PANORAMA OF THE MANUFACTURING INDUSTRY OF THE CZECH REPUBLIC 2016
Dear readers,

It is a pleasure for me to write a few words for the twentieth edition of Panorama of the Manufacturing Industry of the Czech Republic. The Panorama is published by the Ministry of Industry and Trade in close cooperation with the Czech Statistical Office with the contribution of the Ministry of Agriculture, the Confederation of Industry, selected sectoral associations, as well as the Office of the Government.

It is a brief analysis of the individual branches of the Czech Republic’s manufacturing industry, which is broken down into three-digit CZ-NACE classification and CZ-CPA classification of foreign trade in commodities, and aims to provide the reader with an overview of the current situation in the branch and its segments. It covers developments over the period 2008–2016.

In 2016, our economic development continued to be favourable. Although the Czech economy slowed to 2.6% year-on-year, it continued to be in very good shape. The decisive factor for GDP growth was stable consumption of households, which posted 3.6% more year-on-year. Their willingness to spend was underpinned primarily by growth in employment and wages, as the labour market saw extraordinary gains last year. Total employment increased, its rate being the highest in the history of the Czech Republic; conversely, unemployment was the lowest throughout the EU. Foreign trade in national concept reached a record volume, increasing to CZK 6,434.6 billion, up CZK 39.6 billion from in the same period of 2015.

The industry, a cornerstone of the Czech economy accounting for roughly a third of its performance, contributed 32.1% to gross value added in 2016, while the contribution of the manufacturing industry was 27.1%. In the EU-28, the Czech Republic belongs to the countries with the highest share of the manufacturing industry in gross value added. Also, its share in total employment, which was 26.6% in 2016, is significant.

While production in industry as a whole grew by 3.5%, it grew by 4.3% in the manufacturing industry. Manufacture of motor vehicles has consistently been the key sector for the entire manufacturing industry; it provided nearly one third of total industry revenues and grew by 11.8% year-on-year. In addition, largest gains were seen in printing and reproduction of recorded media (+13.9%), manufacture of furniture (+6.3%), manufacture of fabricated metal products, except machinery and equipment (+5.0%) and manufacture of textiles (by 4.8%).

Dear readers, I believe that this publication, which is unique because it provides manufacturing industry data broken down to the branch structure, will benefit you and provide an important source of information. At present, there is no other document presenting data in such a detail, and many years of experience have shown that it is in high demand. The Panorama of the Czech Manufacturing Industry provides professionals in the Czech Republic and abroad with the results in individual branches of the manufacturing industry over the last period and at the same time offers the chance to present the achievements of Czech companies on an international scale.

Ing. Jiří Havlíček, MBA
Minister of Industry and Trade
Dear Readers of the Panorama,

I am proud of the fact that the industry has for several years now confirmed its key role in the development of the economy, not only by its share but also by contributing to its growth. The industry grew again, the growth rate of the value added of the manufacturing industry was roughly double that of the whole economy. It contributed decisively to the condition of the economy, significantly contributing to the decline in unemployment to a record low or to exports worth almost CZK 4 billion.

However, the biggest obstacle to the development of our economy is the shortage of labour, which has also created pressures on wage growth, in some cases outpacing the growth of labour productivity. We need another 150,000 people, and as a result some of the companies had to start rejecting more contracts. Further development of the economy is also hampered by the insufficient motorway network or the coverage by high-speed internet. I consider the failure to amend the building legislation as the biggest mistake of the Government. In three and a half years, the government has only made the first step towards the amendment, which will not bring about a major improvement for the industry. Without a functioning motorway network, however, we cannot expect an efficient economy.

Companies also have to respond to new challenges related to digitization or to rapidly changing market demands and opportunities. The growth of key world economies is not significant, contracts still have to be fought for hard and the double-digit pace of their growth is no longer expected this year. There are also risks associated with political trends and developments in the EU such as Brexit or elections in a number of countries. In the global context, we will have to prepare for problems arising from growing protectionism in international trade or the restriction of the freedoms of the single European market.

This year, the economy is also returning to the floating exchange rate against the euro. Despite the short-term positive impact for domestic exports due to the temporarily weaker koruna, entrepreneurs that prefer stability see the euro as an important anchor. At the same time, the euro as the single currency carries a significant value for European integration, and the Czech Republic cannot afford to stand aside. The fact that we have succeeded in winning a place in global chains over the past few years will need to be confirmed and maintained.

I believe that, despite all the challenges facing our economy, domestic entrepreneurs will prove their skills and strength and will manage to maintain the positive trend in economic growth also this year. Industry developments in the early months give positive signals.

Ing. Jaroslav Hanák
President of the Confederation of Industry of the Czech Republic
Dear readers,

You are holding the twentieth issue of the analytical publication Panorama of the Manufacturing Industry prepared by the Ministry of Industry and Trade in close cooperation with the Czech Statistical Office. Over the past twenty years, the manufacturing industry as well as the whole economy have undergone a number of structural changes. What remains unchanged is the purpose of this publication, which continues to show the extraordinary importance of this sector. The long-term significance of the manufacturing industry in the Czech Republic has not decreased; conversely, it has been slightly increasing. While in 1996 the manufacturing industry accounted for 24.8% of the added value generated by the Czech economy, it was 27.1% in 2016. By contrast, within the European Union, this share fell from 19.2% to 16% in the same period.

The manufacturing industry remains the main driver of the Czech economy’s growth, as evidenced by the current national accounts data. Although the growth rate of GDP in 2016 slowed down to 2.6%, roughly half that in the previous year, the manufacturing industry was by far the most significant contributor to growth. Its gross added value increased by 7.0%, while the contribution to the growth of gross value added was 1.9 pp. This represents approximately 70% of total growth. Although this result is not dramatically different from previous years, it shows a slight increase in the share of the manufacturing industry in economic growth.

Also, in terms of sectoral short-term statistics, 2016 appears to be successful. The output of the manufacturing industry, measured by the industrial production index, grew by 4.3% year-on-year, which was mainly due to the results of the automotive industry, which, as in the previous year, continued to grow at double-digit rate of 11.8%. It contributed 2.6 pp to the year-on-year growth of the manufacturing industry.

In 2016, employment, too, continued to increase. In the manufacturing industry, nearly 27,000 employees were added, a 2.4% increase. However, employment is becoming an important factor in further development. As confirmed by the CZSO’s business surveys, a growing number of companies consider the lack of employees as the main barrier to further growth. In January 2017, their share was 26.6%, more than doubling over the past year.

The following pages provide the reader with a number of other detailed statistical information on each sector. At a time when unverified data of uncertain origin and unclear methodology commonly appear in the media, the Panorama of the Manufacturing Industry brings an admirable amount of hard data based on official statistics. The twenty-year tradition suggests that such information is in high demand among readers, and I am glad that the Czech Statistical Office could also make its contribution.

prof. Ing. Iva Ritschelová, CSc.
President of the Czech Statistical Office
## Contents

**MINISTER OF INDUSTRY AND TRADE**  
**PRESIDENT OF THE CONFEDERATION OF INDUSTRY**  
**PRESIDENT OF THE CZECH STATISTICAL OFFICE**  
**FEDERATION OF THE FOOD AND DRINK INDUSTRIES OF THE CZECH REPUBLIC (FFDI)**  
**CZECH BEER AND MALT ASSOCIATION**  
**ASSOCIATION OF TEXTILE–CLOTHING–LEATHER INDUSTRY**  
**ASSOCIATION OF FORESTRY AND WOOD PROCESSING COMPANIES**  
**ASSOCIATION OF THE PULP AND PAPER INDUSTRY**  
**ASSOCIATION OF THE CHEMICAL INDUSTRY OF THE CZECH REPUBLIC**  
**ASSOCIATION OF THE GLASS AND CERAMIC INDUSTRY OF THE CZECH REPUBLIC**  
**CZECH CEMENT ASSOCIATION**  
**ASSOCIATION OF FOUNDRIES OF THE CZECH REPUBLIC**  
**ASSOCIATION OF ENGINEERING TECHNOLOGY**  
**AUTOMOTIVE INDUSTRY ASSOCIATION**  
**ASSOCIATION OF THE CZECH AEROSPACE INDUSTRY**  
**ASSOCIATION OF CZECH RAILWAY INDUSTRY**  
**SHIP-BUILDING INDUSTRY ASSOCIATION**  
**ASSOCIATION OF CZECH FURNITURE MANUFACTURERS**  
**METHODOLOGY**  
**SOURCE OF DATA FOR THE PANORAMA**  
**CHAPTER STRUCTURE**  
**INFA METHODOLOGY**

### 1. MANUFACTURING INDUSTRY

1.1 PRODUCTION CHARACTERISTICS  
1.2 INVESTMENT, R&D EXPENDITURES AND INNOVATIONS  
1.3 PRICES  
1.4 FOREIGN TRADE  
1.5 ECONOMIC VALUE ADDED  
1.6 SUMMARY AND PROSPECTS OF THE MANUFACTURING INDUSTRY

### 2. CZ-NACE 10 MANUFACTURE OF FOOD PRODUCTS

2.1 DIVISION CHARACTERISTIC  
2.2 DIVISION DEVELOPMENT  
2.3 MAIN ECONOMIC INDICATORS  
2.4 FOREIGN TRADE  
2.5 RESEARCH AND DEVELOPMENT  
2.6 DIVISION SUMMARY AND PROSPECTS

### 3. CZ-NACE 11 MANUFACTURE OF BEVERAGES

3.1 DIVISION CHARACTERISTIC  
3.2 DIVISION DEVELOPMENT  
3.3 MAIN ECONOMIC INDICATORS  
3.4 FOREIGN TRADE  
3.5 RESEARCH AND DEVELOPMENT  
3.6 DIVISION SUMMARY AND PROSPECTS

### 4. CZ-NACE 13 MANUFACTURE OF TEXTILES

4.1 DIVISION CHARACTERISTIC  
4.2 DIVISION DEVELOPMENT  
4.3 MAIN ECONOMIC INDICATORS  
4.4 FOREIGN TRADE  
4.5 RESEARCH AND DEVELOPMENT  
4.6 DIVISION SUMMARY AND PROSPECTS
12. CZ-NACE 22 MANUFACTURE OF RUBBER AND PLASTIC PRODUCTS
   12.1 DIVISION CHARACTERISTIC 125
   12.2 DIVISION DEVELOPMENT 126
   12.3 MAIN ECONOMIC INDICATORS 127
   12.4 FOREIGN TRADE 128
   12.5 RESEARCH AND DEVELOPMENT 129
   12.6 DIVISION SUMMARY AND PROSPECTS 130

13. CZ-NACE 23 MANUFACTURE OF OTHER NON-METALLIC MINERAL PRODUCTS
   13.1 DIVISION CHARACTERISTIC 133
   13.2 DIVISION DEVELOPMENT 134
   13.3 MAIN ECONOMIC INDICATORS 135
   13.4 FOREIGN TRADE 137
   13.5 RESEARCH AND DEVELOPMENT 138
   13.6 DIVISION SUMMARY AND PROSPECTS 139

14. CZ-NACE 24 MANUFACTURE OF BASIC METALS, METALLURGY; CASTING OF METALS
   14.1 DIVISION CHARACTERISTIC 141
   14.2 DIVISION DEVELOPMENT 142
   14.3 MAIN ECONOMIC INDICATORS 142
   14.4 FOREIGN TRADE 144
   14.5 RESEARCH AND DEVELOPMENT 145
   14.6 DIVISION SUMMARY AND PROSPECTS 146

15. CZ-NACE 25 MANUFACTURE OF FABRICATED METAL PRODUCTS, EXCEPT MACHINERY AND EQUIPMENT
   15.1 DIVISION CHARACTERISTIC 149
   15.2 DIVISION DEVELOPMENT 150
   15.3 MAIN ECONOMIC INDICATORS 150
   15.4 FOREIGN TRADE 152
   15.5 RESEARCH AND DEVELOPMENT 153
   15.6 DIVISION SUMMARY AND PROSPECTS 153

16. CZ-NACE 26 MANUFACTURE OF COMPUTER, ELECTRONIC AND OPTICAL PRODUCTS
   16.1 DIVISION CHARACTERISTIC 155
   16.2 DIVISION DEVELOPMENT 156
   16.3 MAIN ECONOMIC INDICATORS 156
   16.4 FOREIGN TRADE 156
   16.5 RESEARCH AND DEVELOPMENT 159
   16.6 DIVISION SUMMARY AND PROSPECTS 160

17. CZ-NACE 27 MANUFACTURE OF ELECTRICAL EQUIPMENT
   17.1 DIVISION CHARACTERISTIC 161
   17.2 DIVISION DEVELOPMENT 162
   17.3 MAIN ECONOMIC INDICATORS 162
   17.4 FOREIGN TRADE 164
   17.5 RESEARCH AND DEVELOPMENT 165
   17.6 DIVISION SUMMARY AND PROSPECTS 166

18. CZ-NACE 28 MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.
   18.1 DIVISION CHARACTERISTIC 167
   18.2 DIVISION DEVELOPMENT 168
   18.3 MAIN ECONOMIC INDICATORS 168
   18.4 FOREIGN TRADE 170
   18.5 RESEARCH AND DEVELOPMENT 171
   18.6 DIVISION SUMMARY AND PROSPECTS 171
The Czech food industry has historically been one of the fundamental branches of the manufacturing industry within the national economy and represents a relatively independent element of the food chain. Its importance is mainly due to the fact that it ensures the nutritional needs of the population by processing the majority of domestic agrarian production and production of healthy, high-quality and widely available food. To achieve this goal, it is necessary to ensure continuous improvement of its competitiveness within this industry.

At present, the Czech food industry continues to be affected by a number of external factors stemming from ever-increasing globalization. The high number of foreign chains in the Czech Republic creates an unequal market environment for Czech producers towards their foreign competitors. In addition, the overly dense sales network in the Czech Republic distorts the natural competitive environment, where food businesses are forced to compete with price, reducing their production costs at the expense of product innovation. This situation is totally contrary to the existing lifestyle trends and does not allow them to engage in the European competitive environment.

As a result of the embargo on exports to Russia, there has been an outage in (or maybe, in the future, even the loss of) the Russian market. Also in 2016, the sanctions against Russia led to various EU chains trying to sell surplus goods in European markets. All this has led to a deterioration of relative market stability and a reduction in the dynamics of the food industry. Moreover, the trend of reduced manufacturing investment from own resources and the cost reduction accompanied by job cuts continued.

Exports of food products saw a significant year-on-year increase of almost 11% in 2016 (6% for beverages). In the case of food products, year-on-year growth in exports was achieved only for some groups that were not affected by the ban on exports to Russia. A more pronounced increase in exports was seen in rapeseed oil, food preparations, chocolate and other food preparations containing cocoa, beer and malt, sugar, sweet biscuits and wafers, confectionery without cocoa, and eventually processed and preserved fruit and vegetables. On the other hand, there was an especially significant decline in the group of dairy and meat products. In food production, all product groups are essentially involved in the growth of imports. The main import commodities in 2016 included pork and poultry, fresh, chilled or frozen, often used as so-called production meat, vegetables, fruit and nuts, animal and vegetable fats and fish and, in terms of dairy products, mainly cheeses, but also chocolate, coffee, tea, rice and wine.

Foreign trade in food commodities takes place primarily within the EU single market, but companies also seek other territories. Food is exported mainly by food producers, not only by large companies and companies with foreign participation.

Imports are largely brought by retail chains, especially when they can buy products at lower prices than from domestic producers. However, imports also include certain commodities which are further processed in the Czech Republic, e.g. so-called production meat, which is imported by the producers themselves. However, it is essential that supervisory authorities monitor the imports of final commodities or commodities for further processing in terms of their risk to health.

This overview shows that the main objective for the development of the food industry requires ongoing improvements in efficiency and competitiveness not only in the European but also in the global market. It can build on the application of the results of research and development, and on developing product, technological and organizational innovations, including efficient acquisitions. Furthermore, full use must be made of sales promotions by means of modern forms of marketing aimed at enhancing consumer confidence in food produced in the Czech Republic, as well as of subsidies from EU and national funds. The development of the sector must be in line with external macroeconomic and internal social conditions – economic growth, real wage growth, and other opportunities that drive up demand for food.

Ing. Miroslav Toman, CSc.
President of the Federation of the Food and Drink Industries of the Czech Republic
The Czech Beer and Malt Association brings together breweries, malt houses and other institutions that are directly or indirectly involved in beer production in the Czech Republic. At present, the Association brings together 26 brewing companies, 7 malt houses and 19 contributing members. The contributing members include producers of beer glass, labels, technological and technical equipment for the brewing sector, educational institutions, etc.

History of the CBMA

The current form of the Association dates back to 1991. The Association follows a long tradition which goes back into the second half of the 19th century. At that time, the first professional brewing and malting organizations were established in our lands. The most important of these was founded in 1873 under the name Association for the Brewing Industry in the Czech Kingdom.

The main objective of the CBMA is to promote and defend the rights and common interests of its members. The Association supports activities contributing to the development of the Czech beer industry, provides contacts to legislators, relevant government bodies, professional associations, industrial, scientific, research, training, trade and agricultural institutions. The Association represents the interests of its members also internationally in beer and malt industry associations and organizations.

The positive perception of Czech beer is increasing and its popularity rising. The brewing sector pays CZK 29 billion a year on taxes. It creates jobs for 65,000 people. It pays CZK 20 billion per year to its suppliers, of which more than 90% goes to suppliers in the Czech Republic. Beer industry is also a significant customer of Czech farmers. It significantly affects restaurants and pubs, where more than 25% of revenues come from beer sales. One job in the beer industry creates one job in supplier companies, five jobs in restaurants, two in retail and two in other industries. The world class reputation of Czech beer is thanks to both favourable conditions for the cultivation of malting barley and hops, as well as the high professional level of the workforce. The long-term research of the typical characteristics of Czech beer at the Research Institute of Brewing and Malting (RIBM) has demonstrated the specific qualities of Czech beers, thanks to which we can certainly distinguish the Czech lager from European beers of the same type. The RIBM completed the basic characteristics in 2004, which was one of the key documents for the application for the Protected Geographical Indication (PGI) Czech beer, which was granted in 2008. This guarantees consumers the use of Czech brewing ingredients, traditional practices and the place of production – the Czech Republic.

Days of Czech beer are aimed at supporting Czech beer and reminding of its main tradition – a common consumption in a circle of friends in pubs and restaurants. Of course, we want to introduce modern elements into Czech beer culture, especially to introduce the combination of beer with modern gastronomy. Days of Czech beer are traditionally opened on September 27, on the eve of St. Wenceslas’ Day.

Also very important are projects supporting the social responsibility of the beer industry, especially those that lead to a responsible consumption of beer. The ambition of our projects “I am driving, I drink non-alcoholic beer” and “Man, be cool” is to help eliminate alcohol-related driving problems and drinking of teenagers.

