FRIEDRICH NAUMANN FOUNDATION For Freedom.

THE AUTOMOTIVE INDUSTRY AS A DRIVER OF PROSPERITY

Global challenges and opportunities

A report by the Friedrich Naumann Foundation for Freedom
in cooperation with C4D – consulting4drive GmbH

ANALYSIS

Executive Summary

Background: The automotive industry transformation puts the global economy to the test

The automotive industry is undergoing profound change – both in Germany and globally. Uncertainties regarding future climate-neutral drive technologies, dynamic regulatory frameworks, advancing digitalization and the trend towards autonomous driving are putting increasing pressure on manufacturers worldwide. In addition, there is structural overcapacity, geopolitical tensions and, more recently, a protectionist tariff policy of the US administration.

Despite these challenges, the automobile remains the preferred means of transport for individual mobility worldwide and a central pillar of economic performance. For instance, the automotive industry's share of total exports in 2023 was around 22% in Japan, around 17% in Germany, around 6% in China and around 5% in India. While in many industrialized countries the question is how to maintain this contribution, for many emerging countries there is a great opportunity in the development and expansion of the automotive industry.

In this context, the study „ The Automotive industry as a driver of prosperity – Global Challenges and opportunities" by C4D on behalf of the Friedrich Naumann Foundation for Freedom sheds light on the global development of the automotive industry, analyzes location and regulatory conditions and highlights examples of success. The current upheavals open up risks, but at the same time offer considerable opportunities for traditional and newly emerging automotive regions.

Guarantor of prosperity: Industrialized nations such as Germany are dependent on the automotive industry

Germany is particularly dependent on the automotive industry and is an example for other industrialized nations. Around 780,000 people work in the industry in Germany. The economic volume of the automotive industry accounts for about 10% of Germany's total gross value added. In addition, due to the required technical expertise, jobs in the automotive industry and related industries are well paid above average. This also applies to other industrialized nations, which is why the automotive industry is responsible for a significant contribution to the tax revenues of many industrialized countries and thus makes a central contribution to the prosperity of the people of these countries.

Global location competitiveness: Emerging markets are becoming increasingly attractive

An international comparison of locations reveals clear differences: industrialized countries such as Germany and the USA score points with infrastructure and quality of education. However, many industrialized nations, especially Germany, suffer from high tax burdens and energy costs. In contrast, emerging markets offer more attractive conditions in the labor market, but struggle with deficits in areas such as the rule of law (e.g. Mexico) or the freedom to invest (e.g. China). In addition, emerging countries such as China and Brazil have strategic advantages in terms of access to essential raw materials, which increasingly puts traditional industrialized countries in dependency. Tax burdens are increasingly becoming the focus of business location decisions. In view of the intense price competition, companies are more than ever required to strategically choose their locations from a cost perspective. Developed countries often face challenges compared to emerging market economies, which often offer a more favorable tax environment.

India can be cited as an example of success for an up-and-coming automotive location. Through market liberalization and a holistic industrialization strategy, India rose to become the fourth largest automotive market in the world. Since the 1990s, various car manufacturers have settled here, who want to further expand their production plants in the country.

Competition Among Powertrains: Electric drive has yet to achieve dominance worldwide

Electric vehicles are gaining global relevance, but they are not yet dominating the global market. Hybrid vehicles are the preferred electrified solution in most countries, especially in Japan. Contrary to prevailing opinions, Europe, including Germany, is quite competitive in electrification by international standards. On the other hand, the classic combustion engine remains dominant in emerging markets, apart from China, with shares of over 90% in India, 92% in Mexico, 93% in Brazil and 99% in South Africa.

Autonomous driving: Germany leads the regulatory framework, the USA and China the practical application

The status and level of detail of the legal framework for automated and connected driving vary considerably around the world, with countries from the European Union performing best overall. Germany in particular is a world leader in the creation of a uniform legal framework for autonomous vehicles. However, a completely different picture emerges when it comes to practical use and the commercialization of autonomous driving. In this area, the USA (Waymo as the first public commercial self-driving taxi service) and China (more than 16,000 test licenses for autonomous driving in more than 50 cities) are leading the way.

Outlook: Future of local automotive industries depends on local political decisions

The study by C4D shows that the attractiveness of the location and thus the future of local automotive industries depend very centrally on the local political framework conditions. This is especially true for the European market. In a pessimistic scenario with an increasing tax burden, rising energy costs and progressive deindustrialization, Europe's attractiveness as a development and especially as a production location would deteriorate massively. This would have considerable economic consequences.

The political framework also plays an important role for the automotive industry in the USA, China and India, but its attractiveness depends somewhat less strongly on these factors. Especially with regard to a pessimistic scenario, these markets are proving to be more resilient.

Recommendations and conclusion: The situation Is serious, but not hopeless

The study recommends concrete measures to improve the attractiveness of the automotive industry as a business location:

→ Adopt a technology-neutral approach in energy and climate policy to lower energy costs.

→ Reduce bureaucracy through goal-oriented regulation.

→ Advance education programs, smart automation, and targeted migration policies.

→ Reduce the tax burden and state levies, prioritize public spending.

→ Align trade policy globally and strengthen strategic partnerships.

In emerging countries, it is particularly important to have the right foundations: a secure energy supply, reliable institutions and a secure state monopoly on the use of authority.

For the Friedrich Naumann Foundation for Freedom, C4D's study of the future of the automotive industry shows two things in particular. **First,** the situation is serious. The automotive industry is undergoing profound change worldwide. The increasing attractiveness of emerging markets as a location poses enormous challenges, especially for traditional industrialized countries such as Germany. **Secondly,** the situation is not hopeless. With the right framework conditions (including a lower tax burden, lower energy costs and less bureaucracy), it is quite possible to maintain the attractiveness of industrialized countries.

Management Summary

Objective:

Analyzing the significance of the automotive industry for the economic strength of selected countries and outlining the relevant framework conditions. The goal is to understand the reasons behind the strategic focus (both technological and market-related) of key companies. Based on this, potential development scenarios will be evaluated to assess the attractiveness of selected regions for businesses in the automotive sector.

Cross-regional findings

The automotive industry is growing strongly, particularly in young industrialized nations, but political uncertainties still represent a significant risk factor.

Established industrialized countries offer stability and technological expertise, but these advantages are becoming less important in the choice of location due to high costs.

Road transport remains globally central to passenger and freight transport.

The nations under consideration are focusing on electrification. FCEVs and e-fuels are currently only intended for selected applications.

OEM-specific findings

Manufacturers are responding to market trends with an increased focus on software solutions, digital services and autonomous driving functions.

The change in powertrain technology is taking place in different ways: European OEMs (electric first and only) vs. Asian players (focus on hybrids and gradual e-mobility).

Mobility solutions play a central role in OEM strategies: The aim is to develop modern, vehicle-centred mobility offerings along digital platforms.

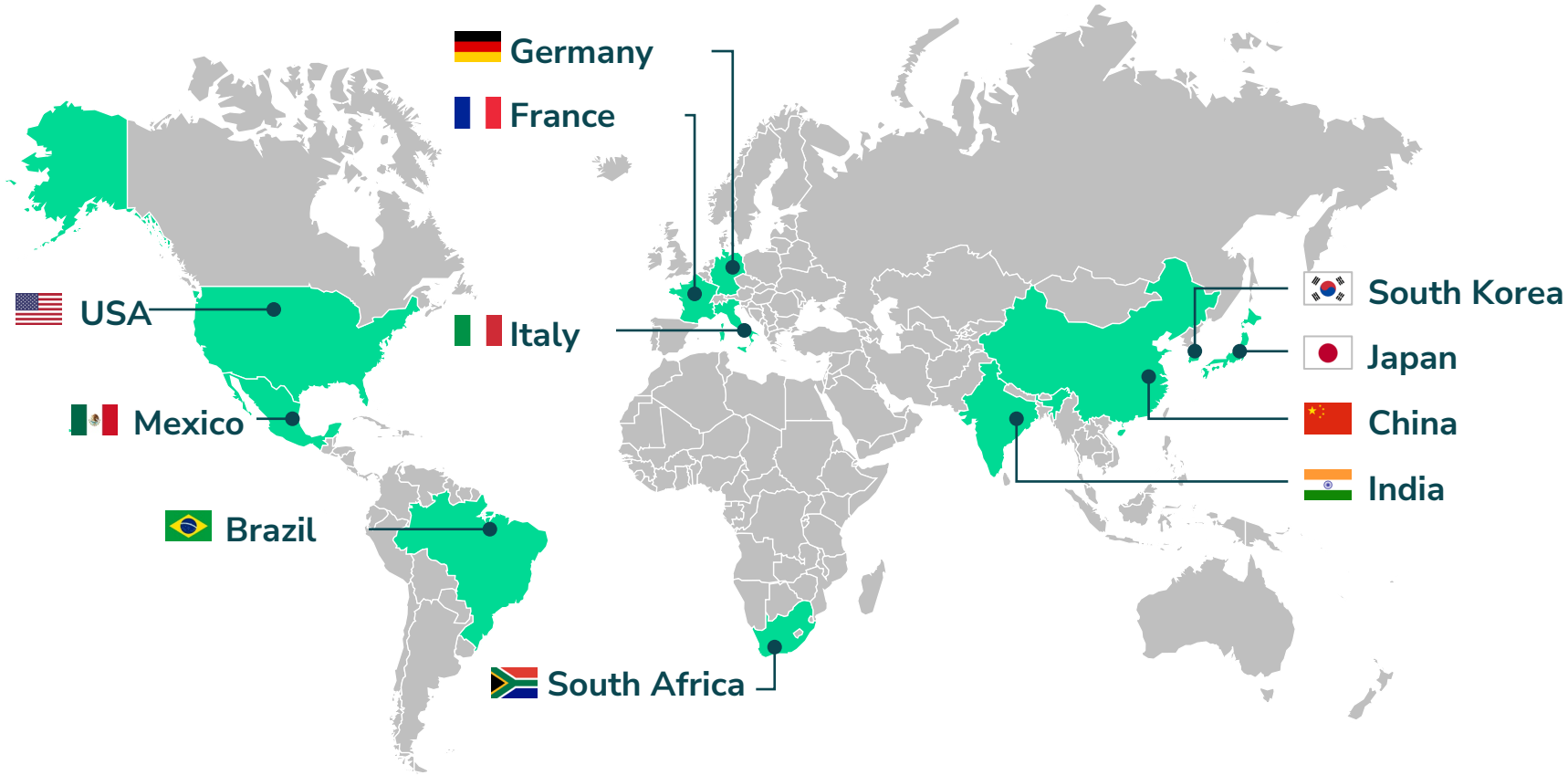
Findings on regional attractiveness

The USA and China offer the best compromise in terms of location conditions. The resulting growing attractiveness for R&D, production and sales is a driver for further technology leadership.

Europe's declining importance due to weak innovation, regulatory hurdles, high location costs and a lack of research-industry links requires targeted reforms such as a competitive energy policy, tax relief and the strategic use of AI and education.

Markets such as India, Southeast Asia and parts of Africa are gaining in economic and geopolitical importance, particularly as production and development centers, often at the expense of Europe.

Overview of the countries analysed



The selection of countries represents a broad spectrum of political, (socio-)economic and technological conditions and includes the largest sales and production locations for automobiles

Overview of the work packages

WORK PACKAGE 0
Introduction

- Derivation of the historical significance of mobility in the general history of mankind
- Description of the role of mobility as a driver of economic power
- Derivation of the resulting significance of the automotive industry
- Description of current industry challenges and consequences

Target:

Brief introduction to the presentation of the socio-economic significance of mobility and the automotive industry

WORK PACKAGE 1
Country-specific analysis

- Creation of country profiles
- PESTEL analysis of country-specific framework conditions
- Deriving an assessment of key location factors for each country
- Assessment of the strategic direction of the country (e.g. climate protection, security, etc.)

Target:

Analysing the location factors of different countries and their framework conditions using the PESTEL logic.

WORK PACKAGE 2
Company analysis

- Creation of company profiles for representative companies in the analysed countries
- Collection of relevant company key figures
- Identification of the strategic focus (technological and market-related) and global expansion

Target:

Presentation of representative Companies in the automotive industry in the countries analysed and their strategic orientation

WORK PACKAGE 3
Comparison of reg. strategies

- Comparative analysis of the assessment of location factors in all countries
- Comparative analysis of the strategic focus of all companies
- Derivation of the attractiveness of the location and the strategic direction of the companies in all markets
- Identification of success stories (both at regional and company level)

Target:

Comparative analysis of the countries and companies, highlighting the strategic orientation of the companies in the countries

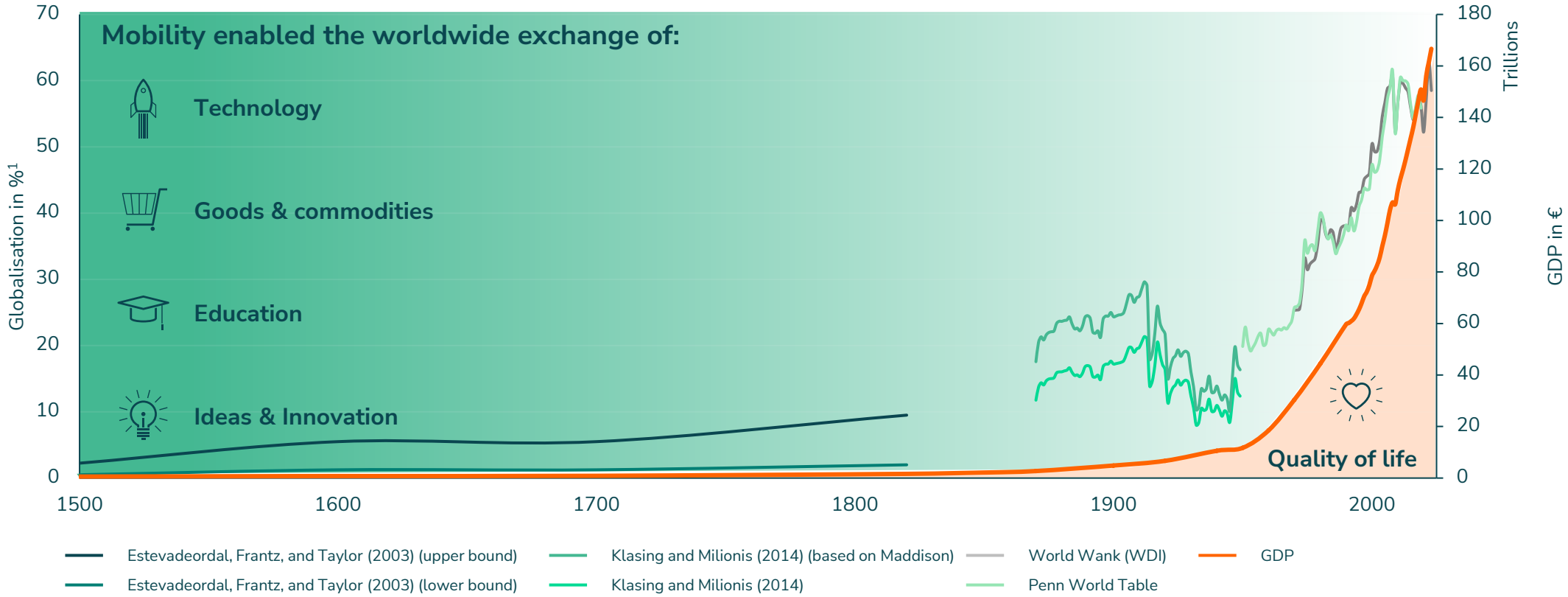
WORK PACKAGE 4
Recommendations for action

- Creation of future development scenarios up to 2035 for the core regions from the perspective of the companies and their reasons for their involvement in a country
- Analysing the consequences of the scenarios for the individual core regions
- Derivation of conditions for an optimistic scenario in the core regions

Target:

Derivation of recommendations for action for the core regions in various development scenarios

Mobility – A central driver of human evolutionary history



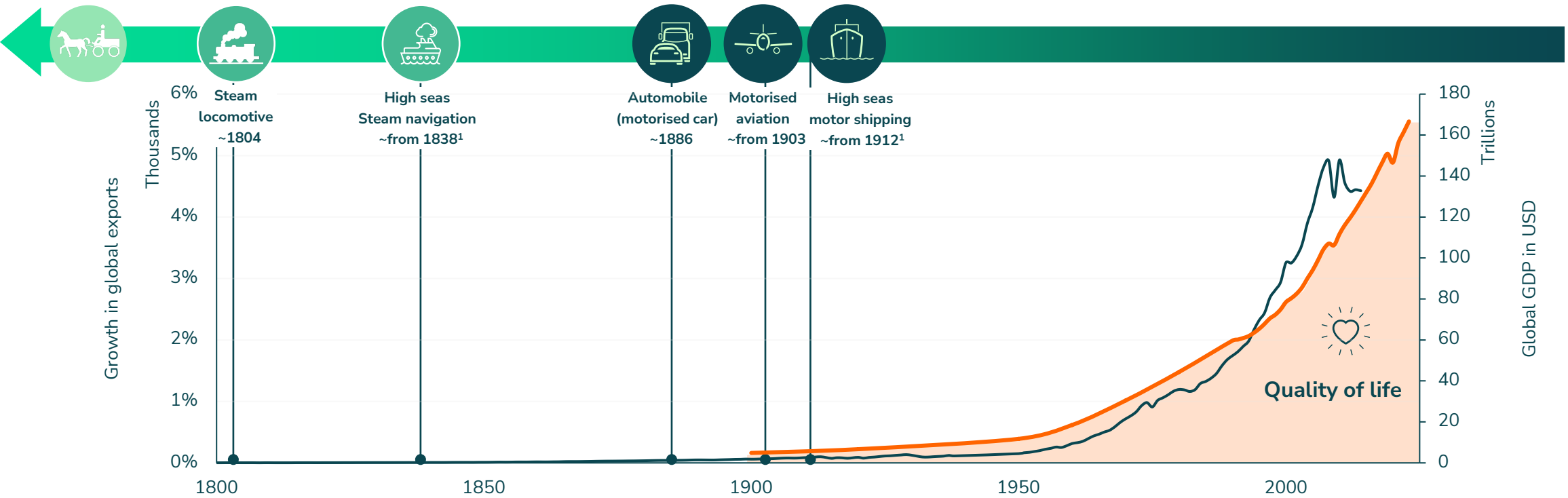
Advanced mobility solutions have made globalisation possible in the first place. These developments have not only brought economic, technological and cultural progress for mankind, but have also significantly improved the quality of life that prevails today.

(1) Presented as the "Trade openness index". This is calculated as the sum of global exports and imports divided by global GDP. Illustration of the assessment of various sources.

Source: OurworldinData

The further development of means of transport drove economic growth and globalisation

Global export growth with the help of suitable mobility solutions and the resulting increase in quality of life



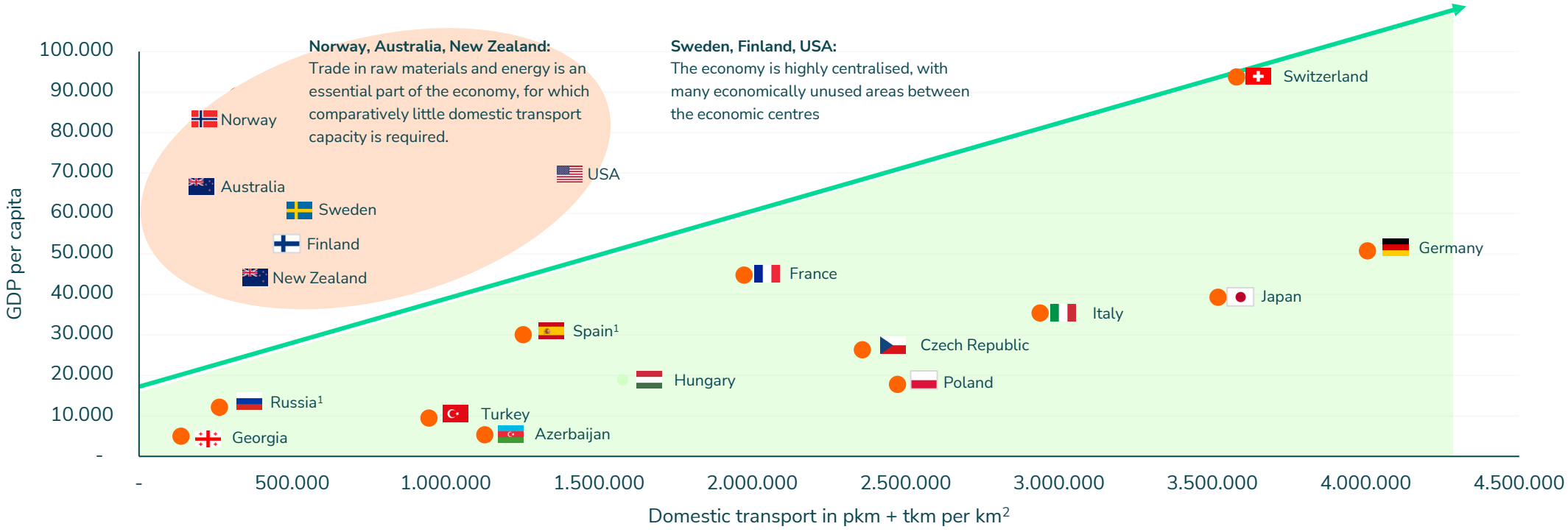
The motorization of transport enabled the exponential growth of global trade and consequently economic prosperity. The invention of the automobile played a decisive role in this.

(1) Steam navigation on inland waterways already before 1800. First crossings of the Atlantic with steamships from 1838.

Source: Ourworldindata.org

Relationship between transport volume and economic performance

Evaluation of GDP as a function of total transport performance (passenger + freight transport) 2021



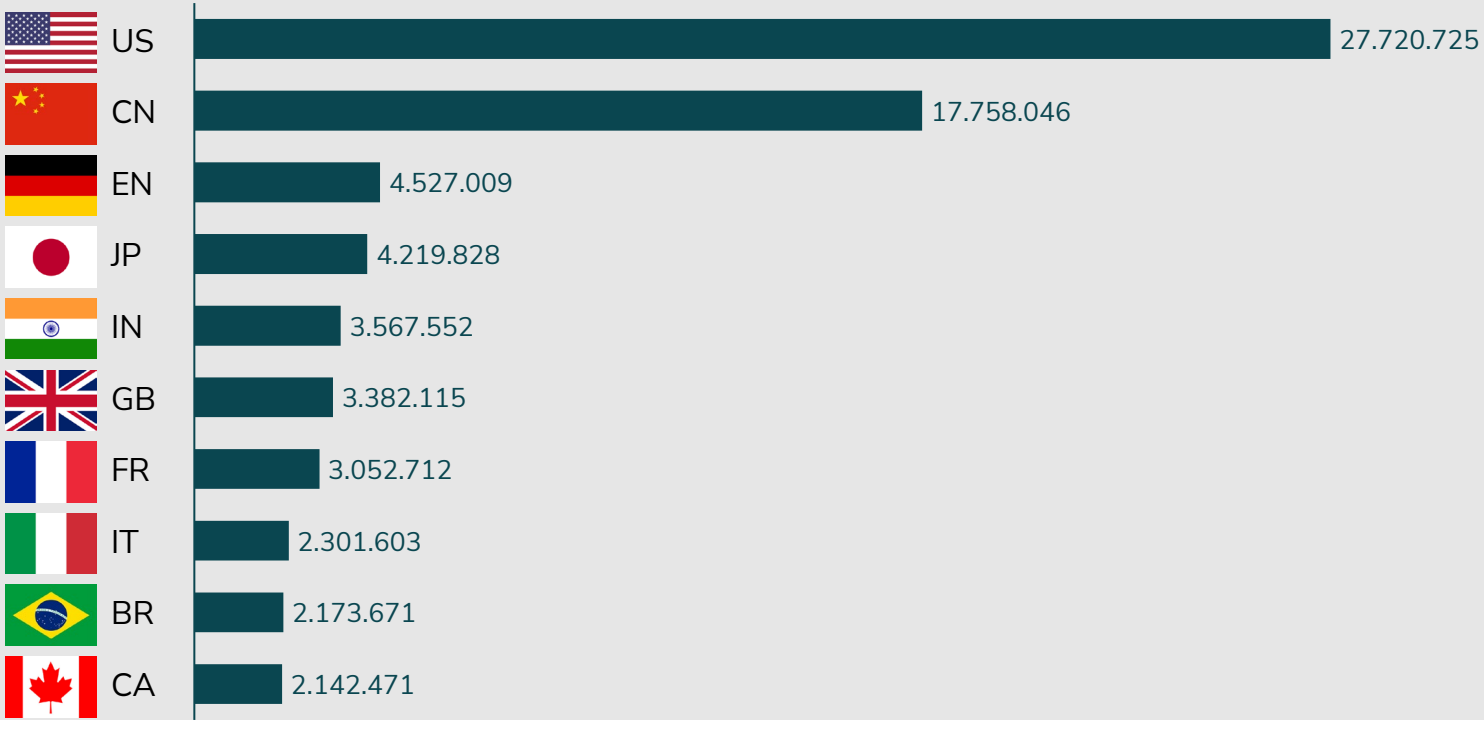
Whether transporting goods or passengers, a high volume of mobility reflects a country's economic performance. In many countries, road transport plays a central role in this.

(1) Here value for 2020

Sources: OECD Data, Federal Statistical Office

Importance of the automotive industry for large economies

Top 10 countries GDP in USD million 2023



Importance of the automotive industry in 2023

~8%	of the total export performance
~6%	of the total export performance
~17%	of the total export performance
~22%	of the total export performance
~5%	of the total export performance
~10%	of the total export performance
~9%	of the total export performance
~8%	of the total export performance
~4%	of the total export performance
~11%	of the total export performance

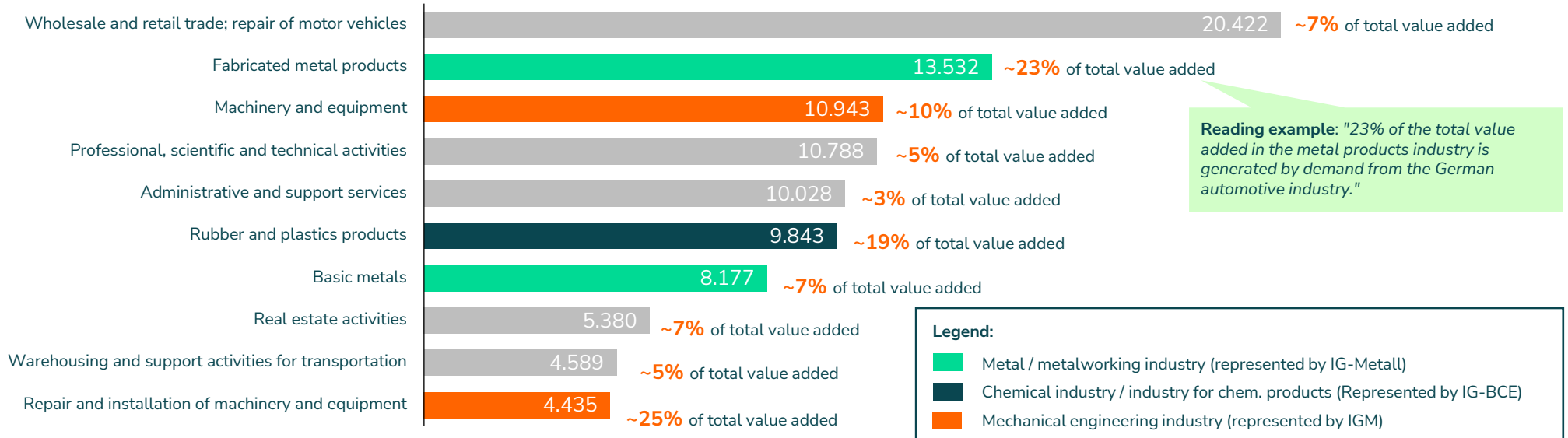
Over the course of time, the automotive industry has developed into a central economic sector for leading national economies and is therefore a key pillar of their economic performance.

Source: Trading Economics

Importance of the automotive industry for other sectors and industries

Triggered added value of the German automotive industry in other German sectors and industries in USD million 2019

Example Germany



Total: USD 133.002 million

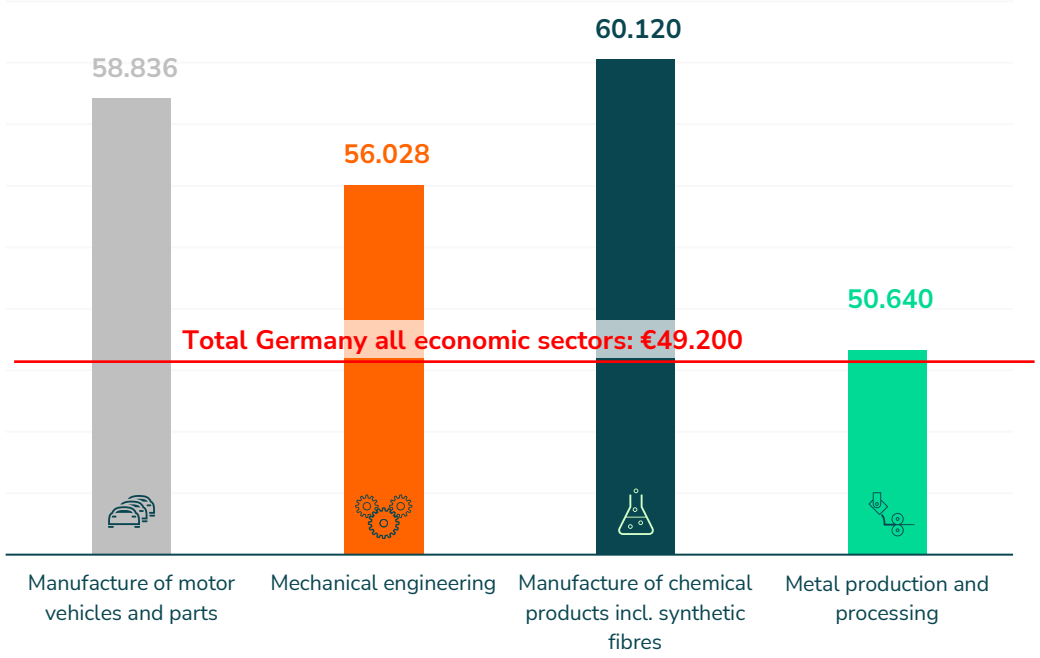
Due to its high product complexity, the automotive industry is closely interlinked with other sectors and branches of industry and triggers a high level of added value due to its demand.

Source: OECD

Economic importance of the automotive industry and related sectors for tax revenues

Ø gross annual earnings by economic sector 2021

Special payments not considered



Resulting income tax revenue 2021

Income tax burden for tax class 4

Industry	Economic branch	Ø annual earnings (gross)	Ø Number of employees	Approx. wage tax revenue
Automobile	Manufacture of motor vehicles and parts	58.836 €	783.859	€ 8,7 billion
Mechanical engineering	General Mechanical engineering	56.028 €	935.902	€ 9,5 billion
Chemistry	Manufacture of chemical products incl. man-made fibres	60.120 €	330.650	€ 3,8 billion
Metal	Metal production and processing	50.640 €	224.515	€ 1,9 billion
				∑ € 23,9 billion

Due to the specialised expertise required, jobs in the automotive industry and related sectors pay above average wages. As a result, they make a significant contribution to the prosperity of industrialised countries and at the same time demonstrate the potential for emerging and developing countries.

Sources: Federal Statistical Office 1, Federal Statistical Office 2

Current challenges facing the automotive industry worldwide

Examples

PRICE PRESSURE

- Many **companies are under unprecedented price pressure** due to the market entry of **new, heavily subsidised brands, for example from China**
- In combination with the currently **higher costs for new electr. drive variants**, established western manufacturers can only offer their **new product portfolio at competitive** prices **to a limited extent**

DE-COUPLING

- **Major trading nations** such as the USA and China **are closing their markets** due to geopolitical disputes
- In the automotive industry, this leads to considerable **challenges when it comes to securing supply chains** and the **availability of materials and components**

CO_2 EMISSIONS ...

