e.g., engines or exhaust systems).

50 Directorate-General for Research and Innovation, Science, research and innovation performance of the EU 2020, European Commission, May 27, 2020, https://research-and-innovation.ec.europa.eu/knowledge-publications-tools-and-data/publications/all-publications/science-research-and-innovation-performance-eu-2020_en.

51 European Commission, “DESI 2022,” the Digital Economy and Society Index (DESI), accessed January 1, 2024, <https://digital-strategy.ec.europa.eu/en/policies/desi>.

52 European Commission, “DESI 2022.”

53 Kia plans to maintain its ICE production after 2035, if only for the non-EU markets. Within the Hyundai conglomerate, it also focuses efforts on maintaining various potential avenues for the future of mobility, including hybrid technologies, hydrogen, and BEVs.

54 VW Group's battery unit will begin production of battery cells in 2025, with three production plants announced in Salzgitter (Germany), Valencia (Spain), and Ontario (Canada). Materials for cell production in the Salzgitter and Valencia plants will most probably be supplied from China, since PowerCo's technological partner in Salzgitter is Chinese battery giant Gotion (and VW China, in turn, is the largest single shareholder in Gotion). However, the prime minister of Lower Saxony (where the Salzgitter plant is located), Stephan Weil, said that the “time of the pandemic has taught us that we need to be independent of supplies from distant countries in important areas of production. This applies in particular to the battery as the most important component of electric vehicles,” thus indicating other possible sources. (Tim Fronzek and Dr. Stefan Ernst, “‘Unboxing’ in Salzgitter: Prime Minister Stephan Weil unpacks first industrial machine for future Gigafactory,” Volkswagen Group, press release, June 30, 2023, <https://www.volkswagen-group.com/en/press-releases/unboxing-in-salzgitter-prime-minister-stephan-weil-unpacks-first-industrial-machine-for-future-gigafactory-17428>). EU OEMs could consider getting more directly involved at the level of extraction (or refinement) themselves, as, for example, Japan's Mitsubishi is doing in Chile with the Japanese government's help. (Shuhei Ochiai, “Japan's Mitsubishi Materials aims to start cobalt production in Chile,” Nikkei Asia, May 7, 2023, <https://asia.nikkei.com/Business/Materials/Japan-s-Mitsubishi-Materials-aims-to-start-cobalt-production-in-Chile>.)

and Lyten,⁵⁵ respectively. The latter is a Silicon Valley-based company, which develops applications for lithium-sulfur-based batteries promising to deliver more than twice the energy density of lithium-ion, representing an alternative solution to China-dominated supply chains.⁵⁶ To foster domestic innovation, the Slovak government could encourage the local retention of patents and the establishment of innovation hubs. A systemic framework supporting the protection of intellectual property could synergize with existing EU funds allocated for small and medium-sized enterprises.

However, large OEMs may need to balance their investments in novel technologies with their existing strengths, such as usability, service networks, brand recognition, and heritage. Novel technologies also entail risks, such as high costs, uncertain demand, and regulatory hurdles, as well as those pertaining to data privacy and remote manipulation capabilities.⁵⁷

To this end, Europe's leadership in data regulation (the Data Governance Act), as well as ambitious and comprehensive policies to ensure the protection of privacy (the General Data Protection Regulation), promote a fair and competitive digital market (the Digital Markets Act, the Digital Services Act), and ensure trustworthy and ethical artificial intelligence (the AI Act) may help address these risks; safeguard democratic principles, individual rights, and freedoms; and afford European OEMs a competitive boost through fostering trust and transparency.

55 It was established with an initial investment of €300 million to target startup companies that are developing cutting-edge automotive technologies. ("Stellantis Ventures," Stellantis Ventures, accessed January 1, 2024, <https://www.stellantis.ventures/en>.) More generally, it is a good sign for the EU's battery industry, since global private investment and equity actors tend to remain skeptical about its scale and competitiveness for now. Leading players in the battery ecosystem currently are clearly in Asia, primarily China and South Korea. Large, scaled players with advanced technology tend to dominate the market due to long-term R&D investments and no capital constraints.