Other important activities of the Association are the appreciation of important people for their contribution to Czech brewing and malting. Every year, we therefore award the Prize of Czech Brewmaster F. O. Poupé for activities that have contributed most to the development of the beer and malt industries in the Czech Republic in that year, and we also select important personalities to the Hall of Fame. Last but not least, in autumn we announce the results of the prestigious tasting competition Czech Beer.

Czech beer industry has become our country famous and continues to improve its reputation throughout the world. It is an important branch of the national economy, which contributes to the uniqueness of the Czech Republic abroad, supports its economic development and contributes significantly to the State budget.

The evolution of beermaking in our country reflects changing consumers’ lifestyle, as well as the current state of the national and world economy. Total volume of beer produced in the Czech Republic, including non-alcoholic beer, was up 1.9% last year to reach the record high of 20.5 million hectolitres of beer. This situation is encouraging in that the increase in beer production is due to both higher volume produced for the domestic market and the continuing trend in the export sector, which has been growing steadily for four years in a row.

Although the volume of beer produced in the domestic market increased, the average beer consumption per capita remained the same year-on-year at 143 litres. This is mainly because last year the population of the Czech Republic increased. Average consumption per person has been between 143 and 146 litres for the last seven years. For comparison, in the “breakthrough” year of 2009, when the beer market underwent a deep shock, the consumption was 153 litres.

Ing. František Šámal
President of Czech Beer and Malt Association
The textile and clothing industry has undergone relatively deep restructuring in the past years, accompanied by a change in the dominant orientation from classic textiles to technical textiles. The focus on the production of technical textiles gives companies a fairly wide range of opportunities in terms of sales and development, whether they are textiles for the automotive and aviation industries or for healthcare, construction, agriculture sectors and other fields of human activity. The success of the sector’s restructuring is also evidenced by the fact that revenues have been increasing steadily for eight years. In 2016, the revenues of companies with more than twenty employees were at CZK 53.49 billion. As regards textile and clothing exports, it is still a relatively varied mix of goods composed of both technically advanced products, semi-finished products and products with lower added value. These products are primarily directed to demanding European markets, mainly to Germany, Italy, Poland, Slovakia, Austria, France, the Netherlands and the United Kingdom.

In the textiles sector, the Association of Textile-Clothing-Leather Industry (ATOK) and textile companies have established CLUTEX (the technical textile cluster) and the Czech Technology Platform for Textile. These two organizations are aimed at supporting technical development and innovation in the textile industry. For example, the cluster has helped to organise the development of Prowell, a new material which is unique in its design using two different materials – cotton and polyester, which give the fabric new properties, its advantages being excellent absorbency, warmth, fast drying and low volume of the textile. Other textiles include Nanomembrane, a brand new nanofibre membrane. This membrane has unique properties that are unrivalled among other membranes in the world. This membrane is used for sports and outdoor purposes. Textiles intended for health care include anti-decubitus bed mattresses or a new type of surgical thread (visible by NMR imaging) suitable for permanent applications as an in-vivo medical equipment. We can also mention a new inspection system for assessing colour defects of finished fabrics and equipment designed to measure the characteristics of spool coils intended for dyeing in pressure machines.

In addition to the above-mentioned organizations, it is necessary to also mention the Faculty of Textile, Technical University of Liberec (FT TUL). In addition to teaching, this school also focuses on the research and development of applications of new materials in the field of clothing and technical textiles, the development of composite structures containing inorganic fibres, nanoparticles and textile reinforcements, the design and evaluation of intelligent textiles, the modification and development of technologies for the processing of new materials, new energy sources and new transport media in textiles. Furthermore, the areas of interest of this school include interdisciplinary use of textiles, the use of optical fibres and shape memory materials for technical products, the development of textile sensors and sensors suitable for use in textiles. The faculty is also relatively well-known for research and development in the field of nanotechnology utilization in textiles.

There are naturally also companies in the Czech Republic which have their own technical development or which cooperate with other (also foreign) schools and research institutions.

Securing new workers with adequate textile education is currently one of the biggest problems in the textile and clothing industry, which is difficult and takes time to resolve. As far as higher education is concerned, the FT TUL is a positive factor; however, the situation much worse in the case of secondary education. The problem has two aspects: the insufficient number of young people interested in textile and clothing education, and the poorly structured secondary and apprenticeship education in the regions where textiles and clothing companies operate; also, with one exception, there are no longer any textile technology schools. Therefore, to improve the situation, a nation-wide sectoral agreement was initiated, which forms the basis for regional sectoral agreements based on cooperation among regions, companies and schools in an effort to meet the educational needs of companies in the regions. At present, such agreements have been concluded in the Hradec Králové Region and the Zlín Region. Currently, sectoral agreements are being negotiated in the Olomouc Region, the South Moravian Region, the South Bohemian Region and the Pilsen Region, and prospectively also in Vysočina and the Moravian-Silesian Regions.

In the textile and clothing industry (as in other consumer industries), large one-off contracts are not usually concluded. This sector is rather characteristic for a number of smaller orders.

The textile and clothing industry has been growing for the eighth year in a row and it can be assumed that barring unexpected events, it will continue to grow in the years to come, especially in the context of economic recovery. Among the most important factors that may adversely affect the industry are the shortage of skilled workers and the international security situation, which is currently far from satisfactory. An example of adverse effects is the development in Africa, which first faced the epidemic of the Ebola virus, and then political and security destabilization due to the activities of Islamist groups. The destabilization also had an impact on local consumption, which was also reflected in exports of textiles to the African continent. While in 2016 exports of textile goods to Africa totalled CZK 2.27 billion, they were only CZK 1.14 billion in 2016, a decrease of about 50%. The drop in the exports to Africa was offset by increased exports to European countries and the American continent. These two regions are currently key to the textiles and clothing industry and will continue to be in the medium term.

Jiří Grund
President of the Association of Textile–Clothing–Leather Industry
Due to the ongoing bark beetle infestation, the last two years have been a period of relative sufficiency of the basic production raw material for the forestry and woodworking industry in the Czech Republic. Although it lacks the required quality for certain part of the final products, it is acceptable given the technological level of the woodworking plants. At present, crucial aspects are speed and flexibility of production with the possibility of further downstream woodworking as required by the end customer, which requires constant modernization of the technology used.

Stiff competition in the industry and the amount of primary wood processing capacities completed around 2010, especially in the Central European region, result in ongoing extreme pressure on the prices of final products and overall production efficiency. This, in turn, severely limits the generation of resources to further invest in expanding or restoring existing technology. In this respect, the position of enterprises without a strong foreign owner with a relatively large amount of finance for further modernization is very difficult and we have lately seen the gradual reduction of the total number of production units in primary woodcutting.

In the area of education and research, there are two wood faculties, one in Brno and the other in Prague. In this respect, we appreciate the completion of the construction of a new scientific pavilion under the Faculty of Wood Sciences of the Czech University of Life Sciences in Prague - Suchdol. It will now be a matter of how quickly the state-of-the-art techniques in teaching and research will be reflected in outputs applicable in existing production facilities.

The quality of the outputs of the scientific activities, the possibilities of its practical application and the close cooperation with other sectors will determine the further character of our field, i.e. whether we will continue to strongly focus on simple primary wood processing and low value added exports, or, like in the Scandinavian countries, we will gradually build up progressive technology manufacturing centers, which we can generally refer to as biotechnological production. Examples include innovative production of further waste-based products, for example, in the pulp industry. In the Czech Republic, one of the few examples of this kind is a complete production transformation at Biocel Paskov from paper pulp to viscose pulp as a raw material for the production of textile fibres.

The woodworking industry has a stable position within the manufacturing industry and its products are in high demand in terms of quality and price both in the Czech Republic, in the EU and beyond. Its competitive advantage is the sufficiency of domestic timber – a renewable and environmentally friendly raw material. On the less positive note, the Czech Republic is among the largest European exporters of timber, and our exports are dominated by products with lower value added. At present, we are the world's largest timber exporter relative to total wood area, which is mainly due to the constantly high demand in neighbouring countries – Austria and Germany.

After 2008, this sector, too, suffered a protracted crisis. The fall in revenues was accompanied by weakened investment activity and the decline in construction industry; only in the last two years, revenues were again approaching 2008 levels. The volume of investments plummeted, and there has been recovery only since 2014, but still significantly below 2008 levels. However, we can see a very positive trend – a continuous growth in the share of wooden buildings in the total number of completed residential buildings; compared with 2010, when the share was 6.87%, it grew annually to 14.36% in 2016.

We welcome the progressive development of cooperation between industry and agriculture as we believe that for increased competitiveness and further development, the division will require the introduction of state-of-the-art technologies, support for science and technology, and the support for small and medium-sized enterprises in existing and new subsidy programmes.

Our long-term goal is to increase the consumption of wood in the Czech Republic as a domestic renewable, environmentally friendly and versatile raw material! It is fundamental to explain to the public the benefits of increased use of wood-based products in an appropriate form, and in particular to align supportive measures with strategies in other sectors of the economy (environment, energy, industry, construction, etc.).

Ing. Petr Jelínek
President of Association of Forestry and Wood Processing Companies
ASSOCIATION OF THE PULP AND PAPER INDUSTRY

The Czech paper and pulp industry is not a large or key sector in terms of its share of the total GDP of the Czech Republic, although it has the necessary potential. It is a traditional and significant sector that is a competitive and highly perspective branch of the manufacturing industry with good environmental performance. Its products are indispensable in all other branches of the manufacturing industry, mainly in the manufacture of packaging of all types where consumption is constantly rising, but also in the printing industry and in the provision of health and social standards of the population (hygienic papers).

Paper industry production is based on the processing of renewable raw materials of predominantly domestic origin (wood) and recyclable secondary raw materials (recovered paper). For many years, the strategy of sustainable development has been actively pursued in this field, and the production of pulp and paper takes place in a virtually closed cycle. Paper mills have always behaved both economically and ecologically, and will continue to do so. However, the processing of recovered paper is lower than required in the Czech Republic and most of the collected paper intended for paper recycling is exported (830,000 tonnes out of a little more than 1 million tons collected), because there are no suitable production capacities available. The situation in the production of fibres and papers based on primary raw material (wood) is somewhat different. After years of stagnation, there is now a massive investment of more than CZK 10 billion, which should not only lead to increased wood processing and pulp and paper production, but also to the energy recovery of all types of biowaste from this production.

As has already mentioned above, the paper and pulp industry is very investment-intensive. The production of paper pulp also consumes relatively large amounts of water as well as other energies (electricity, heat), but they are almost entirely provided from the recovery of waste from the production of pulp (bark, sawdust, chips, liquor) or paper.

The Czech paper industry, which is now an integral part of the European paper industry (a member of CEPI), is still affected by the important fact that it is conceived as a Czechoslovak industry. This still significantly influences the production historical capacities and, above all, the coverage of real consumption from domestic sources. The Czech paper industry is characterized by production specialising in packaging and wrapping papers, which are massively exported in the case of some products. However, the bulk of domestic paper and cardboard consumption still has to be covered by imports (1,493 million tonnes in 2016), which is almost 88% higher than the total domestic production (794 thousand tonnes). In particular, graphic papers and hygienic papers are imported, as well as some materials for the production of corrugated cardboards.

The economic development of the Czech Republic as a whole and the prospects of the paper industry are quite accurately described in the different types of statistics, in particular statistics on the annual per capita consumption of paper. According to UNESCO, the consumption of communications (print and graphic) papers quite accurately documents the literacy and social and cultural maturity of the society, the consumption of hygienic papers informs about the health and social level and the consumption of packaging and wrapping papers is indicative of the development of the entire industry and food sector, because practically all goods are packaged. In the last year, the paper sector statistics document the development of the industry (total production and consumption increased by about 5% year-on-year), which is also related to the domestic consumption of paper per capita which grew from 136 kg in 2015 to more than 139 kg in 2016, but still has potential for further growth. The average annual consumption in the EU is around 160 kg of paper per capita.

In the coming years, it seems necessary to ensure consistent non-discrimination of all energy sources and a balanced design of systemic changes to avoid inefficient growth of enterprise costs and discouraging of foreign investors from doing business in the paper sector in the Czech Republic. This involves in particular risks to the availability of the basic raw material – wood – for the paper industry, which may materialise if wood is used for the production of renewable energy. At the same time, it is necessary to avoid reducing the competitiveness of Czech enterprises in the European market by creating unequal conditions. Environmental objectives in the paper industry need to be assessed with regard to their economic and social impacts. In doing so, optimal measures must be found both in the economy, employment and in the environment. This approach reflects the principle of sustainable development based on the dynamic balance of the economic, social and environmental pillars. The Czech paper industry has adopted this approach together with other member countries of the Confederation of European Paper Industries (CEPI).

Despite the dynamic growth in paper and cardboard consumption, the Czech Republic still lags behind the levels of advanced EU countries. However, in the coming years, this indicator may be expected to increase further to consumption approaching 180 kg per capita. This would be equivalent to the total domestic consumption of paper and cardboard of approximately 2 million tonnes per year. However, reaching this level only by another absolute increase in imports is not an economically efficient solution and larger investments should be considered (also in connection with a large surplus of recovered paper in the Czech Republic which is exported). The optimistic outlook for the paper sector is significantly affected by the fact that it is a sector based on renewable sources abundant in the Czech Republic which can be easily recycled and are generally seen as environmentally friendly.

Ing. Jaroslav Tymich
President of the Association of the Pulp and Paper Industry
The chemical industry is represented in the national economy by manufacturing companies, companies providing business, logistics and other services and also by organizations dealing with research, development and innovation classified under CZ-NACE 20, 21 and 22. After automotive, the chemical industry has the second highest revenues in the Czech manufacturing industry and it is also a major exporter and importer. In 2016, the revenues in the entire chemical industry amounted to CZK 470.2 billion, 99.2% of the sector’s revenues in 2015. The performance of the Czech chemical industry in 2016 was significantly affected by the accident of the ethylene unit in August 2015, which was renovated and commissioned only in October 2016. This negatively affected mainly revenues in CZ-NACE 20, which fell by 2.7%. However, the overall development of the sector has been relatively favourable and the chemical industry remains one of the most important industrial sectors contributing to the stability and growth of the Czech economy. This will determine its further development, investment in innovation and the expansion of current production capacities in a challenging competitive and legislative environment. Investments in industry and innovation, including research and development, are necessary to preserve the future competitiveness of the European (and thus the Czech) chemical industry. While in the EU the share of investment to revenues has been declining slightly since 2000 (annually around EUR 8.3 billion in 2015), there was a significant increase in the Czech Republic in 2016 – a repeated increase in material investment to CZK 27.5 billion.

By contrast, R&D expenditure relative to revenues remains below the EU average. The Strategic Research Agenda of Technology Platforms Supporting the Chemical Industry set out the basic strategic areas with sufficient scientific and technological potential, where projects are feasible and can contribute significantly to addressing the needs of the Czech society:

- industrial biotechnologies and the use of renewable resources,
- technology of materials incl. nanomaterials,
- manufacture and processing of polymers and biopolymers,
- use of plastics at the end of their life,
- new types of reactions and processes.

These areas are accompanied by the following current issues:

- circular economy,
- replacement of substances problematic in terms of health and environment,
- water management,
- materials for power engineering,
- prevention of the increase of waste plastics in seas,
- special polymers.

The state of the industry in 2016 was repeatedly positively affected by the implementation of the principles of Responsible Care, a global voluntary initiative. Currently, the Responsible Care initiative has 81 member organizations of the Association of Chemical Industry of the Czech Republic and its collective members of the Association of Paint Manufacturers of the Czech Republic, the Czech Association of Cleaning Stations and the Chemical Traders and Distributors Association of the Czech Republic. The manufacture of all chemicals has since 2007 been operated on the basis of an integrated permit, that is, in accordance with the best available techniques. Businesses are involved in the preparation of new documents on Best Available Techniques and have continually been preparing the necessary technology upgrades. In 2016, the most significant investments included the construction of membrane electrolysis at SPOLCHEMIE and the reconstruction of the ethylene unit and the start of the construction of a new polyethylene plant at Unipetrol RPA.

The chemical industry employed 123,000 persons; however, as well as many other segments of the Czech manufacturing industry, it now faces a shortage of suitable workforce in service professions and middle technical management. The situation could be improved in the future by Sectoral Agreement on Chemistry, which was concluded in the so-called “Industrial and Technical Education Year 2015”. In 2016, in order to keep sustainability of this agreement involving 50 partners, of which 18 secondary vocational schools with vocational chemistry education, the European Social Fund supported a five-year project “Sectoral Agreement on Chemistry – Social Dialogue to Promote Employment”. We are also looking towards the youngest generation: the competition “We are looking for the best young chemist of the Czech Republic” organized since 2012 by the Association of Chemical Industry of the Czech Republic in cooperation with its member organizations and other partners involved almost 14,000 pupils from 545 elementary schools from all the regions of the Czech Republic. This competition draws on the experience of cooperation between secondary vocational schools and chemical enterprises in individual regions and further develops it. This creates a prospective group of young people who can one day replace the current generation not only in the manufacture of chemicals but also in the use of chemicals and technologies in the energy sector, agriculture, health care, metallurgy, paper industry, glass industry, mechanical engineering including automotive, and in recent years also in waste processing and recycling. Of course, all the above is based on the awareness that chemistry brings not only technical benefits, but also contributes to the protection of the environment.

Ing. Petr Cingr
President of the association of the Chemical Industry of the Czech Republic
The manufacture of glass, ceramics and porcelain is one of the traditional industries in the Czech Republic. Since its beginnings, the industry has undergone a long and interesting historical development, primarily affected by all industrial revolutions. It is also characterized by its strong focus on exports and it is directly influenced by economic changes in the world, especially in the European Union, the destination of 70% of exports. Among the largest Czech glass customers in Europe are Germany, France, Poland, Austria, Hungary and Russia. However, Czech quality and imaginative modern design have been successful on all continents – from the Middle East to America. It should be remembered that products from glass, ceramics and porcelain are almost everywhere and we use them daily.

One of the most serious challenges for companies today is the search for qualified employees, especially graduates of vocational (preferably glass) secondary and higher education institutions. The number of employees in the sector also increased slightly in 2016. Glass is closely related to craft tradition and industrial production in Bohemia and Moravia. In the context of generational exchange higher labour migration as well as a low rate of unemployment, the risk of high employee turnover is increasing, thus reducing the number of loyal, full-time employees. In order not to lose specific, historical craft skills, companies have begun to take responsibility for the succession and actively bring up their students, their future employees. It is important for today’s young people to see the beauty of glass production, which is also associated with technological progress, and to find their future job in this traditional sector.

At present, the economic situation in our companies is positive, the sector is still growing and we also expect favourable development in the future. In 2016, the trend from previous years continued, characterized by a gradual increase in revenues and employment. It can be noted with satisfaction that there have been a lot of positive changes over the past few years. Companies have new contracts, they are working on technology development, innovating workflows and increasing production capacities. Growth is mainly driven by increased demand for products in the downstream sectors of the construction, automotive, chemical and food industries. Certain barriers, but also challenges are posed by some regulatory measures, especially in the field of environment and energy performance, which are directly related to further sustainability. We believe in the skills of our employees, in the management and decision-making skills of entrepreneurs and management, which ensures the continuous competitiveness of the glass and ceramics industry in the Czech Republic.