- Due to the **high environmental impact of traffic**, the **regulatory requirements** for vehicles are constantly increasing
- This creates a **technical pressure for change** in the industry to move in the orientation of **electr. vehicles**
- Most OEMs have **not** yet achieved **broad acceptance** of the new drive solutions among customers

Examples of direct state subsidies in 2022

Source: Kiel Institute for Economic Research

BYD **~€ 3,6 billion**

GAC MOTOR **~€ 212 million**

Geopolitical tensions in main sales markets

US-Außenhandel

Source: tagesschau

Trump will bis zu 25 Prozent Zölle auf Autoimporte

Source: tagesschau

Reaktion auf USA

China kündigt Gegenzölle auf US-Produkte an

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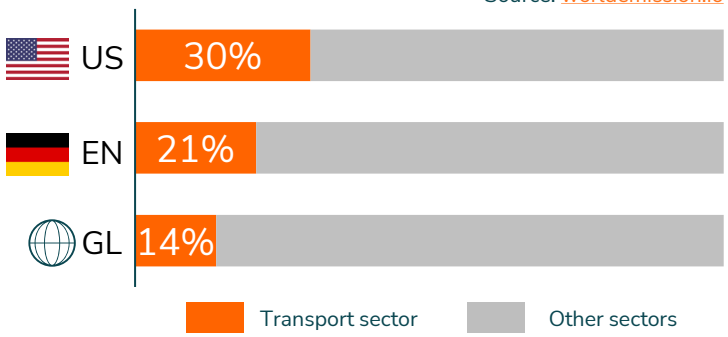
Share of transport in CO2 emissions 2024

Source: worldemission.io



Consequences of the challenges facing the automotive industry - Example DE

Consequences of the challenges from the German perspective:

Employees
~780.000 persons

Econ. Relevance
~10%
of Germany's total gross value added in 2022
without related value added in other sectors

Car production
~4,1 million

Car export share
~76%

Sources: Federal Ministry for Economic Affairs and Climate

The increasing relocation of production and development centres abroad and the associated relocation of jobs presents established economies such as Germany with enormous challenges and makes it necessary to gain a comprehensive understanding of the strategies and conditions of other nations.

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Methodological approach for the country-specific PESTEL analysis

PESTEL Factors		Detailing the PESTEL factors into several sub-categories
P	Political Factors	Tax policy, subsidy policy, regulatory policy
E	Economic Factors	Automotive vertical integration, market proximity, availability of resources and of capital
S	Socio-Economic Factors	Population characteristics, labour market conditions, availability of skilled workers
T	Technological Factors	Energy supply, general technology focus, nature of the transport sector
E	Ecological Factors	Status quo environmental and climate protection, emission targets, environmental performance
L	Legal Factors	Governance rating, property rights, bureaucracy rating

Collection of relevant key figures, indices and facts per country

Indices and market studies, e.g:

Databases, among others:

WORLD BANK GROUP

OECD

Overview of the structure of the country analysis

Country analysis

01 Basic data
General overview of basic economic data and key figures for the domestic automotive industry.

02 Political
Description of the political framework conditions for companies with regard to tax policy, subsidies and regulatory policy.

03 Economical
Brief overview of the vertical integration in the automotive industry, the availability of key resources, market proximity and –regulation and capital availability.

04 Socio-Economic
Description of population characteristics to classify conceivable mobility solutions and assess the nature of the labour market and availability of skilled workers.

05 Technical
Assessment of the energy supply situation and description of the main areas of technical development and the current situation in the transport sector.

06 Ecological
Presentation of the importance of environmental protection and quantification of the country's greenhouse gas emissions as well as the targets set for the reduction of greenhouse gases.

07 Legal
Assessment of the governance situation, including the fight against corruption, the rule of law, the effectiveness of political and administrative decisions, bureaucratic efforts and respect for property rights.

08 Conclusion
Summary of the most important findings from the PESTEL components and derivation of the assessment of site conditions.

Resulting valuations

Evaluation of country-specific location conditions
for companies in the automotive industry

Quantification of the degree of fulfilment of national goals / focus topics
to which the country has committed itself

Methodology for deriving the location factor assessment

Country-specific location factors

Identification of location factors

Procedure

- Web research of relevant literature
- Internal workshops

Result

- Listing of all relevant location factors from the company's perspective, including
  - Attractiveness of the tax system,
  - Availability and quality of skilled labour,
  - Nature of the infrastructure and more.

Quantification and selection

Procedure

- Research country comparison data
- Check for plausibility and relevance

Result

- Identifying the best measurable value for each location factor by country based on available data
- Removal of incomplete, out-of-date or unclear indices

Country benchmarking

Procedure

- Identification of the best value per factor
- Use of relative differences

Result

- Realistic picture of the strengths and weaknesses of each country in terms of location attractiveness for (industrial) companies

Methodology for assessing progress towards national targets

Fulfilment of national targets

Identification of a common jumping-off point for national goals

Source: United Nations (UN)

Source: Institute for Economics & Peace (IEP)

Grouping of national goals into 5 overarching categories

Economic growth and prosperity:

No poverty, no hunger, health and well-being, decent work and economic growth

Education, technology and innovation:

High-quality education, industry, innovation and infrastructure

Justice and the rule of law:

Gender equality, fewer inequalities, peace, justice and strong institutions

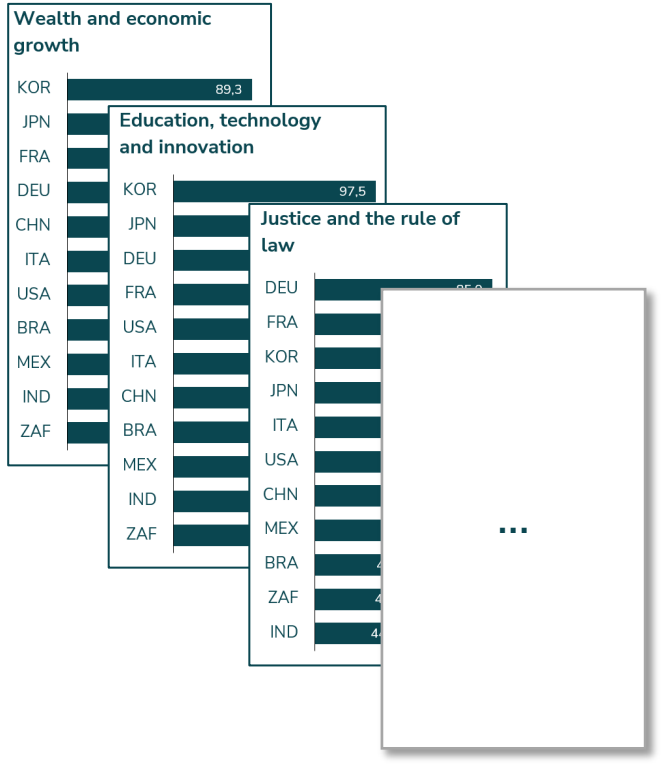
Internal and external security:

Ongoing internal and international conflicts, security and protection of society, militarization

Environmental and climate protection:

Clean water and sanitation, affordable and clean energy, sustainable cities and communities, sustainable consumption and production, climate protection measures

Analysis of the average score per country and target category



PESTEL Analysis of the countries' location factors

Selected location factors:

Political:
- Attractiveness of the tax system
- Freedom of investment

Economical:
- Performance of the financial markets

Socio-Economic:
- Attractiveness of the labour market
- Quality of the education system

Technological:
- Quality of the infrastructure

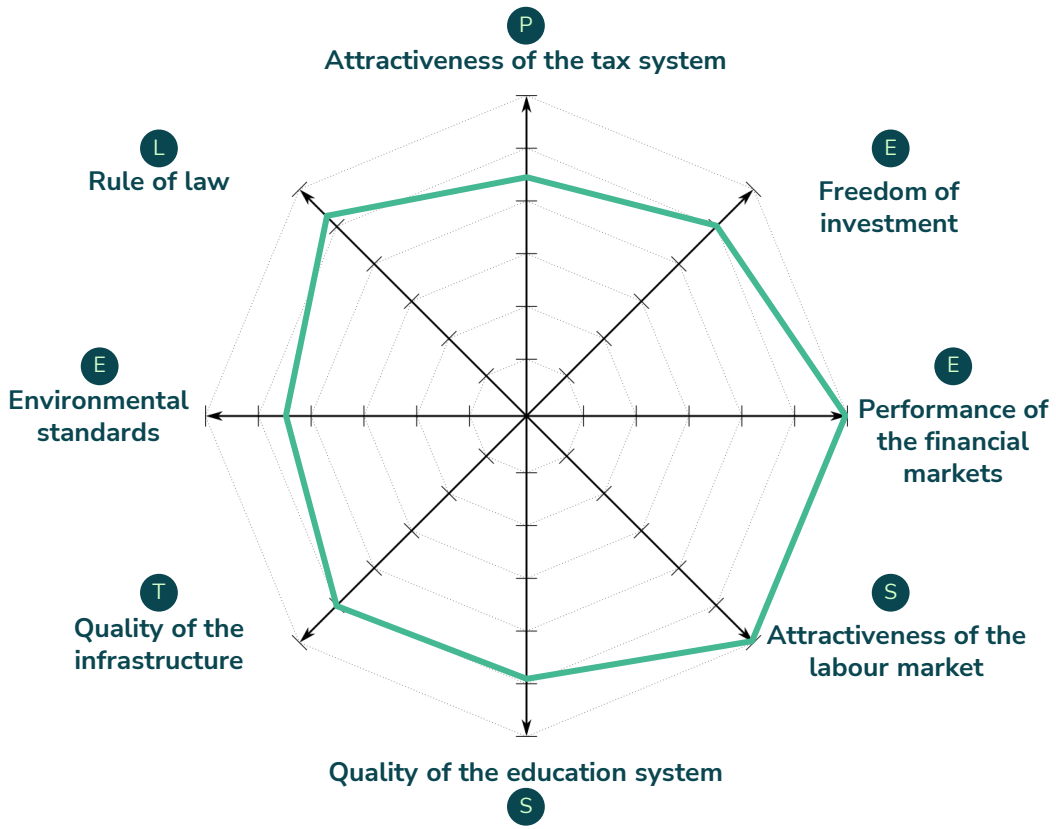
Ecological:
- Environmental standards

Legal:
- Rule of law

Results of the country analysis:

The results of the analysis in WP1 serve as input for the comparative evaluation and the identification of success stories in WP3

Evaluation of selected location factors



Note: Relative characteristics of the location factors compared to the benchmark country (1) Intellectual property

Key takeaways from the PESTEL analysis

P
- Tax system geared towards intranational competition
- Comprehensive economic development with high national debt

E
- Strongly negative trade balance, especially for motor vehicles
- Attractive capital market and high availability of fossil resources

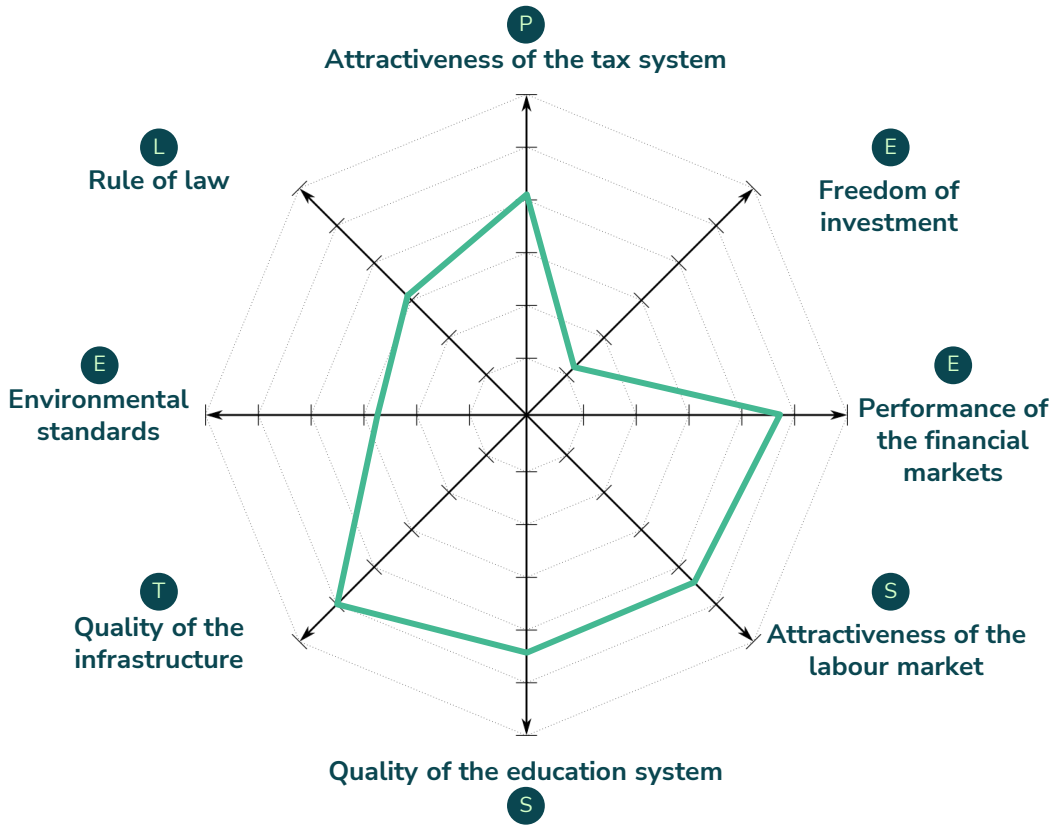
S
- Urbanised society with heavy use of road transport
- Lightly regulated labour market with high availability of skilled workers

T
- Cost-effective energy supply based on fossil resources
- Low market penetration of low-CO2 energies and powertrains

E
- Historically the largest and currently large emitter of greenhouse gases
- Scaling back of climate protection measures by new government

L
- High importance of the rule of law and freedom of expression
- Strong IP protection[1] and a broad legal framework for autonomous driving

Evaluation of selected location factors



Note: Relative characteristics of the location factors compared to the benchmark country (1) Intellectual property

Key takeaways from the PESTEL analysis

P
- Sector and region-dependent tax and subsidy system
- Government regulation of key industries, rising debt

E
- Focus on exports, increasingly also for motor vehicles
- Regulated financial market, high share of global commodity extraction

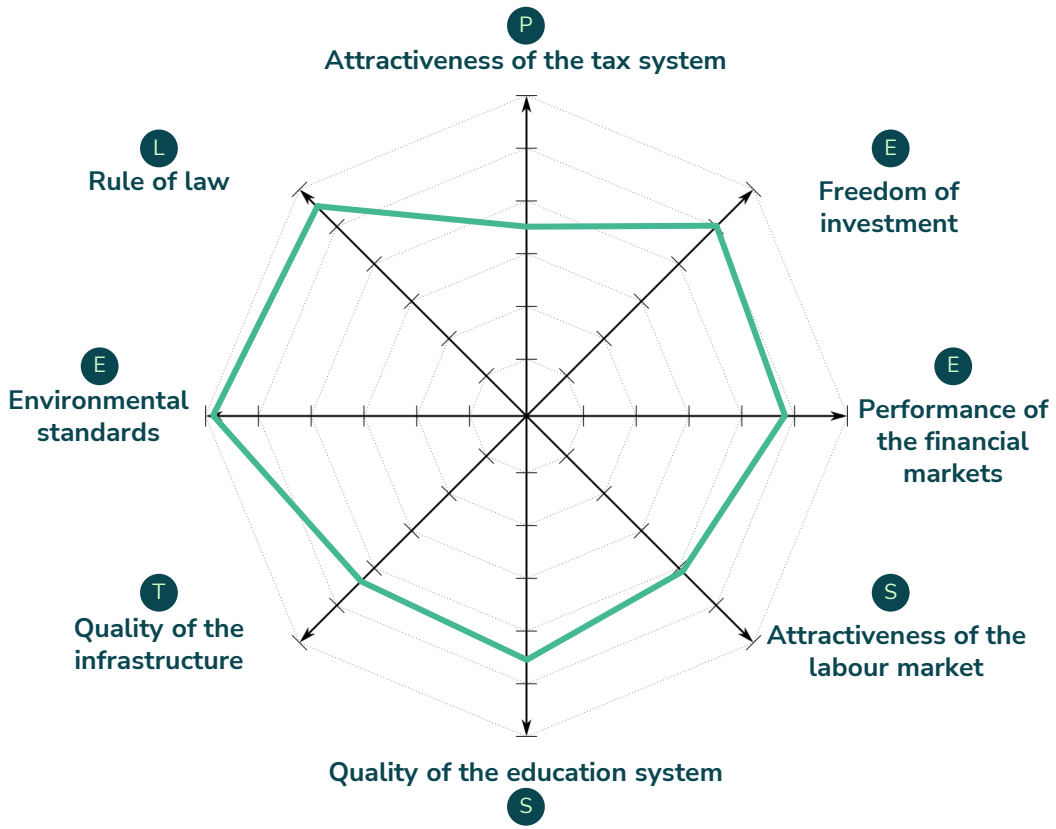
S
- Moderately urbanized population with a medium level of motorization
- Sector and region-specific labour market characteristics

T
- Cost-effective energy supply based on fossil resources
- Increasing relevance of alternative drives and nuclear energy

E
- Absolutely the largest greenhouse gas emitter in the world, heavy coal utilisation
- Expansion of solar and wind energy, climate neutrality by 2060

L
- Oppression and corruption accompany poor rule of law
- Endangering IP[1] protection; broad legal framework for autonomous driving

Evaluation of selected location factors



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Key takeaways from the PESTEL analysis

P
- Multi-layered tax system with a very high tax burden in some cases
- Comprehensive subsidy packages with moderate fiscal health

E
- Strong (national) economic dependence on the automotive industry
- High level of trade and investment freedom, weak venture capital market

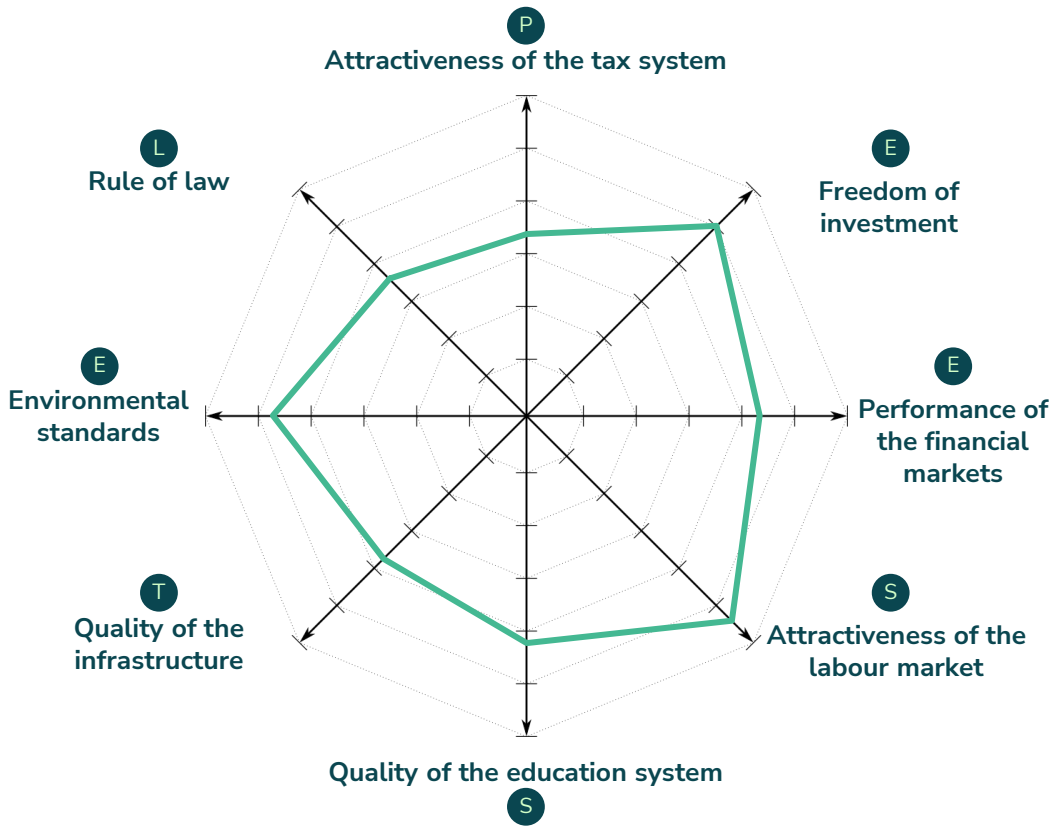
S
- Urbanised country with high road traffic volume and car density
- Employee-friendly labour market with average educational performance

T
- Net energy importer with high prices for industry and households
- Digital, energy and transport infrastructure in need of improvement

E
- Historically significant greenhouse gas emitter, EU emissions trading
- Above-average prioritisation of the fight against climate change

L
- Liberal, democratic basic order in accordance with the rule of law
- Strict legal framework for IP[1] protection and autonomous driving

Evaluation of selected location factors



Note: Relative characteristics of the location factors compared to the benchmark country (1) Intellectual property

Key takeaways from the PESTEL analysis

P
- Unattractive tax system with a very high tax burden
- Reallocation of subsidy programs for greater fiscal stability

E
- Moderate economic dependence on the automotive industry
- High level of trading and investment freedom, expandable capital availability

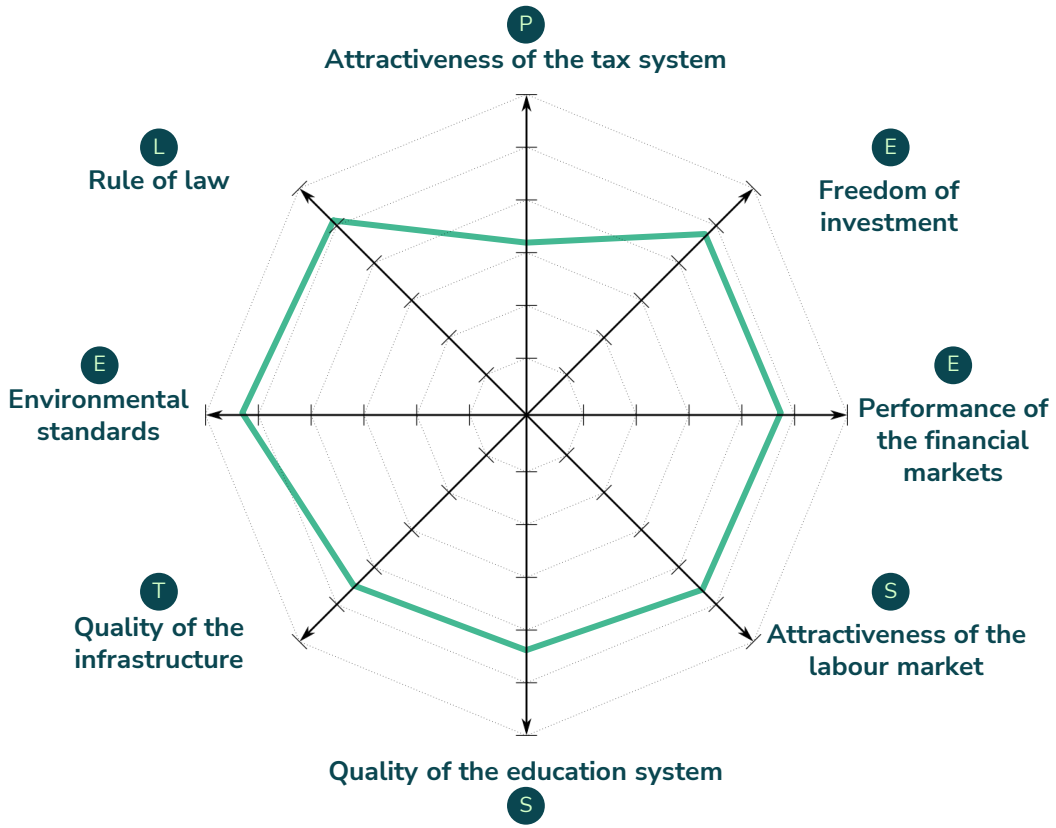
S
- Urbanised country with high road traffic volume and car density
- Increasing labour market freedom at moderate costs; moderate education

T
- High energy imports with high prices for industry and households
- Digital, energy and transport infrastructure in need of improvement

E
- One of the western countries with the weakest environmental protection
- Expansion of climate protection measures. Climate neutrality by 2050

L
- Liberal, democratic basic order in accordance with the rule of law
- Strong IP[1] protection; limited legal framework for autonomous driving

Evaluation of selected location factors



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Key takeaways from the PESTEL analysis

P
- Unattractive tax system with a very high tax burden
- Strategic subsidy programs with high national debt

E
- Moderate economic dependence on the automotive industry
- High freedom of trade and investment, good capital availability

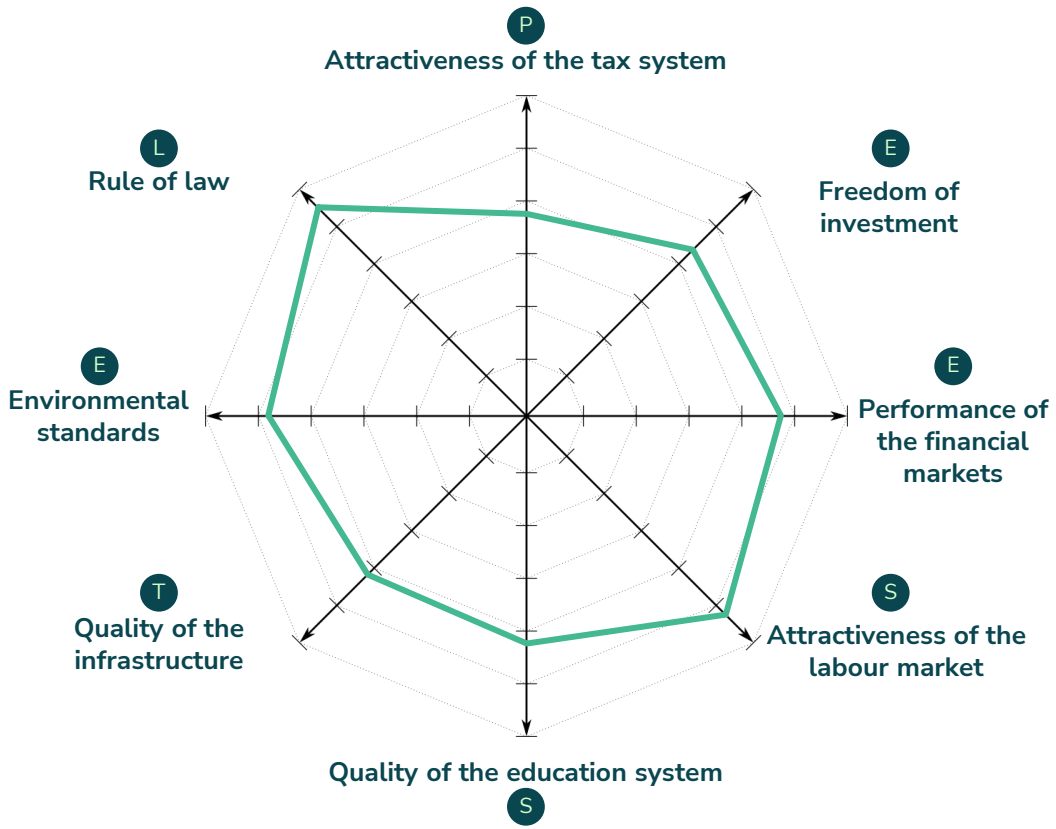
S
- Urbanised country with high road traffic volume and car density
- Regulated and cost-intensive labour market; moderate education system

T
- Stable energy system with a strong focus on nuclear energy
- Digital and transport infrastructure in need of improvement

E
- Above-average environmental protection with strong potential for improvement
- Expansion of climate protection measures. Climate neutrality by 2050

L
- Liberal, democratic basic order in accordance with the rule of law
- Strict legal framework for IP[1] protection and autonomous driving

Evaluation of selected location factors



Note: Relative characteristics of the location factors compared to the benchmark country

Key takeaways from the PESTEL analysis

P
- Unattractive tax system with a multi-layered tax burden
- Ongoing subsidy programs with high government over-indebtedness

E
- High economic dependence on the automobile, especially exports
- High level of trade and investment freedom, strengthening of the financial market

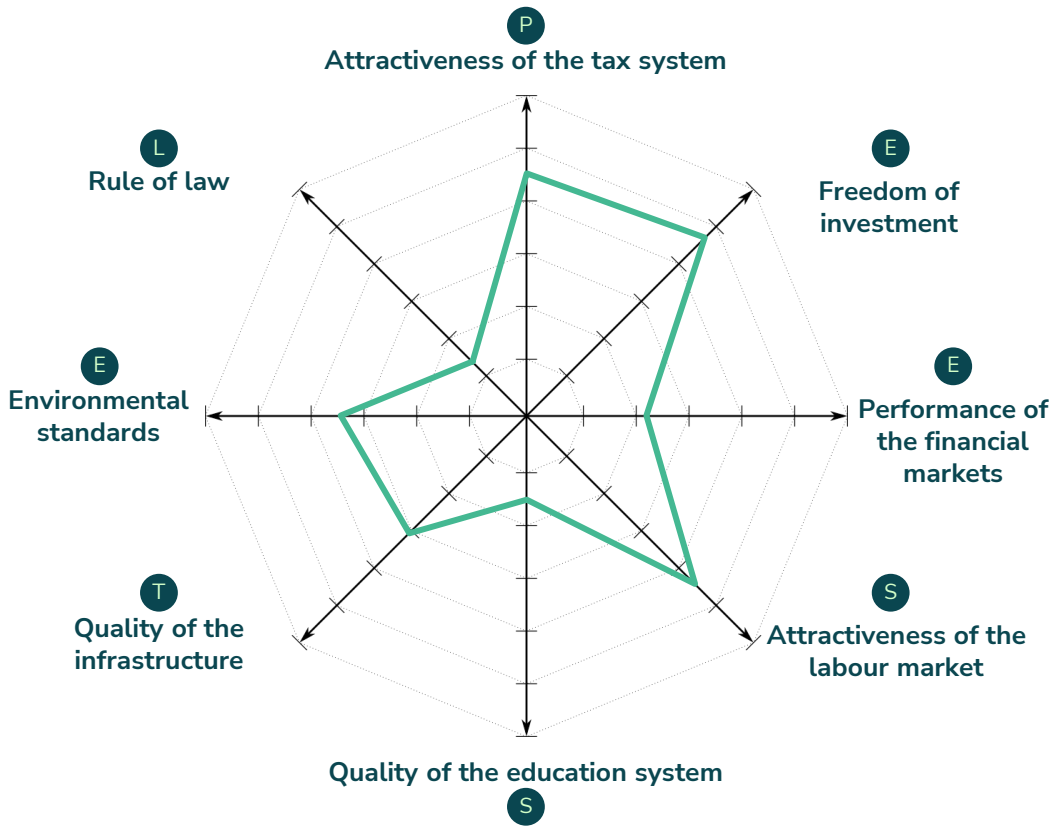
S
- Concentration on urban centres; high car density
- Dominant principle of lifelong employment; strong science

T
- Strong dependence on fossil fuel imports; fourth largest importer
- Comprehensive, efficient transport infrastructure

E
- Leading environmental protection in the region with potential for improvement
- Major greenhouse gas emitter, climate neutrality by 2050

L
- Liberal, democratic basic order in accordance with the rule of law
- Strong legal framework for patents and autonomous driving

Evaluation of selected location factors



Note: Relative characteristics of the location factors compared to the benchmark country (1) Intellectual property

Key takeaways from the PESTEL analysis

P
- Moderate attractiveness of the tax system; low tax burden
- Strong incentive systems for nearshoring with high fiscal leeway

E
- Importance of automotive exports for the economy
- Adequate trade and investment freedom, but weak financial markets