56 Stellantis, "Stellantis Invests in Lyten's Breakthrough Lithium-sulfur EV Battery Technology," PR Newswire, press release, May 25, 2023, <https://www.prnewswire.com/news-releases/stellantis-invests-in-lyten-s-breakthrough-lithium-sulfur-ev-battery-technology-301834973.html>.

57 Consider two examples. On several occasions, Tesla BEVs were temporarily banned from entering certain areas in China for fear of collecting sensitive data and then transferring and storing them outside China (Jacob Bourne, "China's Tesla restrictions expose growing concern about AVs' digital privacy," Insider Intelligence, June 23, 2022, <https://www.insiderintelligence.com/content/china-s-tesla-restrictions-expose-growing-concern-about-avs-digital-privacy>). In 2021, China moved to require all vehicles used in China to store their collected data in China, banning overseas transfer of road and landscape information (see Shunsuke Tabeta, "China clamps down on auto data collection by Tesla and others," Nikkei Asia, May 13, 2021, <https://asia.nikkei.com/Business/Automobiles/China-clamps-down-on-auto-data-collection-by-Tesla-and-others>). The move was even framed as an "anti-spying" one and was said to be particularly aimed at Tesla, which promised to abide by these Chinese laws (see Rita Liao, "Tesla reassures Chinese users on data security amid spying concerns," TechCrunch, August 15, 2023, <https://techcrunch.com/2023/08/14/tesla-reassures-chinese-users-on-data-security-amid-spying-concerns/>). The second example illustrates another ability unique to the BEVs with potential implications for security as well as individual rights and freedoms. In 2017, during Hurricane Irma in the United States, Tesla remotely boosted its vehicles' battery capacity in order for the owners to safely leave impacted areas. To remotely manipulate with and change such core functions of a vehicle does not only have certain economic implications (see, for example, Simon Osborne, "How did Tesla make some of its cars travel further during Hurricane Irma?" Guardian, September 11, 2017, <https://www.theguardian.com/technology/shortcuts/2017/sep/11/tesla-hurricane-irma-battery-capacity>); Bob O'Donnell, "Tesla's remote upgrades to its vehicles during Hurricane Irma are the future of tech," Vox, September 19, 2017, <https://www.vox.com/2017/9/19/16335054/elon-musk-software-hardware-upgrades-tesla-hurricane-irma-apple-ios11>), but can have profound security implications as well as a practical effect on individual rights and freedoms. These examples highlight new and incoming capabilities of (BEV) cars as platforms and raise concerns over human rights and freedoms such as privacy, data protection, right to repair, control over individual's privacy and property, as well as freedom of movement, but also over national and individual security. OEMs that are established on the EU market and are based in democratic countries should reflect on this reality. Non-EU actors wanting to operate in the EU market serving EU customers should adhere to laws and rules protecting these rights and freedoms.

g. EU pathway to a more secure, resilient, and robust supply

China harbors a dominant position in the EU's BEV supply chains. This dominance has been shown to carry security risks originating from Black Swan events (such as the COVID-19 pandemic) or the deterioration in geopolitical relations. For example, angered by Lithuania's decision to allow Taiwan to open a representative office in Vilnius, Beijing attempted to boycott trade with Lithuania and discouraged multinationals from using Lithuanian-produced auto parts.⁵⁸ Specifically, China blocked Lithuanian imports, stopped issuing food export permits, cut credit lines, and removed Lithuania from the customs system,⁵⁹ which Lithuania responded to by seeking legal action at the World Trade Organization.⁶⁰ This case illustrates well why the EU has adopted a number of strategies to enhance its supply chain resilience, including:

- **The Industrial Strategy**, which aims to strengthen the EU's industrial base, foster innovation, and competitiveness, and support the green and digital transitions.
- **The trade policy review**, which sets out the EU's vision for an open, sustainable, and assertive trade policy that promotes its values and interests while addressing unfair trade practices and market distortions.
- **The Critical Raw Materials Act**, which identifies key raw materials that are essential for the EU's strategic sectors and proposes measures to de-risk and secure their supply, such as diversifying sources, developing domestic production, and boosting recycling and substitution.
- **The Open Strategic Autonomy concept**, which reflects the EU's ambition to shape the global order in line with its values and interests while reducing its dependencies and vulnerabilities and enhancing its capacities and partnerships.