Founded in 1990, the Association of the Glass and Ceramic Industry of the Czech Republic is the umbrella organisation whose aim is to support and cultivate the business and legislative environment in the sector. Czech glass industry is one of the branches that have and will continue to have an irreplaceable position within the manufacturing industry. In the Czech economy, our industry is doing very well, which is evidenced by the turnovers of businesses. New investments in technology and in the development of our employees are a commitment and a hope for the future. Naturally, not everybody and everywhere is doing the same, but we can proudly say that all of our glass, ceramics and porcelain manufacturing and processing sectors have grown year on year.

Ing. Petr Mazzolini
President of the Association of the Glass and Ceramic Industry of the Czech Republic
The current production of cement and other clinker-based hydraulic binders in the Czech Republic is at top technological and qualitative level due to the application of BAT IPPC principles in manufacturing practice. Individual manufacturing plants belonging to global cement groups use high-quality domestic raw materials and offer customers a wide range of products according to European standards which are also ready for specific applications.

The cement industry, as an integral part of the Czech construction industry, is experiencing its ups and downs, whether due to the natural need to strengthen the construction industry, for example in the area of transport infrastructure, as is the case today or in the area of social housing, as will be the case in the following period. However, some of the drops are caused by unresolved problems in State administration or national legislation. Production and consumption of cement is always a national activity, as cement is never a commodity with a significant export or import share. Given the fact that the production of cement, and especially of clinker as the basis of all types of cement binders, is among the energy and environmentally intensive industries, the import of clinker into all EU countries, including the Czech Republic, may be of particular interest to environmental balances necessary to be taken into account in the future. Here, cooperation with the national administration will be necessary.

We highly appreciate our cooperation with vocational secondary schools and higher education institutions. We are currently focusing on two different ways of cooperation, which, as we believe, will reach a common goal. The first activity is the basic modern concrete building training, a “concrete building university” of sorts, i.e. the exchange of the latest knowledge among hydraulic binder manufacturers and concrete builders and builders of various construction professions. A second activity focused on future architects is the regular national student competition “Concrete and Architecture”, so that novice architects are better acquainted with the possibility of modern concrete.

The aim of the cement industry beyond 2020 is to expand the portfolio of cement products and explain their different utility properties for various concrete building applications. Our job is not only to use the material resources economically, but to continue to process many other alternative raw materials and fuels, thereby contributing to the saving of fossil resources. The cement industry must be prepared for further challenges in reducing greenhouse gas emissions, which, however, do not have a real ecological but rather an administrative nature in Europe. It will also be necessary to respond to the future decline in European grant funds and to make building logistics more efficient.

Ing. Karel Chuděj
President of the Czech Cement Association
Foundry production constitutes the foundation on which downstream industries can build. It reflects the demand and formation of the Czech industry in the last decade, when the economy’s material composition has transformed in favour of light alloy metals. The automotive industry is the most involved in these changes. The weight reduction of structural elements in Fe-based castings requires the use of qualitatively more demanding materials. The reduction in casting weight is negatively reflected in the cumulative volume outputs of foundries – production volumes are decreasing. This trend most affected grey cast iron and carbon steel castings.

After the historical minimum of the total production of castings in the Czech Republic in 2010, the trend of 2014, 2015 is expected, i.e. around 400,000 tonnes of castings per year.

The total production of Fe-based castings oscillates around 300,000 tonnes per year. However, there is also gradual stagnation and decrease of classical cast iron with flake graphite (it still holds its position in the traditional segment of the engineering industry, especially in machine tools) at the expense of sphericoidal cast iron or special cast iron containing alloying elements such as Si, Mo for exhaust pipes or turbocharger bodies.

The demand for carbon steels is slowly declining. The production of alloyed steels for mining equipment, mills and crushers or incandescent grate castings for incinerators is stable. Growth is seen in demand for infrastructure, particularly for rail transport and rolling stock parts whose construction requires high-quality steel castings. The production of pump bodies for the energy sector is also not negligible. The production of steel castings is based on single-item and small-series production with a high share of manual work by qualified workers. With an annual volume of about 60 thousand tonnes, the Czech Republic places fifth in the production of steel castings in Europe. Unfortunately, the demand for this material is declining globally, which is reflected in the production in the Czech Republic, which is export-oriented.

In the case of Al alloy castings, the situation is diametrically different. The demand for castings is increasing every year. The main driver is the automotive industry. In addition to the established production of components for light technology, power units, axles and transmissions, there is growing worldwide demand for structural castings for body parts. Al alloy composition is increased to include these new items. Production of 100,000 tonnes is exceeded each year. Large-scale production is based on high-pressure casting machines with robotic handling. Seventy-five percent of the total production is dispatched to foreign automotive companies and the situation is to remain unchanged in the coming years.

Production of castings from other non-ferrous metals mainly involves copper alloys, reaching annual production of about 20 thousand tonnes/year. We expect the same volume also in the coming years. The sharp increase in 2009–2011 has stopped and now it is stabilized with only moderate growth. Castings from this material are used for pump impellers, placings and hinges of engineering equipment and also in the electrical engineering industry.

The total production of Czech foundry industry will continue to hover around 400 thousand tonnes per year. 90% of production capacities for iron castings are used. For Al alloy foundries, capacities are completely full. At present, demand exceeds supply, especially due to the high investment intensity of this segment. Nevertheless, a number of foundries are preparing or investing in increased production capacities.

The limiting factor in the Czech foundry industry is the critical shortage of skilled labour. The use of foreign workers is complicated by legislation and difficult administration. Investing in new technologies does not always allow job reductions and growth in labour productivity. This is especially true for one-piece and small-series production of Fe-based castings.

The use of progressive 3D printing methods is at its beginnings. For economic reasons, it cannot compete with the traditional methods of manufacturing of engineering components with complex shapes. Still, most foundries experiment with this technology.

Generally, there is a shift from traditional “iron” castings to “non-ferrous” ones, but these are subsequently pushed out of the market by plastics and super-hard carbon fibres. Still, foundry industry belongs in the Czech Republic and globally to industries that provide a number of irreplaceable parts for a wide range of customers who use the casting to further work on their final products.

Ing. Zdeněk Vladár
President of the Association of Foundries of the Czech Republic
The Association of Engineering Technology currently brings together 49 companies, mainly manufacturers of machine tools, instruments and components. Except TRENS, a Slovak company, all companies are based in the Czech Republic. In terms of total production of the Czech Republic, this group accounts for approximately 75% of the branch. After the most successful year 2015, when the absolute highest values were reached, we recorded a fall in production and exports of about 11% in 2016. In the domestic market, the main reason was problems with disbursement of European subsidies. In exports, there was a significant fall in demand in China, the continuing unfavourable political and economic situation in Russia, and the overall stagnation in demand in European markets.

The Czech Republic has been globally No 15 producer of machine tools, and placing 8th in per capita production. Among European manufacturers, Czech companies place 5th. These figures confirm the high level of competitiveness of a large number of Czech manufacturers. The world’s largest machine tool maker is China, with Switzerland having the biggest production per capita.

The main export territories for Czech engineering companies are Germany (about 30%), Russia (about 11%) and China (7.3%). They are followed by Slovakia, Italy and the USA. Exports to Germany have been slightly declining. Exports to Russia were further reduced as a result of sanctions and a drop in oil prices. Compared to 2013 and 2014, this is about 50% decrease. After years of growth in exports to China, there was a significant decline of about 30% in 2016. It is encouraging that our exporters try to return to the US market.

In imports, Germany is No 1, followed by Italy, Taiwan, Japan, Switzerland and South Korea.

In terms of export commodities, No 1 are grinders, followed by lathes, machining centers and milling machines. The main sector purchasing engineering technology is automotive and its subcontractors, tool makers, as well as defence, aviation and energy companies.

The field is characterized by a high level of technological sophistication, which is due to the basic standard requirements for machine tools. These requirements include in particular precision, productivity, safety and reliability. In terms of electronics, drives, mechatronics, control and technological SW, machine tools are among the very best. Most of our manufacturers use the same components for their products as their competitors and are thus able to integrate their machines into the Industry 4.0 communication structures.

The high quality of Czech machine tools also driven by the innovation activity of most manufacturers such as TOS VARNSDORF, a.s., KOVOSVIT MAS a.s., TAJMAC - ZPS, a.s., TOSHULIN, a.s., TOS Kuřim - OS, a.s., FERMAT Group, a.s., etc. They build on their own design and development capacities supported by cooperation with universities, such as the Research Center of Manufacturing Technology (RCMT) of the Faculty of Mechanical Engineering, Czech Technical University in Prague, or with independent research institutes such as the Research Institute of Textile Machines in Liberec, and producers and suppliers of electronic and mechatronic components, tools and robots.

One of the main limiting factors for the development of the division is the insufficient supply of technical workforce. Although the situation is slowly improving, companies are still forced to look for their own ways to find skilled labour. Founded last year, TOS VARNSDORF Secondary Technical School is, for now, an isolated example of the manufacturing industry’s involvement in the education system. Most enterprises still rely on collaboration with public schools and vocational schools. The Czech Republic does not have machine tool companies of such size that could afford to establish their own universities. For this reason, close cooperation between existing technical universities and manufacturers is important.

In 2017, we expect improved results compared to 2016. Due to the still high growth dynamics of the automotive industry and the generally favourable economic situation in the Czech Republic, we expect an increase in domestic demand for machine tools. In the light of past experience, e.g. during this year’s international engineering fairs, we are also expecting some improvements in exports to China, as well as to Germany and other European countries.

Ing. Oldřich Paclík, CSc.
Director of Association of Engineering Technology
The automotive industry continues to be the most important sector of the Czech economy. In 2016, it saw extraordinary growth. Automotive companies produced the most passenger cars in history in 2016. More than 1,344,000 passenger cars were produced in the Czech car factories. In addition to the production of passenger cars, 1,326 trucks, 4,388 buses, 1,228 motorcycles and 24,690 trailers and semi-trailers were produced. Therefore, the Czech Republic continues to be a world superpower in the production of passenger cars and buses. The Czech Republic ranks fifth in Europe and the 15th in the world in motor vehicle production. In per capita terms, the Czech Republic is number two producer of passenger cars in the world, second only to Slovakia. In the production of buses per capita, the Czech Republic is the world leader.

The position of our automotive industry is also favourable in the global context. The automotive industry in the Czech Republic is growing faster than the world as a whole. This is also because the European automotive market is experiencing a period of boom. While global vehicle production grew by 4.5% year on year (to 95 million cars), domestic vehicle production grew by 8.2%.

The historically highest production of vehicles was reflected in the financial results of domestic vehicle manufacturers and suppliers. Total revenues of the members of the Automotive Industry Association exceeded CZK 1 trillion and reached a record high of CZK 1,021.4 billion, being up 12%. The export volume of AutoSAP members grew by almost 11% in 2016 to CZK 864.6 billion. The industry thus accounts for one quarter of the total industrial production of the Czech Republic. It also makes up almost 22% of the Czech Republic exports. The share of gross domestic product is estimated at 9%. These data underline the key role played by the automotive industry in the national economy.

Traditionally high was the contribution of the automotive industry to the foreign trade balance of the Czech Republic. Exports are dominated by European markets, with more than 82% of automotive exports heading to EU and EFTA countries. Members of the Automobile Industry Association employed 118,000 people in 2016 and their number grew by 4.5% year-on-year. All companies that produce cars or their components currently employ approximately 160,000 people; the number is about 400,000 people when we include employees in downstream sectors. Data on employee numbers and revenues show the high productivity and efficiency of the Czech automotive industry. The automotive industry boasts higher labour productivity than in other sectors, with employees receiving higher wages. The average wage in the automotive industry grew to almost CZK 35,000, more than 26% higher than the average wage in the Czech Republic.

Investors who came to the Czech Republic 10 or 15 years ago are now benefitting from their new plants equipped with modern technology and highly qualified workforce. However, the lack of more qualified workforce is the biggest obstacle and a threat to further development at the moment. For this reason, the training of employees, as well as focus on the Czech system of education, constitute a long-term priority for the vast majority of companies in the field. In recent years, companies have been focusing on secondary education, but attention is also paid to university education as well as lower levels of the education system. A number of businesses are already targeting lower grades. Simply, the activities of companies in education focus mainly on two priorities. The first priority is cooperation between companies and schools to increase the share of practical training of pupils in companies. The second is to increase the motivation of pupils to study technical fields and work in industry after graduation. At the industry level, the automotive industry seeks to promote legislative changes that will improve the quality of schools and their teachers, as well as the quality and content of curricula. The figures of R&D investment are also interesting. There is an increasing number of professionals and companies in the automotive industry that focus on R&D, a key factor for the future. In 2016, the members of the Automotive Association were employing more than 6,000 employees in R&D, representing 5% of the total number of employees. About half the companies have their own research and development. Demand for new developers and engineers is higher every year and already exceeds supply on the labour market today. Most companies are also planning new investments in R&D and technology, especially with the emergence of Industry 4.0.

Concerning the outlook for this year, it can be assumed that the automotive industry will continue to grow, albeit at a slower pace. All three car manufacturers operating in the Czech Republic are very successful in European markets. According to the available 2017 data, the Czech Republic and the entire European Union will have another successful year. Over the five months of this year, more than 628,000 road motor vehicles were produced, up 5.2% over the same period in 2016. From the beginning of the year to the end of May, companies produced 624,994 passenger cars, 656 trucks, 1,798 buses and 786 motorcycles. From January to March 2017, a total of 5,826 trailers and semi-trailers were produced, an increase of 10%.

Finally, it should be emphasized that the Czech automotive industry is not made up of only final manufacturers. The automotive supply sector is equally important, and its results are also excellent. Among the top ten exporters who are members of the Automotive Industry Association, there are six suppliers. In 2016, automotive suppliers in the Czech Republic recorded a more dynamic growth of revenues (+14.6%) and exports (+12.8%) than final vehicle manufacturers (+9.6%). The share of suppliers in the total revenues of the members of the Automotive Industry Association has consistently been over 40% and these companies employ 65% of all the persons employed in the industry. The share of suppliers’ investments in research and development increased to 65.7% in 2016 (CZK 11.1 billion out of the total of CZK 16.9 billion).

Ing. Bohdan Wojnar
President of the Automotive Industry Association

AUTOMOTIVE INDUSTRY ASSOCIATION
The Czech aviation industry has traditionally been based on the close cooperation of all economic and non-economic entities which focus on the whole life cycle of the aircraft. These are universities, research organizations, development and design offices, manufacturers of aircraft and their parts, maintenance and repair centres, and air traffic control. The Czech Republic is one of the few countries in the world that has retained the ability to develop and manufacture the entire portfolio of basic aerospace products – aircraft, engine and propellers – and the related accessories. Our main domain are sports aircraft, small transport aircraft for up to 19 passengers, training jets and small unmanned aircraft, as well as participation in the supply chains of major global manufacturers such as Airbus.

For all of these activities, our industry has the necessary technological background that is not in any way different from that of other advanced aviation countries. This technological background is constantly being upgraded and extended to cover new technology domains that result from ongoing research and development.

The Czech aerospace industry has its own (in-house) development centres but also closely cooperates with national research institutes (e.g. Czech Aerospace Research Centre) or specialized institutes of the Czech Technical University in Prague and the Brno University of Technology.

The life cycle of an aircraft is hardly comparable to any other industry sector. Its development takes from 7 to 10 years and then it is produced and operated for 20 to 30 years. In this timeframe, also for reasons of traffic safety, it is virtually impossible to immediately incorporate the latest R&D results. The innovation process is continuous with the gradual implementation of the latest R&D results; in the Czech Republic, this applies to current programmes (e.g. L410NG or EV-55), but also for global players (e.g. Airbus, Boeing, Bombardier).

In Europe, the Czech aviation industry is not isolated, but it is involved in the largest European CLEAN SKY 2 programme. Our companies and research centers are respected members of the team, consisting, among other things, of strong European players such as Airbus, Dassault Aviation, Leonardo, Rolls Royce, Airbus Helicopters, Safran Group, Thales, etc.

A long-term problem is the critical shortage of workforce qualified in the aviation profession, at all levels of education. Recently, therefore, a very important issue is retraining and employment of people from abroad. Many large aviation companies operate their own vocational secondary school whose students are directly involved in company practice during their studies. Also, university students often research themes of diploma or dissertation theses related to the aviation industry. Also typical for companies is employing undergraduates in final years of study or part-time doctoral students. The best industry experts in specific fields also become part of the learning process as lecturers at both secondary and tertiary schools. The cooperation between manufacturing enterprises and education institutions is good.

In terms of maintaining the capabilities of our aviation industry, we consider all contracts important, regardless of their size or focus, because they all help to develop the use of all the cutting edge and demanding technologies. Here are some of the most important activities recently dealt with by some of the Czech companies:

- Aircraft Industries – manufactures and sells nineteen-seat L 410 aircraft (Czech design). At the same time, it is completing the certification of the highly modernized version of this aircraft – the L 410 NG – whose production started with the first three units currently in production;
- Aero Vodochody Aerostructures – cooperates as a contractor for projects of Bombardier (Canada) or Embraer (Brasil). It provides “after market service” for its L39 and L159 training aircraft. It is also developing a new modern version of the L39NG training aircraft;
- GE Aviation Czech – manufactures GE H80 turboprop engines that have replaced the original M601 engines by Walter;
- PBS Velká Bítěš – develops, produces and sells small modern turbine aviation engines and auxiliary power units;
- Czech Sport Aircraft – develops and manufactures lightweight PS 28 Cruiser / Sport Cruiser sports airplanes, 600 units of which have been produced and delivered worldwide.

The Czech aviation industry is highly export oriented; therefore, many of our activities aim to find new outlets for our products. In addition, we work with the Czech government to create an effective system of national support for the aerospace industry. Most of our companies participate in the completion of the L 410 NG and EV-55 and starting of its mass production. We are intensively trying to engage in European and global supply chains.

We have a lot to offer.

Ing. Josef Kašpar
President of Association of the Czech Aerospace Industry
The railway industry is a stable pillar of the Czech economy. The turnover of the Czech railway industry is CZK 80 billion, of which exports are 51%, and the total number of employees is 21 000. The products of the Czech railway industry are operating both on Czech railways and abroad: Třinecké železárny delivers rails and fasteners to a number of European countries, BONATRANS, a wheelset producer, has recently opened a factory in India, Czech products are used for example in Malaysia’s subway or in Iran’s railway operations, while Czech trams are used in Turkey. In the Czech Republic, we have been a stable partner to the national carriers CZECH RAILWAYS and ČD CARGO.

Specific projects include, for example, new InterPanter or RegioPanter units manufactured by ŠKODA TRANSPORTATION; new or highly modernized locomotives from CZ LOKO production; modern block equipment supplied by AŽD Praha and many other projects.