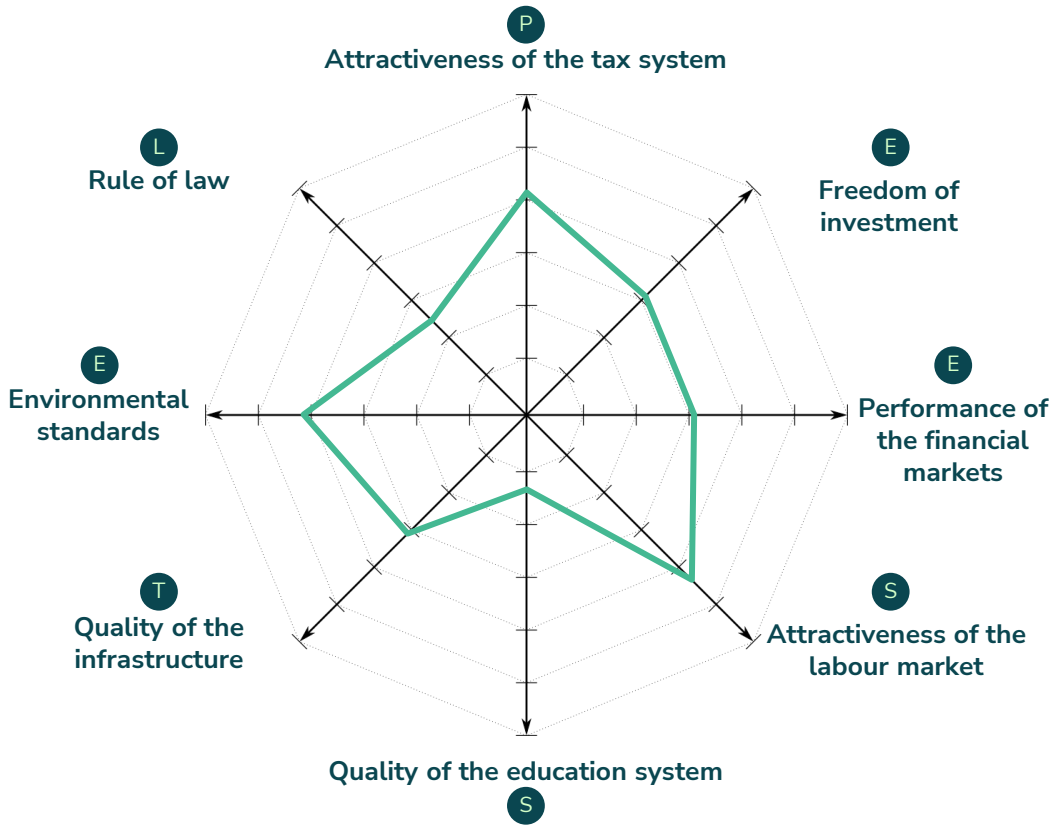
S
- Concentration on urban centres; only moderate transport performance
- Regulated but favourable labour market; weak education and R&D

T
- Strong and increasing dependence on fossil fuel imports
- Energy & transport infrastructure in need of considerable improvement

E
- Deficits in environmental protection, deforestation and air pollution
- Pursuing the emissions target with a focus on expanding renewables energies

L
- Democracy with corruption problems & weak rule of law
- Endangering IP[1] protection; no legal framework for autonomous driving

Evaluation of selected location factors



Note: Relative characteristics of the location factors compared to the benchmark country (1) Intellectual property

Key takeaways from the PESTEL analysis

P
- Moderately attractive tax system in the midst of a long-term overhaul
- Multiple investment programs to strengthen the (automotive) economy

E
- Stronger trade and investment barriers, broad raw material stocks
- Largest financial market in Latin America, but weak internationally

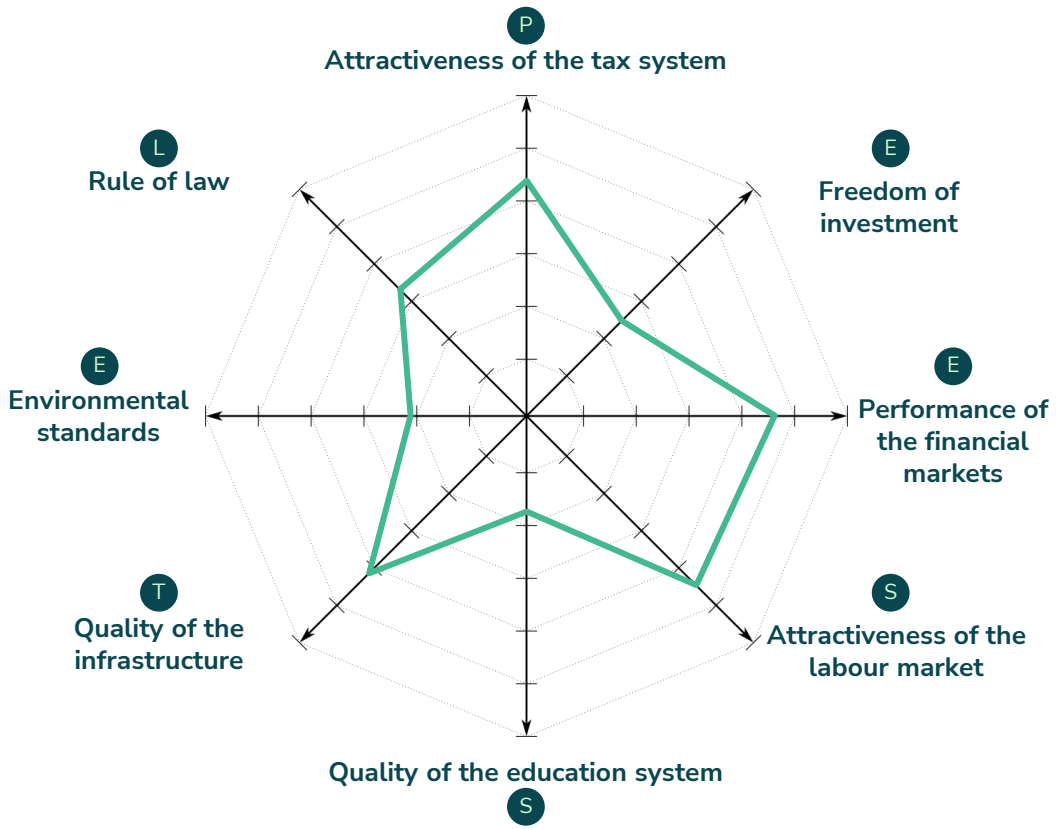
S
- Few urban agglomerations and a large proportion of unpopulated areas
- Regulated but favourable labour market; weak education despite investments

T
- Independent energy system with a high proportion of renewables energy sources
- Significant need for infrastructure improvements; focus on roads

E
- High deforestation, but with strong improvement in recent years
- Main emissions from agriculture and deforestation. Climate neutral 2050

L
- Democracy with corruption problems & weak rule of law
- Inadequate legal framework for IP[1] rights and autonomous driving

Evaluation of selected location factors



Key takeaways from the PESTEL analysis

P
- Tax system that favours domestic companies; low tax rate
- Strategic investments in domestic production and supply chains

E
- Stronger trade and investment barriers, high availability of raw materials
- Low (car) trading volume; second largest financial market in APAC[2]

S
- High population density; mostly rural lifestyle; low car density
- Regulated, efficient labour market; weak education; good R&D

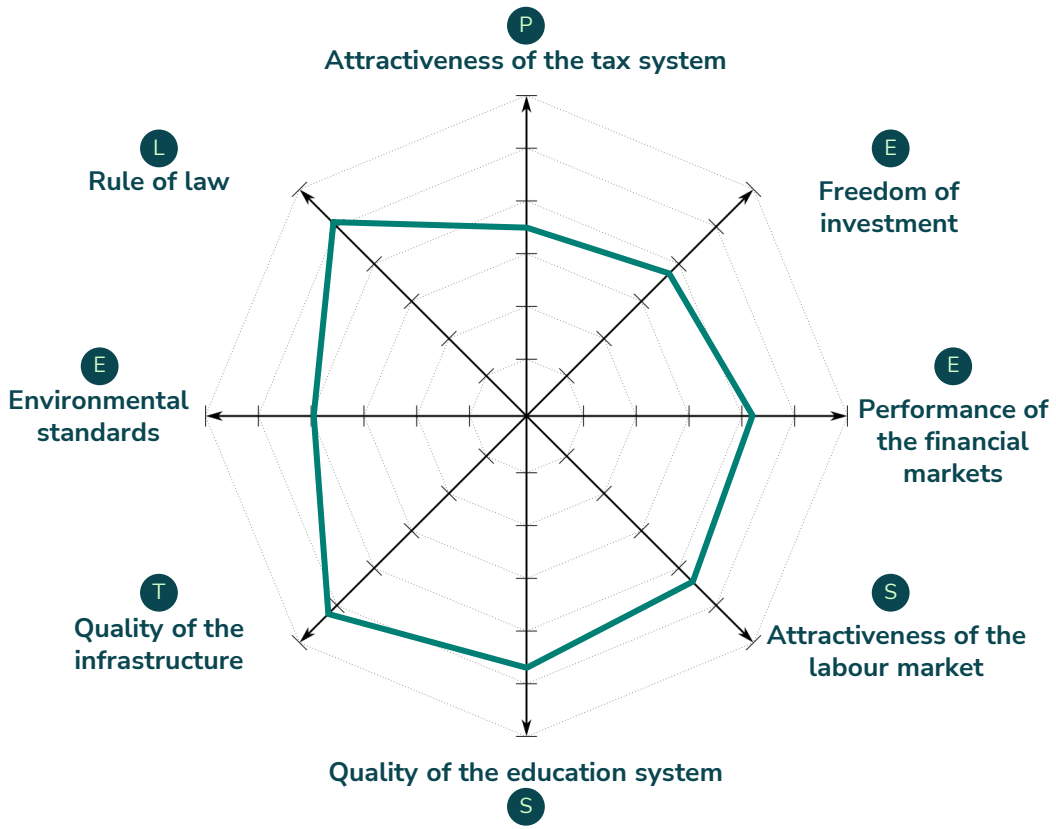
T
- High dependence on energy imports and coal
- Infrastructure in need of improvement, including roads, energy, water

E
- Major deficits in environmental protection, particularly in terms of air quality
- Third-largest emitter in the world, with emissions continuing to rise

L
- Fragile democratic basic order in accordance with the rule of law
- Weak IP[1] protection; no infrastructure/legal framework for auton. driving

Note: Relative characteristics of the location factors compared to the benchmark country (1) Intellectual property (2) Asian-Pacific

Evaluation of selected location factors



Note: Relative characteristics of the location factors compared to the benchmark country

Key takeaways from the PESTEL analysis

P
- Unattractive tax system for companies with increased tax burden
- Strong support for domestic industries with solid public finances

E
- Good trade and investment freedom, high car export dependency
- Low availability of raw materials; good availability of capital (especially banks)

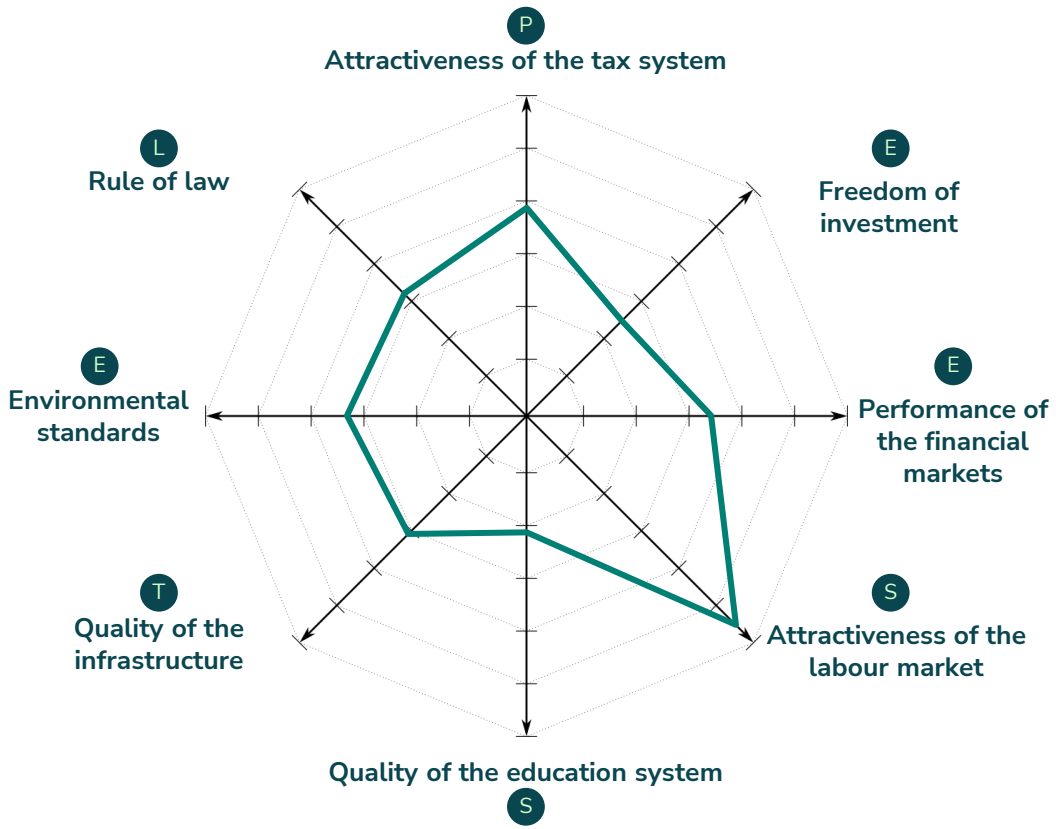
S
- Urbanised society with high population and car density
- Medium labour market freedom; good education; outstanding R&D performance

T
- High dependence on energy imports and fossil fuels
- Strong focus on the development of high-tech industries

E
- Particularly affected by air pollution and natural disasters
- Main emissions from energy and industrial sectors; climate neutrality 2050

L
- Liberal, democratic basic order in accordance with the rule of law
- Strong legal framework for patents and autonomous driving

Evaluation of selected location factors



Note: Relative characteristics of the location factors compared to the benchmark country (1) Intellectual property

Key takeaways from the PESTEL analysis

P
- Moderate tax system with medium tax burden; numerous exemptions
- Strategic strengthening of the domestic automotive industry; moderate financial situation

E
- Strong contribution of the automotive sector to GDP; medium trade freedom
- Severe investment restrictions; moderate capital availability

S
- Few urban centres and a large proportion of rural areas
- Lightly regulated labour market; many unemployed; poor education

T
- Unreliable electricity supply and high dependence on coal
- Significant need for improvement in transport and telecommunications infrastructure, among other things

E
- Environmental pollution, in particular air quality and water resources
- Largest emitter in Africa. Climate neutrality 2050

L
- Fragile democratic basic order in accordance with the rule of law
- Weak IP[1] legal framework; no framework for autonomous driving

Overview of the work packages

WORK PACKAGE 0
Introduction

- Derivation of the historical significance of mobility in the general history of mankind
- Description of the role of mobility as a driver of economic power
- Derivation of the resulting significance of the automotive industry
- Description of current industry challenges and consequences

Target:

Brief introduction to the presentation of the socio-economic significance of mobility and the automotive industry

WORK PACKAGE 1
Country-specific analysis

- Creation of country profiles
- PESTEL analysis of country-specific framework conditions
- Deriving an assessment of key location factors for each country
- Assessment of the strategic direction of the country (e.g. climate protection, security, etc.)

Target:

Analysing the location factors of different countries and their framework conditions using the PESTEL logic.

WORK PACKAGE 2
Company analysis

- Creation of company profiles for representative companies in the analysed countries
- Collection of relevant company key figures
- Identification of the strategic focus (technological and market-related) and global expansion

Target:

Presentation of represent. Companies in the automotive industry in the countries analysed and their strategic orientation

WORK PACKAGE 3
Comparison of reg. strategies

- Comparative analysis of the assessment of location factors in all countries
- Comparative analysis of the strategic focus of all companies
- Derivation of the attractiveness of the location and the strategic direction of the companies in all markets
- Identification of success stories (both at regional and company level)

Target:

Comparative analysis of the countries and companies, highlighting the strategic orientation of the companies in the countries

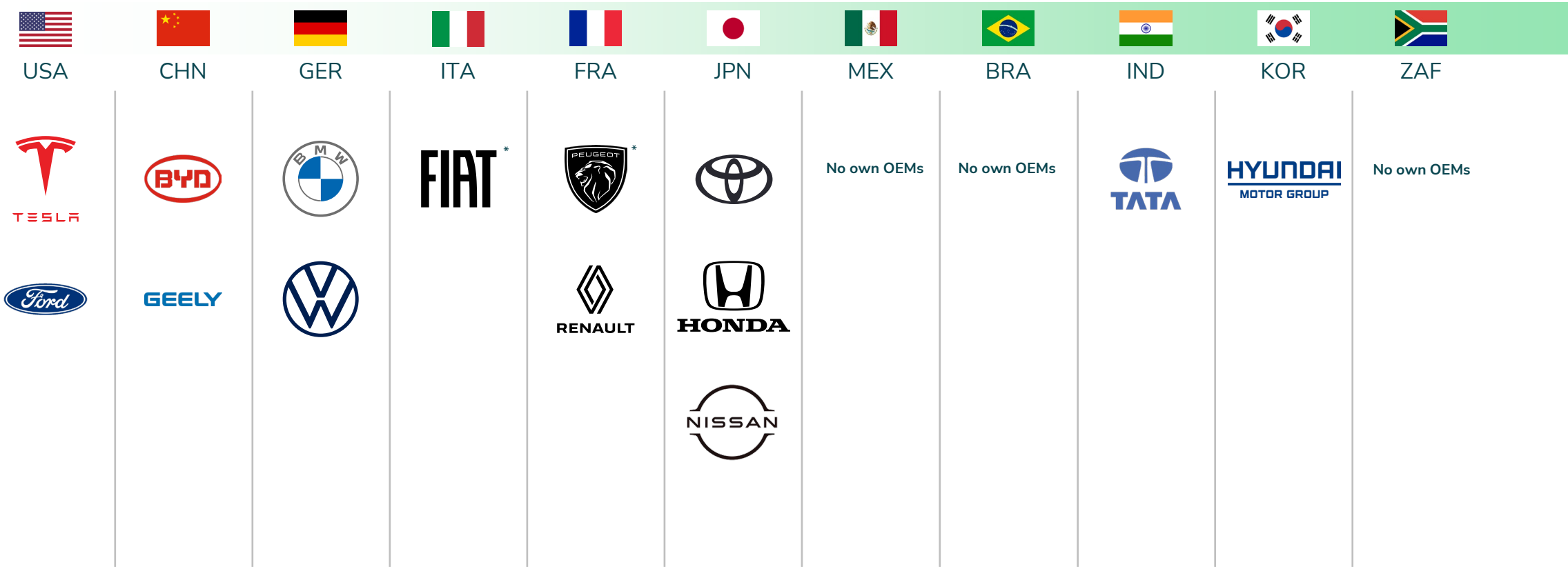
WORK PACKAGE 4
Recommendations for action

- Creation of future development scenarios up to 2035 for the core regions from the perspective of the companies and their reasons for their involvement in a country
- Analysing the consequences of the scenarios for the individual core regions
- Derivation of conditions for an optimistic scenario in the core regions

Target:

Derivation of recommendations for action for the core regions in various development scenarios

Overview of the companies analysed



By systematically analysing the current competitiveness and future strategies of selected automotive companies, recommendations for industrial policy action can be derived.

* For this purpose, the parent company Stellantis was analysed instead

Analysing the competitiveness and strategies of the companies under review

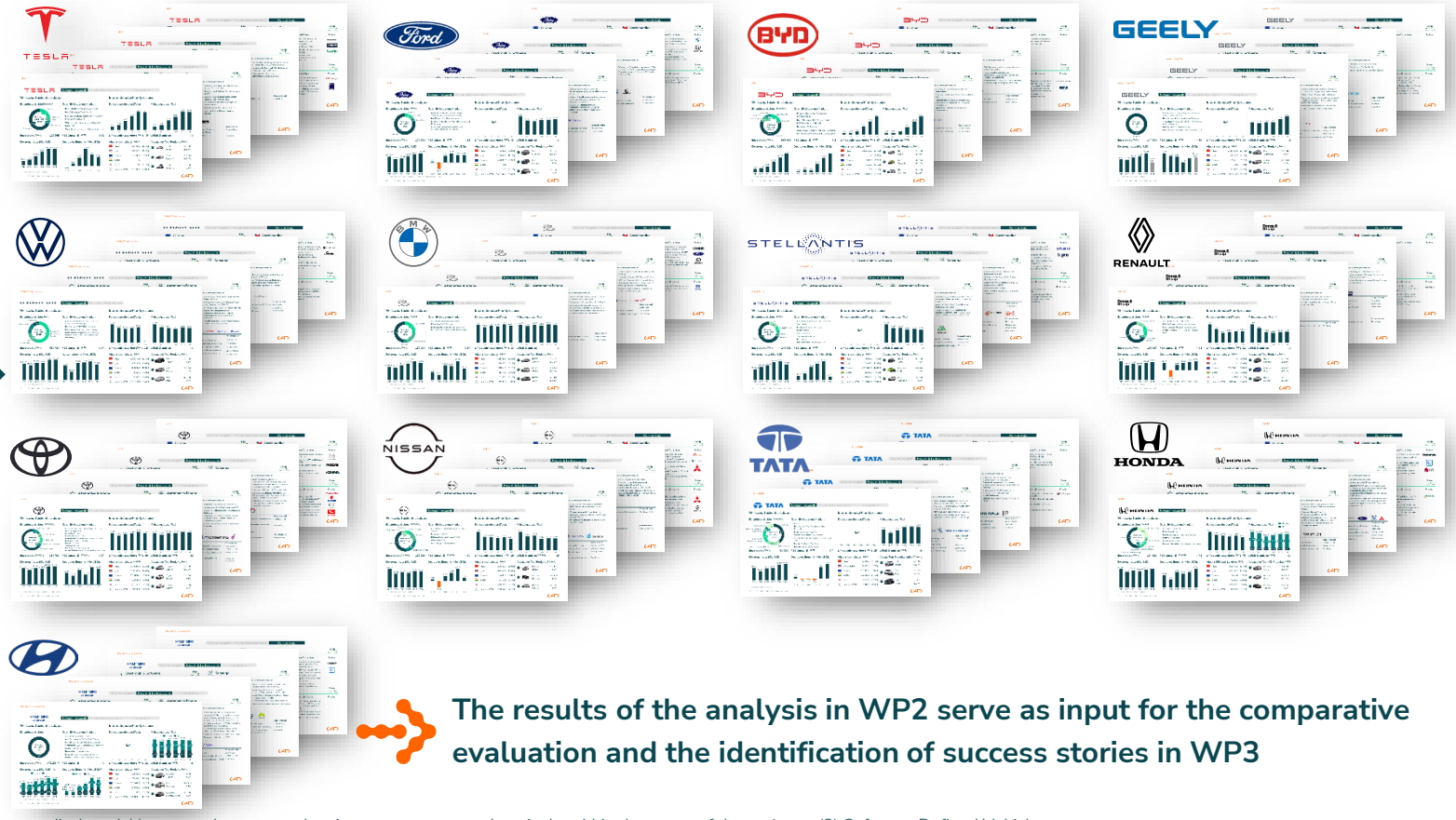
Company analysis with a focus on:

Base profile
including economic data, international market presence and sales

Product & service strategy
with a focus on alternative drives, autonomous driving, SDV[2] & other relevant fields

Market strategy
for Europe, USA, China and other potentially relevant regions

Results of the company analysis[1]



The results of the analysis in WP2 serve as input for the comparative evaluation and the identification of success stories in WP3

(1) For reasons of confidentiality, detailed results of the preview shown here are not disclosed. However, they were taken into account comprehensively within the scope of the project. (2) Software Defined Vehicle

Key findings on industry development

Economic data

- Since the recovery following the coronavirus pandemic, companies have been under pressure from 2024 due to intense global competition and significant investments in technology
- This is reflected in their divergent and unstable results and in sales
- Traditional OEMs such as VW, Ford and Toyota are more affected than "newcomers" such as BYD, Geely and Tesla

Development of sales revenues[1] (2019 - 2024)

+24%	+19%	+513%	+297%

Operating earnings development[1] (2019 - 2024)

+9%	-19%	+33%	+1900%

Vehicle sales development[1] (2019 - 2024)

-19%	-17%	+1%	+53%

Product strategies

- Car manufacturers are increasingly focusing their investments on alternative drive systems and new E/E and software architectures
- However, the majority of their turnover still comes from the sale of vehicles with combustion engines
- Global automotive manufacturers have a multi-layered cooperation ecosystem, however there are a few "must-have" cooperation partners per technology domain and world region

Key partner for alternative drives[1]

CATL, LG, SK

Key partner for autonomous driving[1]

mobileye, WAYMO, HUAWEI

Key Partner for E/E & Software[1]

NVIDIA, Google

Market strategies

- Companies are predominantly focussing on the USA and Europe on the market side. The Chinese market is assessed differently, as strong competition and high entry barriers make it appear less attractive in some cases
- Companies are increasingly shifting their sales focus to other regions of the world, including South America, Africa and increasingly India (e.g. Renault or Tata). This is mainly due to increasing purchasing power and technological flexibility

Companies with little focus on China

STELLANTIS, Hyundai, RENAULT

Company with little focus on the USA

RENAULT, TATA, BYD, GEELY

Companies with a strong focus on other regions of the world (outside the EU, China, USA)

RENAULT, TATA, BYD, GEELY, Hyundai

(1) Selection

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Target:

Derivation of recommendations for action for the core regions in various development scenarios

Procedure for comparing regional strategies

WP1

Country analysis

WP2

Company analysis

WP 3 | Comparison of regional strategies

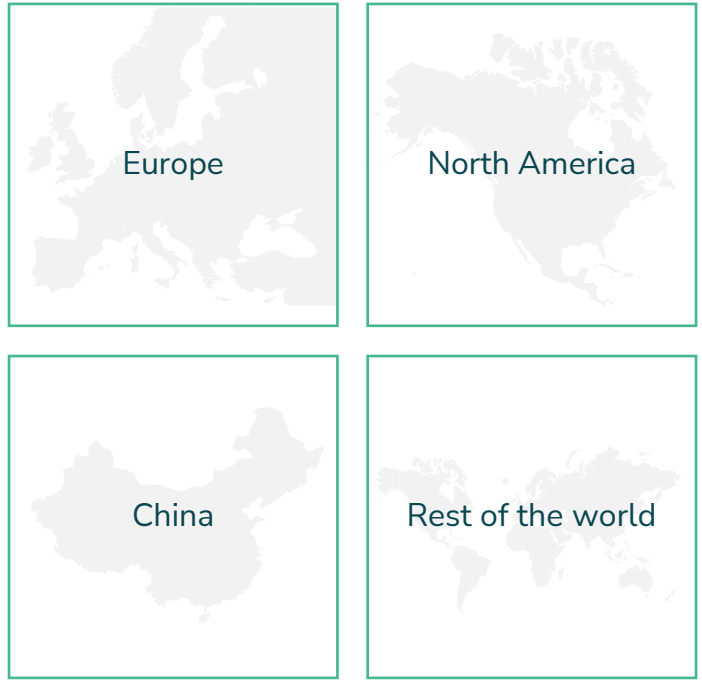
Comparison of location factors

- Political factors
- Economic factors
- Socio-economic factors
- Technological factors
- Ecological factors
- Legal factors

Comparison of corporate strategies

- Financial and sales data
- Product and service strategy
- Market strategy

Assessment of the location attractiveness of core regions from a company perspective



Companies' motives for involvement in a country

Decisive location factors for entrepreneurial motives

Research location

- Access to highly qualified specialists and renowned educational institutions
- Public funding for (basic) research
- Availability of advanced technology and infrastructure

Development site

- Opportunity to collaborate with local companies and research institutions
- Access to highly qualified specialists, especially in the fields of engineering and IT

Production site

- Favourable production costs, especially labour and energy costs
- Competitive labour market conditions
- Efficient infrastructure for transport and logistics
- Entrepreneurial freedom for investment and trade

Sales market

- Access to a market with high and/or growing demand
- High consumer purchasing power and positive consumption trends
- Balanced competitive environment with low barriers to market entry

The decision as to whether an (industrial) company becomes involved in a country along the value chain is closely linked to the degree of fulfilment of high and complex requirements.

WP3 – Comparison of regional strategies

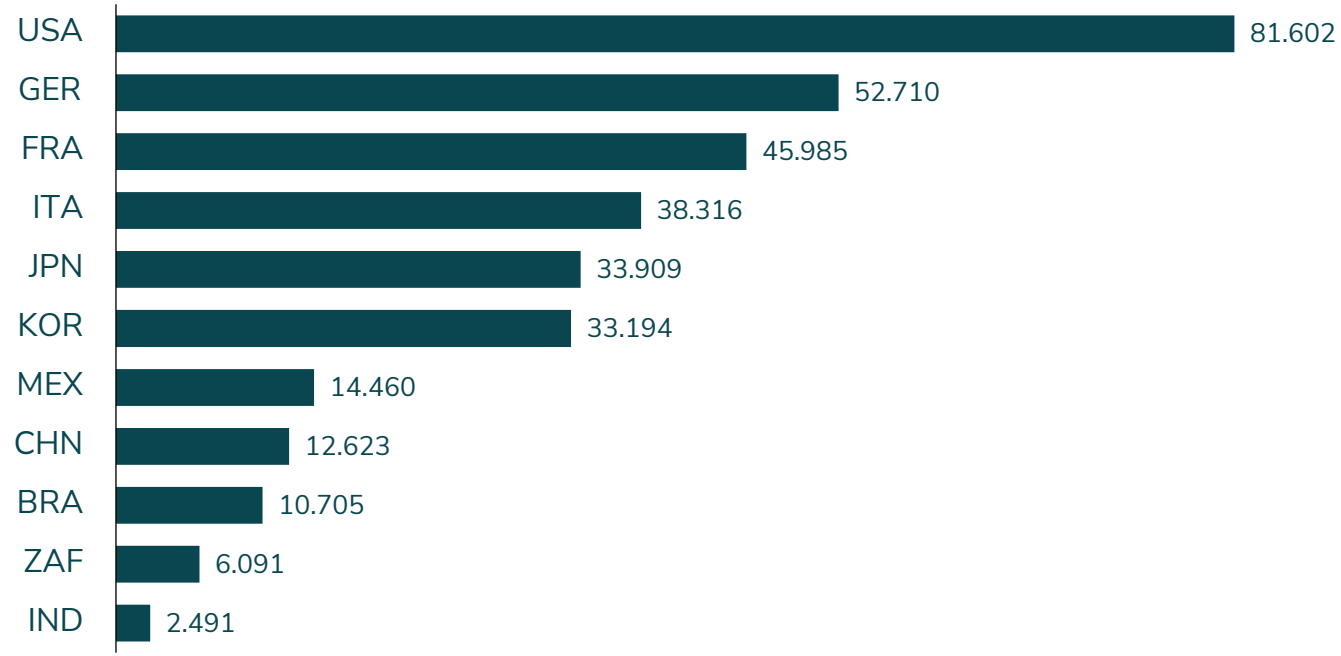
Comparative analysis of location factors

Comparative analysis of corporate strategies

Final assessment of the attractiveness of the location from a company perspective

Economic performance of the population by country

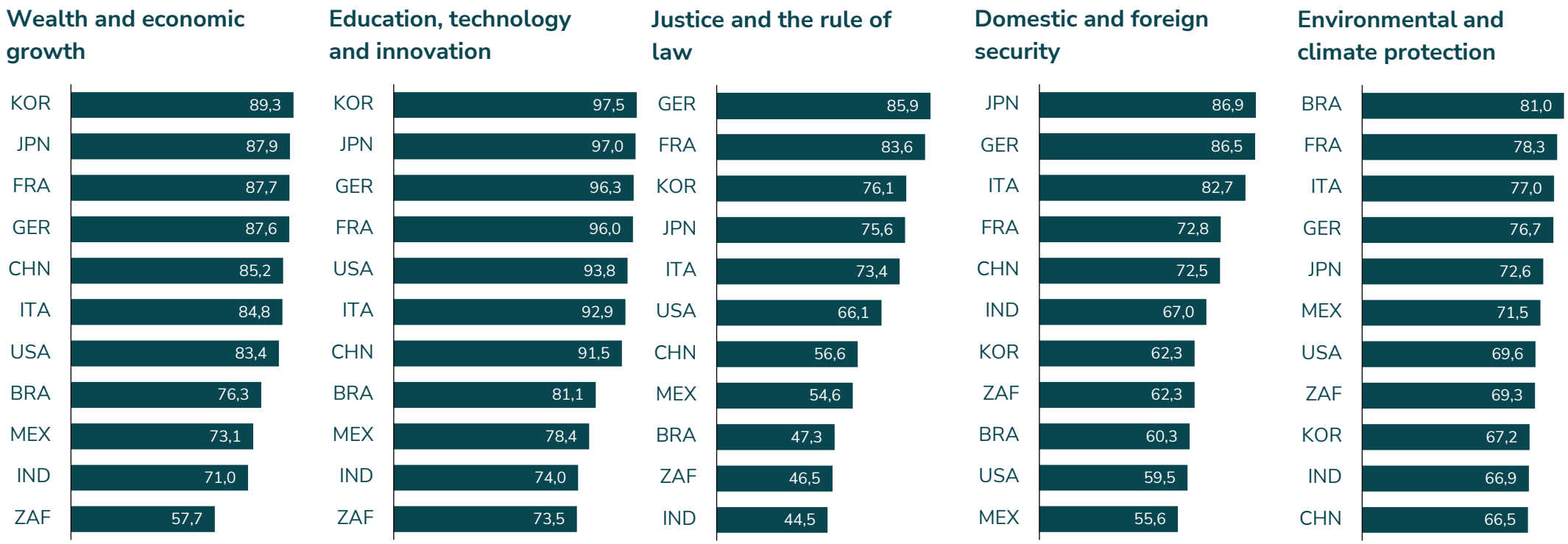
Gross domestic product (GDP) per capita
in USD (2023)



Gross domestic product (GDP) in USD billion (2023)	**Population size** million (2023)
27.348,0	335,1
4.456,1	84,5
3.030,9	65,9
2.254,9	58,9
4.212,9	124,2
1.712,8	51,6
1.874,5	129,6
17.794,8	1.409,7
2.173,7	203,1
377,8	62,0
3.558,1	1.428,6

Established economies such as the USA, Germany and France show a significantly higher economic output per capita in an international comparison

Progress on national targets by country



Emerging economies such as South Africa, Brazil, India and Mexico have significant development potential compared to the leading (automotive) industrialised nations.