While various EU strategies constitute a step in the right direction, they might perform better if underpinned by joint EU foreign policy, and liaison with likeminded partners, such as the EU-US Trade and Technology Council, to coordinate their policies and actions on trade, technology, and digital issues, including supply chain security and diversification.⁶¹

Turning to Slovak enterprises that depend (to some extent) on Chinese markets, Slovak business leaders perceive supply chain vulnerabilities, including those emanating from the changing Chinese political landscape in recent years. However, they tend to align closely with their parent company's strategies—exercising little autonomy on how to approach China—and/or approach doing business with China with a sizable dose of pragmatism, as a business opportunity and to improve their profitability. Since the pandemic, many also follow a strategy of producing locally for nearby markets. This is well exemplified by Continental Slovakia.

⁵⁸ Teddy Ng and Kinling Lo, "China-Lithuania tension: German firms may have to shut factories in Baltic state amid Beijing retaliation," *South China Morning Post*, December 25, 2021, <https://www.scmp.com/news/china/diplomacy/article/3160982/china-lithuania-tension-german-firms-may-have-shut-factories>; Andrius Sytas and John O'Donnell, "EXCLUSIVE China pressures Germany's Continental to cut out Lithuania — sources," *Reuters*, December 17, 2021, <https://www.reuters.com/world/china/exclusive-china-asks-germanys-continental-cut-out-lithuania-sources-2021-12-17/>.

⁵⁹ Ng and Lo, "China-Lithuania tension."

⁶⁰ LRT (Lithuanian Radio and Television), "German firms pressure Lithuania to deescalate China tensions — media," January 21, 2022, <https://www.lrt.lt/en/news-in-english/19/1594168/german-firms-pressure-lithuania-to-deescalate-china-tensions-media>.

⁶¹ "EU-US Trade and Technology Council," European Commission, accessed January 3, 2024, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/stronger-europe-world/eu-us-trade-and-technology-council_en.

This is not to say that OEMs operating in Slovakia are oblivious to these risks, but de-risking and diversification efforts have been measured and guided primarily by economic logic. For example, in reaction to the EU's ongoing anti-subsidy investigations into EU imports of Chinese BEVs, Volvo will manufacture its upcoming EX30 model at its Ghent manufacturing facility in Belgium alongside China.⁶²

Additional existing formats and tools could be leveraged to promote gradual supply chain de-risking and diversification strategies, including:

- **The International Automotive Task Force (IATF)**, which unites VW, JLR, and Stellantis, among others, to develop policies for a supplier registration scheme with the goal of ensuring worldwide consistency and providing training to support the IATF's requirements.⁶³
- **The Responsible Supply Chains Initiative**,⁶⁴ which includes OEMs like VW, Porsche, and Mercedes-Benz, and suppliers like ZF and Schaeffler, to promote a unified system of supply chain control, audit, certification, and monitoring.⁶⁵
- **The Environmental-Social-Governance (ESG) framework**, which already imposes on OEMs' resources and could be used also to promote these objectives.

Supply chain dependency in the automotive industry does not have to be only the case of batteries. In some instances, companies have been completely reliant on Russian industry to produce and supply certain materials, like synthetic rubber. This was the case before the Russian invasion of Ukraine in February 2022. A series of subsequent decisions by the EU (as well as the United States) to impose sanctions on Russia has led to an imperative to abruptly cut these dependencies. Some companies needed to quickly cover the supply from elsewhere—usually from China.⁶⁶ The COVID-19-related supply crisis and the Russian invasion of Ukraine and the West's reaction to it were two great lessons for companies in supply chain monitoring, de-risking, and contingency planning.

De-risking the supply chains will be a major task, requiring a complex strategy covering multiple areas and aspects. Effective cooperation between the state and the private sector at both the national (Slovak) as well as the EU level is needed. The Slovak government could lobby for a coherent and complex investment and industrial strategy for the EU, mainly when it comes to signing and ratifying Free Trade Agreements (FTAs) and setting clear and realistic criteria for the new Global Gateway initiative.