Significant innovation projects include Catenary-free – trams manufactured by ŠKODA TRANSPORTATION for the Turkish city of Konya can currently be powered by pantographs and travel in normal urban traffic at least 3 kilometers at a speed of up to 30 km/h. This type of power supply is mainly used when the tram travels to areas where contact lines are not installed, so there is no need for high investment in infrastructure or, as in the case of historic parts of the city of Konya, where the overhead contact lines would interfere with the local atmosphere.

The ForCity Alfa trams are designed to handle the most demanding track profiles without any problem, which is also thanks to the individual wheel drive. The biggest advantage of the tram is its rotating undercarriage that is gentle on the tracks and reduces the cost of vehicle and infrastructure maintenance. The optimum speed is controlled by a computer, depending on occupancy by passengers, track condition and track profile. ForCity Alfa has anti-slip and anti-skid protection.

The Škoda Electric from Pilsen together with SOR Libchavy, another Czech company, produced an 18-meter fully low-floor articulated trolleybus designed for urban public transport. The modern Škoda vehicle makes transport easy thanks to five doors for passenger entry and exit. The first Škoda 31 Tr trolleybus was manufactured at the end of 2010 and it is the latest trolleybus model produced by Škoda.

GHH-BONATRANS annually launches around a hundred new products (wheelsets or their parts). BONASTAR wheels have improved steel quality for wheelset wheels with brake discs. This gives operators up to 30% increase in distance covered before scheduled maintenance, and thus significant life cycle cost savings. Another example of product innovation is induction-hardened axle. A multi-year project of researchers has brought a revolutionary technological innovation in the field of heat treatment of axles, which increases the fatigue strength several times.

The four-axle interoperable dieselelectric EffiShunter 1000, developed and manufactured in CZ LOKO, has an output of 895 kW, a maximum speed of 100 km/h and a pulling force of 267 kN. The version for Italy will be equipped with a BL3 block system. It is designed especially for all types of movement and heavy duty on industrial sidings. It is equipped with alternating AC/AC power transfer from an internal combustion engine to the drive wheel, and its parameters conform to the latest TSIs for operation across Europe. The locomotive is equipped with a digital control system with on-line diagnostics and GPS monitoring. Further sophisticated technologies such as automatic speed control, radio remote control, or automatic coupling devices can be installed on request.

AŽD Praha, the leading European supplier of railway signaling and communication equipment, is one of the top companies in its field. On test polygons, AŽD PRAHA is preparing to test a system for regional trains that will run on an open track without drivers. AŽD Praha wishes to develop this system by 2020. It would be the first European producer of similar technology. For the time being, there are driverless trains or metro only on closed tracks. New technologies with the use of the highly accurate Galileo satellite system will also be interesting.

For the project of eight diesel FLIRT3 diesel trainsets manufactured by the Swiss Stadler Rail, AMiT will deliver its durable panel computers for TCMS (Train Control and Management System). These panel computers will act as a diagnostics server, for example display process and status characteristics of the trainset, control non-viable operating technologies, and act as digital rear-view mirrors.

Marie Vopálenková
Director of the Association of Czech Railway Industry
Ship-building has had a long tradition in Bohemia dating back hundreds of years. Very well-known is the Lanna Shipyard in České Budějovice, where in the 18th century Mr. Lanna annually produced 300 boats in lengths from 20 to 40 meters, which were used to transport salt, wood and other raw materials and products down the Vltava river. Most ships ended up in Hamburg for sale. Some were sent back, pulled upstream by horses. This was followed by the production of large steel ships, which developed especially in Děčín and Mělník. It ended with privatization when, for political reasons, there was a transition from shipping to trains and trucks. At present, ship transport is again developing, but for recreational purposes, because we have 600 km of navigable rivers and several large lakes in the Czech Republic. This restarted both the sale of ships and boats produced abroad and their production in the Czech Republic. The largest manufacturers are MARINE and VARI MARINE. They focus on the production of smaller ships primarily designed for security forces, firefighters, rescuers and police, but also for fishermen and recreational purposes.

In the Czech Republic, we can also find manufacturers of special boats using the latest technology using carbon fibre. These are mostly racing boats, both rowing boats, the fastest motor boats and sailing boats participating in world championships. Our manufacturers are also major subcontractors of components for shipbuilding throughout Europe. For example, Lanex and FSE produce high quality rope, Compotech manufactures carbon parts and masts for racing sailboats and catamarans. Navigation, especially on the sea, is subject to strict safety regulations, and therefore high demands are placed on production. This is similar to the aviation industry. And therefore the most advanced technologies and materials taken from the aviation industry or from Formula 1 are often used by shipbuilders.

With respect to major contracts, VARI MARINE has managed to get an important contract in Vietnam. Last year, it built 50 Patrol vessels for the Vietnam Coast Guard, with a length of 15 meters and a power output of 700 HP. This year, in the presence of President Miloš Zeman, a contract was signed for 90 vessels valued at one and a half billion crowns. Ships are manufactured using state-of-the-art welding and vacuum forming polypropylene technology specially developed for shipbuilding. The material is resistant to seawater and UV radiation, with excellent elasticity and puncture resistance. These modern powerboats are manufactured by the company in a factory in Vietnam. A major exporter of aluminum boats is MARINE; this year, for example, they supplied work boats for Slovak border patrol.

The year 2015 was important for further development of this sector, when Decree No 46 came into force, which significantly relaxed recreational sailing in the Czech Republic and started up the development of this sector. Business and tourism around rivers and lakes increased. New docks and marinas are being built, and boat rentals are being established like in the Netherlands or France. Last year’s statistics show that the density of recreational sailing has increased by more than 30%. Extraordinary interest in sailing is evidenced by data from the State Navigation Authority, which reports that 3,356 new licences for small and recreational vessels were issued in 2016. Approximately 800 new vessels were registered, reaching the total of 16,411 small vessels registered in the Czech Republic.

Sailing is beneficial to the growth of tourism and brings employment opportunities and the development of other recreational sectors along watercourses. The Vltava waterway which has recently been made navigable after the opening of the Hněvkovice lock offers enormous possibilities. From the spring of 2017, it is navigable from České Budějovice to Orlik for recreational sailing and, for smaller boats which can be transported by a lift at Orlik and by a tractor at Slapy, it is navigable even to the mouth of the Elbe, becoming connected to a network of European waterways. Through Germany, small vessels from all corners of Europe can get to the Czech Republic, while Czech boat owners can get to the sea. Therefore, positive developments are expected to continue and the manufacture and sales of ships and boats will continue to grow.

Petr Novotný
President of Ship-Building Industry Association
The Czech furniture industry has been growing for the sixth consecutive year. Exports of Czech furniture have been very successful. Domestic consumption of furniture shows a moderate recovery. This is a confirmation of the association’s forecast from September 2016. Furniture production in the Czech Republic rose from CZK 43.55 billion in 2015 to CZK 44.64 billion last year. This is an increase of more than CZK 1 billion. This year, due to the uncertain prognosis of the koruna’s exchange rate, it is harder to make a forecast. Currently the industry reports sufficient contracts for the next period.

In 2016, unfortunately the growth of domestic furniture consumption slowed slightly again. Thus, the good results of the furniture industry are underpinned by export success even more than in the past years. The growth in the volume of imported furniture from abroad remains basically balanced. The share of imports on domestic consumption is also increasing. The share of import in domestic consumption exceeded 50% last year. The export performance of the Czech furniture industry exceeds 20.52%.

The price of furniture exported from the Czech Republic is constantly increasing. The average price for one kg in 2015 was CZK 78.08. In 2016, the price for 1 kg of exported furniture was 79.71 CZK. On the other hand, the price of imported furniture in 2015 reached 66.38 CZK/kg. In 2016, the price fell to 64.64 CZK/kg. This means that we are importing increasingly cheaper furniture and, of course, the quality of cheap imported furniture is questionable. Of course, statistics also include luxury and very expensive furniture that is also imported.

The largest furniture importers in the Czech Republic are still mainly large specialized furniture companies. The largest importer of furniture into the Czech Republic is Poland, followed by Germany, China, and Slovakia. The bulk of exports go to Germany, well ahead of Slovakia and France.

Since its inception, the Association of Czech Furniture Manufacturers has supported the sale of quality furniture and the provision of quality furniture related services in the Czech Republic. The Association of Czech Furniture Manufacturers is the administrator of the label Czech Quality – Furniture www.ceska-kvalita-nabytek.cz and the operator of a search engine of proven furniture companies www.nabytek-jistota.cz. The Association of Czech Furniture Manufacturers focuses significant part of its activities on long-term monitoring of the statistical trends in the manufacture and trade in furniture. The Association is an important partner for state administration institutions in representing the requirements of Czech furniture manufacturers.

Ing. Martin Čudka
President of the Association of Czech Furniture Manufacturers
The Panorama of the Manufacturing Industry 2016 is published as a joint document of the Ministry of Industry and Trade (MIT), the Czech Statistical Office (CZSO) and the Confederation of Industry of the Czech Republic (CI).

Its first part contains views of some sectoral associations on the development of selected industries and their future perspectives. The data presented in this part are also based on internal sources of individual sectoral associations, and given that the structure of the division of individual branches of industry may differ from the official CZ-NACE classification of economic activities used by the MIT and the CZSO, these data are not always comparable to data presented in the second part of the publication.

The second part of the publication has been prepared by the MIT and deals with the basic production and financial characteristics, price developments and foreign trade.

SOURCE OF DATA FOR THE INDUSTRY PANORAMA

The Panorama classifies enterprises by the dominant economic activity using the CZ-NACE classification of economic activities. The CZ-NACE code list is based on NACE, the standard classification of economic activities of the European Union:

– sections, the first level, are identified by an alphabetical code;
– divisions, the second level, are identified with a two-digit numerical code;
– groups, the third level, are identified with a three-digit numerical code;
– classes, the fourth level, are identified with a four-digit numerical code.

The alphabetical section code is not part of the activity code that identifies the other levels of classification; for example, “manufacture of glues” is classified under code 20.52, where 20 is the code of the division, 20.5 is the code of the group, and 20.52 is the code of the class. Section C, to which this activity falls, does not appear in the code.

The Panorama analyses the sectors at group level. The monitored period in the analysis is 2008–2016.

The characteristics of the manufacturing industry, its divisions and groups according to CZ-NACE is based on the data from CZSO annual statistical report P5-01 (period 2008–2015). The data in the P5-01 comprise all sizes of enterprises, i.e. also self-employed persons. The 2016 period is calculated additionally using the 2016/2015 indices, which are based on the quarterly statistical statements P3-04, P6-04, Work 2-04, and data from the Business Sector Financial Analysis 2016.

In 2015, there was a change in accounting methods and thus also in accounting statements with effect from 2016. Panorama reflects this change. The 2008–2015 data were transferred to the accounting methodology valid from 2016. The data in the statement P5-01 are in the format of financial statements valid until 31 December 2015. First, the data were converted to the format valid as of 31 December 2015 and then subsequently to the format valid from 1 January 2016. Indicators are defined in Tables 1 to 5.
Table 1

<table>
<thead>
<tr>
<th>Balance sheet (effective until 31 December 2015)</th>
<th>Data source or calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total assets</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>B. Fixed assets</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>B.I. Intangible fixed assets</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>B.II. Tangible fixed assets</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>B.III. Financial fixed assets</td>
<td>Fixed assets – intangible fixed assets – tangible fixed assets</td>
</tr>
<tr>
<td>C. Current assets</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>C.I. Inventories</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>C.II. Long-term receivables</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>C.III. Short-term receivables</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>C.IV. Short-term financial assets</td>
<td>Current assets – inventories – long-term receivables – short-term receivables</td>
</tr>
<tr>
<td>A.+D.I. Accruals + receivables Equity</td>
<td>Total assets – fixed assets – current assets</td>
</tr>
<tr>
<td>Total liabilities</td>
<td>Total assets</td>
</tr>
<tr>
<td>A. Equity</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>B. Liabilities</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>B.I. Inventories</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>B.II. Long-term payables</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>B.III.- (B.II.6.+B.II.7.) Long-term bonds and promissory notes</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>B.II. Other long-term payables</td>
<td>Long-term payables – (long-term bonds and promissory notes)</td>
</tr>
<tr>
<td>B.III. Short-term payables</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>B.III.- (B.III.8.+B.III.9.) Short-term bonds and promissory notes</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>B.III. Other short-term payables</td>
<td>Short-term payables – (short-term bonds and promissory notes)</td>
</tr>
<tr>
<td>B.IV. Bank loans and aid</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>B.IV.1. Long-term bank loans</td>
<td>Bank loans and aid - (short-term bank loans and aid)</td>
</tr>
<tr>
<td>B.IV.2.+BIV.3. Short-term bank loans and aid</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>C.I. Accruals</td>
<td>Calculated by MIT</td>
</tr>
</tbody>
</table>

Source: MIT
### Table 2

<table>
<thead>
<tr>
<th>Balance sheet (effective from 1 January 2016)</th>
<th>Balance sheet (effective from 31 December 2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total assets (A. + B. + C. + D.)</td>
<td>Total assets</td>
</tr>
<tr>
<td>B. Fixed assets</td>
<td>Fixed assets</td>
</tr>
<tr>
<td>B.I. Intangible fixed assets</td>
<td>Intangible fixed assets</td>
</tr>
<tr>
<td>B.II. Tangible fixed assets</td>
<td>Tangible fixed assets</td>
</tr>
<tr>
<td>B.III. Financial fixed assets</td>
<td>Financial fixed assets</td>
</tr>
<tr>
<td>C. Current assets</td>
<td>Current assets</td>
</tr>
<tr>
<td>C.I. Inventories</td>
<td>Inventories</td>
</tr>
<tr>
<td>C.II. Receivables</td>
<td>Calculated by MIT: C.II.1. Short-term receivables + C.II.2. Short-term receivables</td>
</tr>
<tr>
<td>C.II.1. Long-term receivables</td>
<td>Long-term receivables</td>
</tr>
<tr>
<td>C.II.2. Short-term receivables</td>
<td>Short-term receivables</td>
</tr>
<tr>
<td>C.III. + C.IV. Short-term financial assets + cash</td>
<td>Short-term financial assets</td>
</tr>
<tr>
<td>A. + D. Accruals + equity receivables</td>
<td>Accruals + receivables</td>
</tr>
<tr>
<td>Total liabilities</td>
<td>Total liabilities</td>
</tr>
<tr>
<td>A. Equity</td>
<td>Equity</td>
</tr>
<tr>
<td>A.I. Registered Capital</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>A. V. profit/loss for accounting period</td>
<td>profit/loss for accounting period from the P&amp;L account</td>
</tr>
<tr>
<td>B.+C. Liabilities</td>
<td>Liabilities</td>
</tr>
<tr>
<td>B. Inventories</td>
<td>Inventories</td>
</tr>
<tr>
<td>C. Payables</td>
<td>Calculated by MIT: C.I. Long-term payables + C.II. Short-term payables</td>
</tr>
<tr>
<td>C.I.1.+C.I.5. Issued long-term bonds and promissory notes</td>
<td>Long-term bonds and promissory notes</td>
</tr>
<tr>
<td>C.I.2. Long term payables towards credit institutions</td>
<td>Long-term bank loans</td>
</tr>
<tr>
<td>C.II.1.+C.II.5. Issued short-term bonds and promissory notes</td>
<td>Short-term bonds and promissory notes</td>
</tr>
<tr>
<td>C.II.2. Long term payables towards credit institutions</td>
<td>Short-term bank loans and aid</td>
</tr>
<tr>
<td>D. Passive accruals</td>
<td>Accruals</td>
</tr>
</tbody>
</table>

*Source: MIT*
Table 3

<table>
<thead>
<tr>
<th>Profit and Loss Statement (effective until 31 December 2015)</th>
<th>Source or calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Revenues for the sales of goods</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>A. Cost of goods sold</td>
<td>Revenues from sales of goods – trade margin</td>
</tr>
<tr>
<td>+ Trade margin</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>II. Outputs</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>II. part 1 Revenues from sales of own products</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>II. part 1 Revenues for the sales of services</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>II.2. + II.3. Change in inventory + activation</td>
<td>Outputs – sales of own products – revenues from sales of services</td>
</tr>
<tr>
<td>B. Consumption</td>
<td>Trade margin + outputs - value added</td>
</tr>
<tr>
<td>+ Value added</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>C. Personnel costs</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>C.1. Payroll</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>C.3. + C.2. Cost of soc. and health security + remuneration of members of the company’s bodies</td>
<td>Personnel costs – payroll – other personnel costs</td>
</tr>
<tr>
<td>C.4. Other personnel costs</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>Gross operating surplus</td>
<td>Value added – personnel costs</td>
</tr>
<tr>
<td>E. Depreciation</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>Other revenues</td>
<td>Total revenues – sales of goods – outputs</td>
</tr>
<tr>
<td>Other costs</td>
<td>Total revenues – costs incurred on goods sold – Consumption – personnel costs – depreciation – EBIT</td>
</tr>
<tr>
<td>EBIT</td>
<td>profit/loss before tax + cost interest</td>
</tr>
<tr>
<td>N. cost interest</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>**** profit/loss before tax</td>
<td>profit/loss for accounting period + tax</td>
</tr>
<tr>
<td>Q. + S. Tax</td>
<td>CZSO statement P5-01</td>
</tr>
<tr>
<td>*** profit/loss for accounting period</td>
<td>CZSO statement P5-01</td>
</tr>
</tbody>
</table>

Source: MIT
Table 4

<table>
<thead>
<tr>
<th>Profit and Loss Statement (effective from 1 January 2016)</th>
<th>Profit and Loss Statement (effective until 31 December 2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Revenues from the sales of goods and services</td>
<td>Revenues from the sales of own products + Revenues from sales of services</td>
</tr>
<tr>
<td>II. Revenues for the sales of goods</td>
<td>Revenues for the sales of goods</td>
</tr>
<tr>
<td>A.1. Cost of goods sold</td>
<td>Cost of goods sold</td>
</tr>
<tr>
<td>A.2. Material and energy consumed, and services</td>
<td>Consumption</td>
</tr>
<tr>
<td>B. Change in inventory + activation</td>
<td>Change in inventory + activation with opposite sign</td>
</tr>
<tr>
<td>D. Personnel costs</td>
<td>Personnel costs</td>
</tr>
<tr>
<td>D.1 Payroll costs</td>
<td>Payroll</td>
</tr>
<tr>
<td>D.2. Cost of soc. and health insurance and other costs</td>
<td>Calculated by MIT: D.2.1 Cost of soc. and health insurance + D.2.2 Other costs</td>
</tr>
<tr>
<td>D.2.1 Cost of soc. and health insurance</td>
<td>Cost of soc. and health security + remuneration of members of the company’s bodies</td>
</tr>
<tr>
<td>D.2.2 Other costs</td>
<td>Other personnel costs</td>
</tr>
<tr>
<td>E. Adjustments to intangible and tangible fixed assets</td>
<td>Depreciation</td>
</tr>
<tr>
<td>J. Cost interests and similar costs</td>
<td>cost interest</td>
</tr>
<tr>
<td>** profit/loss before tax</td>
<td>profit/loss before tax</td>
</tr>
<tr>
<td>L. Income tax</td>
<td>Tax</td>
</tr>
<tr>
<td>*** profit/loss for accounting period</td>
<td>profit/loss for accounting period</td>
</tr>
</tbody>
</table>

Source: MIT

Table 5

<table>
<thead>
<tr>
<th>Additional data</th>
<th>Source: PS-01 or Profit and Loss Statement (effective until 31 December 2015)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value added</td>
<td>Value added</td>
</tr>
<tr>
<td>Gross operating surplus</td>
<td>Gross operating surplus</td>
</tr>
<tr>
<td>EBIT</td>
<td>EBIT</td>
</tr>
<tr>
<td>Net turnover for accounting period</td>
<td>Total revenues from statement PS-01 – (Change in inventory + activation)</td>
</tr>
<tr>
<td>Revenues</td>
<td>Revenues from the sales of own products + Revenues from sales of services + Revenues from sales of goods</td>
</tr>
<tr>
<td>Average registration number of employees</td>
<td>CZSO statement PS-01</td>
</tr>
<tr>
<td>Working owners</td>
<td>CZSO statement PS-01</td>
</tr>
<tr>
<td>Number of units</td>
<td>CZSO statement PS-01</td>
</tr>
<tr>
<td>Investment</td>
<td>CZSO statement PS-01</td>
</tr>
<tr>
<td>Total costs</td>
<td>Total revenues from statement PS-01 – (Change in inventory + activation) – profit/loss before tax</td>
</tr>
<tr>
<td>Interest-bearing sources</td>
<td>Equity + bank loans + long-term bonds and promissory notes + short-term bonds and promissory notes</td>
</tr>
</tbody>
</table>

Source: MIT

Price development is based on the CZSO monthly data statement Prices Avg 1-12. 2005 is considered the base year, i.e. 2005 = 100%. Industrial producer prices are in the CZ-CPA classification.