Comparison of the relative attractiveness of location factors by country

Location factors from the PESTEL analysis

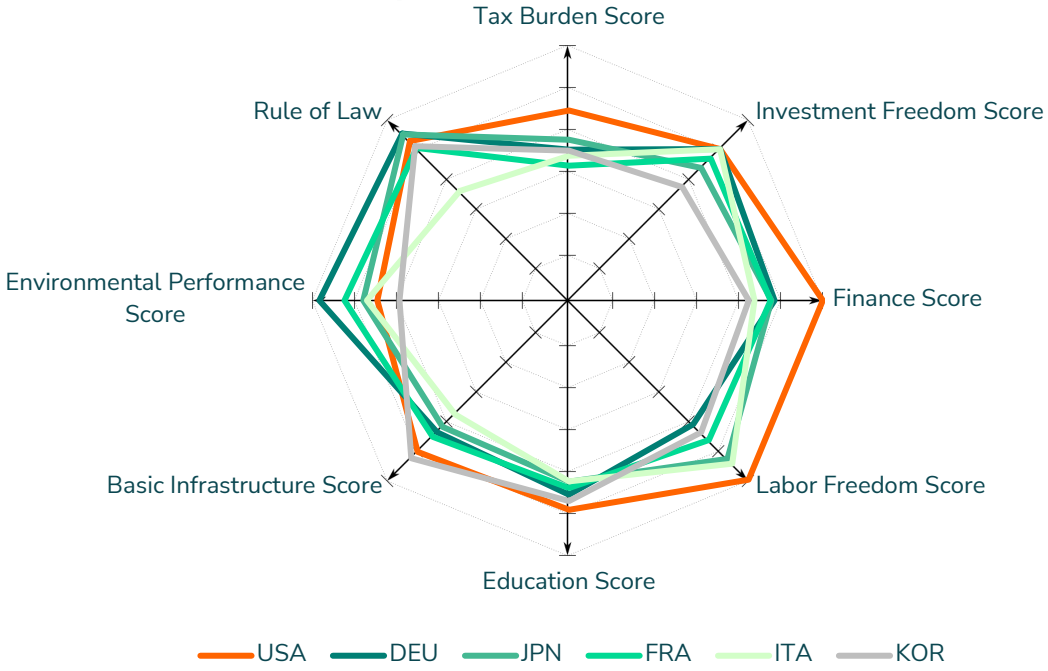
	Attractiveness of the tax system	Freedom of investment	Performance of the financial markets	Attractiveness of the labour market	Quality of the education system	Quality of the infrastructure	Environmental standards	Rule of law
Top performer (100%)	AE	LU	US	US	CH	QA	EE	FI
USA	75%	**84%**	**100%**	**100%**	**82%**	84%	76%	89%
China	69%	21%	79%	74%	75%	84%	47%	53%
Germany	59%	**84%**	81%	69%	77%	74%	**98%**	**93%**
Italy	57%	**84%**	73%	91%	71%	64%	80%	61%
France	53%	79%	79%	78%	74%	76%	88%	85%
Japan	63%	74%	80%	88%	72%	71%	81%	92%
Mexico	**76%**	79%	38%	75%	26%	52%	58%	24%
Brazil	70%	53%	52%	73%	23%	53%	70%	42%
India	74%	42%	78%	75%	30%	70%	36%	56%
South Korea	59%	63%	71%	74%	79%	**88%**	67%	86%
South Africa	65%	42%	58%	93%	37%	52%	56%	54%

Countries with the best results in each category

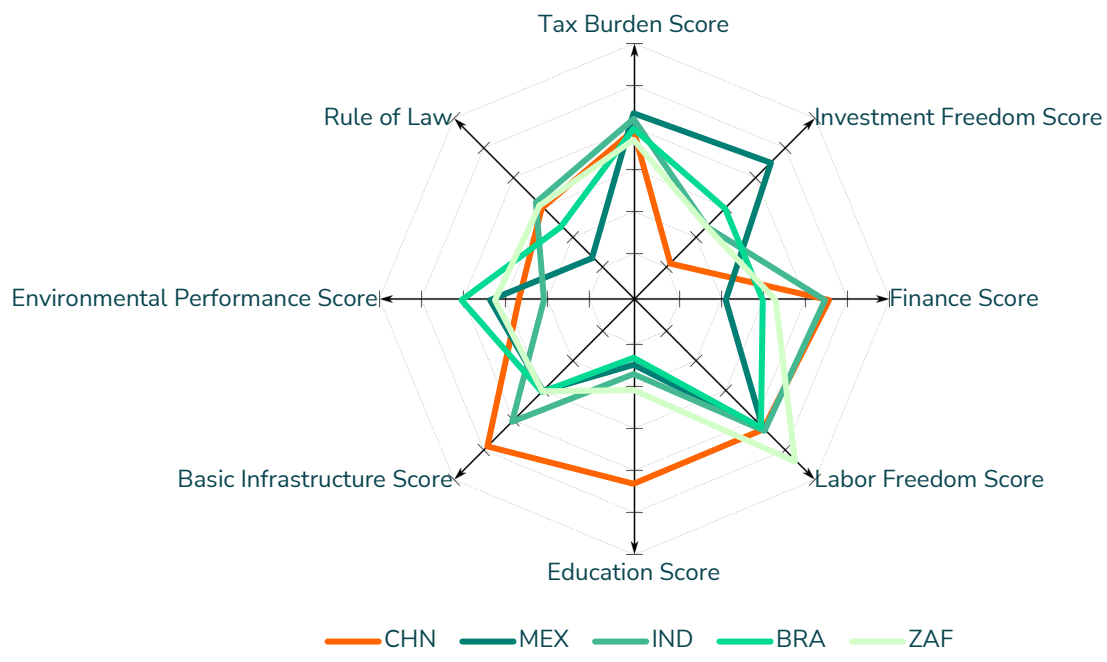
From a business perspective, the location factors are not optimal in any country in the world; the choice of location is always a compromise within a multi-criteria evaluation.

Comparison of the relative attractiveness of location factors by country

Group 1: Established economies



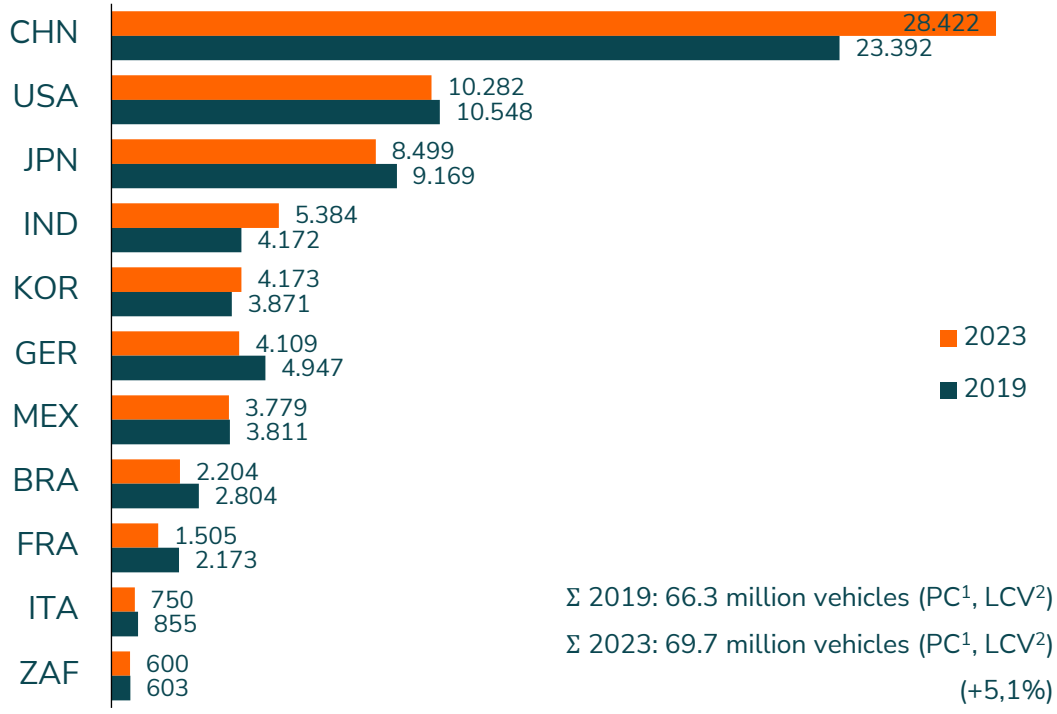
Group 2: Emerging economies



Industrialized countries such as the United States or Germany set the standard for many location factors, while emerging countries often have deficits. The extremely low rule of law in Mexico and the limited freedom of investment in China are particularly notable examples

Comparison of vehicle production and new registrations by country

Production per country (thousand)

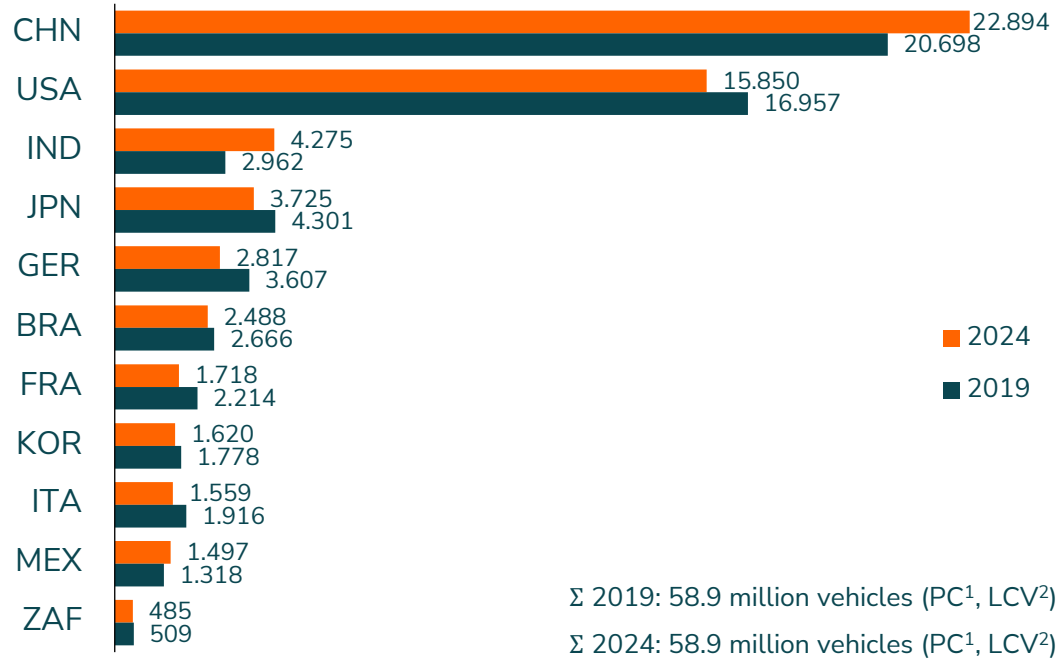


Σ 2019: 66.3 million vehicles (PC[1], LCV[2])

Σ 2023: 69.7 million vehicles (PC[1], LCV[2])

(+5,1%)

New registrations per country (thousand)



Σ 2019: 58.9 million vehicles (PC[1], LCV[2])

Σ 2024: 58.9 million vehicles (PC[1], LCV[2])

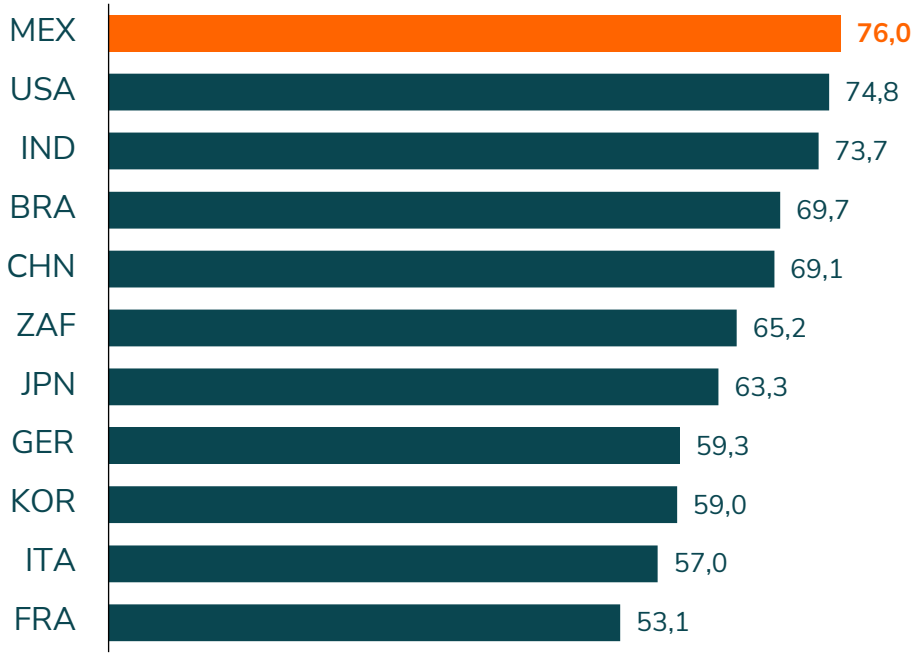
(+/-0%)

Despite the negative trend in automotive production and sales observed in most countries, this trend is being offset overall by growth in China and India.

(1) Passenger cars (2) Light commercial vehicles

Tax system by country

P E S T E L



Tax rate in % of GDP (2023)	**Information on the taxation of corporations**
17,7	30% corporation tax; strong concession for IMMEX[2] companies
25,2	21% Federal Corporate Tax + State Corporate Tax of up to 9.8%
11,6	30% corporate tax + profit, health & education surcharge
33,3	15+10% corporate tax + social security contribution; reform currently underway
20,1	25% corporate tax; reductions for industries and SEZs[1]
27,1	27% corporate tax; reductions for industries and SEZs[1]
34,4	23.2% Corporate tax + local taxes (up to 36.8% in total)
38,1	15% corporation tax + solidarity surcharge + trade tax
28,9	Up to 24% national corporate tax + local tax (up to 2.4%)
42,8	24% corporate tax + regional value added tax (≈3.9%)
43,8	25% corporate tax + trade tax

Companies find the tax and social system in European countries less attractive due to the high tax burden, whereas up-and-coming nations are becoming more attractive due to lower burdens.

(1) SEZ = Special Economic Zone (2) Incentive programme for production companies in Mexico

Subsidy policy by country

P E S T E L

	Overview of subsidy activities	Fiscal health (index points) 2024	Debt-equity ratio (% of GDP) 2022
USA	• USD 548 billion investment program for transport, internet and energy infrastructure (Infrastructure Investment and Jobs Act, 2021) • USD 370 billion investment program for the development and expansion of renewable energies and (climate) technologies (IRA[1], 2022)	**0,0**	**121,3**
CHN	• Total volume of at least EUR 221 billion in 2019; direct subsidies of EUR 35,3 billion for >99% of listed Chinese companies in 2022 (n = 5.260). companies in 2022 (n = 5.260), increase of 27% compared to 2019; technology companies with particularly high subsidies	8,1	77,0
GER	• Total volume of EUR 67,1 billion in 2024, of which 40,1% for the commercial sector and 9,2% for the transport sector • Climate and transformation fund in the amount of EUR 212 billion (2024-27) as a central funding program for national decarbonization	71,9	66,1
ITA	• EUR 5,8 billion for the transformation of the automotive industry between 2025 and 2030 (cuts of EUR 4,6 billion planned) • Promotion of domestic e-car production (planned abolition of incentives for e-cars from China or other countries)	**0,0**	**144,4**
FRA	• EUR 54 billion "France 2030" transformation program for the French economy (since 2021) • Reduction of the funding budget for e-mobility from EUR 1,5 billion in 2024 to EUR 1 billion in 2025	6,9	111,8
JPN	• Subsidies totaling 11 trillion JPY (USD 72 billion) to reduce electricity, gas and petrol prices • Provision of up to JPY 350 billion (USD 2,4 billion) for 12 national projects for the production of batteries for electric vehicles	**0,0**	**260,1**
MEX	• Tax deductions for the establishment of companies from eleven sectors, including the automotive industry (by decree) • > USD 3 billion in tax subsidies for car purchases and (partial) exemption from vehicle tax for selected sectors in 2024/25	66,9	54,1
BRA	• USD 47 billion investment program "PAC"[2] for strategic sectors such as infrastructure, mobility, technology and energy transition since 2023 • USD 13 billion investment program to accelerate innovation and new technologies, financed by the Development Bank	30,9	85,3
IND	• INR 259 billion (USD 3 bln.) support program to increase domestic automotive production and supply chains from April 2021 to March 2027 • INR 181 billion (USD 2 bln.) support program to increase domestic battery value creation with production starting by the end of 2029	6,9	81,0
KOR	• 366 trillion KRW (USD 260 bln.) in financial aid for domestic semiconductor companies in response to US trade policy under Donald Trump • 5 trillion KRW (USD 3,5 billion) in funding for R&D, including for semiconductors, artificial intelligence and quantum technology	91,6	53,8
ZAF	• Central development program "Automotive Production Development Program" to strengthen the automotive industry since 2013 • More than 150 projects with more than USD 4 billion in investments triggered between FY16/17 and Sep. 2024	19,7	71,1

Many nations are intensifying their support programs and subsidy activities with the aim of strengthening the domestic (automotive) industry without taking fiscal health directly into account.

(1) Inflation Reduction Act (2) Programa de Aceleração do Crescimento

Regulatory policy by country

P E S T E L

	Regulatory quality (percentile rank) 2023	Vehicle homologation	Other specifications
JPN	**92,5**	• Ministry of Land, Infrastructure and Transport (MLIT): Type approval • Strengthening the certification process for compliance with safety standards	• Financial support in the amount of JPY 50 thousand (USD 330) for cars manufactured with "green" steel
GER	92,0	• KBA: Determination of registration and safety standards for vehicles • CO2 emissions reduction from PC[1] and LCV[2] by 100% by 2035 compared to 2021	• Low emission zones with driving bans for vehicles with old emission standards • Occasional route-related and zonal transit restrictions for diesel vehicles
USA	90,6	• NHTSA: Safety standards for motor vehicles and road traffic • EPA: Setting emission limits for motor vehicles	• Local content clauses for the use of funding programs • E-car share of between 30% and 56% of total sales by 2032
FRA	85,4	• Ministère de l'Intérieur: type approval, authorisation, vehicle registration • Environmental tax on first registration depending on pollutant emissions	• At least 1 charging station for all new and renovated non-residential buildings with >20 parking spaces
KOR	84,9	• MoLIT: Establishment and enforcement of the "Korean Motor Vehicle Safety Standards" (KMVSS) in terms of safety, environmental compatibility and quality	• n/a
ITA	72,6	• Ministero delle Infrastrutture e dei Trasporti: Type approval, authorisation • Direzione Generale per la Motorizzazione: Homologation and vehicle testing	• Zonal driving bans for vehicles with certain emission standards (e.g. Milan, Rome)
IND	47,2	• MoRTH: Registration, traffic control, vehicle construction and driving licences • Automotive Industry Standards Committee: Safety and emission standards	• Linking tax concessions and other incentives to the fulfilment of local content requirements (e.g. as part of the PLI[3] program)
MEX	46,2	• SCT: Definition of safety standards for motor vehicles and road traffic • SEMARNAT: Determination of emission limits for motor vehicles	• IMMEX program: tax concessions, customs exemptions/reductions for companies that produce components at the location
ZAF	44,3	• NRCS: Definition of standards for vehicles and components • Emission standards based on Euro standards	• Local content clauses for the utilisation of subsidies • Special economic zones with special incentives, including reduced corporate tax
BRA	40,1	• SENATRAN: Setting standards for vehicle safety and emissions • INMETRO: Certification system to ensure product quality and safety	• Local content requirements (e.g. >40% of car parts from Mercosur and Mexico) • Incentives for local production, such as high import duties, including electric cars
CHN	38,7	• MIIT: Type approval, emission, safety and production standards • Certification system to obtain sales approval (also for passenger cars)	• 14th Five-Year Plan, goal includes technological leadership in key technologies • Part driving and purchase restrictions, license plate lotteries for combustion cars

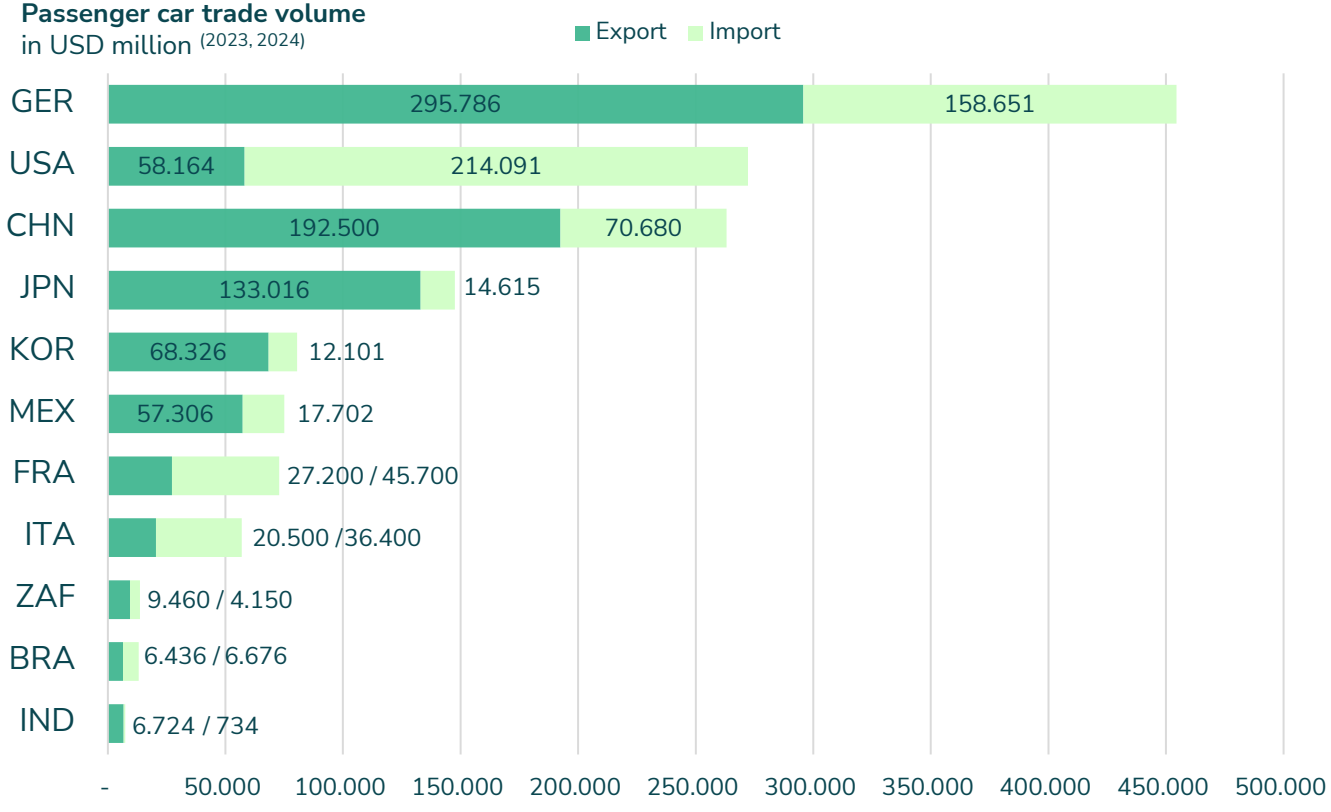
The regulatory frameworks differ only marginally, with developed industrialised countries tending to set more solid guidelines and enforce them more consistently.

(1) Passenger Car (2) Light Commercial Vehicle (3) Production Linked Incentive

Automotive industry added value by country

P **E** S T E L

Passenger car trade volume
in USD million (2023, 2024)



Trade volume in USD million (2023, 2024)	Employees per value-added stage[1]		
	Suppliers	Manufacturer	(After-)Sales
454.437	273.000	466.000	430.000
272.255	572.000	313.000	3.505.000
263.100	Together approx. 5,000,000		3.300.000
147.631	668.000	215.000	1.009.000
80.427	Together 529.000		1.711.000
75.008	885.381	101.195	n/a
72.900	Together 105.200		543.500
56.900	Together 167.500		418.700
13.610	66.524	36.690	176.370
13.112	269.940	76.476	752.944
7.458	781.625	187.866	1.490.000

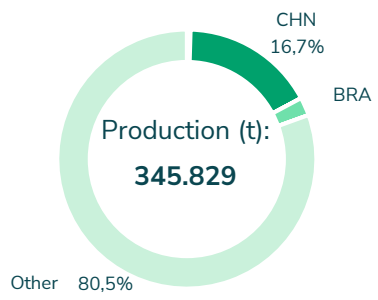
In manufacturing countries, automotive value creation is a central backbone for economic performance in foreign trade, creating numerous jobs at national level.

(1) Values from different years (2022-24); varying national definition of industrial sectors

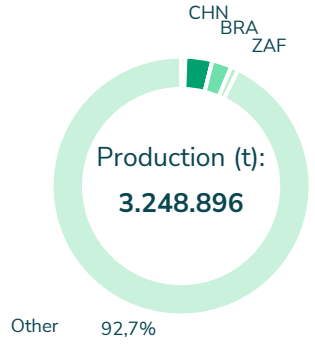
Resource availability by country

P E S T E L

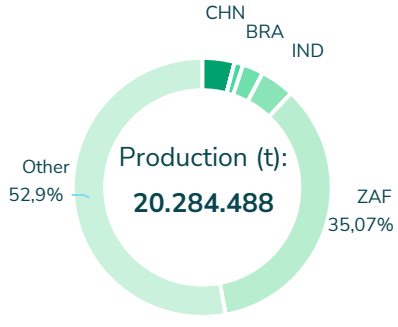
Lithium



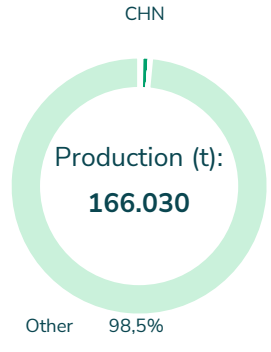
Nickel



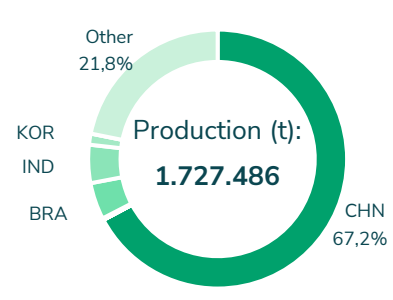
Manganese



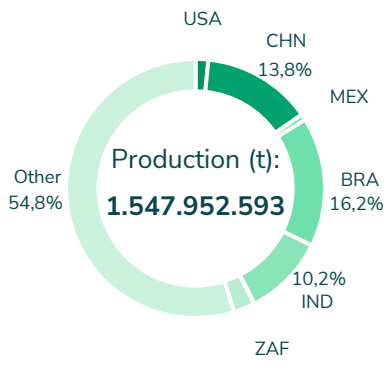
Cobalt



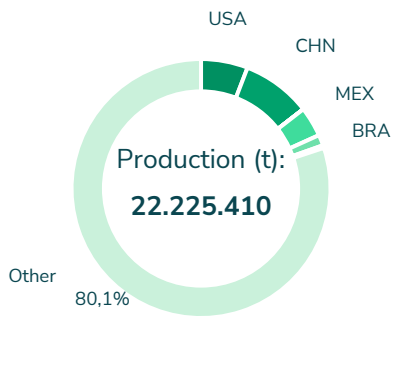
Graphite



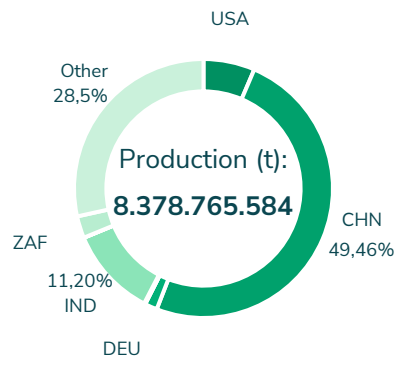
Iron



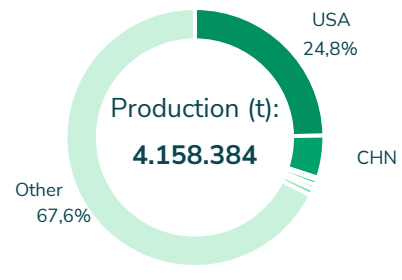
Cooper



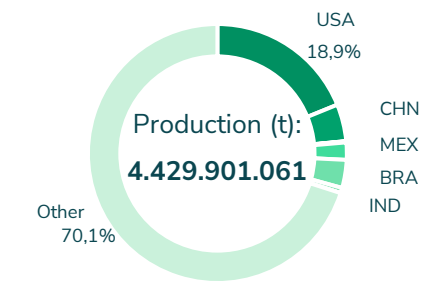
Coal[1]



Natural gas



Oil



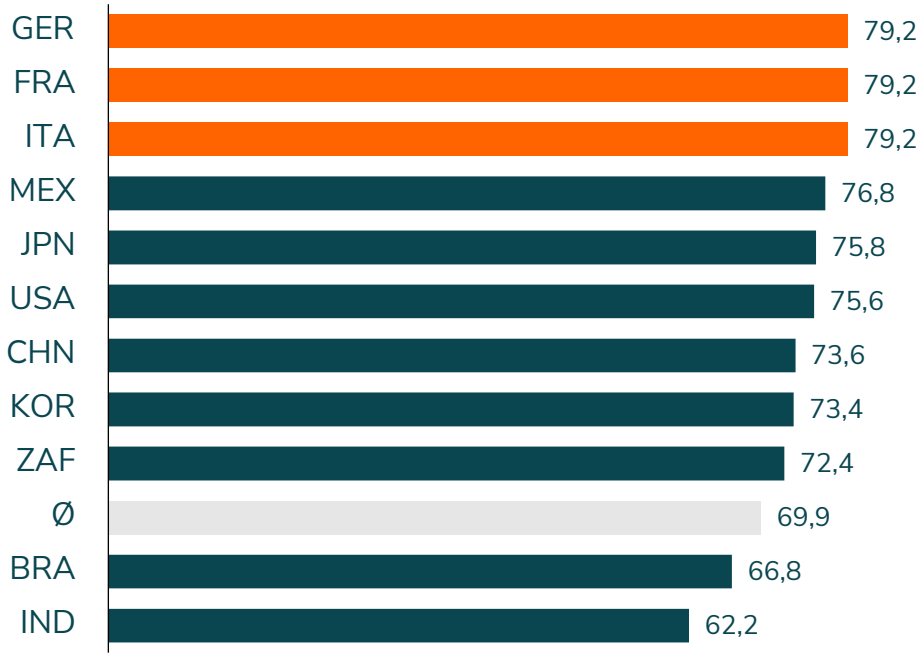
Emerging nations such as China & Brazil have the best access to necessary raw materials, making traditional industrialised countries dependent on supplies from other countries.