The EU's crucial FTAs—from an automotive industry perspective—being negotiated or in the process of being adopted or ratified as of November 2023 include the ones with

⁶² Matthias Schmidt, "Volvo Cars to shift some China production to Europe as EU investigation takes hold," Schmidt Automotive Research, October 26, 2023, <https://www.schmidtmatthias.de/post/volvo-cars-to-shift-some-china-production-to-europe-as-eu-investigation-takes-hold>.

⁶³ IATF 16949 is a technical specification aimed at the development of a quality management system, defect prevention, and the reduction of variation and waste in the automotive industry supply chain and assembly process.

⁶⁴ "The Responsible Supply Chain Initiative (RSCI)," RSCI, accessed January 3, 2024, <https://www.rsci.online/en>.

⁶⁵ This is already partly the case. OEMs require certification and they don't work with a supplier if it doesn't have a license. In order to acquire and maintain it, the supplier is audited every three years and recertified. The company, besides quality control of its production and products, also needs to prove that there is a control of risks, including contingency plans that reflect global developments across the economic, political, and security spectrum. As such, there is already a tool for supply chain monitoring that also requires an evaluation of the geopolitical and geo-economic situation, and, if needed, find alternative ways (i.e., diversify) in order for the product to continue to be safely supplied in time and in necessary quantity and quality. Generally speaking, the COVID-19 pandemic proved to be an important lesson in diversification and contingency planning for most companies, our research finds. It has strengthened the trend of Western companies following the "In China for China" strategy and a push for reshoring or solidifying regional supply and value chains.

⁶⁶ In connection to this, it is perhaps interesting to note that when companies cut certain supplies from Russia, Russian companies were then forced to sell the products or commodities elsewhere—mostly to China. Moreover, this was usually done for a significantly lower price. At the end of the day, the EU and other Western companies were forced to find new suppliers, usually Chinese, that sold them a product or commodity with a much larger margin, having bought it cheaply from the Russians.

Chile,⁶⁷ India,⁶⁸ Indonesia,⁶⁹ Mercosur (an economic and political bloc formed by Argentina, Brazil, Paraguay, and Uruguay),⁷⁰ Mexico, and South Korea. Slovakia's interest should be to advocate for the prompt conclusion of the negotiations and/or prompt ratification of these FTAs, as they can have multiple and various positive effects on (a) the supply of critical materials and minerals and thus the diversification of critical supply chains relevant to the automotive industry, and (b) having a clear legal bilateral framework to work with, which increases predictability, stability, and can also lead to an increase in automotive exports. It is equally important to push for continuing negotiations for an FTA with Australia, as it is one of the most crucial countries with regard to the future of the automotive industry (it holds vast resources of materials and minerals relevant to BEVs), as well as consider relaunching negotiations on an FTA with the United States.

The Global Gateway initiative is a newly launched EU strategy to “boost smart, clean and secure links in digital, energy and transport sectors” and is set to mobilize up to some \$328 billion (€300 billion) of investments until 2027 for “sustainable and high-quality projects.”⁷¹ Its inaugural milestone was the Africa-Europe Investment Package with approximately \$164 billion (€150 billion) of investment dedicated to bolstering cooperation with African partners. This tool holds great potential to help reconfigure automotive supply chains as well as value chains for the mutual benefit of the EU and its partners. In Africa, where China is indeed very active in terms of extraction of resources essential for the future of the automotive industry, the Global Gateway initiative could be used as a vital mechanism to strike bilateral agreements with countries like, for instance, the Democratic Republic of the Congo (DRC).⁷² The DRC could be considered as an example and an opportunity for the EU, through its Global Gateway initiative, to offer better, mutually beneficial arrangements with countries in Africa and elsewhere, ensuring transparency, deliverability, better working conditions, more investments in value-added industries (like refining, not just extraction), as well as clear accountability for the projects—in comparison to the Chinese. This is, in essence, a political issue and such opportunities should be clearly identified. It is equally important to note that China's economic offensive, such as the one in the DRC, was enabled by U.S. (and other Western) political disinterest, low prioritization, and focus on other issues of the time. Some interviewees noted that the risk that could endanger the deliverability of the Global Gateway initiative in practice lies precisely in prioritization and implementation of the criteria proposed within the strategy, which should focus on mutually beneficial economic cooperation.