Cross-border data on foreign trade are taken from CZSO, where they are based on customs statistics. The CZ-CPA production classification has been chosen, which corresponds to the CZ-NACE classification.

The import intensity of exports was calculated from the Input – Output tables.
Individual data for innovation and R&D expenditures were linked to individual production and financial data. From the linked data, the part on innovation and R&D expenditures in Chapter 1 and in each section under the title Research and Development was elaborated. The data presented in the publication could differ from the official data published by the CZSO because of different methodology of data processing.

**CHAPTER STRUCTURE**

The Panorama contains chapters for the entire CZ-NACE C section of the Manufacturing Industry and for individual divisions of the manufacturing industry, with the exception of sections CZ-NACE 12 Manufacture of tobacco products, CZ-NACE 19 Manufacture of coke and refined petroleum products and CZ-NACE 33 Repair and installation of machinery and equipment, which were omitted for reasons of individual data protection. The sum of data for the entire section contains these omitted divisions.

Chapter 1 Manufacturing industry includes subchapter 1.1 Production characteristics, which first presents the development of the indicator in 2008–2016, and then the shares in the relevant indicators for individual divisions ordered by size. If it is a relative indicator, its values for each division are ordered again by size.

Subchapter 1.2 Investments, R&D and innovation expenditures deals with approaches to investment in tangible and intangible assets, and to R&D and innovation expenditures. Subchapter 1.3 Price developments discusses price developments (2005 = 100%). Subsection 1.4 deals with foreign trade in the CZ-CPA classification. Subchapter 1.5 analyses the developments in economic value added and its causes. Subchapter 1.6 contains summary and perspectives of the manufacturing industry.

The chapters for each division are broken down into the subchapter Division characteristics, which specify the group shares in the selected absolute indicators. The data in the interactive browser on the MIT website can be used to calculate the group shares for all absolute indicators. Below follows a descriptive subchapter Division developments, which is followed by the subchapter Main economic indicators. This chapter includes the selection of economic indicators for the division and price development of the commodities of the division. Again, all indicators for both the division and the groups can be obtained from the interactive browser on the MIT website, but not for price development, which is available on the CZSO website. The following subchapter Foreign trade contains the development of exports, imports and balances in terms of commodities broken down according to CZ-CPA. A new subchapter on science and research is included. The chapter is concluded with a subchapter section Summary and perspectives of the division.

**INFA METHODOLOGY**

The performance of sections, divisions and groups was evaluated using the INFA methodology, which is used by the Ministry of Industry and Trade in Financial Analysis and was also used in the previous Panorama. The INFA methodology is a financial analysis tool that allows for a comprehensive assessment of the profit/loss of enterprises in each group, linking financial controlling and risk controlling indicators in a causal manner. The INFA methodology was not applied in full in Panorama.

INFA is based on the need to link (and at the same time have the possibility of a separate view) the indicators of financial controlling and risk controlling when assessing enterprise performance. The indicator which is the most aggregated embodiment of this link is economic value added. Both an enterprise and a division, group or the entire manufacturing industry have high enough performance if they achieve positive economic value added.
INFA works with the management form of EVA, based on the calculation of “spread”. Spread compares a company’s return on equity (ROE) with an alternative cost of equity, that is, the return on equity required in relation to the risk incurred \((r_e)\). EVA is the product of spread and equity. \(EVA = \text{Spread} \times \text{equity}\).

When analyzing the generation of EVA, INFA separates the generation of company output (represented by EBIT), its division and the relationships between the time structure of assets and liabilities (see Figure 1).

In Figure 1, the first group (I.) contains those factors that affect the size of the enterprise output created (EBIT). EBIT is the most appropriate output characteristic, since this quantity is not affected by the amount of output for creditors (interest) and the State (tax). The amount of EBIT needs to be evaluated in relation to the size of property that is bound (assets) and through which the EBIT was created. The EBIT/asset indicator shows the overall profitability of an enterprise and is called the production capacity of an enterprise. The first group of indicators comprises the productive capacity and indicators explaining and illustrating how it was created. High and stable production capacity has a positive effect on both ROE and \(r_e\).

The second group (II) contains factors that are decisive for the method of distributing EBIT created by an enterprise among the owners and creditors (i.e. the capital providers) and the State.

The production capacity is also influenced by the company’s debt ratio (financial leverage). If the production capacity of the company is not sufficient, ROE deteriorates due to higher indebtedness. The leverage clearly affects the level of risk \((r_e)\): higher indebtedness always generates higher risk. With the growth of indebtedness, the division of EBIT changes to the detriment of the owners, as the portion of the EBIT taken by creditors in the form of interest grows.

The third group (III) includes indicators indicating the financial stability which creates the conditions for the generation and division of company output. Assets and their sources are compared in terms of their lifetime.

*Fig. 1 INFA diagram*
Indicators representing the equilibrium of the system (the ability of an enterprise to meet its obligations to all stakeholders in a timely manner) are a prerequisite for the operation of the business and have a significant impact on corporate risk. These include, in particular, common liquidity (L3).

What is decisive is how the indicators of all of the above-described groups collectively affect the return on equity (ROE) and risk (re), i.e. whether the spread (ROE – re) increases or decreases. INFA allows the selection of basic indicators to assess the performance of enterprises (Fig. 2). EBIT creation indicators are orange, EBIT division indicators are green and financial stability indicators are red.

Estimating the value of alternative equity cost re according to INFA methodology is, as applied by the MIT, based on several simplifying assumptions:
- Real interest rate is substituted for the cost of foreign capital.
- The market value of the foreign capital is made identical to the book value of foreign interest-bearing capital.
- It is assumed that the weighted average cost of capital (WACC) is independent of the capital structure. A change in the capital structure merely reallocates the total cost of capital between the owners and creditors.
- In the WACC formula, the share of net profit to profit is substituted for (1 – income tax rate) that characterizes the tax, i.e. the actual impact of taxation is taken into account.

The alternative cost of equity re must be calculated separately for each enterprise. Re is calculated automatically for most enterprises; individual specificities are taken into account in the most important businesses. This involves approximately 500 enterprises.

The re for individual groups, sections and divisions is counted as a weighted arithmetic mean:
$$\text{re of the group} = \frac{\sum \text{Re of enterprise} \times \text{enterprise’s equity}}{\sum \text{enterprise’s equity}}.$$  

In accordance with the financial analysis of the corporate sector, risk-free rate rf means 10-year government bond yield (Table 6).
Fig. 2 INFA diagram (including basic indicators)

Note: 6 = Interest-bearing capital

Table 6

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk-free rate $r_f$</td>
<td>4.55%</td>
<td>4.67%</td>
<td>3.71%</td>
<td>3.79%</td>
<td>2.31%</td>
<td>2.26%</td>
<td>1.58%</td>
<td>0.58%</td>
<td>0.48%</td>
</tr>
</tbody>
</table>

Source: CNB data, MIT calculations

The use of the INFA methodology determined the choice of calculated indicators, which is supplemented by labour productivity, average wage and endowment with tangible fixed assets (Table 7).
### Table 7

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Source or calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVA</td>
<td>Spread * Equity</td>
</tr>
<tr>
<td>Spread</td>
<td>ROE - re</td>
</tr>
<tr>
<td>ROE</td>
<td>profit/loss for accounting period / equity</td>
</tr>
<tr>
<td>Alternative cost of equity rate (re)</td>
<td>Calculation according to the INFA methodology</td>
</tr>
<tr>
<td>EBIT / Assets</td>
<td>EBIT / Assets</td>
</tr>
<tr>
<td>Net turnover / Assets</td>
<td>Net turnover / Assets</td>
</tr>
<tr>
<td>EBIT / Net turnover</td>
<td>EBIT / Net turnover</td>
</tr>
<tr>
<td>Equity / Assets</td>
<td>Equity / Assets</td>
</tr>
<tr>
<td>Interest-bearing sources / Assets</td>
<td>Interest-bearing sources / Assets</td>
</tr>
<tr>
<td>Interest rate.</td>
<td>Cost interest and similar costs / (Interest-bearing sources – Equity)</td>
</tr>
<tr>
<td>L3</td>
<td>Current assets / Short-term payables</td>
</tr>
<tr>
<td>L2</td>
<td>(Long-term receivables + Short-term receivables + Short-term financial assets and cash) / Short-term payables</td>
</tr>
<tr>
<td>L1</td>
<td>Short-term financial assets and cash / Short-term payables</td>
</tr>
<tr>
<td>Gross operating surplus / Net turnover</td>
<td>Gross operating surplus / Net turnover</td>
</tr>
<tr>
<td>Value added / Net turnover</td>
<td>Value added / Net turnover</td>
</tr>
<tr>
<td>Personnel costs / Net turnover</td>
<td>Personnel costs / Net turnover</td>
</tr>
<tr>
<td>Labour productivity</td>
<td>Value added / (Average registered number of employees + Working owners) * 1,000</td>
</tr>
<tr>
<td>Average wage</td>
<td>Wages / (Average registered number of employees/12 * 1,000)</td>
</tr>
<tr>
<td>Endowment with tangible fixed assets + intangible fixed assets</td>
<td>(Intangible fixed assets + tangible fixed assets) / (Average registered number of employees + working owners) * 1,000</td>
</tr>
</tbody>
</table>

*Source: MIT calculations*

The data from Tables 2, 4 to 7, for each group, division, and manufacturing industry total, are available in the interactive table on the MIT website at [https://www.mpo.com/en/panorama-interactive-table.html](https://www.mpo.com/en/panorama-interactive-table.html)
1. MANUFACTURING INDUSTRY

The manufacturing industry (MI) is a significant segment of the economy and an important actor contributing to the development of technology, knowledge and job opportunities. In the Czech Republic, it has a long-standing tradition and in its development it has demonstrated the ability to maintain its position in a competitive environment, mainly thanks to the entry of foreign capital and involvement in regional and global value chains. However, a high degree of integration and connection to foreign trade makes the MI sensitive to changes in external conditions. During the global recession, this was reflected in a sharp drop in production and efficiency in foreign-controlled firms, while Czech companies passed through the crisis period with minimal fluctuations.

The dynamic development of the MI in the Czech Republic also confirms its growing share in the gross value added (GVA), which reached 27.1% in 2016, with a year-on-year increase of 0.3 pp. with the total GVA (in current prices) up by 3.8%, the MI grew by 4.8%. The Czech Republic belongs to the countries with the highest share of MI in GVA; within the EU 28, it is second only to Ireland. In terms of employment in the Czech Republic, the share of MI reached 26.61% in 2016 and was up 1.79 pp. year-on-year.

With the development of technology as well as with economic policy plans, the MI also increasingly involves activities that have the character of services (science and research, education, servicing and complementary activities) that intertwine with the services sector, but cannot be statistically separated. The MI is thus gradually losing the character of the assembly plants.

The development of the basic production characteristics shows that after the economic downturn during the recession, since 2011 the MI has started to exceed the 2008 level. Since 2012, the MI as a whole has gone from negative economic value added and Spread to positive numbers, which further improved in 2014 and 2015, and thus strengthened its competitiveness.

The automotive industry, which at the same time acts as a multiplier for the development of other downstream industries, heavily dominates the MI. For example, an important part of the automotive industry is the production of automotive parts and accessories, which are an important export item and which, after they are mounted in foreign (mostly luxury) vehicles, are exported to third countries.

1.1 PRODUCTION CHARACTERISTICS

1.1.1 REVENUES

Business is based on revenue generation. If there are no revenues, there is not enough cash for wages and profits for the owner. Revenues from the manufacturing industry mainly consists of revenues from the sale of products and services. Revenues from the sale of goods, i.e. from what businesses resell, account for a small portion of total revenues. In 2008–2016, there were several periods in the development of revenues. In 2009, they started to decline during the crisis, followed by increase of revenue in 2010, which, however, did not reach above 2008 levels. In 2011, there was another period when revenues reached higher than in 2008 and continued to grow slightly until 2013. The last period began in 2014 with strong revenue growth, followed again by a slight revenue growth until the end of 2016 (see Chart 1.1).
In terms of revenues, the most important division is definitely the production of motor vehicles (CZ-NACE 29), whose share was more than a quarter of the GDP. It is well ahead of other important divisions with shares of 8.5 to 6.5%: manufacture of metal structures (CZ-NACE 25), manufacture of machinery (CZ-NACE 28), manufacture of computers (CZ-NACE 26), manufacture of electrical equipment (CZ-NACE 27), manufacture of rubber and plastic products and manufacture of electrical equipment (CZ-NACE 22) and manufacture of food (CZ-NACE 10), see Chart 1.2.

The development of personnel costs over the period 2008–2016 corresponds to revenue growth, with year-on-year relative changes being mostly lower (Chart 1.6). The share of individual divisions in personnel costs is below the IM average (see Chart 1.5).

1.1.2 VALUE ADDED, PERSONNEL COSTS AND GROSS OPERATING SURPLUS

Value added does not appear in the profit and loss statement as of 2016. It can, however, be calculated. Its importance lies in showing what has been added to the purchased material, semi-finished products, services and goods. The development of value added in the manufacturing industry was similar to that of revenues in 2008–2016 (see Chart 1.3). The largest share is again the manufacture of motor vehicles, which accounts for more than 10% of the MI (see Chart 1.4).

The information about the share of value added to revenues (value added margin) is interesting. This is one of the main indicators of profitability for manufacturing enterprises and shows how a company is able to cover the cost of material, energy and purchased goods and services. In terms of total revenues, not-so-significant divisions have the highest share of value added to revenues, i.e. manufacture of leather and related products (CZ-NACE 15) and manufacture of wearing apparel (CZ-NACE 14). This indicator is influenced by the nature of the manufacture in the relevant division, as well as the degree of involvement in transnational chains and their impact on the redistribution of financial resources within the chain. For example, this is evidenced by the fact that in terms of volume, in the largest division of CZ-NACE 29 the share of value added to revenues is below the IM average (see Chart 1.5).

The development of personnel costs over the period 2008–2016 corresponds to revenue growth, with year-on-year relative changes being mostly lower (Chart 1.6). The share of individual divisions in personnel costs is between the share of revenues and the share of value added (Chart 1.7).
Gross operating surplus is the difference between value added and personnel costs (Chart 1.8). It tells us what is left for the company after it pays personnel costs. The developments are similar to value added, but in 2014 there was a surge in gross operating surplus to value added, which was positively reflected in the efficiency and competitiveness of businesses. The share of gross operating surplus to revenues is shown in Chart 1.9. This indicator shows the specific aspects of the individual divisions, namely the share of value added to revenues and the need for a workforce to generate revenues. From this perspective, the best divisions are manufacture of beverages (CZ-NACE 11) and printing and reproduction (CZ-NACE 18).
Chart 1.6 – Personnel costs (in CZK billions)

Source: CZSO data, 2016, MIT calculations

Chart 1.7 – Share of personnel costs according to CZ-NACE (MI = 100 %)

Source: CZSO data, 2016, MIT calculations

Chart 1.8 – Gross operating surplus (in CZK billions)

Source: CZSO data, 2016, MIT calculations

Chart 1.9 – Share of gross operating surplus to revenues by CZ-NACE (%)

Source: CZSO data, 2016, MIT calculations
1.1.3 NUMBER OF EMPLOYEES AND EMPLOYED PERSONS

In addition to employees, owners (entrepreneurs) work in the manufacturing industry, especially in micro-enterprises (self-employed persons). After including the working owners, the number of employed persons is higher than the number of employees. The share of working owners in the number of employed persons increased from 8.8% in 2008 to 10.8% in 2016. The development of employment in the manufacturing industry had the form of a slight W curve, with the lowest number of employees being in 2010 and the second lowest in 2013. There is an increase in the number of employed persons between 2013 and 2016 in both groups (Chart 1.10).

In terms of MI divisions, the largest employers are CZ-NACE 29 manufacture of vehicles, and CZ-NACE 25 manufacture of metal structures. Somewhat smaller employers are CZ-NACE 28 manufacture of machinery, CZ-NACE 27 manufacture of electrical equipment and CZ-NACE 10 manufacture of food (Chart 1.11). The share of working owners in employment in individual divisions (Chart 1.12) is the largest in manufacture of wood (CZ-NACE 16) and manufacture of wearing apparel (CZ-NACE 14).

Chart 1.10 – Employed persons

Source: CZSO data, 2016, MIT calculations
1.1.4 LABOUR PRODUCTIVITY AND AVERAGE WAGE

Generally, labour productivity is calculated as a share of value added and the number of employees. This calculation is correct for capital companies, but it is a problem for self-employed persons because self-employed persons also work and create value added. Therefore, labour productivity per employed person, i.e. employees + working owners, was calculated. The development of both productivities was compared with the development of the average wage. The development of both productivities is very similar, with the labour productivity of employed persons being less dynamic. In terms of labour productivity dynamics and average wage dynamics, the situation was favourable except in 2009. Owners are remunerated from profits, which is not reflected in the average wage. After including owners’ remuneration, the “average wage” would probably increase, and this could mean that also in 2012, the labour productivity dynamics of employed persons would be worse than the “average wage” (see Chart 1.13).