(1) Steam coal, coking coal and lignite

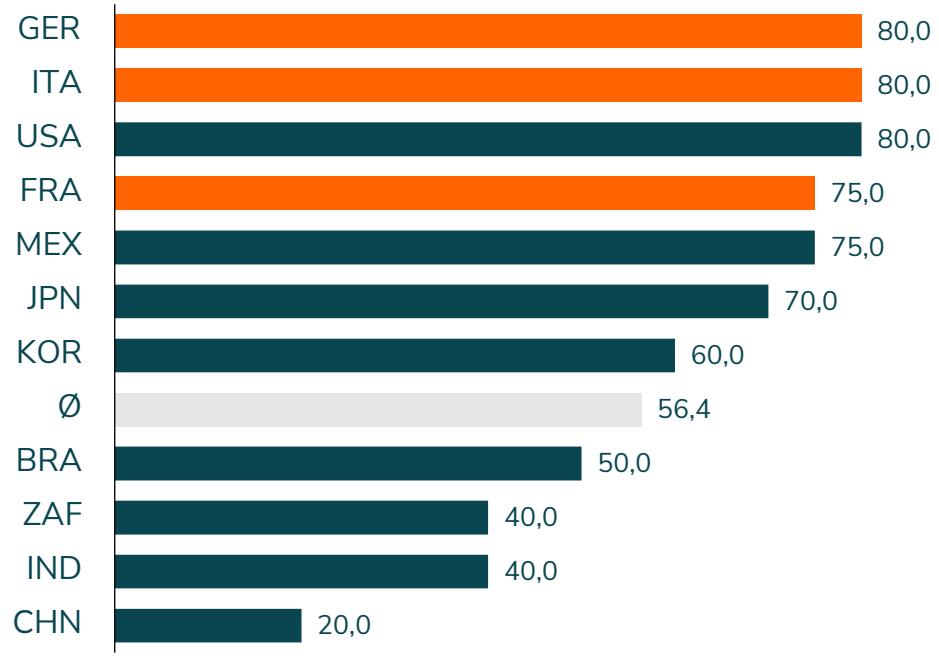
Market proximity/regulation by country

P E S T E L

Freedom of trade (Index)



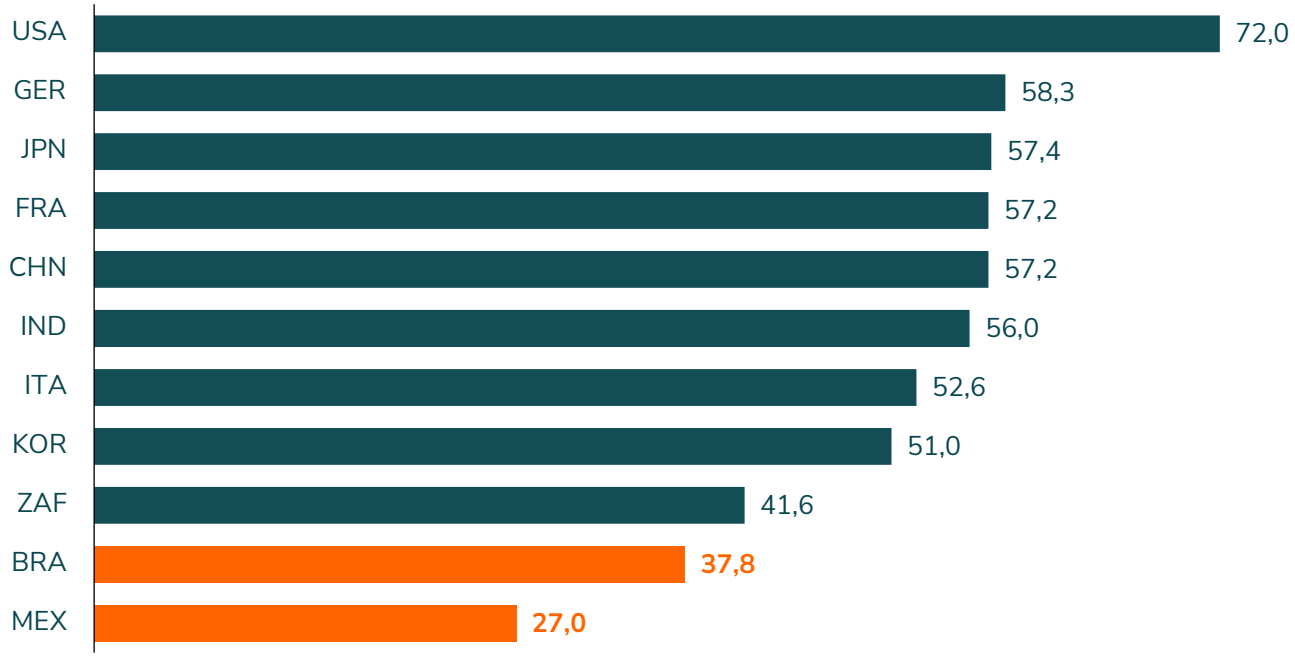
Investment freedom (Index)



From a business perspective, European countries offer the greatest freedom in the trade of goods and the inflow and outflow of investment capital.

Capital availability by country

P **E** S T E L



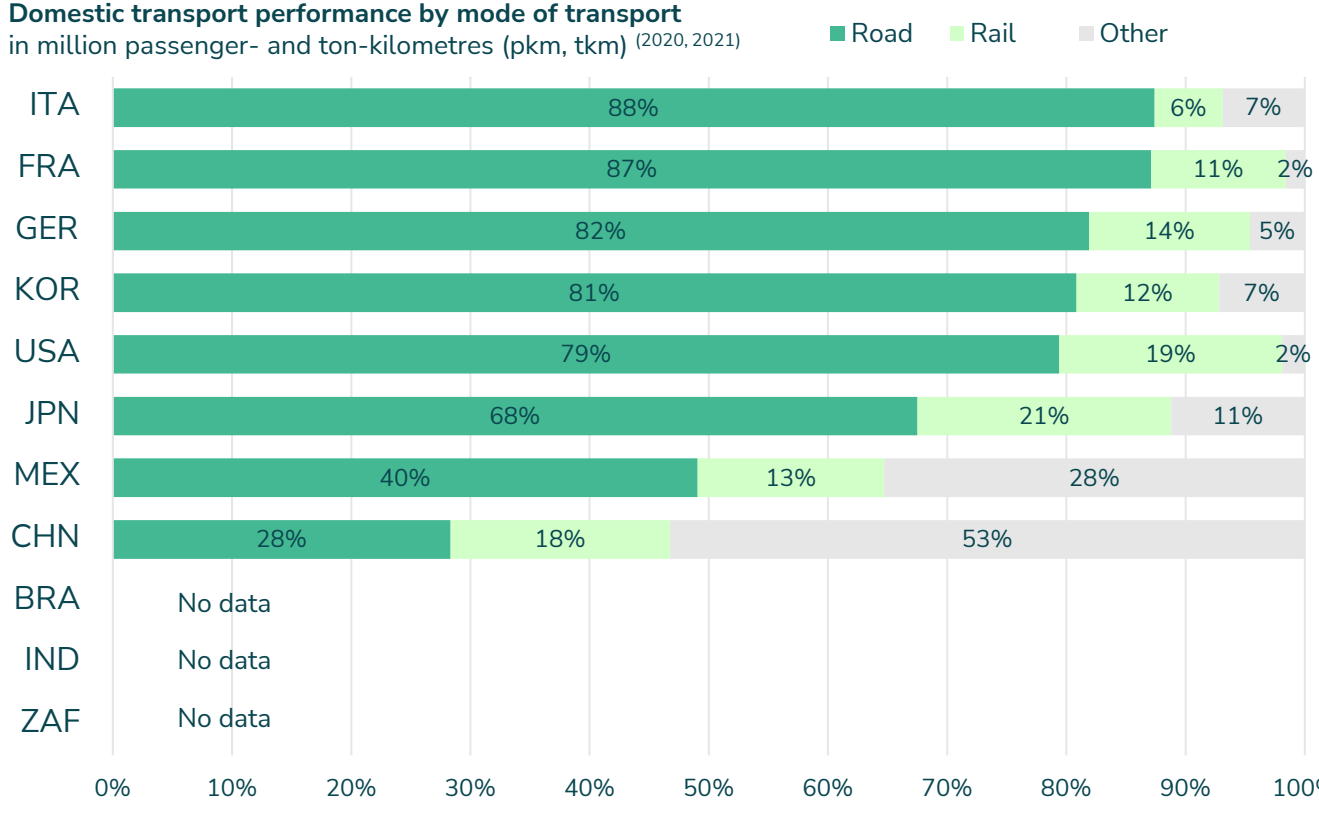
Market capitalisation in % of GDP (2022)	**Venture capital investments** in % of GDP (2023)
155,0	0,535
45,4	0,175
126,4	0,098
134,1	0,155
64,1	0,239
107,5	0,269
32,1	0,056
98,2	0,490
288,0	0,145
40,7	0,081
31,0	0,056

Emerging nations such as Mexico or Brazil have limited capital availability due to less developed banks and capital markets, among other things, which restricts growth and innovation in the industry.

Transport volume by country

P E **S** T E L

Domestic transport performance by mode of transport
in million passenger- and ton-kilometres (pkm, tkm) (2020, 2021)



Domestic transport capacity in million pkm, tkm (2020, 2021)	**Degree of motorisation** in cars per 1.000 pop. (2022, 2023)
917.803	694
1.084.827	575
1.396.391	581
622.182	428
12.079.240	772
1.444.294	501
737.379	293
27.757.700	209
n/a	304
n/a	35
n/a	126

Road transport, accompanied by an often-high density of cars, accounts for the majority of transport volumes and thus ensures national passenger mobility and the supply of goods.

Labour market freedom by country

P E **S** T E L

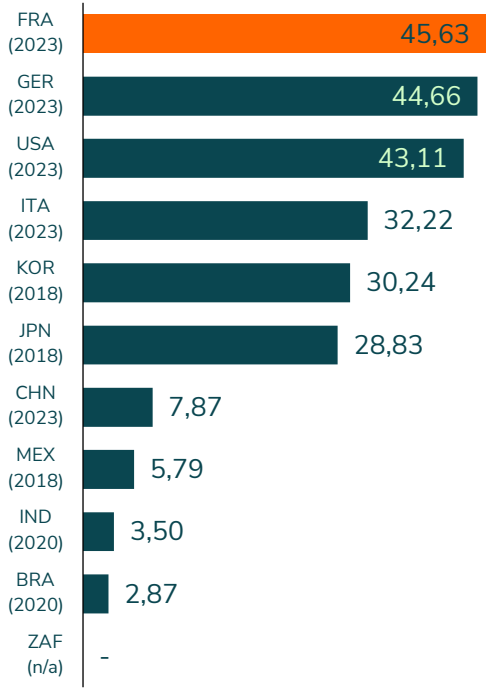
	Labour market freedom (index points) 2024	... regarding working time regulations	... regarding holiday entitlement	... regarding protection against dismissal
USA	**77,7**	No maximum daily or weekly working hours, but entitlement to overtime pay	No fixed minimum holiday entitlement; in practice staggered according to affiliation	No comprehensive protection, but partial obligation to provide information in good time
ZAF	72,1	High contribution of informal work; max. 9h/day or 45h/week; max. 3h/day or 10h/week overtime	At least 21 days per year with >24 hours of work per month; 12 public holidays	Justified ordinary and extraordinary cancellation possible; notice period depending on job (1-4 weeks)
ITA	70,7	High contribution of informal work; regular working hours of 40h/week; overtime permitted, <8h/w	4 weeks minimum holiday per year; public holidays	Cancellation only possible for good or just cause
JPN	68,6	Regular working hours of 40 h/week; entitlement to overtime pay	Staggered minimum holiday between 10 and 20 days depending on length of service	Cancellation only for good cause; at least 30 days notice period
FRA	60,5	Statutory working time of 35 h/w; maximum 48 h/w; break time of at least 20 min. after 6 hours of work	30 days minimum holiday with a 6-day week; 11 national public holidays	Termination only for "actual and serious cause"; multi-stage termination procedure for each reason
IND	58,4	Between 40h and 48h max. working time per week; overtime permitted	1 day of holiday for every 20 days worked in previous year for employees in the manufacturing industry	Authorization from the competent authority required for industrial workers
MEX	58,0	Maximum working hours 7-8 h/day depending on shift type; overtime premium of up to 200%	Statutory minimum holiday depending on affiliation; no statutory holiday in the first year of employment	Cancellation only possible for good cause; entitlement to compensation
CHN	57,8	Regular 40h/w (8h/day); max. 36 hours overtime per month; exceptions for some sectors (e.g. high-tech)	At least 5 days minimum holiday per period of employment; public holidays (e.g. Chinese New Year)	Obligation to give reasons for termination, deadlines usually 30 days; partial obligation to pay severance pay
KOR	57,2	Regular working hours of 40 h/week; up to 12 hours of overtime per week; overtime premium	15 days after >80% of the minimum annual working time; increase by 2 days every 2 years up to 25 days	Disciplinary measures or dismissals depending on the labour agreement and contract; 30-day notice period
BRA	56,9	Max. working time of 8h/day and 44h/week; overtime allowance; break of 1h for >6h of work	Statutory holiday entitlement of 30 consecutive days p.a.; split into up to 3 periods	Notice period between 30 and 90 days (depending on length of service)
GER	53,7	Regular working hours of 8 h/day, break time of at least 30 minutes after 6 hours of work; overtime pay	20 days minimum holiday with a 5-day week; public holidays	Termination generally only for personal, behavioural or operational reasons with at least 4 weeks' notice

The “At-Will Employment" principle in the USA gives companies the greatest possible freedom to organize employment contracts at the expense of employees' job security.

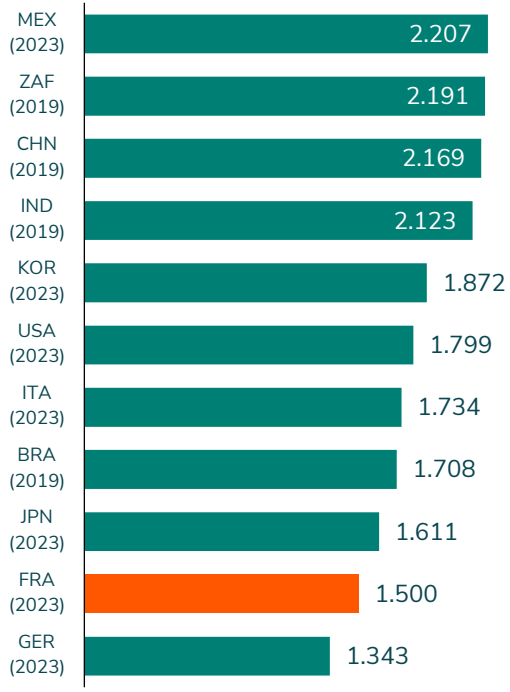
Labour market indicators by country

P E **S** T E L

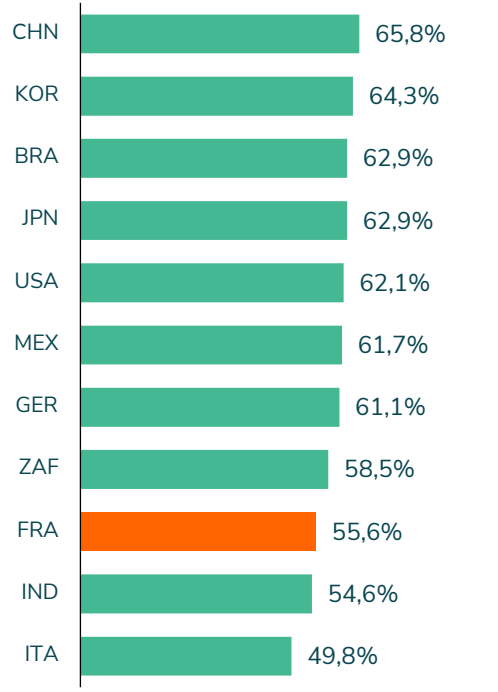
Average labour costs
in USD per hour (2018, 2020, 2023)



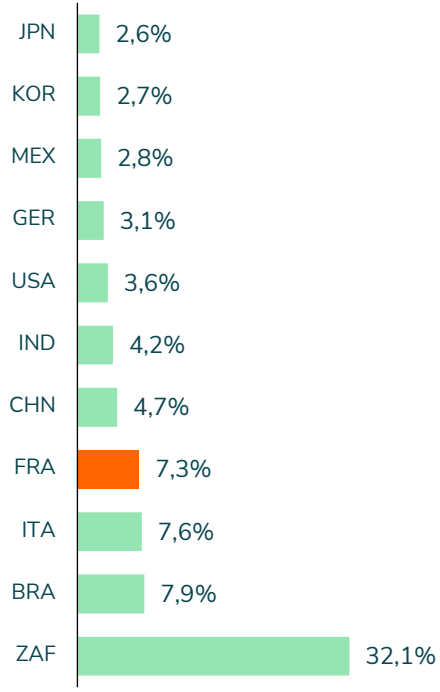
Average working time
in hours per year (2019, 2023)



Labour force participation rate
in % of the population aged over 15 (2023)



Unemployment rate
in % of the labour force (2023)

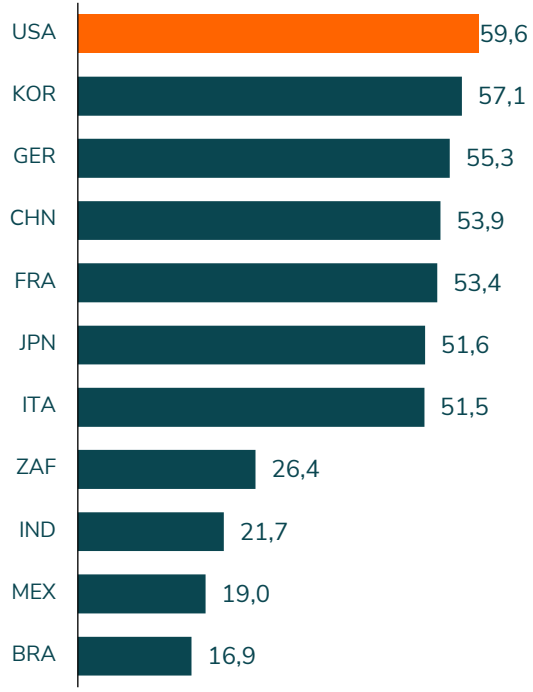


High-cost countries tend to have lower working hours, even though there is almost full employment, while low-cost countries work above average hours with higher job insecurity.

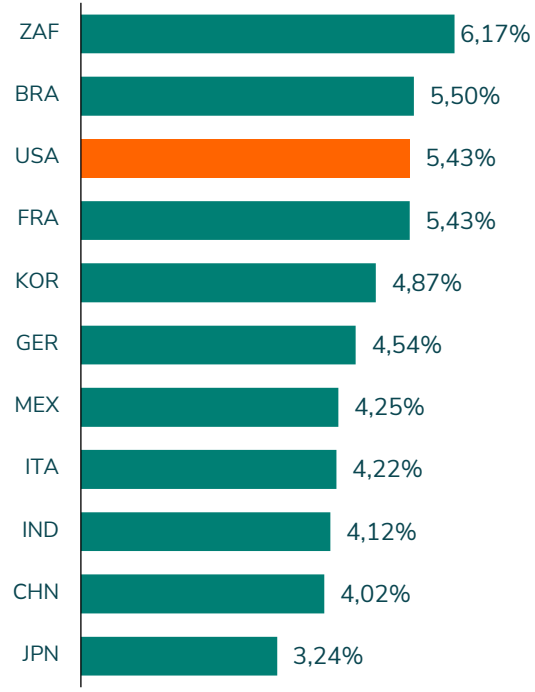
Education indicators by country

P E **S** T E L

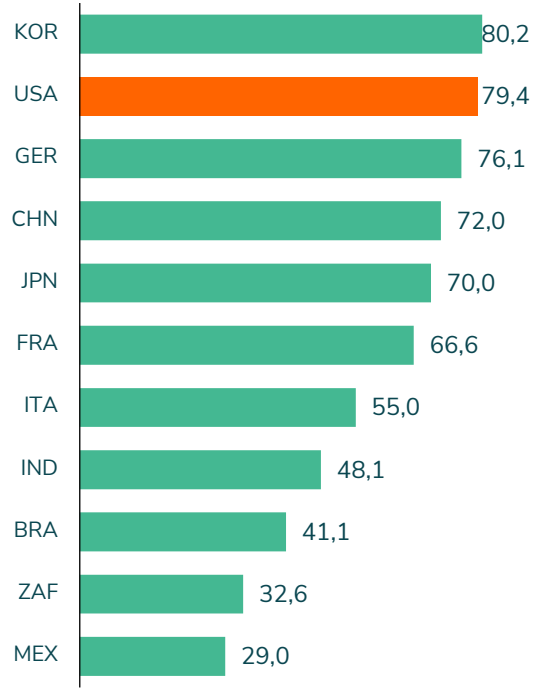
Quality of the education system
in index points (2024)



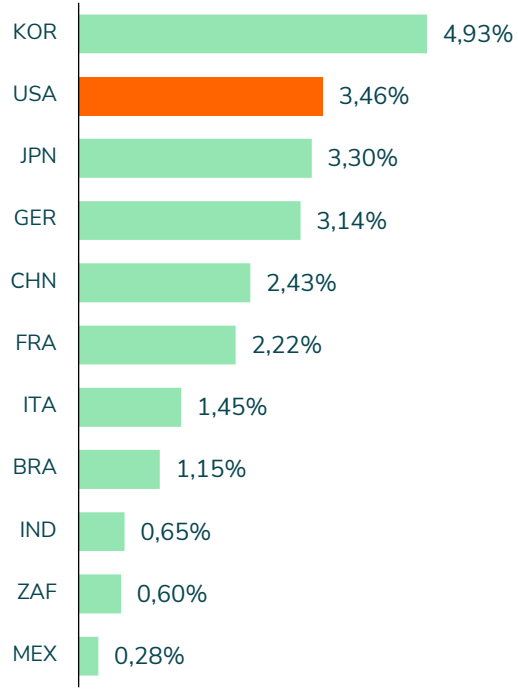
Public investment in education
in % of GDP (2021, 2022)



Performance of the science system
in index points (2024)



R&D expenditure ratio
in % of GDP (2020, 2021)

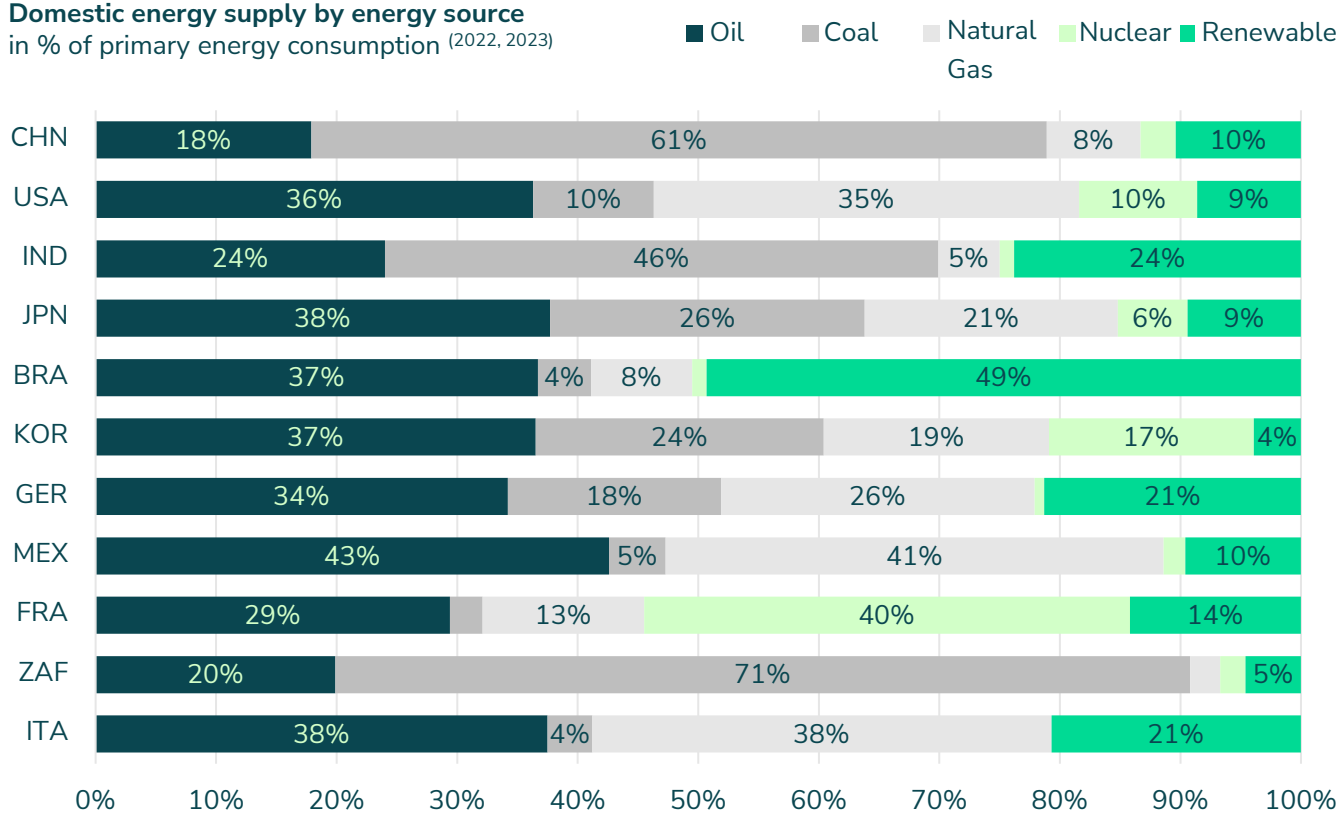


High-cost countries typically have a strong education and science system, which they use to recruit qualified labour for the industrial and service sectors.

Energy supply by country

P E S **T** E L

Domestic energy supply by energy source
in % of primary energy consumption (2022, 2023)



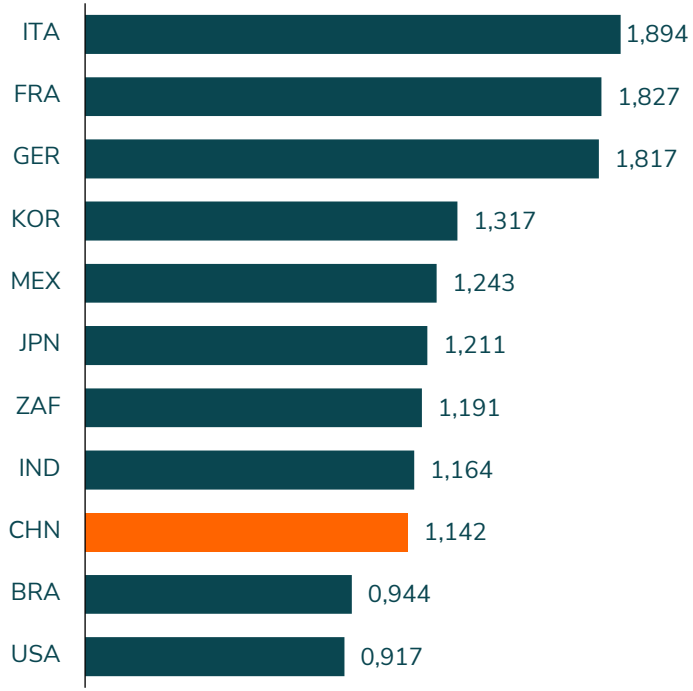
Energy consumption / domestic production in TWh (2022, 2023)	**Production/consumption ratio** (%)	**Energy security** in index points (2023)
46.569 / 39.330	84,5	66,3
27.429 / 30.137	109,9	72,7
10.838 / 7.725	71,3	61,7
4.834 / 666	13,8	61,1
3.854 / 4.209	109,2	73,1
3.454 / 691	20,0	62,2
3.165 / 967	30,6	72,9
2.348 / 1.878	80,0	53,4
1.640 / 1.370	83,5	69,4
1.348 / 1.608	119,3	54,5
1.324 / 384	29,0	66,4

The fossil fuels oil, coal and natural gas account for an average of around 77% of domestic primary energy consumption, although the security of supply fluctuates greatly.