67 Frédéric Simon, “EU in talks with Chile on raw materials ‘strategic partnership,’” Euractiv, June 19, 2023, <https://www.euractiv.com/section/circular-economy/news/eu-in-talks-with-chile-on-raw-materials-strategic-partnership/>.

68 ACEA (European Automobile Manufacturers' Association), “Position paper — EU-India trade negotiations,” March 10, 2023, <https://www.acea.auto/publication/position-paper-eu-india-trade-negotiations/>.

69 Associated Press, “Germany backs EU-Indonesia trade pact to curb China reliance,” April 16, 2023, <https://apnews.com/article/germany-indonesia-eu-trade-agreement-scholz-widodo-946cb8b58f4dcef2403b0bc53d55b07a>.

70 ACEA (European Automobile Manufacturers' Association), “Auto makers welcome conclusion of EU-Mercosur trade deal,” July 1, 2019, <https://www.acea.auto/press-release/auto-makers-welcome-conclusion-of-eu-mercosur-trade-deal/>.

71 “Global Gateway,” European Commission, accessed January 3, 2024, https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/stronger-europe-world/global-gateway_en.

72 The Democratic Republic of the Congo (DRC) can serve as a case in point with regard to the EU's potential to address certain African countries' dissatisfaction with China and Chinese investments. Chinese acquisitions in cobalt and copper mines in the DRC (that on its own produces twice as much cobalt than any other country in the world) (see Dionne Searcey, Michael Forsythe, and Eric Lipton, “A Power Struggle Over Cobalt Rattles the Clean Energy Revolution,” *New York Times*, December 7, 2021, <https://www.nytimes.com/2021/11/20/world/china-congo-cobalt.html>) mirror the strategy applied to the whole continent, following a playbook announced by Beijing in 2015 to dominate the world's emerging clean energy economy (see Searcey, Forsythe, and Lipton, “A Power Struggle.”). The way the Chinese are operating in the DRC, however, is not so straightforward and seems to have led to certain pushback from the local government in the past. Congolese officials decided to carry out a broad review of past mining contracts (with financial help from the U.S. government), especially with regard to Chinese companies' contractual obligations to deliver billions of U.S. dollars' worth of infrastructure for the DRC (see Searcey, Forsythe, and Lipton, “A Power Struggle.”). Additionally, mines under Chinese ownership have seen a drastic decline in safety and an increase in injuries (see Searcey, Forsythe, and Lipton, “A Power Struggle.”) highlighting human rights aspects as well as cultural differences. Another specific case of potential pan-African dissatisfaction with how the Chinese (co)operate in some African countries could be the modes of operation of the Chinese private military companies across the continent. Their presence is expanding without a clear regulatory framework and can—or already does—have direct negative effects on the security of the citizens (see Paul Nantulya, “Chinese Security Firms Spread along the African Belt and Road,” *Africa Center for Strategic Studies*, June 15, 2021, <https://africacenter.org/spotlight/chinese-security-firms-spread-african-belt-road/>).

4. Conclusions and Way Forward

This paper examines the challenges and opportunities for the automotive industry in Slovakia, which faces major changes due to the green transition, the rise of China, and the security of supply. The paper draws on interviews with stakeholders from OEMs, suppliers, business associations, NGOs, and government experts. The main findings are:

- Slovakia is highly exposed and among the highest-risk economies not just within the Central European region, but within Europe as a whole, given its heavy reliance on automotive manufacturing, undiversified economy, and lack of continuous political vision and key policy underpinnings.
- Slovakia is a destination for foreign investment, as recently demonstrated by FDI from Volvo and Chinese Gotion High-tech's investment in batteries in partnership with Slovak battery start-up InoBat. However, Slovakia's neighbors—Czechia, Poland, and Hungary—tend to consistently attract more robust and/or higher-quality investments.
- While the private sector is to varying degrees adapting to the realities of the emerging automotive landscape, strategic decisions continue to stay with the parent company, leaving Slovakia's OEMs/suppliers as decision-takers, not decision-makers.
- The OEMs' strategies vary widely in response to the green transition, from fully switching to BEVs to offering models in all fuel variants, including BEV, hybrid, or ICE, and investing in battery modules and premium workshops for battery manufacturing.
- The OEMs in Slovakia face fierce competition among plants within the same OEM. Often, efficiency is not the main criterion for deciding which model is produced where, as headquarters, labor unions, and regional governments' interests have more weight. When relative plant efficiency does matter, lacking or limited state support for energy prices and innovation reduces the ability of Slovak plants to realize investments, making them less competitive intra-group. Taking Stellantis as an example, in the absence of sufficient state support, the Slovak Trnava plant may get outcompeted by Zaragoza, Poissy, or Modena plants because its cost-base ends up being prohibitively high in relative terms.
- Turning to the security of supply, supply chain bottlenecks have been common in the last two to three years, affecting production volumes and profitability of the OEMs. Some automakers have mitigated the losses by focusing on more expensive/higher-margin vehicles where possible, while others, especially Asian automakers, have leveraged their long-term and loyal relationships with suppliers to overcome the disruptions. The bottom line, based on most respondents' views, is that going forward, diversification of supply chains will be essential for achieving resilience and security. Public-private cooperation will be key in that regard, as will be the successful implementation of the EU's Critical Raw Materials Act, setting clear and realistic criteria for the bloc's Global Gateway initiative, and making strides in signing and ratifying various FTAs.
- Respondents also underscored the importance of the state's role in the transition, particularly with regard to public goods, such as education and infrastructure. Most prominently, the pool of existing talent in Slovakia does not correspond to the country's present and future economic needs. As a consequence, industry players pursue various approaches to fill the void. Some OEMs have increasingly started to embrace foreign workers' deployment in manufacturing certain auto models. Others have bet on dual learning academies or specialized vocational schools to patch up the yawning engineering skill gap. While these approaches have helped, they remain small in scale and pose an extra burden on OEMs' already squeezed resources, leaving them caught between a rock and a hard place.

- The energy prices (and infrastructure) and charging infrastructure are major concerns for the respondents, as they are largely absent or inconsistent. The state has the responsibility to ensure the capacity and suitability of the grid and electrical transmission. Despite some progress toward eliminating dependency on Russian fossil fuels, and a simultaneous pursuit of a balanced energy mix with a tilt toward nuclear energy due to Slovakia's heavy industrial base and landlocked position, more needs to be done.
- Import tariffs on Chinese EVs, subsidies, and domestic content requirements are not considered long-term solutions to limit China's market share in Europe, as they only provide short-term relief. A long-term solution should focus on increasing domestic competitiveness, buttressed by systematic and strategic state support for R&D&I activities, to boost the innovation capabilities of the Slovak industry. Innovation was also cited as the key strategy to cope with global competition—notably from China—mitigating risks along the existing supply chains and creating new ones.
- Along with the development of innovation capabilities, incumbent OEMs and suppliers could leverage usability, service networks, brand recognition, and heritage as their competitive advantages over market newcomers, such as those from China. These aspects should be simultaneously buttressed by Europe's leadership in data regulation, and ambitious and comprehensive policies to ensure the protection of privacy, promote fair and competitive digital markets, ensure trustworthy and ethical AI, and safeguard democratic principles, individual rights, and freedoms that can afford European OEMs a competitive advantage by fostering trust and transparency.

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CENTER FOR INTERNATIONAL
PRIVATE ENTERPRISE

- CIPE Europe Office
Strakova 228/1
811 01 Bratislava
Slovak Republic
- www.cipe.org

**Adapt
Institute**

- Na vršku 8
811 01 Bratislava
Slovak Republic
- office@adaptinstitute.org
- +421 908 327 491
- www.adaptinstitute.org