Given that the share of working owners is high in some divisions, labour productivity is further considered as productivity of employed persons. The development of labour productivity and average wage in the manufacturing industry is shown in Charts 1.14 and 1.15.

The highest levels of labour productivity in 2016 are shown in manufacture of beverages, manufacture of vehicles, and pharmaceutical and chemical industries, which also have the highest monthly average wage (manufacture of beverages CZK 32,917, manufacture of vehicles CZK 32,832, pharmaceutical industry CZK 32,328, and chemical industry CZK 31,111). Conversely, the lowest labour productivity and monthly average wage are in the wearing apparel and leather industries (wearing apparel industry CZK 16,056, leather industry CZK 18,672), see Chart 1.16 and Chart 1.17.
1. MANUFACTURING INDUSTRY

Chart 1.13 – Comparison of labour productivity and average wage development (2008 = 100 %)

Source: CZSO data, 2016, MIT calculations

Chart 1.14 – Labour productivity (CZK/person/month)

Source: CZSO data, 2016, MIT calculations

Chart 1.15 – Average wage (CZK/person)

Source: CZSO data, 2016, MIT calculations
1.1.5 NUMBER OF ENTERPRISES

In spite of the economic recession, the number of entities in the manufacturing industry grew year on year, except in 2013. This was partly due to a dramatic reduction in employment, when some of the employees who lost their jobs started business. In 2016, the number of enterprises was up 27,876 compared with 2008 (Chart 1.18). This growth is mainly due to the boom of micro-enterprises. In 2016, the number of enterprises exceeded their level in 2012.

In the MI structure by the number of enterprises (Chart 1.19), the dominant divisions are those with a high share of micro enterprises, including self-employed persons (CZ-NACE 25 manufacture of metal structures and CZ-NACE 16 manufacture of wood). On the other end, there are divisions with mostly large enterprises.
1.1.6 ASSETS AND EQUITY

From 2009, the size of assets in the manufacturing industry was growing until 2016, following a decrease compared to 2008 (Chart 1.20). In terms of divisions, manufacture of motor vehicles (CZ-NACE 29) had markedly highest assets (Chart 1.21). It was followed by the manufacture of machinery (CZ-NACE 28) and the manufacture of metal structures (CZ-NACE 25).

The endowment of employed persons with intangible and tangible fixed assets (Chart 1.22) demonstrates the capital intensity of production. Its year-on-year increase of 12.1% in the crisis year of 2009 was due to a sharp drop in employment. Over the entire monitoring period 2008–2016, the endowment grew by almost a quarter. In terms of divisions, endowment with intangible and tangible fixed assets (Chart 1.23) is highest in the manufacture of metals (CZ-NACE 24), manufacture of motor vehicles (CZ-NACE 29), manufacture of beverages (CZ-NACE 11) and also in the chemical industry (CZ-NACE 20). Only in these divisions is endowment higher than in the manufacturing industry as a whole. The lowest endowment is shown in the manufacture of wearing apparel (CZ-NACE 14) and the manufacture of leather (CZ-NACE 15). Endowment of employees with assets reflects the different nature of production in each division.

From 2009, the book value of equity in the manufacturing industry was growing until 2016, following a decrease compared to 2008 (Chart 1.24). The share in equity of the manufacturing industry in the CZ-NACE divisions is shown in Chart 1.25. The shares approximately correspond to asset shares.
Chart 1.20 – Assets (in CZK billions)

Source: CZSO data, 2016, MIT calculations

Chart 1.21 – Assets by CZ-NACE (MI = 100%)

Source: CZSO data, 2016, MIT calculations

Chart 1.22 – Fixed tangible and intangible assets per person (CZK thousands/person)

Source: CZSO data, 2016, MIT calculations

Chart 1.23 – Fixed tangible and tangible fixed assets per person by CZ-NACE (CZK thousands/person)

Source: CZSO data, 2016, MIT calculations
1. INVESTMENT, R&D EXPENDITURES AND INNOVATIONS

1.2.1 INVESTMENTS

Investments, i.e. purchases of tangible and intangible fixed assets, fell by one third to CZK 148 billion in 2009 and further slightly decreased in 2010. In the following years, they grew year-on-year, but in 2016 they remained 4% below the 2008 level (Chart 1.26).

In MI structure, (Chart 1.27), by far the largest investment was in manufacture of motor vehicles (CZ-NACE 29) and then in manufacture of metal structures (CZ-NACE 25) and machinery (CZ-NACE 28).

The share of investments in revenues shows the investment intensity of revenues. This indicator is influenced by the technological nature of production and the investment period, i.e. also by structural changes within the MI. In 2009, the value of the indicator decreased significantly and dropped further in 2010. Then, its value grew until 2015 and fell slightly in 2016. In 2016, the 2008 level was far from being reached (Chart 1.28).

Values for individual MI divisions in 2014 and 2015 are shown in Chart 1.29. The best divisions with above-average values are other manufacturing (CZ-NACE 32), printing (CZ-NACE 18) and manufacture of chemicals (CZ-NACE 20). On the other hand, the manufacture of motor vehicles and manufacture of computers, the manufacturing industry’s leaders, are below average.
1.2.2 R&D EXPENDITURE IN THE MANUFACTURING INDUSTRY

R&D expenditure includes all current and investment expenditure incurred in the Czech Republic in the given year. Reporting units are all economic entities performing R&D in the Czech Republic as the primary or secondary economic activity. Linked R&D data are available for 2010–2015.

In the monitored period 2010–2015, the total value of R&D expenditure was highest in 2011 (Chart 1.30). By type of expenditure, most R&D expenditure consists of experimental research, followed by applied research, the only one that shows a steady increasing trend. Expenditures on basic research are negligible in the business sector of the MI. However, when interpreting these data, it is necessary to assume that the boundary between the different types of R&D is not always clear.

The main source of R&D funding were company resources (Chart 1.31).

In 2015, the highest R&D expenditures (Chart 1.32) by CZ-NACE were in manufacture of motor vehicles (CZ-NACE 29), manufacture of machinery (CZ-NACE 28) and manufacture of electrical equipment (CZ-NACE 27). It is gratifying that basic research expenditures are highest in manufacture of machinery, i.e. the sector where there is a higher share of enterprises under Czech control. Chart 1.33 shows the sources of funding in individual divisions. Most of the public sources are in the manufacture of computers and machinery.

*Chart 1.30 – R&D expenditures in the manufacturing industry by purpose (CZK million)*

*Source: CZSO data, MIT calculations (for methodological reasons the figures may differ from the data published by the CZSO)*

*Chart 1.31 – R&D expenditures in the manufacturing industry by source of funding (CZK million)*

*Source: CZSO data, MIT calculations (for methodological reasons the figures may differ from the data published by the CZSO)*
1.2.3 INNOVATIONS

To analyse the development and role of innovation in the MI, attention has been focused on activities that are crucial for industry, i.e. on enterprises with technical innovations, namely innovations in products and services that are new to the market. These are just some of the innovation activities that are methodically...
summarized in the “Oslo Manual”\textsuperscript{1}, which further breaks down innovation (in addition to product innovation) to process, ongoing or suspended technological innovation, marketing and organizational innovation.

Data available for 2010, 2012, and 2014 linked data for innovations with production and financial data for enterprises of the whole MI. The 2016 innovation data will be made available by the CZSO after the publication of Panorama. Thus, a group of innovative enterprises was created, the results of which were compared with the enterprises of the entire MI.

The number of innovative enterprises accounts for over one fifth of the enterprises in the entire manufacturing industry, but their shares in production characteristics are predominant and have a growing trend. Their share in MI revenues increased from 60\% in 2010 to 68\% in 2014, the share of value added increased from 57\% to 72\% and the share of employment increased from 52\% to 66\% (see Chart 1.34). The lower share of these enterprises in employment than in value added is indicative of their higher level of labour productivity.

In 2010–2014, the share of revenues from innovative products rose from 20\% to 29\% of the total revenues of innovative enterprises. The largest share of innovated products (Chart 1.35) is represented by the manufacture of computers (CZ-NACE 26) and the manufacture of motor vehicles (CZ-NACE 29). These two divisions are the only ones above the average of the manufacturing industry.

For innovation enterprises, the share of revenues from innovation to total revenues was calculated (Chart 1.34). The biggest share is represented by the manufacture of computers, followed by the manufacture of motor vehicles and the manufacture of wearing apparel. There are two important phenomena here. Most innovations in the manufacture of computers were not created in the Czech Republic, as the manufacture predominantly takes place in enterprises that are part of global value chains (GVC). Revenues from innovation in the manufacture of wearing apparel (CZ-NACE 14) are mostly innovations of the lowest orders. The “Oslo Manual” does not distinguish the order of innovation. If the order of innovation were to be distinguished, the share of innovation is likely to be significantly lower in the manufacture of wearing apparel.

In addition, revenues from innovative products in 2014 are shown in Chart 1.36. Clearly, the highest revenues are to be found in the manufacture of motor vehicles.

\textit{Chart 1.34 – Share of basic data of innovative companies in MI}

![Chart 1.34 – Share of basic data of innovative companies in MI](image)

Source: CZSO data, MIT calculations

Companies performing product innovations have, in aggregate, higher labour productivity than the manufacturing industry average. Above the manufacturing industry average is the manufacture of beverages (CZ-NACE 11), manufacture of chemicals (CZ-NACE 20), manufacture of motor vehicles (CZ-NACE 29), manufacture of pharmaceuticals (CZ-NACE 21) and manufacture of rubber and plastics (CZ-NACE 22).

\textsuperscript{1} The OECD document “The Measurement of Scientific and Technological Activities, Proposed Guidelines for Collecting and Interpreting Technological Innovation Data” contains methodological guidelines for the collection and use of industrial innovation data.
1.2.4 INNOVATION AND R&D

Very interesting is a combined view of innovative enterprises and enterprises with R&D expenditure (Tab. 1.1). Companies with product innovations and R&D represent only 13.4% of the manufacturing industry’s revenues. This group of enterprises is the main driver of innovations and R&D in the manufacturing industry and thus also of competitiveness. There are other two groups of enterprises: innovating non-R&D enterprises account for 54.6% of revenues and non-innovating R&D enterprises account for 10.7% of revenues; these are the drivers of innovation and R&D, respectively. The worst group of manufacturing industry are non-innovation non-R&D enterprises, accounting for 21.3% of the manufacturing industry’s revenues.

The difference between the above-mentioned groups of enterprises can be demonstrated at the level of selected indicators from the profit and loss statement per employee. The total excludes self-employed persons (Chart 1.37). Enterprises with innovations and R&D expenditures have unbeatably the best value. By contrast, non-innovation and non-R&D enterprises are significantly lagging behind.

Table 1.1 – Share in manufacturing industry’s revenues in 2014

<table>
<thead>
<tr>
<th>R&amp;D</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24,1%</td>
<td>75,9%</td>
</tr>
</tbody>
</table>

Source: CZSO data, MIT calculations

<table>
<thead>
<tr>
<th>Innovations</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>68,0%</td>
<td>54,6%</td>
</tr>
<tr>
<td></td>
<td>13,4%</td>
<td>4,1%</td>
</tr>
<tr>
<td></td>
<td>32,0%</td>
<td>21,3%</td>
</tr>
</tbody>
</table>

Source: CZSO data, MIT calculations

15
14
13
12
11
10
9
8
7
6
5
4
3
2
1

0 10 20 30 40 50 60

0 100 000 000 200 000 000 300 000 000 400 000 000

Graf 1.3 – Share of innovation revenues in total revenues

Graf 1.36 Revenues from innovated products by CZ-NACE in 2014 (CZK thousand)
### 1.3 PRICES

The prices of manufacturers in the manufacturing industry followed production performance with a certain lag. In the long term, they show lower dynamics compared to prices for the entire industry (where the prices of energy producers are a major factor in their faster growth) and, primarily, compared to consumer prices (see Chart 1.38). The producer prices in the manufacturing sector were affected by the 2009 fall during the crisis, and posted a significant year-on-year decline and subsequent slowdown in growth until 2014. Their decline in 2015 and 2016 was influenced by lower prices of energy inputs and competitive pressures on the global market.

**Chart 1.38 – Industrial Producer Price Indices in 2008 to 2016 (2005 = 100%)**

<table>
<thead>
<tr>
<th>Year</th>
<th>MI</th>
<th>Consumer</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>107,4</td>
<td>112,1</td>
<td>110,5</td>
</tr>
<tr>
<td>2009</td>
<td>101,5</td>
<td>113,3</td>
<td>107,0</td>
</tr>
<tr>
<td>2010</td>
<td>103,0</td>
<td>114,9</td>
<td>108,3</td>
</tr>
<tr>
<td>2011</td>
<td>108,9</td>
<td>117,1</td>
<td>114,3</td>
</tr>
<tr>
<td>2012</td>
<td>111,4</td>
<td>121,0</td>
<td>116,8</td>
</tr>
<tr>
<td>2013</td>
<td>111,6</td>
<td>122,7</td>
<td>117,7</td>
</tr>
<tr>
<td>2014</td>
<td>112,8</td>
<td>123,2</td>
<td>116,8</td>
</tr>
<tr>
<td>2015</td>
<td>108,4</td>
<td>123,6</td>
<td>113,1</td>
</tr>
<tr>
<td>2016</td>
<td>105,0</td>
<td>124,4</td>
<td>109,4</td>
</tr>
</tbody>
</table>

Source: CZSO data, 2016, MIT calculations
1.4 FOREIGN TRADE

Foreign trade is presented in cross-border statistics by commodity, i.e. in the CZ-CPA classification, as opposed to the economic activities given in the CZ-NACE classification. The importance of MI in the national economy is also confirmed by data on foreign trade. In the total exports of the Czech Republic, MI products represent almost 95% (Chart 1.39). The value of MI commodity exports continued to grow in the monitored period 2009–2016, while the value of other commodities representing agricultural and raw material items oscillated, mainly due to their sensitivity to price developments. In a more detailed view of the MI exports, there is evident dominance of the exports of motor vehicles, computers, machinery and electrical equipment (Chart 1.40).

In terms of imports, manufacturing industry products account for about 90% of total value of imports and also show a growing trend. In terms of commodities, the most important imports include computers, motor vehicles, chemicals and metals (Chart 1.40). The value of imports of other items, similarly as in the case of exports, oscillates for price rather than volume reasons.

The positive external trade balance consists of commodities of the manufacturing industry with a growth tendency (except in 2015), while the balance of other commodities is negative mainly due to imports of energy raw materials (see Chart 1.40). The largest positive balance in manufacturing products are in the groups of motor vehicles, followed by machinery, electrical equipment and metal structures. Negative balances are mainly in the groups of metals, chemicals and pharmaceuticals (Chart 1.40).

Engagement of MI enterprises into global value chains can be documented on the import intensity of exports. While in 1990, CZK 1 of exports included CZK 0.286 of imports, in 2013 it was CZK 0.5267 (Chart 1.41). In 2013, the share of foreign-controlled enterprises accounted for around 80% of the manufacturing industry’s revenues, being virtually zero in 1990. Between 1990 and 2013, the exports of the manufacturing industry products grew ten times, which would not have been possible without engaging in international division of labour. In 2013, the most import-intensive division was refined petroleum products (CPA 19), followed by computer products (CPA 26), chemicals (CPA 24) and motor vehicles (CPA 29), see Chart 1.42.

Using the share of necessary imports for export and import intensity of production from I-O tables, imports for the manufacturing industry can be estimated. Imports to the manufacturing industry amounted to CZK 1,922 billion, i.e. the external balance of MI was positive in 2016, amounting to approximately CZK 1,800 billion. Compared to the balance of MI CPA products of CZK 538 billion, it is a big difference. The manufacturing industry does not import all MI CPA goods. The automotive industry does not import vehicles. With the total external balance of CZK 426 billion, the external balance of the other sectors of the economy is significantly negative.
Chart 1.39 – Exports, imports and balance 2008–2016 (CZK billion)

Source: CZSO, data as of 3 May 2017

Chart 1.40 – Export, import and balance in 2016 by CZ-CPA (CZK million)

Source: CZSO, data as of 3 May 2017
In terms of territory, MI Commodities are largely exported to Germany (32%), through which part of commodities from the Czech Republic is part of German exports to third countries. It is well ahead of other countries, especially the neighbouring Slovakia (8%), Poland (6%), France (5%), United Kingdom (5%), Italy (4%) and the neighbouring Austria (4%). Imports are again dominated by Germany (27%), China (13%), followed by Poland (8%), Slovakia (5%), Italy (5%), and France, Austria and South Korea (all 3%), see Chart 1.43.

**Chart 1.43 – Foreign trade in CZ-CPA**

Source: CZSO data as of 3 May 2017
1.5 ECONOMIC VALUE ADDED

The most aggregated indicator of efficiency is economic value added (EVA). The economic value added of the manufacturing industry in 2008–2009 was largely unsatisfactory, being close to zero in 2010 and 2011. This changed in 2012, when the economic value added moved above zero, i.e. the manufacturing industry began to create value for its owners. In 2013, it was still close to zero. In 2014, it started growing radically, which continued in 2016 (Chart 1.44).

In 2016, the main drivers of the excellent result of economic value added are manufacture of motor vehicles (CZ-NACE 29), manufacture of rubber and plastic products (CZ-NACE 22) and manufacture of fabricated metal products (CZ-NACE 25). The divisions with smallest contribution towards the economic value added are manufacture of basic metals (CZ-NACE 24) and manufacture of food products (CZ-NACE 10) – see Chart 1.45.

The value of the economic value added is affected by the size of the division. The relative economic value added, i.e. Spread (the difference between the return on equity and the cost of equity), shows the effectiveness of generating economic value added. Spread can also be expressed as a share of economic value added and equity, i.e. the generation of economic value added from one crown of equity. The developments in spread were determined by the developments in the return on equity (ROE) and the developments in cost of equity (re), which is mainly affected by the decline in the risk-free rate (rf).

The ranking of divisions by spread is more interesting (Chart 1.47). The production of wearing apparel (CZ-NACE 29), manufacture of motor vehicles (CZ-NACE 29), the winner of economic value added. Most other divisions also show differences in the ranking of economic value added and spread. In the EVA chart, the contributions of individual divisions to the overall economic value added in the MI, while the spread chart shows the efficiency of the generation of economic value added.

Chart 1.44 – Economic value added (in CZK billion)  
Chart 1.45 – Economic profit by CZ-NACE (in CZK million)

Source: CSOS data, MIT calculations  
Source: CSOS data, MIT calculations
1.6 SUMMARY AND PROSPECTS OF THE MANUFACTURING INDUSTRY

The results of the manufacturing industry (MI) in the period 2008–2016 and especially in 2016 were very good. Among the significant aspects is the steady rise in labour productivity (except the 2009 crisis year) accompanied by a rise in average wage and maintaining a favourable relationship between the rise in labour productivity and rise in average wage. Productivity is linked to innovation and R&D expenditure. They are mutually conditional, i.e. rise in productivity allows rise in innovation and vice versa. Innovation and R&D enterprises have the highest labour productivity (higher by 42% compared to MI average) and non-innovation and non-R&D enterprises show the lowest labour productivity.