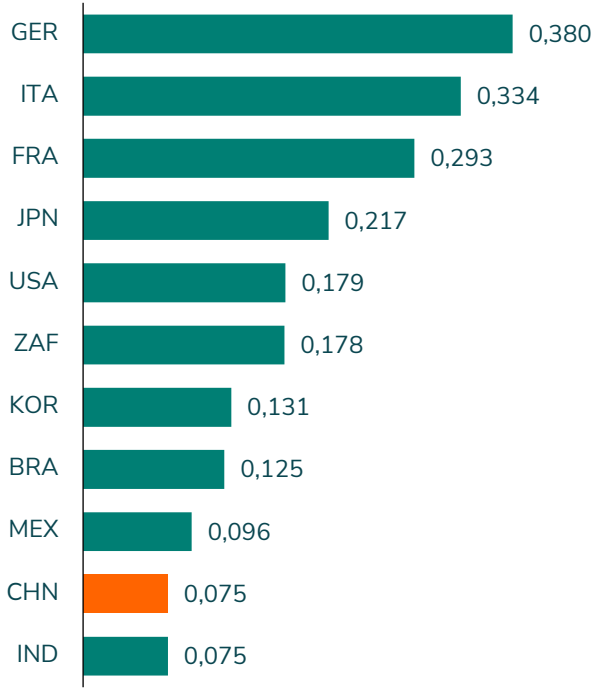
Energy prices by country

P E S **T** E L

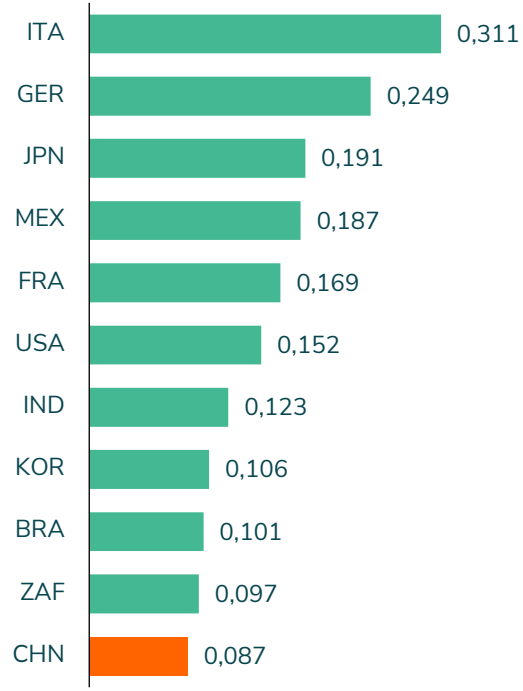
Petrol price
in USD per litre (2025)



Electricity price for households[1]
in USD per kWh (2024)



Electricity price for companies[2]
in USD per kWh (2024)



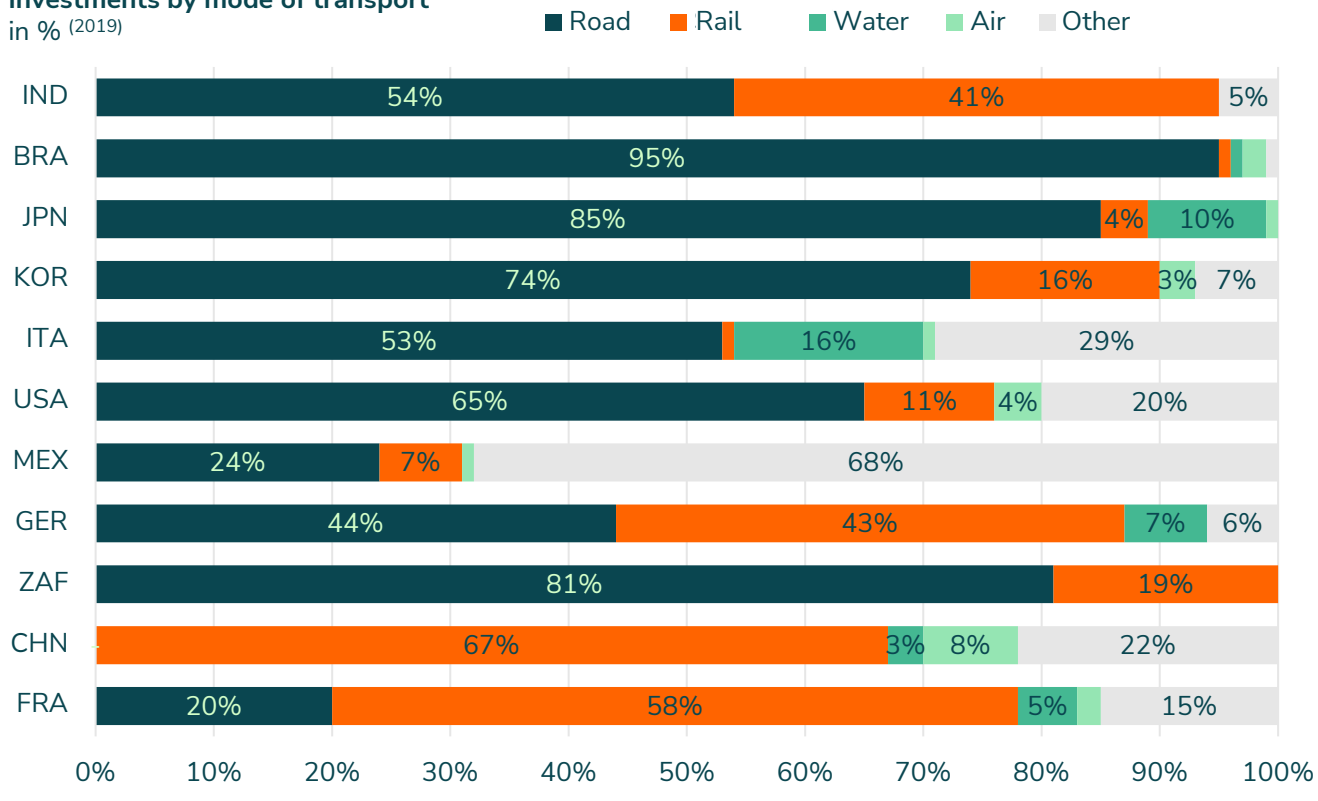
European (automotive) countries have higher energy costs in international comparison, both for private households and for commercial enterprises.

(1) For average annual consumption (2) For 1,000,000 kWh annual consumption

Infrastructure investment and quality by country

P E S **T** E L

Investments by mode of transport
in % (2019)



Transport infrastructure expenditure in % of GDP (2019)	**Quality of basic infrastructure** in index points (2024)
3,51%	44,9
1,65%	33,9
1,41%	45,3
1,15%	56,5
1,13%	40,8
1,01%	54,2
0,98%	33,5
0,77%	47,2
0,74%	33,7
0,49%(1)	54,0
0,26%(1)	48,8

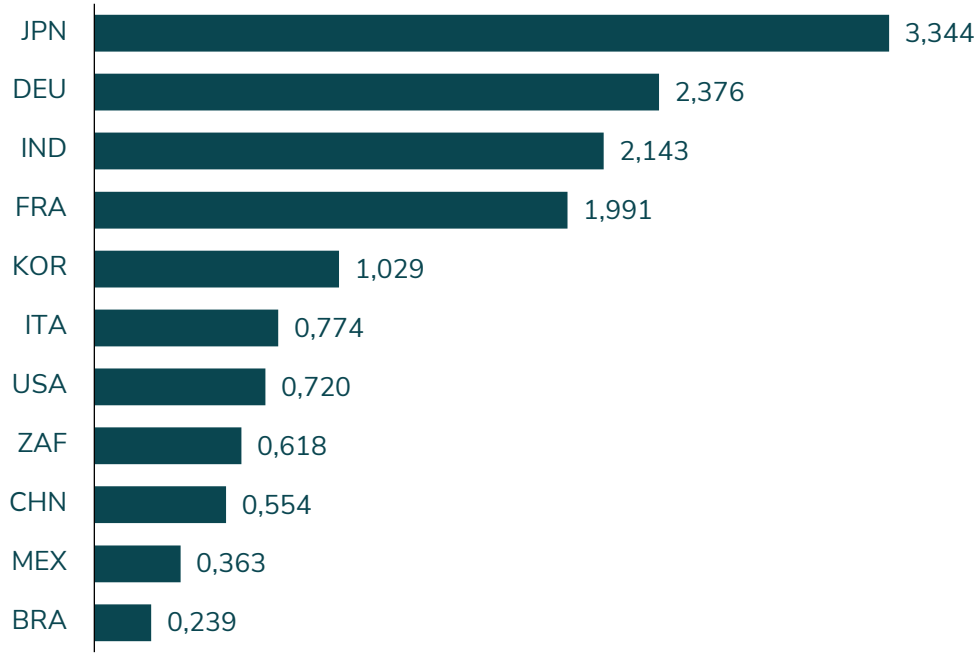
In most countries, public investment in transport infrastructure is mainly channelled into road transport, which remains the central pillar of the transport system.

(1) Information on investments in transport infrastructure incomplete

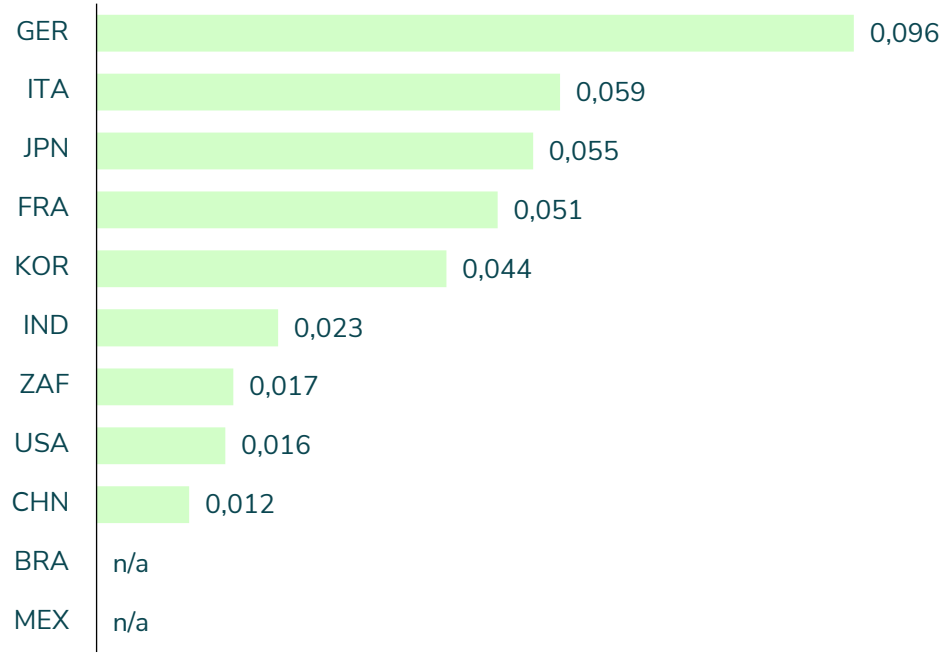
Road and rail infrastructure density by country

P E S **T** E L

Network density of road infrastructure[1]
in km per km² (2020, 2021, 2022, 2024)



Network density of the rail infrastructure[2]
in km per km² (2011, 2021)



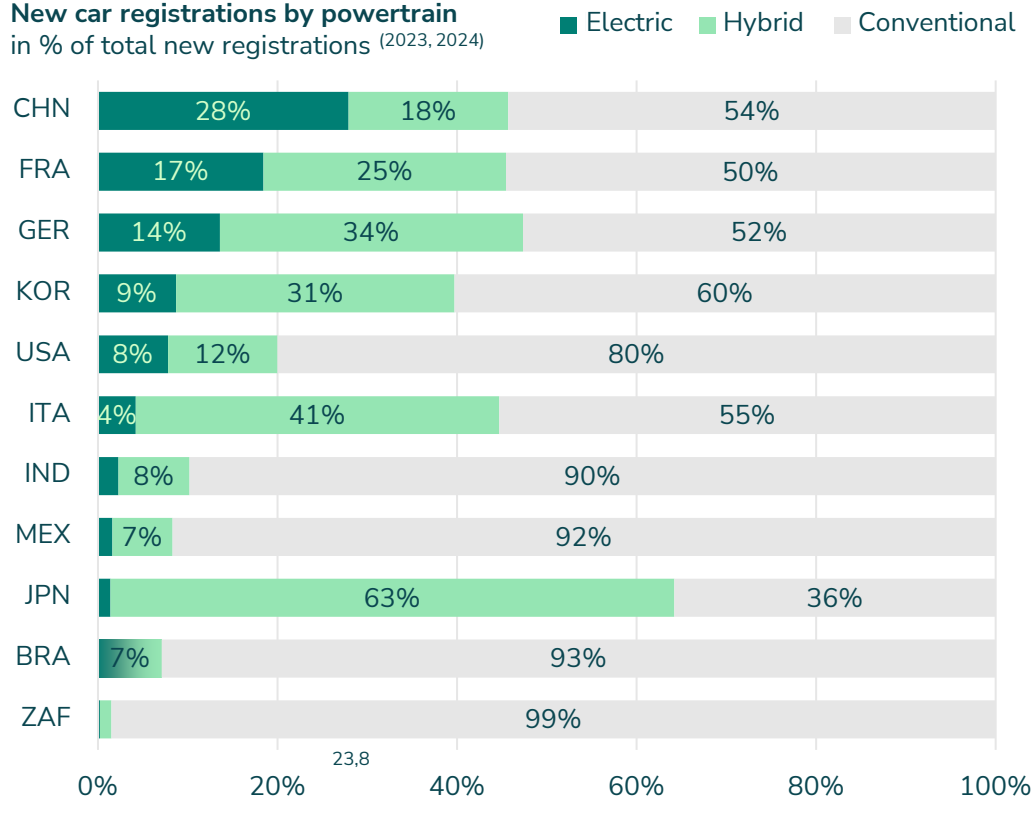
The significantly higher density of road networks compared to rail networks in all the countries analysed underlines the central role of the automobile and the industry's dependence on road transport.

(1) Sum of paved and unpaved road sections (2) Sum of railway lines available for train traffic, regardless of the number of parallel tracks

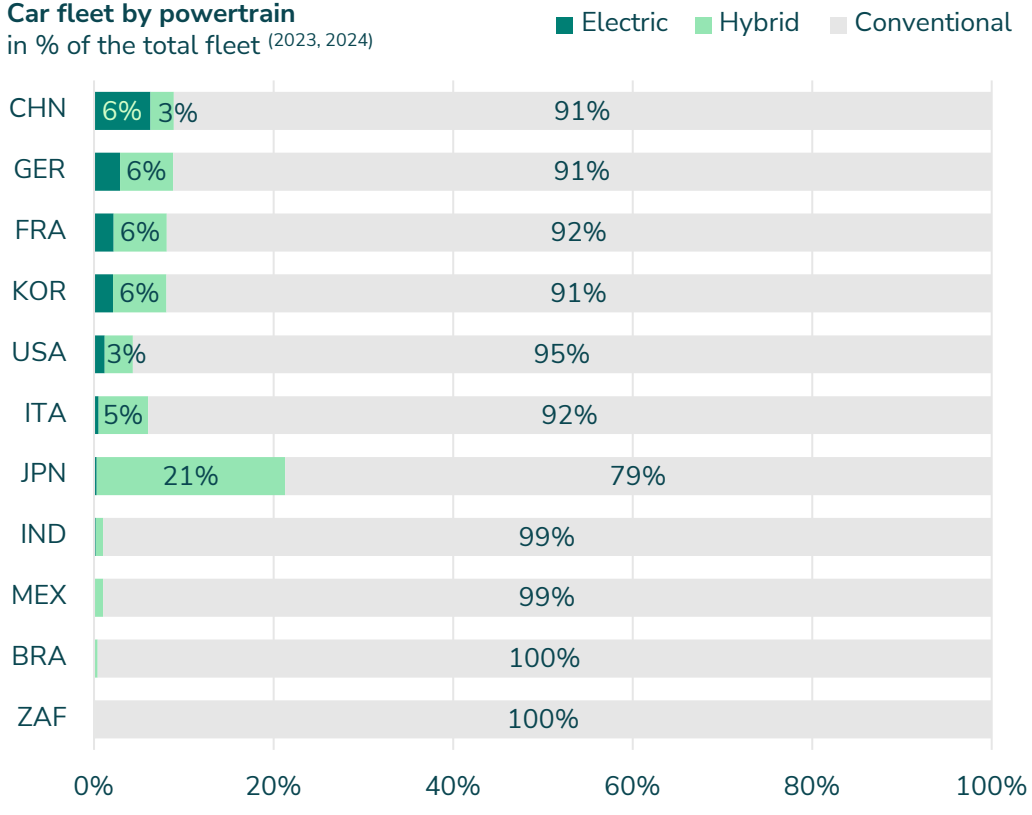
Car drive types by country

P E S **T** E L

New car registrations by powertrain
in % of total new registrations (2023, 2024)



Car fleet by powertrain
in % of the total fleet (2023, 2024)

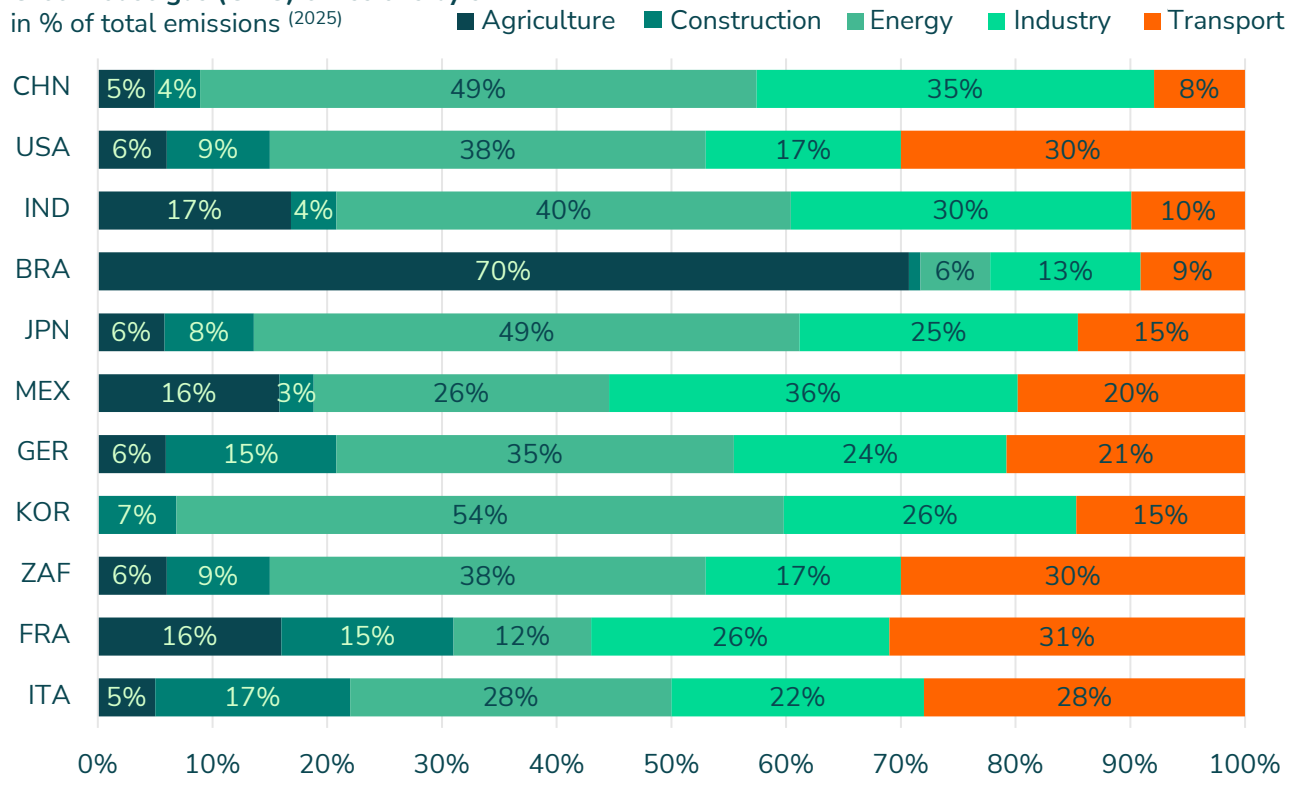


BEVs are slowly gaining in importance, but in most countries the predominant electrified solutions are still hybrid vehicles. The dominance of combustion engines remains.

Greenhouse gas emissions (GHG) by country

P E S T **E** L

Greenhouse gas (GHG) emissions by sector
in % of total emissions (2025)



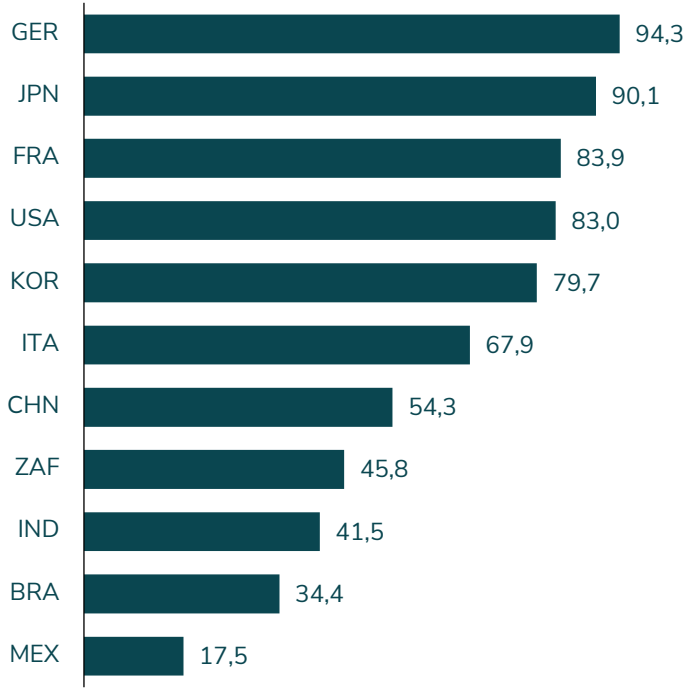
GHG emissions (total) in Gt of CO2 eq. (2025)	**GHG emissions / capita** in tones of CO2 eq. 2025)	**Climate neutrality** Year
15,6	10,9	2060
5,6	16,4	2050
4,3	3,0	2070
2,7	12,2	2050
1,2	10,0	2050
0,8	5,8	2050
0,7	9,4	2045
0,7	13,8	2050
0,6	9,5	2050
0,4	6,0	2050
0,4	6,3	2050

Energy, industry and transport are the main sources of emissions in leading and emerging nations, partly due to the supply situation and slow transformation to electric solutions.

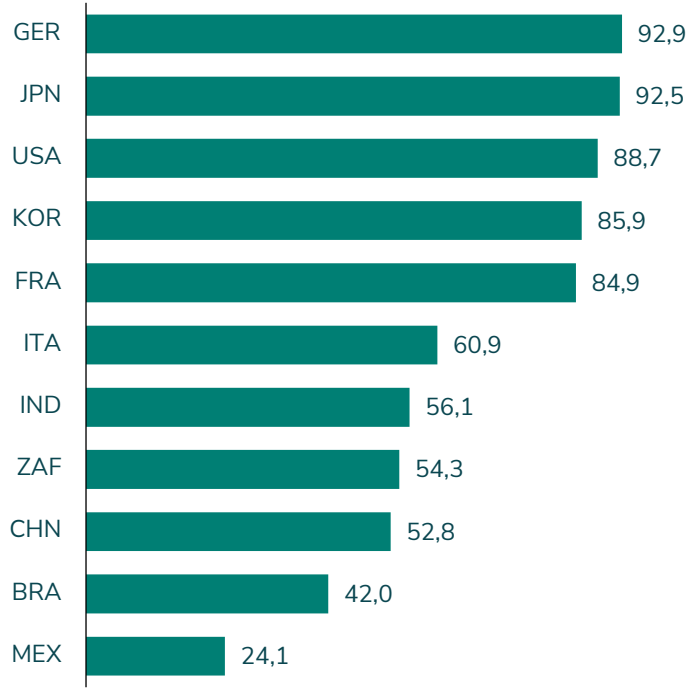
Legal systems by country

P E S T E **L**

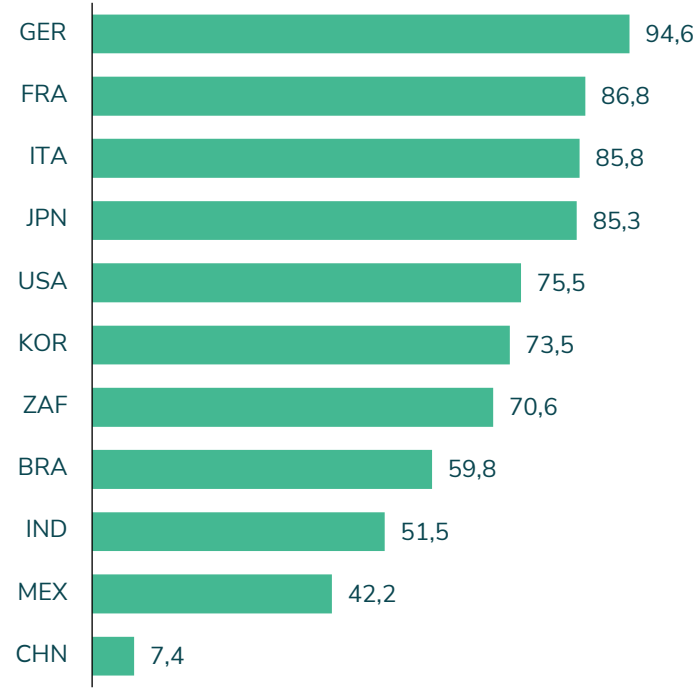
Corruption prevention
as percentile rank (2023)



Rule of law
as percentile rank (2023)



Freedom of speech and expression
as percentile rank (2023)



In an international comparison of leading automotive nations, Germany is the benchmark when it comes to combating corruption, the rule of law and freedom of expression.

Regulatory framework for connected and autonomous vehicles (CAV)

P E S T E **L**

	Legal framework for automated and connected driving (CAV)	Evaluation
GER	• First country in the world to regulate the rights and obligations of drivers using automated driving functions; regulatory framework for the use of autonomous vehicles on public roads since 2021; adoption of EU regulations on safety requirements, cybersecurity and technical standards for automated driving systems	- Extensive +
FRA	• Progressive legal framework of the EU and G7 countries that enables the use of automated vehicles and mobility services, including driverless systems without a driver on board (under supervision and on predefined routes); 100 to 500 automated passenger transport services without drivers by 2030	- Extensive +
KOR	• Consideration of autonomous driving since 2017, including safety standards, insurance guidelines and real driving tests; currently several pilot zones for up to level 4 • Investment of USD 2,8 billion to adapt the infrastructure to autonomous and connected driving; 50% share of Level 4/5 vehicles by 2035	- Extensive +
JPN	• Expansion of the legal framework to facilitate the introduction of autonomous driving systems in road traffic, including authorisation for Level 4 automated driving under certain conditions on the road, safety standards and guidelines and criteria for public road tests; target: Level 4 systems at > 100 locations by 2027	- Extensive +
CHN	• Safety guidelines for the use of autonomous vehicles on public roads since 2023 • Authorization for autonomous driving, but only with a driver or unmanned in designated areas with a safety driver who monitors the system remotely	- Extensive +
USA	• No nationwide legal framework for fully automated driving; some states allow conditional automated driving, but some only allow tests • Inconsistent regulation: the federal government sets safety standards through the NHTSA, while the states are responsible for licensing, insurance and traffic laws.	- Extensive +
ITA	• Lack of regulations on autonomous driving or autonomous vehicles; partial authorisation for autonomous driving tests • Adoption of EU regulations on safety requirements, cyber security and technical standards for automated driving systems	- Extensive +
BRA	• Currently no specific legal framework for autonomous and connected vehicles; however, proposed legislation on technical requirements, driving criteria and liability provisions • New regulation to facilitate access to automated driving technologies	- Extensive +
IND	• Currently no specific legal framework for autonomous and connected vehicles, as well as plans for the near future; however, pilot projects in early development phases • Lack of suitable infrastructure as a major obstacle to the promotion of autonomous driving	- Extensive +
MEX	• Currently no specific legal framework for autonomous and connected vehicles • Regulations on advanced driver assistance systems for new cars from 2025	- Extensive +
ZAF	• No legal framework and no authorization for autonomous vehicles; government announcement to push ahead with the development of such regulations • Poor condition of road and communication infrastructure	- Extensive +

The status and level of detail of the legal framework for CAVs varies considerably from country to country, with EU countries scoring best overall.

Success Story #1: Creating a binding framework for CAV

Initial situation

- **Within the EU regulatory system** for autonomous driving, reducing flexibility in possible CAV regulations
- **No CAV "Big Tech" players** in the region
- **Good digital infrastructure** in place

- **Strong digital infrastructure** in place
- **Close cooperation between the South Korean automotive industry and the government** characterizes the regulation of autonomous driving systems

Strategic solution approach

- Progressive, **stable regulation** with avoidance of overregulation
- First country with a **nationwide legal framework** that enables the operation of level 4 autonomous vehicles on public roads
- Access to a **wide range of test corridors** and pilot projects

- Worldwide **1st safety standards for commercialisation of CAVs Level 3**
- Establishment of **34 test zones for practical trials**
- Regular **updating of regulations**

Achievements

- **Clear regulations enable a predictable market launch**
- By creating a clear regulatory framework at an early stage, both countries offer a **stable environment for investors**
- **Flexible application options** expand business models
- Creation of a **stable basis for scaling and acceptance** through consistent guidelines
- Active promotion of research and testing **supports innovation and rapid market maturity**

Transferability to other regions

- In some countries, such as the USA, **nationwide regulation is more difficult due to the more divided government structure**
- A **strong legal framework will not have the desired effect** if the infrastructure and rule of law are inadequate.

Success Story #2: Commercialisation approaches for autonomous driving

Initial situation

- **No national regulations**, states develop their own regulations. Non-uniformity.
- **Leading the way in the development and implementation**
- The country has a **strong industry ecosystem**

- **Few national regulations**, responsibility lies with local authorities
- The country has a **strong ecosystem in the industry**
- **Rapid increase in the development and implementation** of applications for autonomous driving in recent years

Achievements

- **Leader in accumulated kilometres** in level 4, (+30 million miles)
- **Strengthening technology development**, increasing investment and rapid market maturity
- First public **commercial self-driving taxi service** (Waymo)

- **+20 million miles travelled** with level 4 vehicles
- **+16.000 test licences** for autonomous driving, in +50 cities
- **Encourage** car manufacturers **to increase investment**.
- **Improved infrastructure** for more practical applications

Strategic solution approach

- The government's focus is on **enabling free innovation and commercialisation** while maintaining basic security
- **Strong cooperation with the private sector**
- Allow **exceptions** in the areas of security, testing & development

- **Promoting competition**, but with a stable legal framework. Clear national legal framework for autonomous vehicles up to level 3
- Intensive **support for innovation, production & commercialisation**
- Government **push to improve smart infrastructure**

Transferability to other regions

- These approaches benefit from a **strong technological ecosystem and a good infrastructure**, which are not available in all countries
- Approaches **more difficult to implement** for countries **covered by EU regulations**
- These less safety-center approaches could have a **negative impact on public acceptance** in other regions

Success Story #3: Establishment of (automotive)industry production networks

Initial situation

- **Low industrial density** (approx. 25% of GDP in 1980) and **dominant agriculture** (63% of all jobs in 1991)
- High **barriers** for (foreign) **entrepreneurial activities** (e.g. through state-controlled licensing "Licence Raj" with specifications on production quantities, prices or the use of capital)
- **Rising population** (from 687 million (1980) to 1,24 billion (2010))

Strategic solution approach

- **Liberalisation of the markets** through economic reforms (from 1991)
- Holistic industrialisation strategy **"Make in India"** (2014)
- Development of **cross-industry, strategic investment and support programmes** (in particular "Production-Linked Incentive Schemes", 2021-2027), also for the automotive industry
- Creation of **industrial centres** through **special economic zones**

Achievements

- Rise to become the world's **fourth-largest automotive market**[1], with **demand** largely met **by domestic production**
- **Establishment of numerous automobile manufacturers** since the 1990s (e.g. Honda ('95), Hyundai ('96), Skoda ('01), Renault ('05))
- **Future plans for new construction and expansion of production plants** by various car manufacturers (e.g. Suzuki, Vinfast)

Transferability to other regions

- **Attractive domestic market** and **favourable geostrategic location** crucial for the Asia-Pacific market
- **Political stability** and **fiscal flexibility** necessary
- Opportunity for emerging economies with **low labour and energy costs** and **good availability of industrial raw material deposits**

(1) Volume of new car registrations in 2024: China (22.9 million), USA (15.9 million), Europe (13.0 million), India (4.3 million)

Success Story #4: Opening up domestic sales markets with local brands

Initial situation

- Long-standing **dominance of foreign car manufacturers** (approx. 13% market share of Chinese car manufacturers in 2004)
- **Rising population** (from 981 million (1980) to 1,34 billion (2010))
- **Increasing degree of urbanisation** (from 19% (1980) to 49% (2010))
- **Emerging middle class** as a result of economic reforms

Strategic solution approach

- Massive **funding programs** for research, development and the establishment of domestic production capacities
- Knowledge transfer by means of imposed **joint venture co-operations**
- **Expansion** of domestic **transport routes and infrastructure**
- Creation of **consumption incentives** (e.g. through tax concessions)

Achievements

- Massive **increase** in **domestic passenger car production volume** from 0,5 million (1998) to 27,5 million (2024)
- **Increase in the market share of domestic automotive brands** (61% market share of Chinese manufacturers in 2024)
- **Technology and market leadership of** domestic automotive manufacturers and industrial companies (e.g. BYD, CATL) in key future areas (e.g. high-voltage battery)

Transferability to other regions

- Centralized control and long-term planning favoured by **one-party system** and difficult to transfer to democratic and federal forms of government
- Market attractiveness due to **strong domestic economy and large population**, difficult for smaller nations to replicate
- Growth also thanks to **rising prosperity in China**
- Not same **affinity for technology** in other world regions

WP3 – Comparison of regional strategies

Comparative analysis of location factors

Comparative analysis of corporate strategies

Final assessment of the attractiveness of the location from a company perspective

Sales revenue of global car manufacturers

[in USD million]	2019	2020	2021	2022	2023	2024
Tesla	24.578	31.536 ↗	53.823 ↗	81.462 ↗	96.773 ↗	97.690 →
Ford	155.414	127.191 ↘	136.341 ↗	158.057 ↗	176.191 ↗	184.992 →
BYD	17.633	22.253 ↗	32.751 ↗	63.058 ↗	85.228 ↗	108.250 ↗
Geely Holding	47.902	47.406 →	55.849 ↗	60.416 ↗	70.477 ↗	n/a —
BMW Group	116.705	113.047 →	131.596 ↗	150.282 ↗	168.311 ↗	154.084 ↘
VW Group	282.923	254.534 ↘	295.987 ↗	294.063 →	348.840 ↗	351.343 →
Stellantis[1]	204.850	168.370 ↘	176.763 →	189.254 ↗	205.162 ↗	169.773 ↘
Renault Group	62.196	49.647 ↘	54.670 ↗	48.887 ↘	56.692 ↗	60.854 ↗
Toyota	281.338	250.276 ↘	281.783 ↗	273.939 →	310.433 ↗	308.524 →
Nissan	96.629	72.278 ↘	79.163 ↗	75.231 →	87.106 ↗	83.540 →
Honda	142.801	122.243 ↘	130.137 ↗	126.272 →	137.624 ↗	143.603 →
Tata Group	40.934	30.534 ↘	39.350 ↗	40.561 →	52.023 ↗	53.934 →
Hyundai	95.171	83.198 ↘	105.850 ↗	114.022 ↗	130.131 ↗	122.662 ↘
Kia	52.331	47.334 ↘	62.876 ↗	69.247 ↗	79.846 ↗	75.214 ↘

The positive or negative arrow trend is based on an annual difference of ±5%

Following a general slump in sales during the coronavirus pandemic and the excessive recovery in the following years, the companies' revenues diverge strongly in 2024.