From the perspective of all the MI stakeholders (i.e. owners, employees, the State and others), their coalition in the MI is advantageous, and thus firm. From the perspective of business owners, the high economic value added is favourable. Decent and rising wages and rising employment are beneficial for employees. Finally, the MI’s contribution to GDP creation, the payment of taxes and social security contributions by MI enterprises and, above all, the MI’s contribution to the external economic position of the Czech Republic are beneficial for the State.

The Czech Republic remains a small open economy with a strongly export-oriented industry. Industry accounts for about a third of GDP, which is practically the largest share of the EU-28. Currently, we are also the country with the second lowest unemployment rate. However, if the Czech economy is to keep this strong position on a long-term basis, it is necessary to respond to the developmental trends in technologies and in society, especially connected with digitization, and to apply them in practice. The future will be mainly influenced by the acceleration of technological innovations. At present and in the near future, this primarily...
1. MANUFACTURING INDUSTRY

means Industry 4.0. With regard to this phenomenon, and depending on a successful expansion of new
technology and digital platforms, fundamental technological changes can be expected by 2020, notably in
the manufacturing sector as well as in other sectors of the economy. Industry 4.0 has several levels based on
the deployment of information technologies and the integration of the Internet, cybernetic-physical systems
and artificial intelligence systems into pre-production stages, production, services and all other sectors of the
economy, but also into new business models including product servicing, and on MI stakeholder involvement
in innovation related to the so-called “4th Industrial Revolution”.

It is based on the activity of entrepreneurs who have to adapt to objective development first, apply in time
the trends brought by this brand new philosophy of system use, integration and interconnection of various
technologies, taking account of their continuous and very rapid development. Without it, they cannot
maintain and strengthen their competitiveness in the Czech Republic and the global market.

Fundamental innovations often take place outside the Czech Republic, but given the interconnection of our
MI within global value chains (they account for about 70% of MI revenues), these innovations can be expected
to penetrate most of the MI production in the Czech Republic. For enterprises operating largely outside global
value chains, this is a great opportunity to engage in related innovations. For them, the availability of financial
resources for the necessary investment in technology will be a critical. Therefore, success will not only depend
on the Czech Republic, but will be affected by the situation of our main partners, especially Germany.

Digitization concerns a wide range of economic sectors. Among them are branches of the manufacturing
industry such as electronics, electrical engineering, design and manufacture of machinery and equipment,
manufacture of instrument, automotive industry, manufacture of chemical and pharmaceutical products,
metallurgy and steel, information technology and industrial automation, etc., as well as other sectors such
as power engineering, maintenance, telecommunication and radiocommunication, banking, financial and
marketing services, business activities, consultancy services, advertising, software development, agriculture,
environment, health, nutrition and others.

The government must also play its part. The industry and the whole economy are going through major
changes that will have consequences for the society as a whole, and therefore the Industrial Initiative 4.0 was
formed in 2016. It resulted in a society-wide discussion involving not only businesses, academia and State
administration, but also social partners, and subsequently it resulted in “Society 4.0 Alliance” established by
the government at the beginning of 2017. Its task, or the task of the Digital Agenda Coordinator of the Czech
Republic, is to formulate the Action Plan for Society 4.0 on this basis.

The aim of Industry 4.0 is to show possible directions of development and to outline measures that could
not only support the Czech economy and industrial base, but also help to prepare the whole society for
absorbing this technological change. The initiative contains basic information on the need for urgent changes
brought about by the onset of the 4th Industrial Revolution, and maps out the possible measures to support
investment, applied research and standardization, handles questions related to cyber security, logistics and
legislation, and, most importantly for both trade unions and employers – it involves the trends related to
the labour market, training and human resource development.

It is obvious that the situation on the labour market will change. Although new jobs and professions will be
created, other, especially less qualified jobs, will be lost. Therefore, conditions must be created so that the
changes are not destructive for the development of society, but that they provide an opportunity for the
growth of people’s qualifications. The increase in the requirements for the technically educated workforce
should naturally also lead to an increase in the workers’ wage, as called for by workers’ representatives.

Early recognition of Industry 4.0 will increase the attractiveness of the Czech Republic for new foreign investors
and motivate foreign companies already present in our country to expand their investments. Reducing energy
and raw material intensity of production, increasing productivity in production, optimizing logistics routes,
technology solutions for decentralized energy production and distribution systems, and intelligent transport
systems – these are the major benefits of Industry 4.0 for improved resource efficiency.
The introduction of the Industry 4.0 strategy will allow a comprehensive optimization of the entire vertical production process, for example in the automotive industry and other manufacturing industries. In fully automated manufacturing operations, it will be possible to also produce small production batches that will reflect current customer requirements while maintaining the efficiency of mass production. It will also lead to the creation of “smart factories” where “smart products” will be produced. Enterprise systems will react flexibly to immediate and changing demand for products in real-time. Smart factories will thus open the door for new ways of creating added value.

Note: Model production ŠKODA KAROQ in Kvasiny. Source: ŠKODA AUTO.
2. CZ-NACE 10 MANUFACTURE OF FOOD PRODUCTS

2.1 DIVISION CHARACTERISTIC

CZ-NACE 10 division is broken down into the following groups:

- 10.1 Processing and preserving of meat and production of meat products;
- 10.2 Processing and preserving of fish, crustaceans and molluscs;
- 10.3 Processing and preserving of fruit and vegetables;
- 10.4 Manufacture of vegetable and animal oils and fats;
- 10.5 Manufacture of dairy products;
- 10.6 Manufacture of grain mill products and starch products;
- 10.7 Manufacture of bakery products and confectionery;
- 10.8 Manufacture of other food products;
- 10.9 Manufacture of prepared feeds for animals.

The manufacture of food products in the Czech Republic, as in the whole European Union, is one of the key sectors of the manufacturing industry. The importance of food production is primarily driven by the nutrition of the population through the production and sale of healthy and safe foods. Food and food business operators are inspected by supervising institutions, including the quality of their output.

Food production is a major employer in many regions and holds a leading position in the manufacturing industry.

Some food sectors have, with regard to the classification of economic activities, groups with a direct link to agricultural primary production, others focus on higher food finalization.

In the division, there are many micro-enterprises that make up over 60% of units, 9% of employed persons, but only less than 4.5% of revenue and value added. In revenue and value added, the most significant are medium-sized enterprises, accounting for approximately 45% of the volume generated by the division, while large enterprises comprise a smaller part.

In terms of the number of employees and the number of units, in 2016 the largest group was 10.7 Manufacture of bakery and farinaceous products, which is due to the need to deliver fresh bakery to the market network throughout the Czech Republic. Almost one quarter of the value added of the division was created in Group 10.8 Manufacture of other food products, which includes a wider range of products, but especially those that represent a higher stage of processing of agrarian raw materials. Together with 10.7, these two groups generated almost half of the value added of the division, which is an indicator that greatly affects labour productivity, in which we should reach a comparable level with the EU.

When we assess the individual groups in terms of their relation to the market, the highest share in revenues within the division was represented by group 10.1, followed by group 10.8; these groups also account for a high share of net turnover. Group 10.8 also had the largest share of total assets in the reference year, followed by groups 10.7, 10.1 and 10.9. Specific data are set out in Table 2.1.1.
Table 2.1.1 – Shares of groups in CZ-NACE 10 division division in 2016 (% division = 100 %)

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
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<tr>
<td>10.1</td>
<td>22.9</td>
<td>17.9</td>
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<td>24.4</td>
<td>25.1</td>
</tr>
<tr>
<td>10.2</td>
<td>0.9</td>
<td>0.8</td>
<td>0.9</td>
<td>0.8</td>
<td>1.2</td>
<td>1.0</td>
<td>0.9</td>
<td>0.3</td>
</tr>
<tr>
<td>10.3</td>
<td>3.5</td>
<td>3.4</td>
<td>3.0</td>
<td>3.0</td>
<td>4.1</td>
<td>3.2</td>
<td>3.5</td>
<td>1.8</td>
</tr>
<tr>
<td>10.4</td>
<td>1.5</td>
<td>1.5</td>
<td>4.8</td>
<td>4.8</td>
<td>3.6</td>
<td>3.5</td>
<td>3.5</td>
<td>1.0</td>
</tr>
<tr>
<td>10.5</td>
<td>10.9</td>
<td>11.8</td>
<td>14.4</td>
<td>14.8</td>
<td>10.4</td>
<td>11.0</td>
<td>9.6</td>
<td>2.3</td>
</tr>
<tr>
<td>10.6</td>
<td>3.8</td>
<td>4.6</td>
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<td>3.9</td>
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<tr>
<td>10.8</td>
<td>21.0</td>
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<td>20.8</td>
<td>20.2</td>
<td>19.4</td>
<td>24.9</td>
<td>17.7</td>
<td>19.7</td>
</tr>
<tr>
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<td>11.2</td>
<td>15.3</td>
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<td>16.5</td>
<td>16.7</td>
<td>5.4</td>
<td>4.8</td>
</tr>
</tbody>
</table>

Source: CZSO, 2016, MIT calculations

2.2 DIVISION DEVELOPMENT

The production of pork is declining in the medium term. That is why company managements support restructuring and they are interested in enhancing competitiveness. In particular, support is directed at pig breeding, both from national and EU sources. In particular, this involves investment in technologies, but also in improving animal welfare. The range of meat products is expanding. Milk and dairy products are subject to year-on-year fluctuations, which have been caused, in particular, by the accumulation of stock of some of these products in the EU. Gradually, the production of flour and bread is also declining. A wide range of quality pastries is available to the consumer.

The development in food production, with regulatory requirements for health safety, is based on a system of quality of domestic production. The situation is similar in the EU. In the Czech Republic, branded foods are used in quality systems. Among consumers, the KLASA quality label has become well-known nationally and has clearly demonstrated its marketing power. Quality system also includes “Regional Food”. This label is obtained through regional competitions by local food producers and growers. The competitions take place in all 13 regions of the Czech Republic (except Prague). An agricultural or food product that seeks the Regional Food label must be produced in the region concerned from the raw materials of the region. The label contributes to the presentation of small and medium-sized enterprises serving primarily local markets with mostly food typical for the region. On the domestic market, some consumers also demand organic food, the average annual per capita consumption of which was CZK 213 (2015).

2.3 MAIN ECONOMIC INDICATORS

For the reference period 2008–2016, the number of units and labour productivity grew. Revenues and value added virtually stagnated, as their decline or growth was very modest. The number of employed persons declined, but the average wage grew gradually (Chart 2.3.1). The importance of the division in the manufacturing industry is declining in terms of volume of sales, value added and number of employees.

Producer prices were fluctuating over the reference period (Chart 2.3.2). In both groups and years, the development of prices was different.

Financial analysis culminates by the comparison of Spread (ROE – re), return on equity (ROE), cost of equity (re) and risk-free rate (rf). Very positive is the development of Spread, which after 7 years of negative values almost created value for owners, i.e. almost reached zero (see Chart 2.3.3). The main driver of this development was the development of ROE combined with a decrease in the value of risk (re).
Chart 2.3.1 – Major economic indicators of CZ-NACE 10 division

Source: CSO, MIT calculations

* This is a monthly aliquot share calculated from annual data.

Chart 2.3.2 – Price development of CZ-CPA 10 (2005 = 100 %)

Source: CSO, MIT calculations

Note: Group 10.2 is not monitored

Chart 2.3.3 – Spread (ROE – re) CZ-NACE 10 (in %)

Source: CSO, MIT calculations
2.4 FOREIGN TRADE

2.4.1 DEVELOPMENT OF FOREIGN TRADE

In the reference years, exports of food products (CZ-CPA 10) to troubled markets such as Russia (embargo) grew, indicating the interest especially in processed agrarian commodities from the Czech Republic and the ability of producers and business managers to maintain their positions or penetrate new territories facing strong competition. On the other hand, food imports also grew, mainly driven by retail chains, as well as by manufacturing businesses, such as from the meat industry. The total balance of these products in 2016 was therefore negative at CZK -31,790 million. This balance is CZK 1,278 million higher compared to 2015. See Chart 2.4.1 for more details.

Chart 2.4.1 – Product export, import and balance of foreign trade in CZ-CPA 10 (CZK m)

Source: CSO, data as of 3 May 2017

2.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

As in 2015, the decisive import territories with CZ-CPA 10 products in 2016 were Germany and Poland – EU member states. For exports of these products, Slovakia is the largest territory, followed by Germany and Poland. The shares of these countries in terms of both imports and exports are shown in Chart 2.4.2.

Chart 2.4.2 Foreign trade with CZ-CPA 10 products

Source: CSO, data as of 3 May 2017
2.5 RESEARCH AND DEVELOPMENT

The indicator characterizing the development of research and development in CZ-NACE 10, i.e. the volume of expenditure, shows a deterioration in 2014 and 2015 (2016 data not available). R&D was aimed at increasing the value added to production. The broader goal of research solutions was to increase food competitiveness. Some projects were implemented in collaboration between research institutions and manufacturing companies.

In 2008–2015, CZ-NACE 10 R&D expenditure was mainly channelled into applied research, funded by the business sector (Chart 2.5.1).

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include RABBIT Trhový Štěpánov a.s., EcoFuel Laboratories s.r.o., AMR AMARANTH a.s. and FAVEA a.s.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation segment were allocated in 2015–2016 a subsidy amounting to CZK 127.9 million. The largest beneficiary among large enterprises was PENAM, a.s., a company from Central Bohemia with the project “Innovation line for toast bread production in Zelená louka bakery”; among small enterprises it was AQM s.r.o. from the Moravian-Silesian Region (the project “Development of a new range of powdered and liquid beverages and food supplements in solid form for people suffering from non-specific intestinal inflammations”). Micro-enterprises from the Hradec Králové Region are also significantly represented.

![Chart 2.5.1 – Expenditure on research and development in CZ-NACE 10 (CZK m)](chart)

Source: CZSO data, MIT calculations (for methodological reasons the figures may differ from the data published by the CZSO)
2.6 DIVISION SUMMARY AND PROSPECTS

Manufacture of food remains an important branch of the processing industry, but its key role lies primarily in deliveries to the domestic market, and thereby in the provision of food to the population, which is based on different phases of agrarian raw material finalization. Adopted amendments to food law also provide consumers with a better guide to food selection. They allow the consumer to find out whether it is a “Czech food”, i.e. under what conditions the manufacturer may use the label or logo. It turns out that not only the price but also the quality is decisive when buying a particular food.

For Czech and European food of exceptional quality, trademarks – protected designations of origin, protected geographical indications, as well as designations of traditional specialties – are used as a means of protection. Czech producers take advantage of this protection for their unique agricultural products and food. Also, the national KLASA and the Regional Food labels maintain their long-standing position.

In 2016, a total of 7,742 units throughout the Czech Republic engaged in the manufacture of food, having different ownership and legal forms. In 2016, 95,247 people were employed in the division, which provided jobs for a significant share of the working population; at the same time, most manufacturers were looking for additional employees to ensure timely performance of the contracts. Some companies require shift operation and daily supplies to the market. In the following period, it is necessary to support professional training of employees, to increase the number of apprentices and to create conditions for the development of business.

Even with the negative balance of foreign trade in food products, there is a significant export, which, in a complicated situation in some territories, is increasing. This demonstrates the quality and competitiveness of food products both on the EU and the global markets. New export opportunities for food producers will be actively sought by agrarian diplomats. Also, better conditions are available for participants in international exhibitions and fairs.

Also positive is that after many years, the food industry is now creating value for the owners. Labour productivity is also increasing in the sector. In order to increase competitiveness, it will need to be further strengthened, in particular by increasing value added.

In terms of future prospects, it will be desirable to meet the priorities included in the long-term strategic objectives adopted by the Ministry of Agriculture. These objectives are also supported from EU funds and from national sources provided by the Ministry of Agriculture, the Ministry of Industry and Trade and other ministries. More resources will also be required by science, research and development, especially the application phase.

The main strategic priorities include:
– Food security and adequate self-sufficiency
– Competitiveness and efficiency of food production
– Food safety and consumer protection.

The sector has the following strategic objectives:
– ensuring a reasonable level of food security in terms of maximizing the use of domestic raw materials with sufficient processing capacities;
– eco-friendly growth of efficiency and productivity in the food industry;
– strengthening the importance of the food industry on the domestic market and increasing its export performance;
– increasing the importance of food production in employment and rural development;
– emphasis on improving food safety and consumer protection.

To achieve these objectives, effective links to domestic agriculture will be strengthened. It is also necessary to pursue non-productive objectives, which include enhancing environmental relations, especially for large enterprises, reducing the energy performance of food logistics and, finally, rural development, especially for small and medium-sized enterprises and, in particular, micro-enterprises, as well as horizontal and vertical cooperation between participants in short supply chains and local markets. Meeting these objectives creates a positive long-term perspective for both food and related industries.
3. CZ-NACE 11 MANUFACTURE OF BEVERAGES

3.1 DIVISION CHARACTERISTIC

Sorting of CZ-NACE 11 division (the sorting is by classes, this division is not sorted by groups):
- 11.01 Distilling, rectifying and blending of spirits;
- 11.02 Production of wine from grapes;
- 11.03 Production of apple wine and other fruit wines;
- 11.04 Production of other non-distilled fermented beverages;
- 11.05 Production of beer;
- 11.06 Production of malt;
- 11.07 Production of non-alcoholic beverages, bottling of mineral and other water.

CZ-NACE 11 Manufacture of beverages includes the manufacture of soft drinks (lemonades, mineral waters, etc.), the production of alcoholic beverages produced mainly by fermentation (beer, wine, etc.) and the production of spirits. The manufacture of beverages has had a long tradition, it is influenced by seasonality and depends on weather conditions.

The dominant class in the group of alcoholic beverages using fermentation technology is the production of beer, which is related to manufacture of malt. Another significant commodity of this division are wines, including grape wines, which also include the production of sparkling wine. As for fruit wines, the manufacture includes table, semi-sweet, dessert, dessert spicy and non-sparkling wines and other fruit wines – malt, herbal and liqueur wines. Fermented beverages include cider, which is made from apple juice, or perry using pear juice.

In spirits, the trend is departure from strongly aromatic types to spirits of rather neutral or slightly aromatic character. Gin and vodka are popular. Also, spirits with a lower ethanol content are successful, especially emulsion spirits, i.e. creamy drinks. “Tuzemák”, the Czech rum, dominates the domestic market.

This division also includes the production of soft drinks and bottling of mineral and other waters. These are flavoured or sweetened beverages (lemonades, orange drinks, colas and others) and mineral water as well as other bottled water. For mineral waters, demand for natural waters is growing slightly. For flavoured waters, it is mainly low-calorie water.