(1) Sum of Fiat-Chrysler and PSA Group for the years 2019, 2020

Source: Company press releases and annual reports

Operating result (EBIT) of global car manufacturers

[in USD million]	2019	2020	2021	2022	2023	2024
Tesla	-69	1.994 ↗	6.523 ↗	13.656 ↗	8.891 ↘	7.076 ↘
Ford	6.379	2.779 ↘	10.000 ↗	6.276 ↘	5.458 ↘	5.219 →
BYD	352	998 ↗	718 ↘	3.203 ↗	5.392 ↗	7.033 ↗
Geely Holding	2.676	2.306 ↘	2.255 →	1.414 ↘	2.037 ↗	n/a –
BMW Group	8.300	5.516 ↘	15.852 ↗	14.752 ↘	20.005 ↗	12.455 ↘
VW Group	18.994	11.049 ↘	22.802 ↗	23.298 →	24.436 →	20.627 ↘
Stellantis[1]	14.550	8.482 ↘	17.894 ↗	20.558 ↗	24.265 ↗	3.990 ↘
Renault Group	2.357	-2.283 ↘	1.654 ↗	2.335 ↗	2.690 ↗	2.788 →
Toyota	23.811	17.784 ↘	29.315 ↗	19.726 ↘	34.557 ↗	31.628 ↘
Nissan	541	-2.128 ↘	1.567 ↗	2.662 ↗	4.017 ↗	1.018 ↘
Honda	6.269	4.149 ↘	8.052 ↗	7.187 ↘	7.975 ↗	9.540 ↗
Tata Group	507	-260 ↘	-141 ↗	-401 ↘	2.907 ↗	3.760 ↗
Hyundai	3.245	2.225 ↘	6.011 ↗	7.856 ↗	12.102 ↗	9.968 ↘
Kia	1.809	1.653 ↘	4.559 ↗	5.786 ↗	9.286 ↗	8.867 →

The positive or negative arrow trend is based on an annual difference of ±5%

Since the recovery after the pandemic, companies have been under pressure from global competition and technology investments from 2024 onwards. BYD and Tata, however, are developing very positively.

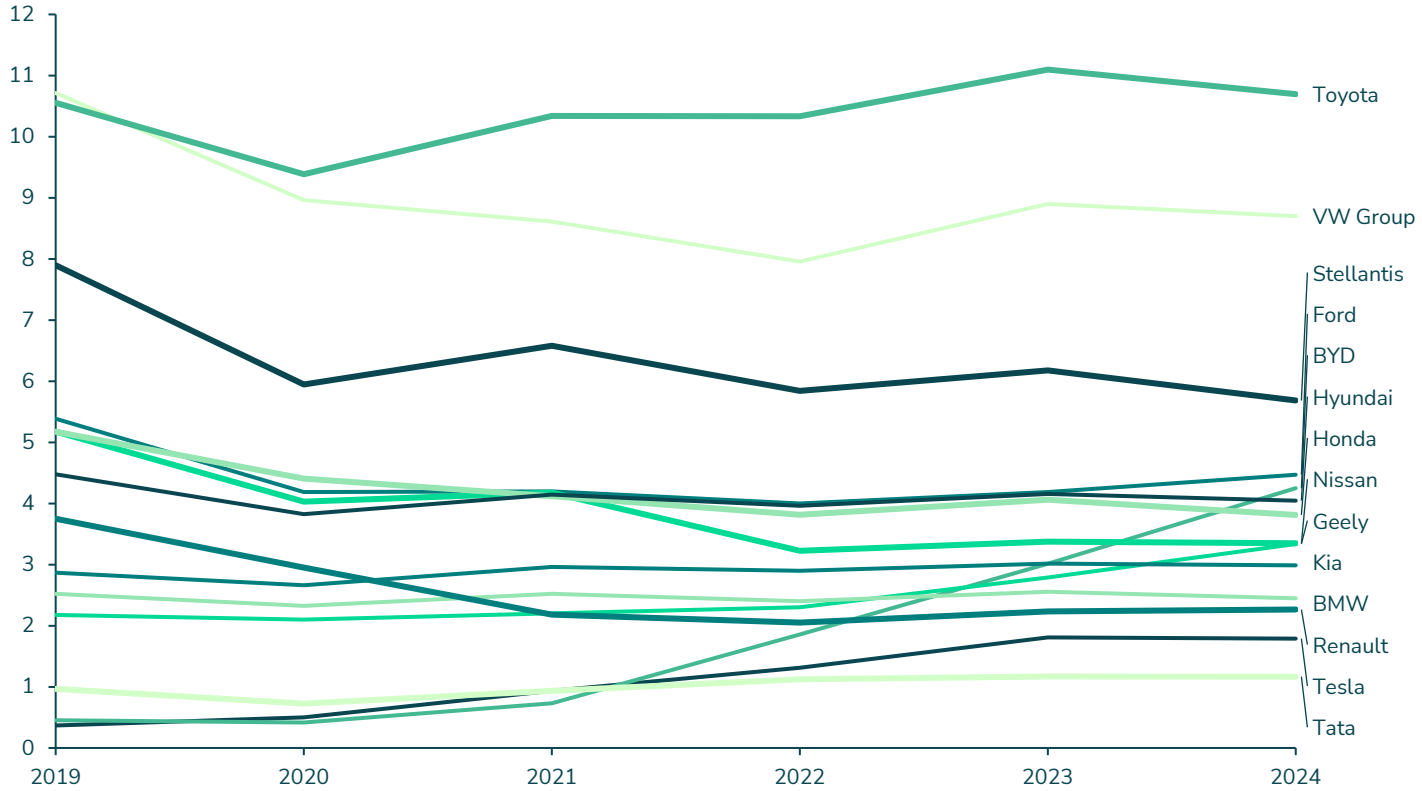
(1) Sum of Fiat-Chrysler and PSA Group for the years 2019, 2020

Source: Company press releases and annual reports

Comparison of vehicle sales by global car manufacturers

Worldwide sales of global car manufacturers

in million vehicles, passenger cars incl. light commercial vehicles, 2019 to 2024



Source: Company press releases and annual reports

Key Takeaways

- With 10,7 million vehicles sold, **Toyota is the largest car manufacturer in the world**.
- **Global sales of the car manufacturers analysed will fall by around 6%** in **2024** compared to the pre-coronavirus year **2019** to **59 million cars**
  (sales for the entire industry excl. commercial vehicles:
  In 2019: 74,9 million vehicles, In 2024: 74,6 million vehicles)
- In the same period, **BYD** increased its sales the most at **+842%** and, with **4,25 million cars sold** , is now on a **par with Ford** (4,47 million).
- **Tesla** also increased its deliveries sharply **by 386%** to **1,79 million cars**, but most recently suffered **stagnating sales figures**.

Comparison of vehicle sales by global car manufacturers

[in mln. passenger cars]	2019	2020	2021	2022	2023	2024
Tesla	0,37	0,50 ↗	0,94 ↗	1,31 ↗	1,81 ↗	1,79 →
Ford	5,39	4,19 ↘	4,20 →	4,00 →	4,19 →	4,47 ↗
BYD	0,45	0,42 ↘	0,73 ↗	1,86 ↗	3,01 ↗	4,25 ↗
Geely Holding	2,18	2,10 →	2,20 →	2,30 →	2,79 ↗	3,34 ↗
BMW Group	2,52	2,32 ↘	2,52 ↗	2,40 →	2,56 ↗	2,45 →
VW Group	10,71	8,97 ↘	8,61 →	7,96 ↘	8,90 ↗	8,70 →
Stellantis[1]	7,90	5,95 ↘	6,58 ↗	5,84 ↘	6,18 ↗	5,69 ↘
Renault Group	3,75	2,95 ↘	2,18 ↘	2,05 ↘	2,24 ↗	2,26 →
Toyota	10,55	9,39 ↘	10,34 ↗	10,33 →	11,10 ↗	10,70 →
Nissan	5,18	4,03 ↘	4,18 →	3,23 ↘	3,37 →	3,35 →
Honda	5,17	4,41 ↘	4,12 ↘	3,81 ↘	4,06 ↗	3,81 ↘
Tata Group	0,97	0,73 ↘	0,94 ↗	1,12 ↗	1,17 →	1,17 →
Hyundai	4,48	3,83 ↘	4,14 ↗	3,96 →	4,16 ↗	4,05 →
Kia	2,87	2,66 ↘	2,96 ↗	2,90 →	3,02 →	2,99 →

The positive or negative arrow trend is based on an annual difference of ±5%

The technological transformation is leading to a reorganisation of the global market for passenger cars, with Chinese companies in particular being able to significantly expand their vehicle sales.

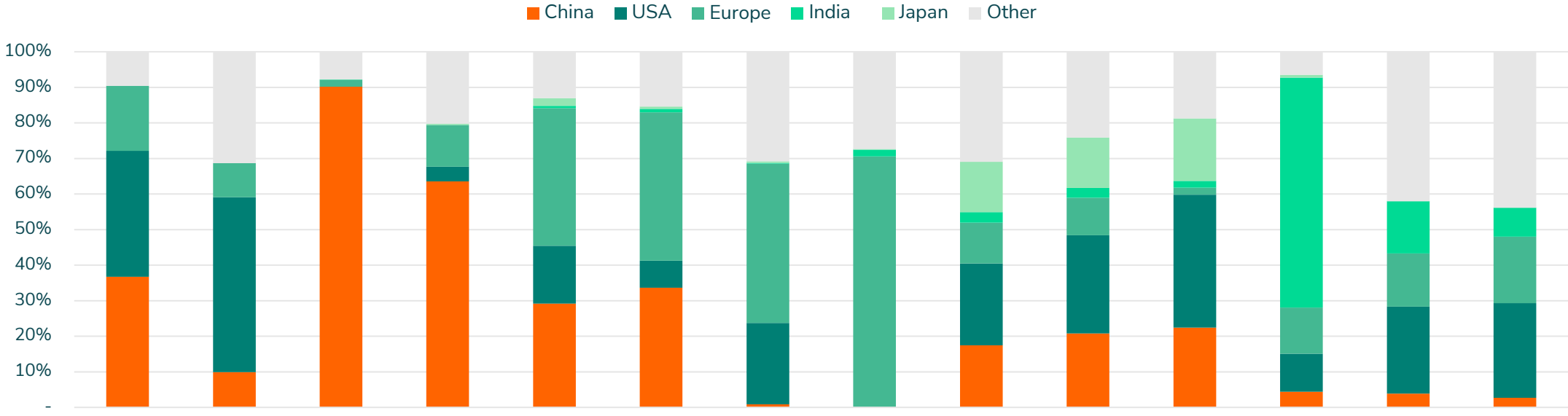
(1) Sum of Fiat-Chrysler and PSA Group for the years 2019, 2020

Source: Company press releases and annual reports

A comparison of the current market positioning of global car manufacturers

Share of core regions in total sales of global car manufacturers

in per cent, passenger cars including light commercial vehicles, 2024



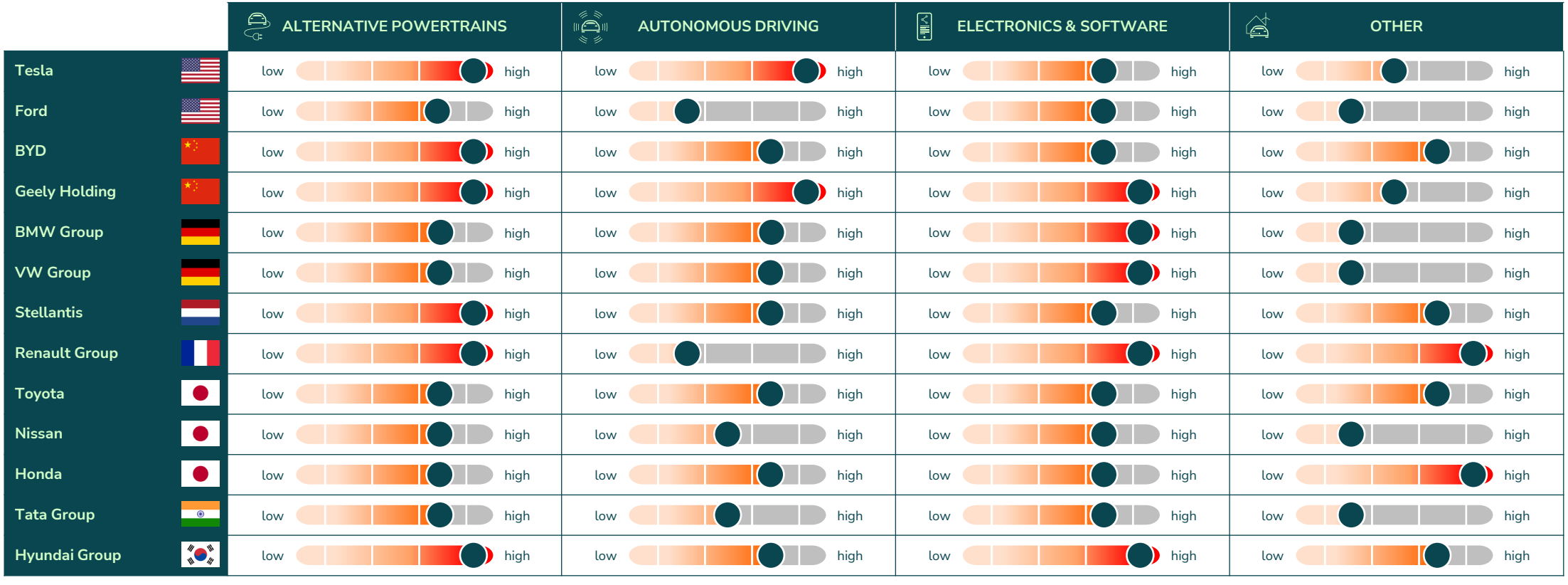
	Tesla	Ford	BYD	Geely	BMW	VW Group	Stellantis	Renault	Toyota	Nissan	Honda	Tata	Hyundai	Kia
Total [in million vehicles]	1,79	4,47	4,25	3,34	2,45	8,70	5,69	2,26	10,70	3,35	3,81	1,17	4,05	2,99

The core markets of automotive manufacturers are often close to home, which reduces their resilience to regional crises compared to more international companies (such as Japanese or German OEMs).

Source: Company press releases and annual reports

A comparison of the technological focus of global car manufacturers

Qualitative assessment



Car manufacturers are increasingly focusing their investments on alternative powertrain systems and new E/E and software architectures, but due to the long transformation process, the majority of their revenue still comes from the sale of vehicles with combustion engines.

A comparison of the cooperation landscape of global car manufacturers

Selection

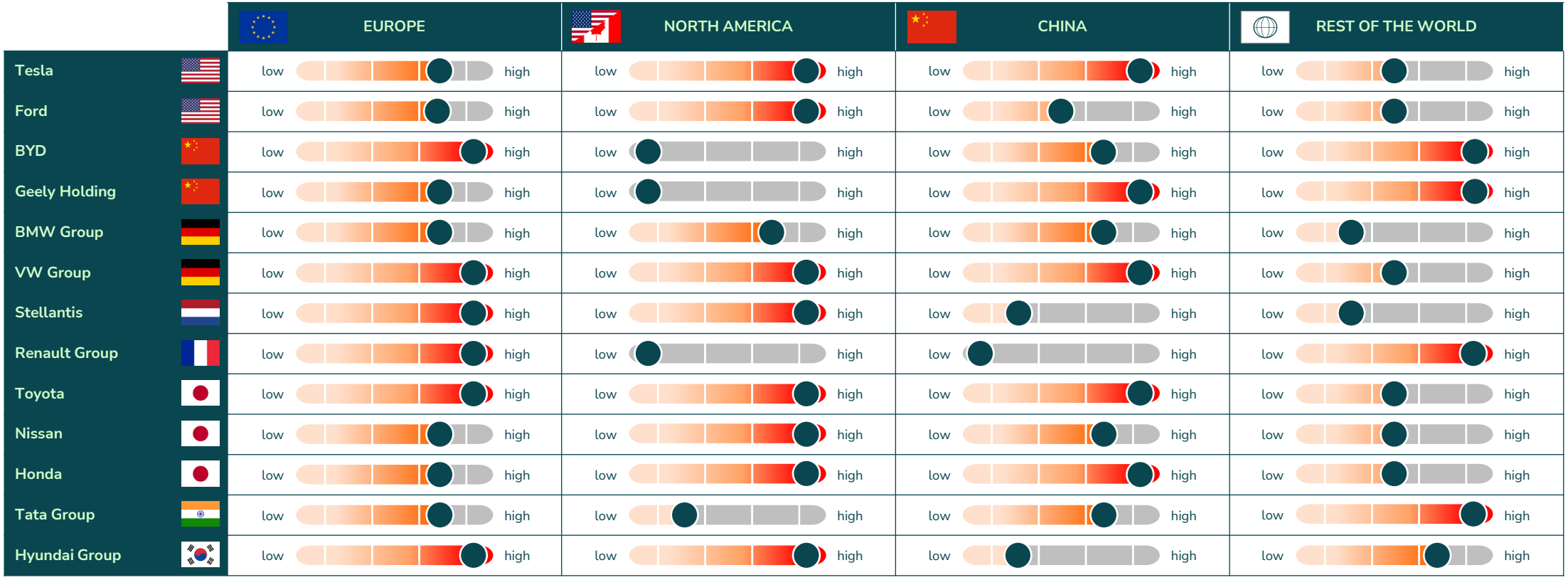
	ALTERNATIVE POWERTRAINS	AUTONOMOUS DRIVING	ELECTRONICS & SOFTWARE	OTHER
Tesla	CATL, Panasonic, EVE Energy	NVIDIA, DEEPSCALE	AMD	SolarCity
Ford	CATL, LG, Solid Power, VW	mobileye, LATITUDE	Google	ChargeScape
BYD	CATL, FinDreams, Toyota, NIO	HUAWEI, deepseek	Google, Alibaba.com, NVIDIA	tsmc, 骏辉腾 JUNHUITENG
Geely Holding	RENAULT, aramco, SK	mobileye, WAYMO, ecarx	NVIDIA, Qualcomm, ecarx	caocao, TERRAFUGIA, MEIZU
BMW Group	CATL, EVE Energy, Solid Power, Toyota	Qualcomm, HUAWEI, Valeo	amazon, TATA	ChargeScape, FREENOW
VW Group	CATL, LG, SK, XPENG	mobileye, BOSCH, Horizon Robotics	RIVIAN, CARIAD	Europcar, MOIA, CARIAD
Stellantis	SAMSUNG, ACC, LG	BMW, WAYMO, aiMotive	amazon, FOXCONN	Free2move
Renault Group	GEELY, AESC, LG	WeRide	Qualcomm, Google	MOBILIZE BEYOND AUTOMOTIVE, THE FUTURE IS NEUTRAL
Toyota	Panasonic, BYD, BMW	momenta, HUAWEI	HONDA, NISSAN	NTT
Nissan	CATL, RENAULT, AESC, SK	RENAULT, RENESAS, WeRide	RENAULT, RENESAS, HONDA, Toyota	ChargeScape
Honda	LG, GSYUASA, POSCO, gm	gm, HUAWEI, helm.ai	RENESAS, NISSAN	ALTNA, ChargeScape
Tata Group	JLR, AGRATAS, Cummins	NVIDIA, BMW, TATA ELXSI	NVIDIA, BMW, arm	Wykes, TATA POWER
Hyundai Group	LG, SK	Motional, WAYMO, 42dot	NVIDIA, Google, 42dot	HTWO, BostonDynamics, supernal

Global automotive manufacturers have a multi-layered cooperation ecosystem overall, although there are a few "must-have" cooperation partners per technology domain and world region.

Source: Company press releases and annual reports

A comparison of the market focus of global car manufacturers

Qualitative assessment



Overall, the market strategies of car manufacturers are focussed on Europe and North America, although potential is increasingly being sought in China and the rest of the world.

Success Story #1: Competitive advantage through vertical integration

Initial situation

- **Leading role as the** world's **largest manufacturer of electric vehicles**
- Original **focus was on battery production**
- The **Chinese** government **recommends keeping 80% of the supply chain in China** to ensure independence

- **Pioneering role as leading manufacturer of electric vehicles** worldwide
- Original focus on the **development of e-drives & software**
- **Rapid expansion** of production capacities with new gigafactories in various regions

Achievements

- **Avoiding problems in the supply chain**, such as the chip shortage that has persisted since 2020

- **Customised development of** own components, such as the blade battery from BYD
- **Tailored supply chain** and production contribute to optimisation and cost reduction
- **Shorter supply chains** allow for faster feedback loops , enabling rapid component customisation and **innovation**

Strategic solution approach

- **Self-research and procurement of all components**, including lithium. With the exception of tyres and glass.
- **In-house development** of battery cells, powertrain & semiconductors by subsidiaries (FinDreams, BYD-Electronics, -Semiconductors ...)

- **Control of 80% of the supply chain**, including vehicle, battery & motor manufacturing, software, power electronics, sales & distribution
- **In-house development of software and ADAS[1] systems** that enable constant OTA[2] updates for vehicles on the road

Transferability to other companies

- Requires **high initial investment**
- **Complex implementation** in companies with an established supply chain
- Less suitable in countries with less **access to resources, cheap labour or government support** & subsidies

(1) Advanced Driver Assistance Systems (2) Over the Air

Success Story #2: Strategically enhancement of the brand identity

HYUNDAI MOTOR GROUP

Initial situation

- **Third largest car manufacturer** in the world behind Toyota & VW
- Brand known for its **affordability and reliability**
- The brand **did not represent its technological expertise**
- **Difficulties with sales figures**, especially in America
- **Need to rebrand** as a company that offers well-designed and technologically advanced cars

Strategic solution approach

- **Rebranding** from "good cars" to modern design and technology
- **Reorganisation of the dealer network with a focus on quality rather than quantity**. Sharp reduction in the number of dealerships in America, concentration on "high-class image" dealerships
- **Less Korea-centred**, expansion of production sites in the US
- Emphasizing **commitment to innovation and sustainability**

Achievements

- **Successful image change** towards a more technological, high-value and qualitative automotive company
- **Tripling of the operating result** in 5 years
- Becoming one of the fastest **growing volume brands in the USA**
- **Significant increase in brand awareness** and positive public perception

Transferability to other companies

- Companies with a **strongly established brand identity** may find it difficult to carry out a comprehensive rebranding without losing **existing customers**
- **High resources** required for restructuring
- **Cultural differences** can have a negative impact on the success of such a rebranding, depending on the region and target market

Success Story #3: Corporate transformation away from the mainstream

Renault Group

Initial situation

- **Decline in Group sales (-26%)** and **Group** operating **result (-152%)** between 2017 and 2020
- **Negative record** for operating income of **€ -2 billion** (2020)
- **Limited competitiveness** in the areas of engineering and production (high costs, slow development processes)
- **Technological transformation** at an increasing pace

Strategic solution approach

- 3-stage "**Renaulution**" with a focus on **value creation instead of volume**
- "**Resurrection**" (2020-2023): Focus on margins and cash (e.g. cost reduction, withdrawal from unprofitable markets such as China)
- "**Renovation**" (2023-2025): Rationalisation of the product portfolio, strengthening of the brands (e.g. Dacia as low-cost champion)
- "**Revolution**" (2025+): Transformation into a mobility and tech player

Achievements

- **Return** to **financial success** (+18% profit in 2024 compared to 2019) with **lower sales volume** (-40% compared to 2019) and **lack of market presence** in core markets (esp. **China** and **USA**)
- **Dacia Sandero** as **the best-selling car** in **Europe** in **2024**
- **Renault 5** and **Alpine A290 honoured** as "**Car Of The Year 2025**", after the Renault Scénic E-Tech won last year

Transferability to other companies

- **Advantageous market trends** in **Europe** in the orientation towards low-cost cars with a supporting effect
- **Concentration on a few focus markets is lengthy** and **costly** for many established manufacturers, as well as **a cluster risk**
- **Utilisation of brand history and tradition** to create **desire** among customer groups (also pursued by other car manufacturers)

Success Story #4: Technological openness and flexibility in transformation

BMW GROUP

Initial situation

- Completion of the **technological transformation** (e.g. in the area of e-mobility) in the core sales markets (e.g. China, USA, Europe) **at different speeds**
- **Complex,** largely **globalised** and in some cases geographically **concentrated supply chains** with a high **susceptibility to crises**
- High **volatility** with regard to **(economic and geopolitical) framework conditions** in the core sales markets

Strategic solution approach

- Utilisation of **multi-powertrain platforms** for a wide range of models independent of the drive system
- Increasing **production flexibility**, including through the introduction **of modular production systems** and **flexible production lines**
- Focus on **localised development and production centres** according to the motto "**Production follows the market**" (e.g. Spartanburg (USA) for SUV models of the "X" model series that are in high demand)

Achievements

- **Resilient** and largely **balanced market positioning** with moderate dependencies on individual markets
- Largely **stable vehicle sales** and **financial success**, even in **years of crisis** (e.g. during the coronavirus pandemic, semiconductor crisis)
- Successful **increase in the EV share** to 24% (2024), especially in comparison to other German manufacturers with an "electric-only" approach

Transferability to other companies

- **Multi-power train platform strategy** replicable, but probably **technologically obsolete by the time it is finalised**
- **Modularisation/flexibilisation** of **production facilities** generally transferable, but **investment-intensive**
- **Many years of experience and expertise** in modular/flexible production on the part of BMW
- **Localisation strategies** currently **optional** (e.g. VW Group)

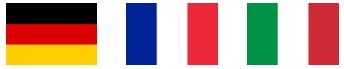
WP3 – Comparison of regional strategies

Comparative analysis of location factors

Comparative analysis of corporate strategies

Final assessment of the attractiveness of the location from a company perspective

Derivation of location attractiveness for the European market



General conditions and location factors

- Large single market with comprehensive freedom of trade and investment
- High-quality and high-performance education/science systems
- Comprehensive, efficient transport infrastructure
- High industrial density and availability of value-added networks
- Rising demand for electrified and electric vehicles
- Largely free, stable and corruption-free legal systems
- Progressive legal framework for automated and connected driving

- Mainly unattractive tax system with a high tax burden
- Strong saturation tendencies in the demand for new cars
- Heavy dependence on imports of energy sources and industrial raw materials
- High energy costs, both for households and (industrial) companies
- Predominantly highly regulated labour market with above-average labour costs and often below-average annual working hours
- High requirements for the fulfilment and documentation of sustainability and environmental standards

Companies' strategic direction

- Investments worth billions in the development and expansion of production capacities for electric vehicles and high-voltage batteries (e.g. BMW, Ford, VW, Tesla, Stellantis)
- High interest of Asian and especially Chinese car manufacturers in the European automotive market with plans for local production, albeit mainly in Eastern Europe (e.g. BYD, Geely)
- Significant expansion of model diversity planned for electrified and fully electric vehicles in all segments

- Decline in European passenger car production (-22% since 2019)
- Further reduction of domestic production capacities and downsizing of the workforce, especially in Germany (e.g. Ford, VW), and relocation to other European countries (e.g. Hungary, Slovakia, Portugal) as well as to Asia (e.g. China) and America (e.g. Brazil)

Location attractiveness for automotive companies: Research & Development

low — high

Location attractiveness for automotive companies: Production

low — high

Location attractiveness for automotive companies: Sales market

low — high

Derivation of location attractiveness for the US market

General conditions and location factors

- Largest economy in the world with > 330 million inhabitants
- Highly attractive tax system with a moderate tax burden
- The world's largest capital and financial market, also for start-ups
- Competitive energy prices for households and companies
- Largely unregulated labour market with a high degree of entrepreneurial freedom in personnel planning thanks to the "at-will employment" principle
- High-quality and high-performance education/science systems
- Liberalised test and trial regulations for autonomous driving systems

- Political unpredictability as a result of the change of government
- (Partial) withdrawal of strategic subsidy programmes (e.g. IRA[1])
- Worrying fiscal stability due to high national debt
- Systematic creation of trade barriers through increased customs policy
- Strong saturation tendencies in the demand for new cars
- Strong concentration of transport infrastructure in urban centres
- No nationwide legal framework for fully automated driving

Companies' strategic direction

- Billions invested in production capacities (e.g. Tesla, Stellantis)
- Strong efforts by foreign car manufacturers to increase market share (e.g. Toyota, Honda, Hyundai, Kia, VW)
- Strong importance of domestic technology companies as central "suppliers of choice" for car manufacturers (e.g. Nvidia, Qualcomm)
- USA as a development and innovation centre for many manufacturers
- Highly dynamic testing & commercialisation of CAV systems & services
- Increased cooperation in the development of public charging infrastructure

- Successive loss of market share by domestic car manufacturers (e.g. Ford)
- Chinese car manufacturers avoiding the US market due to political conflicts and trade barriers (e.g. BYD)
- Renault is the only European car manufacturer without a (planned) presence in the US market due to intense competition and low growth forecasts

Location attractiveness for automotive companies: Research & Development

low — high

Location attractiveness for automotive companies: Production

low — high

Location attractiveness for automotive companies: Sales market

low — high

(1) IRA = Inflaction Reduction Act

Derivation of location attractiveness for the Chinese market

General conditions and location factors

- Second largest economy in the world with > 1 billion inhabitants
- Moderate attractiveness of the tax system with a medium tax burden including various discounts for special economic zones and tech companies
- Extensive direct and indirect subsidies for domestic companies, bonus-malus system for the drive transition in favour of NEVs[1]
- Low energy prices; high access to fossil fuels & raw materials
- Intranational competition in the commercialisation of autonomous driving systems with a partially defined safety/legal framework

- Centralised and planned state apparatus with direct influence on national politics and the economy. Heavily regulated freedom of investment for companies
- Moderate capital availability, partially unstable banking system
- Gradual slowdown in demand for new cars
- Regulated labour market, but with exceptions and low wages
- Strong concentration of transport infrastructure in urban centres
- Weak legal system with severe restrictions on freedom of expression

Companies' strategic direction

- Increase in passenger car production (+21% since 2019) and export focus
- Strong efforts by foreign car manufacturers to maintain/expand their market share (e.g. VW, BMW, Toyota, Honda)
- Increased introduction of assisted driving systems with point-to-point navigation on motorways, country roads and in city centres (L2+)
- Strong importance of domestic technology companies as central "suppliers of choice" for car manufacturers (e.g. CATL, Huawei)
- Highly dynamic testing & commercialisation of CAV systems & services

- Reduction in market shares and profit margins of established manufacturers as a result of an extensive range of models and aggressive price competition (e.g. VW)
- Loss of importance of US automotive brands in the competitive environment with the exception of Tesla; withdrawal by Renault

Location attractiveness for automotive companies: Research & Development

low — high

Location attractiveness for automotive companies: Production

low — high

Location attractiveness for automotive companies: Sales market

low — high

(1) NEV = New Energy Vehicle

Derivation of location attractiveness for the Indian market

General conditions and location factors

- Most populous country in the world with > 1,4 billion inhabitants
- Attractive tax system with low tax burden
- Strategic subsidy programs to strengthen the automotive industry
- Wide range of available raw materials with low energy prices
- Low-wage country with high average annual working hours
- Low car motorisation rate with simultaneously increasing demand
- Above-average investment in transport infrastructure

- Low degree of fulfilment of global sustainability goals
- Restricted freedom of trade and investment for companies
- Greater deficits in terms of comprehensive education provision
- Moderate fiscal stability due to increased public debt
- Linking company incentives to local content requirements
- Largely isolated car market due to high import barriers
- Lack of legal framework and infrastructure for automated driving

Companies' strategic direction

- Increase in domestic passenger car production (+29% since 2019)
- New construction, expansion & recommissioning of production plants at some car manufacturers (planned) (e.g. Tesla, Ford, Vinfast)
- Increased adaptation of the range and product features to local customer needs, including through new platforms (e.g. Renault) and local-for-local developments (e.g. Skoda)
- Increasing willingness of western car manufacturers to co-operate with Indian (technology) companies, e.g. in R&D

- No (planned) activities regarding the testing or market launch of connected and automated driving systems
- High investment costs for establishing and expanding market presence

Location attractiveness for automotive companies: Research & Development

low — high

Location attractiveness for automotive companies: Production

low — high

Location attractiveness for automotive companies: Sales market

low — high

Derivation of location attractiveness for the Japanese market

General conditions and location factors

- Deep-rooted supplier and manufacturer value creation networks
- High degree of entrepreneurial freedom for trade and investment
- Comprehensive, efficient transport infrastructure
- Low unemployment rate due to increased work motivation/morale
- High-quality education and science system
- Largely free, stable and corruption-free legal system
- Progressive legal framework for automated and connected driving

- Unattractive tax system with increased tax and duty burden
- Low fiscal stability due to massive government over-indebtedness
- Increased energy prices despite massive subsidisation efforts
- Almost no domestic availability of important automotive raw materials
- Increased labour costs with average annual working hours
- Moderate energy security, partly due to massive import dependencies
- Largely isolated market with high loyalty to domestic brands

Companies' strategic direction

- New construction and expansion of (EV) production facilities planned at domestic car manufacturers (e.g. Nissan, Honda)
- Strong economic willingness to co-operate and solidarity of domestic car manufacturers with other domestic partners
- Strong interest from BYD in expanding into the Japanese automotive market, having already established itself as a supplier of battery storage, solar products and electric buses

- Decline in domestic passenger car production (-7% since 2019)
- No communicated ambitions of foreign manufacturers to increase investment and/or presence in the Japanese market

Location attractiveness for automotive companies: Research & Development

low — high

Location attractiveness for automotive companies: Production

low — high

Location attractiveness for automotive companies: Sales market

low — high

Derivation of location attractiveness for the South Korean market

General conditions and location factors

- Comprehensive subsidy programs to strengthen domestic expertise in core technologies thanks to high fiscal stability
- High degree of entrepreneurial freedom for the trade of goods
- Above-average importance of investments in start-ups
- Competitive energy prices with high import dependency
- Largely comprehensive, efficient transport infrastructure
- Higher working hours and willingness to work with a low unemployment rate
- Outstanding education and science system, high level of investment

- Unattractive tax system with increased tax and duty burden
- Limited security due to geopolitical location risks
- Almost no domestic availability of important automotive raw materials
- Slightly limited investment freedom for companies
- Limited performance of the financial and capital markets
- Highly regulated labour market with increased labour costs
- Largely isolated market with high loyalty to domestic brands

Companies' strategic direction

- Increase in domestic passenger car production (+8% since 2019) with a strong focus on exports (especially to North America and Europe)
- Strong importance of domestic (electronics) companies as central "suppliers of choice" for car manufacturers (especially LG and Samsung)
- Investment and expansion efforts on the part of Renault (with the Samsung brand), including the development of a new vehicle platform

- No further communicated ambitions of foreign manufacturers to increase investment and/or presence in the South Korean market

Location attractiveness for automotive companies: Research & Development

low — high

Location attractiveness for automotive companies: Production

low — high

Location attractiveness for automotive companies: Sales market

low — high

Derivation of location attractiveness for the other markets

General conditions and location factors

- Attractive tax system with low tax burden (especially Mexico)
- Strategic subsidy programs of varying sizes to strengthen the automotive industry with a focus on domestic production capacities
- Availability of regional supplier structures, particularly in Mexico
- High availability of raw materials at competitive energy prices
- Strong freedom of trade and investment in Mexico
- Low-wage countries with high average annual working hours

- Low degree of fulfilment of global sustainability goals
- Linking company incentives to local content requirements
- Average trade freedom and more restricted investment freedom for companies in Brazil and South Africa
- Major deficits with regard to the performance of financial markets
- Moderate level of motorisation, largely stagnating demand
- Weak education system with increased political instability

Companies' strategic direction

- Strong interest in the South American automotive market, including plans for local production in Brazil (e.g. Stellantis, VW, BYD, Toyota)
- Planned development of new platforms and models (e.g. Stellantis, VW, Renault, Geely), strong importance of ethanol as a fuel
- Establishment and expansion of a dealer network in South America (e.g. Geely in cooperation with Renault for the Brazilian market)

- Decline in domestic passenger car production (-9% since 2019), particularly in Brazil (-21% since 2019)
- Risk of production relocating from Mexico to the USA in the short to medium term as a result of the changed customs restrictions
- Overall low willingness of global automotive manufacturers to increase investment and/or presence in South Africa
- No documented ambitions on the part of premium manufacturers

Location attractiveness for automotive companies: Research & Development

low — high

Location attractiveness for automotive companies: Production

low — high

Location attractiveness for automotive companies: Sales market

low — high

Overview of the work packages

WORK PACKAGE 0
Introduction

- Derivation of the historical significance of mobility in the general history of mankind
- Description of the role of mobility as a driver of economic power
- Derivation of the resulting significance of the automotive industry
- Description of current industry challenges and consequences

Target:

Brief introduction to the presentation of the socio-economic significance of mobility and the automotive industry

WORK PACKAGE 1
Country-specific analysis

- Creation of country profiles
- PESTEL analysis of country-specific framework conditions
- Deriving an assessment of key location factors for each country
- Assessment of the strategic direction of the country (e.g. climate protection, security, etc.)

Target:

Analysing the location factors of different countries and their framework conditions using the PESTEL logic.

WORK PACKAGE 2
Company analysis

- Creation of company profiles for representative companies in the analysed countries
- Collection of relevant company key figures
- Identification of the strategic focus (technological and market-related) and global expansion

Target:

Presentation of represent. Companies in the automotive industry in the countries analysed and their strategic orientation

WORK PACKAGE 3
Comparison of reg. strategies

- Comparative analysis of the assessment of location factors in all countries
- Comparative analysis of the strategic focus of all companies
- Derivation of the attractiveness of the location and the strategic direction of the companies in all markets
- Identification of success stories (both at regional and company level)

Target:

Comparative analysis of the countries and companies and highlighting the strategic orientation of the companies in the countries

WORK PACKAGE 4
Recommendations for action

- Creation of future development scenarios up to 2035 for the core regions from the perspective of the companies and their reasons for their involvement in a country
- Analysing the consequences of the scenarios for the individual core regions
- Derivation of conditions for an optimistic scenario in the core regions

Target:

Derivation of recommendations for action for the core regions in various development scenarios

WP4 – Recommendations for action

Development scenarios for the year 2035

- USA
- China
- Europe
- India

Summary

Recap: Motives for companies to get involved in a country

Decisive location factors for entrepreneurial motives

Research location

- Access to highly qualified specialists and renowned educational institutions
- Public funding for (basic) research
- Availability of advanced technology and infrastructure

Development site

- Opportunity to collaborate with local companies and research institutions
- Access to highly qualified specialists, especially in the fields of engineering and IT

Production site

- Favourable production costs, especially labour and energy costs
- Competitive labour market conditions
- Efficient infrastructure for transport and logistics
- Entrepreneurial freedom for investment and trade

Sales market

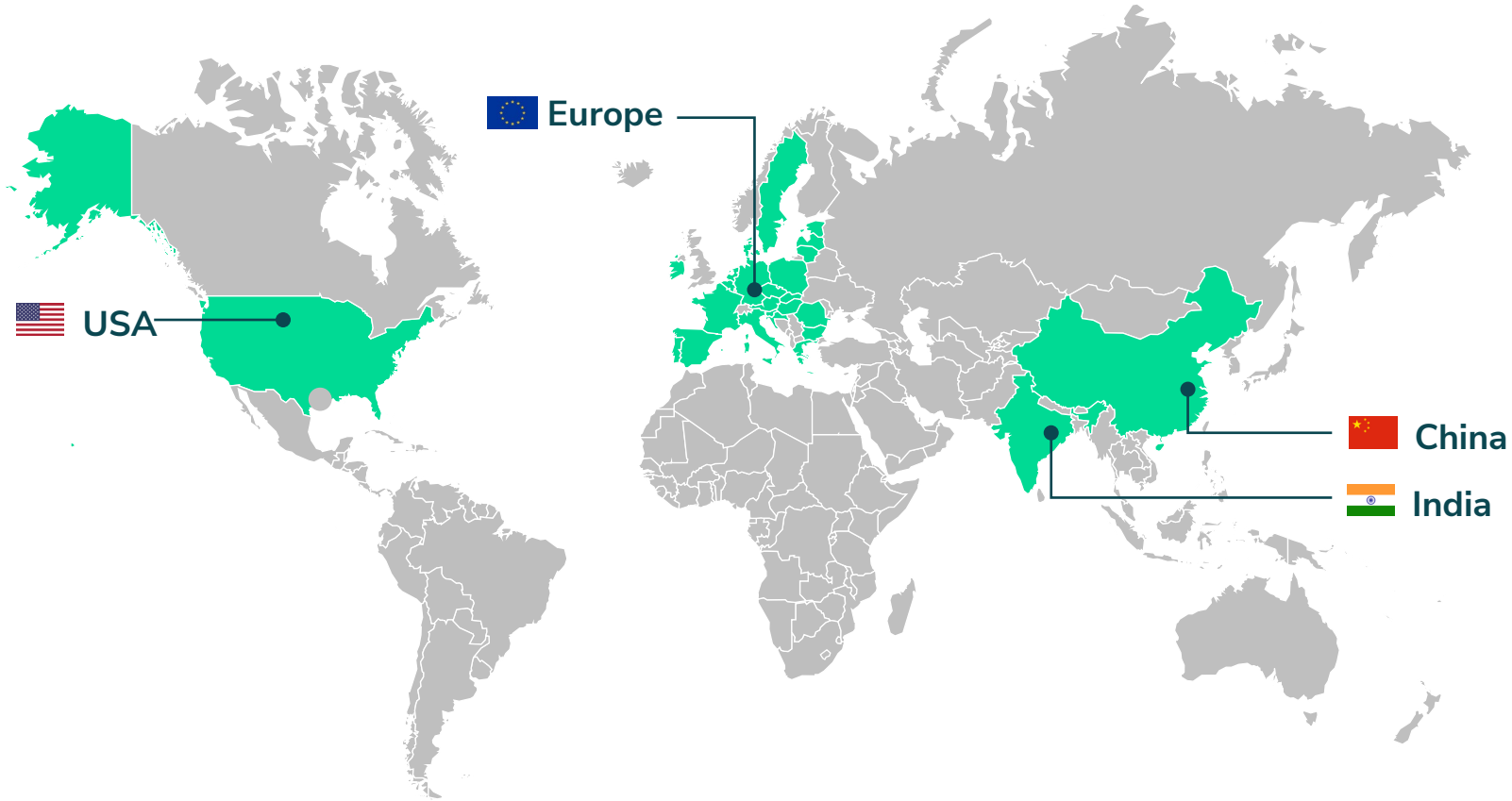
- Access to a market with high and/or growing demand
- High consumer purchasing power and positive consumption trends
- Balanced competitive environment with low barriers to market entry

The decision as to whether an (industrial) company becomes involved in a country along the value chain is closely linked to the degree of fulfilment of high and complex requirements.

Description of development scenarios for the automotive industry up to 2035

	Base scenario	Optimistic scenario	Pessimistic scenario
P	Update of current political framework conditions without significant deviations	Improving the framework conditions for automotive R&D and industrial production	Creation of less favourable framework conditions for automotive R&D and industrial production
E	Development of demand and purchasing power at different speeds based on current trends	Increase in demand and purchasing power due to better economic conditions, rising free trade activities	Crisis-related decline in demand and purchasing power, increased protectionism in trade
S	No significant deviations from current mobility, urbanisation and labour market trends	Increasing importance of individual mobility, company-friendly labour market development	Declining importance of individual mobility, employee-friendly labour market development
T	Continuous development of technologies and innovations with stable infrastructures	Major advancements in future technologies and increased investment in infrastructure	Little progress in future technologies and reduced investment in infrastructure
E	Steady ecological progress at different levels depending on the ambition of the regions	Making ecological framework conditions and requirements more flexible in favour of companies	Tightening of ecological framework conditions and requirements at the expense of companies
L	Largely constant legislative framework conditions, minor progress in CAV	Positive developments in terms of corruption and rule of law, major progress in CAV	Negative developments regarding corruption and rule of law, lack of progress in CAV

Overview of the markets analysed in the development scenarios



The selected markets were prioritised over other markets due to their strategic importance and their potential for market leadership, economic influence and technological innovation

WP4 – Recommendations for action

Development scenarios for the year 2035

- **USA**
- China
- Europe
- India

Summary

USA

Base scenario

General conditions and location factors

P

- Liberal democracy and regulatory policy
- Liberal economic system
- Low corporate tax burden
- Moderate tariff barriers as a protective mechanism

E

- Moderate economic growth (GDP)
- Moderate inflation
- Very high household income
- Constant car sales figures

S

- Low unemployment
- Highly motivated population
- Tendency towards ageing
- Consistent level of urbanisation

T

- Global technology leadership, including in key technologies such as artificial intelligence
- In-house development and production of chips
- Low energy costs for companies

E

- Moderate ambitions about climate protection
- Increasing abolition of regulations on environmental standards
- Consistent greenhouse gas emissions

L

- Consistent rule of law
- Extension of the CAV legal framework

Attractiveness for OEMs

… as a research centre

low — high

Comment: Good availability of skilled labour, renowned educational institutions and sufficient research funding

… as a development location

low — high

Comment: Strong co-operation network, especially in the high-tech sector, and regulatory freedom

… as a production site

low — high

Comment: Moderate attractiveness for domestic production depending on customs policy, but strong subsidisation

… as a sales market

low — high

Comment: High demand at a stable level with above-average purchasing power

USA

Optimistic scenario

General conditions and location factors

P

- Liberal democracy and regulatory policy
- Strengthening the liberal economic system
- Low corporate tax burden
- Skilful customs policy and tariff dismantling

E

- Sustained strong economic growth (GDP)
- Moderate inflation
- Very high household income
- Slight increase in car sales figures

S

- Low unemployment, but continued shortage of skilled labour with apprenticeships
- Highly motivated population
- Measures to combat ageing
- Consistent level of urbanisation

T

- Continued global technology leadership, including in key technologies such as AI
- In-house development and production of chips
- Low energy costs for companies

E

- Efficient market-based climate protection system
- Simplification of procedures and application-free conditions for environmental standards
- Consistent greenhouse gas emissions

L

- Strengthening the rule of law
- Extension of the CAV legal framework

Attractiveness for OEMs

… as a research centre

low — high

Comment: Good availability of skilled labour, renowned educational institutions and sufficient research funding

… as a development location

low — high

Comment: Strong co-operation network, particularly in the high-tech sector, and regulatory freedom

… as a production site

low — high

Comment: Increased attractiveness for domestic production through skilful customs and trade policy

… as a sales market

low — high

Comment: High demand at a slightly rising level with above-average purchasing power

USA

Pessimistic scenario

General conditions and location factors

P

- Democracy with a stricter regulatory policy
- Restriction of economic freedoms
- Slight increase in corporate tax burden
- Protectionist economic policy

E

- Crisis-related weakening of the economy
- Low inflation
- Stagnating household income
- Falling car sales figures

S

- Crisis-related increase in unemployment
- Demotivated and insecure labour force
- Increased tendency towards ageing
- Consistent level of urbanisation

T

- Loss of technological leadership, including in key technologies such as artificial intelligence
- Emerging technological dependency
- Increased energy costs for companies

E

- Uncoordinated climate protection framework
- Increasing environmental requirements for companies
- Decreasing greenhouse gas emissions[1]

L

- Weakening the rule of law
- Stagnation of the CAV legal framework

(1) In this context: leading to less technological pressure to change

Attractiveness for OEMs

... as a research centre

low — high

Comment: Good availability of skilled labour, renowned educational institutions, but lack of research funding

... as a development location

low — high

Comment: Strong cooperation network, but loss of technology leadership in core areas

... as a production site

low — high

Comment: Still attractive for domestic production

... as a sales market

low — high

Comment: High demand at a slightly declining level with high but declining purchasing power

WP4 – Recommendations for action

Development scenarios for the year 2035

- USA
- **China**
- Europe
- India

Summary

CHINA

Base scenario

General conditions and location factors

P

- Socialist one-party system
- Planned economy, market economy elements
- Low corporate tax burden
- High subsidies, moderate import barriers

E

- Strong economic growth (GDP) (low by Chinese standards, however)
- Moderate inflation
- Moderate household income
- Increasing car sales figures

S

- Low unemployment
- Highly motivated population
- Tendency towards ageing
- Increasing degree of urbanisation

T

- Global technology leadership in numerous key technologies[1]
- Low energy costs for companies

E

- Low ambitions with regard to climate protection
- Low environmental requirements for companies
- Rising greenhouse gas emissions

L

- Persistently limited rule of law with restrictions on opinion and corruption
- Further development of the legal framework for automated and connected driving

(1) Measured by the number of patents filed

Attractiveness for OEMs

… as a research centre

low — high

Comment: Good availability of skilled labour, but increased political restrictions

… as a development location

low — high

Comment: Strong cooperation network, especially in the high-tech sector, but regulatory restrictions

… as a production site

low — high

Comment: Increased attractiveness for domestic production depending on the customs policy pursued and trade barriers

… as a sales market

low — high

Comment: High demand at a rising level with increasing purchasing power in large parts of the population

CHINA

Optimistic scenario

General conditions and location factors

P

- Socialist one-party system
- Strengthening market economy elements
- Low corporate tax burden
- High subsidies, moderate import barriers (security planning via government guidelines)

E

- Strong increase in economic growth (GDP)
- Moderate inflation
- Sharp rise in household income
- Strong rise in car sales figures

S

- Low unemployment
- Highly motivated population
- Measures to combat ageing
- Strongly increasing degree of urbanisation

T

- Global technology leadership in numerous key technologies[1]
- Low energy costs for companies

E

- Efficient market-based climate protection framework
- Low environmental requirements for companies
- Rising greenhouse gas emissions

L

- Improvement in the rule of law, freedom of expression, weak corruption
- Further development of the legal framework for automated and connected driving

(1) Measured by the number of patents filed

Attractiveness for OEMs

… as a research centre

low — high

Comment: Good availability of skilled labour, strong basic research, reduced political restrictions

… as a development location

low — high

Comment: Strong cooperation network, especially in the high-tech sector, reduced regulatory hurdles

… as a production site

low — high

Comment: Highly attractive for domestic production, but trade barriers still to be expected

… as a sales market

low — high

Comment: High demand at a sharply rising level with increasing purchasing power in large parts of the population

CHINA

Pessimistic scenario

General conditions and location factors

P

- Socialist one-party system
- Planned economy with increased compartmentalization
- Increased tax burden for non-Chinese companies
- Moderate subsidies, high import barriers

E

- Slight increase in economic strength (GDP)
- Increased inflation
- Slight increase in household income, but high level of household debt
- Slight increase in car sales figures

S

- Increased unemployment
- Demotivated and insecure labour force
- Increased tendency towards ageing
- Consistent level of urbanisation

T

- Loss of technological leadership in numerous key technologies
- Slightly higher energy costs for companies due to higher energy import prices

E

- Uncoordinated climate protection framework, but not achieved in the defined key sectors
- Increased environmental requirements for companies
- Stagnating greenhouse gas emissions

L

- Persistently limited rule of law with restrictions on opinion and corruption
- Stagnation of the legal framework for automated and connected driving

Attractiveness for OEMs

… as a research centre

Comment: Good availability of skilled labour, but strongly increased (economic) policy restrictions

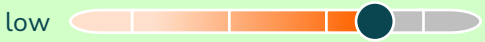
… as a development location

Comment: Strong cooperation network, but political and economic restrictions

… as a production site

Comment: Increased attractiveness for domestic production, very high customs and trade barriers

… as a sales market



Comment: Demand remains high. However, strong competition and high levels of debt among the population

WP4 – Recommendations for action

Development scenarios for the year 2035

- USA
- China
- **Europe**
- India

Summary

EUROPE

Base scenario

General conditions and location factors

P

- Democratic forms of government
- Market economy, planned economy elements
- Increased corporate tax burden
- Moderate import restrictions

E

- Largely stagnating economic strength (GDP)
- Increased inflation rate
- Stable household income at a high level
- Slight downward trend in car sales with a shift to more favourable segments

S

- Moderate unemployment
- Stagnating Average willingness to perform
- Strongly ageing overall population
- Consistent level of urbanisation

T

- Global follower role in numerous key technologies
- Development of European chip production
- High energy costs for companies

E

- High ambitions with regard to climate protection
- Strict environmental regulations for companies
- Decreasing greenhouse gas emissions

L

- Persistently diverse manifestations of the rule of law, partly accompanied by corruption
- Further development of the legal framework for automated and connected driving

Attractiveness for OEMs

… as a research centre

low — high

Comment: Strong pool of skilled labour and reputable educational institutions, but research funding requires growth[1].

… as a development location

low — high

Comment: Strong industrial network, but high costs and often a lack of technological leadership

… as a production site

low — high

Comment: Dense production networks, but persistently high energy and labour costs and lack of space

… as a sales market

low — high

Comment: High demand, but slightly declining willingness to buy, especially in the premium segment

(1) In addition: weak link between research and industry. Concrete product developments from research are rarely realised.

EUROPE

Optimistic scenario

General conditions and location factors

P

- Increased liberalisation of democracies
- Market economy with a liberal bias
- Moderate corporate tax burden
- Reduced import restrictions

E

- Moderate increase in economic strength (GDP)
- Moderate inflation, economic reforms
- High and rising household income
- Stable car sales at pre-crisis level

S

- Low unemployment
- Strengthening the meritocracy
- Inhibition of ageing trends
- Consistent level of urbanisation

T

- Rise to fast follower in numerous key technologies (e.g. artificial intelligence)
- Strengthening of own chip development/production
- Reducing energy costs for companies

E

- Efficient market-based climate protection system
- Market-orientated environmental requirements for companies
- Decreasing greenhouse gas emissions

L

- Strengthening the rule of law and freedom of expression as well as weak corruption
- Harmonised legal framework for automated and connected driving

Attractiveness for OEMs

… as a research centre

low — high

Comment: Good availability of skilled labour, renowned educational institutions, moderate research funding[1]

… as a development location

low — high

Comment: Strong industrial network, improved technology landscape, but persistently high costs

… as a production site

low — high

Comment: Highly attractive for domestic production, but energy and labour costs remain high

… as a sales market

low — high

Comment: High demand at a stable level, but no significant increase in purchasing power expected[2]

(1) However, the link between research and industry remains weak. Concrete product developments from research are rarely realised.
(2) Differences in sales market attractiveness between Western and Eastern Europe to be expected (Western Europe constant / declining purchasing power, Eastern Europe strongly growing purchasing power)

Pessimistic scenario

General conditions and location factors

P

- Weakening of democratic principles
- Highly regulated social market economy
- High corporate tax burden
- Inconsistent political behaviour

E

- Sharp decline in economic strength (GDP)
- Increased inflation rate
- Falling real household income
- Sharp reduction in car sales

S

- Increased unemployment
- Weakening of the meritocracy
- Strongly ageing overall population
- Consistent level of urbanisation

T

- Complete loss of access to key global technologies (e.g. artificial intelligence)
- Increased technological dependency
- Very high energy costs for companies

E

- Uncoordinated climate protection framework
- Increasing environmental requirements for companies
- Sharp decline in greenhouse gas emissions due to ongoing deindustrialisation

L

- Persistently diverse manifestations of the rule of law, partly accompanied by corruption
- Stagnation of the legal framework for automated and connected driving

Attractiveness for OEMs

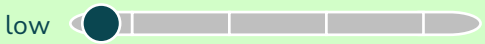
… as a research centre

Comment: Moderate availability of skilled labour, renowned educational institutions, but lack of research funding[1]

… as a development location

Comment: Strongly weakened industrial network with high costs and a lack of in-house technological expertise

… as a production site



… as a sales market

Comment: High but falling demand with declining willingness to buy, especially in the premium segment

(1) In addition: weak link between research and industry. Concrete product developments from research are rarely realised.

WP4 – Recommendations for action

Development scenarios for the year 2035

- USA
- China
- Europe
- **India**

Summary

Base scenario

General conditions and location factors

P	• Parliamentary democracy characterised by religion • Market economy, planned economy elements	• Increased tax burden, low tax burden • Increased import restrictions
E	• Strong economic growth (GDP) • Slightly higher inflation rate	• Rising, but average household income • Rising car sales, also in the premium segment
S	• Low unemployment • High motivation among the population but limited by caste system	• Low average age of the population • Increasing urbanisation
T	• Tendency towards a fast-follower role in numerous key technologies	• Low energy costs for companies • Gradual improvement of the basic infrastructure
E	• Low ambitions with regard to climate protection • Low environmental requirements for companies	• Sharp rise in greenhouse gas emissions
L	• Persistently limited rule of law with restrictions on opinion and corruption	• Insufficient regulatory basis in many areas (also for automated and connected driving)

Attractiveness for OEMs

… as a research centre

low — high

Comment: Strongly increasing availability of highly qualified specialists and renowned research institutions

… as a development location

low — high

Comment: Growing industrial network with low labour costs, but high inefficiency due to lack of regulation

… as a production site

low — high

Comment: Often poor product quality due to a lack of standards. In addition, lack of production networks

… as a sales market

low — high

Comment: Strong increase in demand due to rising purchasing power, but many price level targets.

INDIA

Optimistic scenario

General conditions and location factors

P

- Weakening the influence of religion
- Market economy with a liberal bias
- Moderate tax and low tax burden
- Gradual dismantling of import restrictions

E

- Strong increase in economic growth (GDP)
- Stable inflation rate at a moderate level
- Sharp rise in household income
- Strong rise in car sales figures

S

- Low unemployment
- High-achieving, educated population as a whole but restrictions due to caste system
- Low average age of the population
- Strong increase in urbanisation

T

- Fast-follower role for key technologies
- Development of leading national companies
- Low energy costs for companies
- Significant improvement in basic infrastructure

E

- Efficient market-based climate protection
- Introduction of targeted and flexible environmental standards
- Sharp rise in greenhouse gas emissions

L

- Improvement in the rule of law and freedom of expression as well as weak corruption
- Start of the development of a legal framework for automated and connected driving

Attractiveness for OEMs

… as a research centre

low — high

Comment: High availability of highly qualified specialists, but restrictions due to caste system

… as a development location

low — high

Comment: Strong industrial network with low labour costs, but regulatory basis remains weak

… as a production site

low — high

Comment: Growing production networks at acceptable costs, but persistently poor product quality[1]

… as a sales market

low — high

Comment: Strong increase in demand with rising purchasing power and population, but price targets remain in place

(1) Due to weak regulatory basis

INDIA

Pessimistic scenario

General conditions and location factors

P

- Growing religious influences
- Highly regulated market economy
- Increased tax and average tax burden
- Increased trade protectionism

E

- Slight increase in economic strength (GDP)
- Increased inflation
- Slight increase in household income
- Slight increase in car sales figures

S

- High unemployment
- Demotivated and insecure labour force
- Low average age of the population
- Stagnating urbanisation

T

- Follower role for key technologies
- Lack of development of leading national companies
- Moderate energy costs for companies

E

- Uncoordinated climate protection framework
- Increased environmental requirements for companies
- Stagnating greenhouse gas emissions

L

- Persistently limited rule of law with restrictions on opinion and corruption
- Legal framework for automated and connected driving still lacking

Attractiveness for OEMs

… as a research centre

low — high

Comment: Increasing availability of high-quality skilled labour, severe restrictions due to the caste system

… as a development location

low — high

Comment: Gradually strengthening industrial network, but high inefficiency due to lack of regulation

… as a production site

low — high

Comment: Growing attractiveness for domestic prod. but increased trade barriers and lack of quality standards

… as a sales market

low — high

Comment: Slight increase in demand and purchasing power, but continued strong price sensitivity and cost constraints

WP4 – Recommendations for action

Development scenarios for the year 2035

Summary

Overview of the expected location attractiveness of selected core regions

	USA	China	Europe	India
Research location				
Development location				
Production location				
Sales market				

Depending on the scenario, Europe's attractiveness as a business location, particularly as a development and production centre, could deteriorate massively by 2035, but targeted measures can counteract this

Conditions for an optimistic scenario for established economies

Energy costs

Energy and climate policy can reduce production costs without compromising on sustainability. Nuclear and fusion energy, power plants with CO2 capture, etc. must be taken into account in the same way as wind and solar energy when considering overall costs.

Study on energy sovereignty

Bureaucracy and subsidies

A bureaucracy that controls less by prescribing paths and more by prescribing goals is more efficient, more cost-effective and leaves more room for creative solutions. If you decide in favour of subsidies, then in research, in the short term and on a broad basis.

Study on subsidy policy

Labour force

We need intelligent automation strategies and AI applications combined with an education offensive and a targeted migration, family and social policy.

Study on the labour market

Taxation

Taxes and levies must be reduced and public funds restricted to the core tasks of the state.

Study on stable public finances

Trade policy

The Schengen area is already the largest interconnected market in the world. From strategic trade partnerships to free trade zones, all options must be examined and implemented globally.

Conditions for an optimistic scenario for emerging economies

Energy security

A secure energy supply is a basic requirement for large-scale industrial processes such as automotive production. In addition to economic efficiency and reliability, however, environmental and climate aspects must also be taken into account.

Institutional Basis

Strong and reliable institutions create an investment-friendly environment. Secure property rights, political and governmental transparency as well as freedom of investment and research are important factors for a long-term choice of location.

Security

A secure state monopoly on domestic authority and secure and peaceful foreign policy conditions are basic prerequisites for industrial investment.

Human capital

A qualified and skilled labour force enables an integrated value chain and is therefore the basis for complex production processes, such as in the automotive sector. The education and research environment is therefore an important location factor.

Trade policy

Customs barriers hinder the international exchange of goods and services - in order to serve important and developed markets, the mutual dismantling of trade barriers is an important step to promote international investment.

Conclusion of the overall study

Conclusion

Cross-regional findings

The automotive industry is growing strongly, particularly in young industrialized nations, but political uncertainties still represent a significant risk factor.

Established industrialized countries offer stability and technological expertise, but these advantages are becoming less important in the choice of location due to high costs.

Road transport remains globally central to passenger and freight transport.

The nations under consideration are focusing on electrification. FCEVs and e-fuels are currently only intended for selected applications.

OEM-specific findings

Manufacturers are responding to market trends with an increased focus on software solutions, digital services and autonomous driving functions.

The change in powertrain technology is taking place in different ways: European OEMs (electric first and only) vs. Asian players (focus on hybrids and gradual e-mobility).

Mobility solutions play a central role in OEM strategies: The aim is to develop modern, vehicle-centred mobility offerings along digital platforms.

Findings on regional attractiveness

The USA and China offer the best compromise in terms of location conditions. The resulting growing attractiveness for R&D, production and sales is a driver for further technology leadership.

Europe's declining importance due to weak innovation, regulatory hurdles, high location costs and a lack of research-industry links requires targeted reforms such as a competitive energy policy, tax relief and the strategic use of AI and education.

Markets such as India, Southeast Asia and parts of Africa are gaining in economic and geopolitical importance, particularly as production and development centers, often at the expense of Europe.

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