This division does not include the manufacture of coffee and tea products, fruit and vegetable juices, and dairy drinks.

In terms of size, the division is dominated by large enterprises accounting for 58% of its revenues, 63% of its value added and 41% of its employees. Medium-sized enterprises account for less than a third of revenues, value added and the number of employed persons. Small and micro enterprises are significant in terms of the number of entities (83%) and number of employed persons (27%). The revenues and value added of the division account only for up to 10%.
3.2 DIVISION DEVELOPMENT

According to the data of the Czech Brewery and Malthouse Association (CBMA), beer production in the Czech Republic (in mass units), including non-alcoholic beer, grew by 1.9% year-on-year in 2016, to a record 20.5 million hectolitres of beer. This growth is in the context of both the higher production for the domestic market and the continuing positive trend in beer exports. In terms of beer composition, both tap beer and bottled beer consumption has increased. However, the difference between the volume of beer consumed in catering facilities, in favour of packaged beer, sold in shops, i.e. the ratio of on-trade vs. off-trade consumption reached 39% to 61% (CBMA). Exports are also important in terms of beer production (see point 3.4).

The consumption of beer per capita in the Czech Republic remained at 2015 level, i.e. 143 L. On the one hand, non-alcoholic beer production grew by 17.7% year-on-year (to 555 thousand hl), while beer mixes dropped by 17.3%. In terms of packaging, there was year-on-year growth of beer in cans and slightly also of beer in PET bottles. Bottled beer remained at the same level, while there was a slight increase in tank beer, and a decrease in keg beer. In 2016 domestic malthouses produced approximately 544 thousand tons of malt.

The positive development in this segment is connected with the revival of tourism, climate development, but also with the increasing number of inhabitants of the Czech Republic.

For wine, medium-term development has seen growth in consumption with certain fluctuations, but self-sufficiency is decreasing. According to the Czech Statistical Office, in 2016 the Czech Republic harvested 75.9 thousand tonnes of wine grapes from 15.8 thousand ha of productive vineyards. Must grape production in 2016 was significantly lower year-on-year (16%). A total of 565 thousand hl of wine will be produced from the harvested must grapes. This represents about one quarter of the annual consumption of wine in the Czech Republic. The lacking wine is imported (raw materials and wine), but high-quality wine is also exported from the Czech Republic. The development of viniculture and viticulture in the Czech Republic is supported by both EU funds and national resources. In 2016, the Wine Fund was active in this area, focusing primarily on the promotion of this commodity.

According to the Association of Mineral Waters, in 2016 the total mineral water production reached 8.3 million hl.

3.3 MAIN ECONOMIC INDICATORS

In 2008–2016, the development of selected indicators varied. The number of units grew significantly in this period, especially in manufacture of beer and wine, due to the establishment of mini-breweries and small wineries. Growth was also seen in the average wage, which peaked in 2016. Revenues declined the most in the 2011 crisis period; they recovered in the following years but the 2008 levels have not been fully reached yet. A similar trend was seen in value added and the number of employed persons. In labour productivity, periods of moderate decline and moderate growth alternated. (Chart 3.3.1).

In 2016, in comparison with 2015, the creation of economic value added significantly improved and became positive, meaning that the companies in the division created value for their owners. The increase in economic value added was linked to the level of indebtedness. Favourable developments in this indicator were enabled by changes in NP/profit and they are also linked to EBIT in relation to a significant increase in the productive capacity (EBIT/Assets). The development of economic value added was positively affected by the relation of labour productivity growth to average wage growth.

Industrial producer prices in CZ-CPA 11 recorded a surge in 2012, which continued in the following years at a slower pace (see Chart 3.3.2). In 2012, there was a full recovery in the demand for spirits, even for those that are more expensive and can guarantee to a certain extent that they are not adulterated, and other beverage producers joined this pricemaking tendency which depends on the market situation.
In terms of absolute indicators, revenues, value added and number of employed persons, the importance of the division in the manufacturing industry is decreasing. The estimates of efficiency (Spread) in 2016 are positive.

**Chart 3.3.1 – Major economic indicators of CZ-NACE 11 division**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of units</th>
<th>Average number of employees</th>
<th>Sales (CZK m)</th>
<th>Value added (CZK m)</th>
<th>Average monthly wage (CZK)</th>
<th>Labour productivity from the VA (CZK/month)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>1,024</td>
<td>17,142</td>
<td>10,99</td>
<td>13,512</td>
<td>3,66</td>
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<tr>
<td>2010</td>
<td>1,232</td>
<td>14,070</td>
<td>14,92</td>
<td>14,907</td>
<td>2,74</td>
<td>13,65</td>
</tr>
<tr>
<td>2011</td>
<td>1,277</td>
<td>14,200</td>
<td>15,21</td>
<td>14,37</td>
<td>3,48</td>
<td>13,52</td>
</tr>
<tr>
<td>2012</td>
<td>1,266</td>
<td>14,421</td>
<td>16,00</td>
<td>14,75</td>
<td>3,94</td>
<td>13,48</td>
</tr>
<tr>
<td>2013</td>
<td>1,313</td>
<td>14,706</td>
<td>17,142</td>
<td>15,521</td>
<td>4,70</td>
<td>13,06</td>
</tr>
<tr>
<td>2014</td>
<td>2,008</td>
<td>15,206</td>
<td>18,000</td>
<td>16,604</td>
<td>5,08</td>
<td>12,46</td>
</tr>
<tr>
<td>2015</td>
<td>2,110</td>
<td>15,524</td>
<td>18,721</td>
<td>17,261</td>
<td>5,70</td>
<td>12,31</td>
</tr>
<tr>
<td>2016</td>
<td>2,110</td>
<td>16,124</td>
<td>19,347</td>
<td>17,921</td>
<td>6,31</td>
<td>12,21</td>
</tr>
</tbody>
</table>

Source: CSO, MIT calculations

* This is a monthly aliquot share calculated from annual data.

The development of Spread was negative except in 2012 and 2016. In 2013, Spread decreased significantly and was minimal in the following year. The division was very successful in these years. Situation changed in 2015 and in 2016 Spread reached the highest value (see Figure 3.3.3).

**Chart 3.3.2 – Price development of CZ-CPA 11 (2005 = 100 %)**

**Chart 3.3.3 – Spread (ROE – re) CZ-NACE 11 (in %)**

Source: CSO, MIT calculations

Source: CSO, MIT calculations
3.4 FOREIGN TRADE

3.4.1 DEVELOPMENT OF FOREIGN TRADE

The reported balance of foreign trade in products under CZ-CPA 11 was positive over the whole period. Its growth was reported in 2012–2014 (Chart 3.4.1). The development of the foreign trade balance is mainly correlated with the developments in exports.

The positive situation of exports in the mass units was based mainly on the increasing export of beer. In 2016, 4.4 million hl of beer were exported from the Czech Republic (up 4.5% year-on-year). Malt exports totalled 268 thousand tonnes, up 9.5% year-on-year. Exports also related to other beverages such as mineral water, non-alcoholic flavoured or sweetened drinks, distilled alcoholic beverages, sparkling wines and other beverages.

Likewise, imports involved a wider range of products, including beer, although only to a small extent due to low demand because of the popularity of domestic beer with bottom fermentation technology. Imports of beverages grew steadily throughout the reporting period. This negative phenomenon was dominated by wine, with imports of CZK 4.9 billion in the last year. Red wine represents 35% of exports; the decisive share belongs to white wine. In the case of white wine, it is mainly barrel wine, while in the case of red wine the ratio of barrel to bottled wine is balanced.

Chart 3.4.1 – Product export, import and balance of foreign trade in CZ-CPA 11 (CZK m)

Source: CSO data as of 4/5/2017

3.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

Imports come to the Czech Republic largely from EU countries. These are Germany, Italy, France, Poland, Slovakia and other countries, as shown in Chart 3.4.2. From a commodity perspective, wine was imported from Italy and Spain, Hungary and Slovakia, while beer from Poland (2016).

Imports are traditionally directed to Slovakia, followed by Poland and Germany. In terms of commodities, beer is most exported to Slovakia, Germany and Poland, and from non-EU countries to Russia. In malt, the largest customers are Poland and Germany. The largest customer of wine was Slovakia.
3.5 RESEARCH AND DEVELOPMENT

Expenditures on research and development in CZ-NACE 11 increased significantly between 2013 and 2015, when experimental research was largely carried out, involving the acquisition, consolidation and formation of scientific technological, commercial and other knowledge to develop new or better products – beverages, i.e., for example, the quality of the lemonade products, etc. In terms of the volume of R&D expenditures, this division is among the smallest; R&D expenditures in 2015 amounted to CZK 17 million, which is more than three times the total R&D expenditures in 2011. Almost all of the funds were expenditures from business resources. This division belongs to those that did not receive almost any public support from abroad in previous years.

Increased R&D resources were especially provided by entrepreneurs trying to consolidate their position in the beverage market, both in the domestic market and abroad. Expenditures are shown in Chart 3.5.1.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include IDS Advisory s.r.o., Plzeňský Prazdroj, a.s. and SLADOVNY SOUFFLET ČR, a.s.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation segment were allocated in 2015–2016 a subsidy amounting to CZK 3.9 million. Zastoupeny jsou celkově značné

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation segment were allocated in 2015–2016 a subsidy amounting to CZK 3.9 million. Zastoupeny jsou celkově značné...

Chart 3.5.1 – Expenditure on research and development in CZ-NACE 11 (CZK m)

Source: CZSO, data as of 4/5/2017

Source: CZSO, data as of 4/5/2017
3.6 DIVISION SUMMARY AND PROSPECTS

In summary, the manufacture of beverages has recently seen a diversification in the structure of units, especially with respect to smaller companies operating on regional markets. In addition, large companies strengthen their positions in the domestic economy as well as in foreign markets. From the product point of view, beer production, which is a traditional beverage in the Czech Republic, plays a significant role, and Czech beer has a protected geographical indication. We cannot forget the growing number of microbreweries and the need for brewmasters. Also, wine requires further research for individual wine regions.

In this context, it is desirable to have close links to agriculture – fruit growing, viticulture, but also to grain production for beer – malting barley and hops, and also to gastronomy, especially Czech cuisine and tourism. It is also necessary to take into account the seasonality and the influence of the weather, which affects the demand and thus the volume of production and follow-up indicators.

From an economic point of view, efficiency grew in 2016, which is positive. Expenditures on research and development have also increased. This could in the future lead to an improved product range and increase in the volume of foreign trade and an increase in the positive trade balance.

In the wide portfolio of beverages manufactured in the Czech Republic and their quality and competitiveness in domestic and foreign markets, not only in EU countries, we can see good prospects for this division and its contribution to increasing efficiency.
4. CZ-NACE 13 MANUFACTURE OF TEXTILES

4.1 DIVISION CHARACTERISTIC

CZ-NACE 13 division is broken down into the following groups:
- 13.1 Preparation and spinning of textile fibres and yarn;
- 13.2 Weaving of textiles;
- 13.3 Finishing of textiles;
- 13.9 Manufacture of other textiles.

Manufacture of textiles is divided into cotton, silk, flax and wool, depending on the type of the raw material processed. The manufacturing process of most textile enterprises involves several technological steps. These include spinning, weaving, finishing and manufacture of other textiles. The textile industry is a sensitive sector facing large competition on the global market, especially from third countries, yet the textile industry of the Czech Republic is export-oriented.

The division is characteristic for large businesses, which account for over 50% of revenues, almost 50% of value added and number of employed persons. The second most important group are medium-sized enterprises covering roughly a third of revenues, value added and employed persons. Small and, above all, micro-enterprises are the most numerous, but in terms of revenues and value added, micro-enterprises make up about 3% to 4% and about 7% of the number of employed persons.

Group 13.9 is the largest in the division, accounting for about two-thirds of the value of the indicators examined. Only the share in the number of entities is 93% (Table 4.1.1). There are many micro-enterprises in this group. The second most significant group is 13.2.

Overall, it can be said that the competitive effects of foreign imports significantly affect economic results and the industry is also subject to fashion trends. This is evidenced by the fact that the year-on-year decline in the total number of production units in 2016 was 5.4%. Compared to 2008, on the contrary, the number of production units increased by about 11.1% in 2016. A total of 2,293 production units with an average registered number of employees of 24,224 were engaged in the manufacturing of textiles in 2016.

The production units are dominated by micro-enterprises, small manufacturing companies, small entrepreneurs and self-employed persons. Their economic success and failure results in the fluctuation in the number of production units in the monitored period.

Table 4.1.1 – Shares of groups in CZ-NACE 13 division in 2016 (% division = 100 %)

<table>
<thead>
<tr>
<th>Group</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.1</td>
<td>8,1</td>
<td>9,2</td>
<td>6,7</td>
<td>5,4</td>
<td>8,6</td>
<td>7,9</td>
<td>8,0</td>
<td>2,1</td>
</tr>
<tr>
<td>13.2</td>
<td>22,8</td>
<td>20,1</td>
<td>22,0</td>
<td>22,3</td>
<td>26,9</td>
<td>25,8</td>
<td>22,5</td>
<td>2,5</td>
</tr>
<tr>
<td>13.3</td>
<td>4,2</td>
<td>3,5</td>
<td>3,0</td>
<td>1,9</td>
<td>0,5</td>
<td>2,0</td>
<td>4,4</td>
<td>2,5</td>
</tr>
<tr>
<td>13.9</td>
<td>64,9</td>
<td>67,2</td>
<td>68,3</td>
<td>70,4</td>
<td>64,0</td>
<td>64,3</td>
<td>65,1</td>
<td>93,0</td>
</tr>
</tbody>
</table>

Source: CSOS, 2016, MIT calculations
4.2 DIVISION DEVELOPMENT

The division developed very favourably in 2016 when economic value added reached black numbers. Groups 13.9 and 13.1 contributed most to this result.

At the division level and in both groups, the favourable development of economic value added was due to a decrease in risk and an improvement in indebtedness.

Even though labour productivity grew in the division, which is positive for the development of economic value added, this growth was not enough to offset the negative impact of growing average wage. The ratio of growth of labour productivity to average wage in groups 13.1 and 13.3 had a positive effect on economic value added.

In a number of regions, significant enterprises are large employers and are also an example of entrepreneurial skills and social approach to their employees. Turnovers of leading companies grow by 10% per year, and it is no exception that these companies invest about CZK 100 million per year in their production. Such companies include, for example, JUTA Dvůr Králové n. Labem, BORGES CS, PEGAS Znojmo, Nová Mosilana Brno, LANEX Bolatice, Kordárna Velká n. Velíčkou, PLEAS, VEBA Broumov and many others.

This positive development is based on the effective application of research, development and innovation potential. Evidence of such application is the development of technical textiles, which in recent years grew by an average of about 10% per year. We can say that it has changed the overall character of this division. Today, technical textiles represent a significant majority of the outputs and revenues of textile production (65.0%), and with new markets opening up for new technical textile applications, its share will continue to grow in the future. It is also an opportunity for other manufacturing companies, which is evidenced by the fact that the manufacture of technical textiles is considered by the companies Nyklíček, Nové Město nad Metují or VEBA Broumov.

4.3 MAIN ECONOMIC INDICATORS

The number of units was increasing until 2012 and then started declining (Figure 4.3.1). In 2016, their number decreased year-on-year in the CZ-NACE group 13.9 Manufacture of other textiles by 6.1%. In the remaining groups, on the contrary, the number of units increased by a couple of manufacturing companies.

The number of employees declined significantly in 2009 and stagnated in the following years. In 2016, in the division as a whole, the number of employed persons annually grew by approximately 1.6%. In terms of individual groups, the number of employed persons decreased by about 0.6% in CZ-NACE 13.1, decreased by 4.1% in CZ-NACE 13.2, increased by about 4.9% in CZ-NACE 13.3, and increased by about 3.8% in CZ-NACE 13.9.

The growth of revenues in the following years after the decline in 2009 is positive. However, the development in value added did not copy this positive trend. This means that the volume in CZK of purchased materials, semi-finished products and services grew, including its share of revenues. Combined with the stagnation of the number of employed persons and the stagnation of value added, it was reflected in the development of labour productivity, which was increasing in 2008–2011, then stagnated and was increasing again until 2014 and subsequently stagnated again. In 2016, value added per employee increased slightly by 1.7% year-on-year in the division. In terms of individual groups, value added per employee increased by about 22.1% in CZ-NACE 13.1, decreased by about 5.0 % in CZ-NACE 13.2, increased by about 34.8% in CZ-NACE 13.3, and increased by about 0.3% in CZ-NACE 13.9. The average wage grew by 4.9% year-on-year and reached CZK 22,242.

In 2016, net turnover for the accounting period increased in the whole division by 2.6% year-on-year, being up about 10.7% in CZ-NACE 13.1, down 1.1% in CZ-NACE 13.2, up about 15.9% in CZ-NACE 13.3 and up about 2.9% in CZ-NACE 13.9.
The main economic indicators of the division are significantly influenced by CZ-NACE 13.9 Manufacture of other textiles, which includes the manufacture of non-woven and technical textiles, which represents two thirds of the value added and revenues in the division.

Producer prices of commodities in the division increased continuously in all product groups over the monitored period until 2016, with prices in group 13.9 declining in 2016. However, the price of goods in this group has been consistently growing, including the price of non-woven and technical textile products. The most problematic is the price development in the product group CZ-CPA 13.2 Woven textiles, which is most affected by imports of cheap materials (see Chart 4.3.2).

Return on equity (ROE) has seen a significant improvement since 2010 and practically maintains a steady value, despite slight fluctuations. The significant decrease in risk since 2014 has contributed to the negative Spread approaching black numbers in 2014 and 2015, and becoming positive in 2016 (see Chart 4.3.3).

Both revenues and Spread are growing in the period, but the importance of the division in the manufacturing industry is declining.
4.4 FOREIGN TRADE

4.4.1 DEVELOPMENT OF FOREIGN TRADE

Exports and imports were growing in 2009–2016; the dominating exports pushed the trade balance of CZ-CPA 13 commodities into black (see Chart 4.4.1). In 2016, exports grew by 5.2% year-on-year, imports by 5.3% and the positive trade balance by 4.7%. In terms of foreign trade by individual groups, in 2016 CZ-CPA 13.9 had the highest share in total exports with 58.1% and the highest share in total imports with 71.3%, so this group had a negative balance of CZK -0.98 billion.

Commodity export prices in group 13.1 exceed import prices by more than 45%. Conversely, in other commodities, import prices are higher than export prices.

For domestic producers, the Czech Republic is a relatively small market for the sale of textile and semi-finished products. If manufacturers want to fully use their capacity and if they want to compete with other European producers, they must try to succeed abroad. It can be said that they are doing well, not only by developing new and high-quality textile products, but also by establishing manufacturing cooperation with Western partners. This is significantly facilitated by foreign capital.

Chart 4.4.1 – Product export, import and balance of foreign trade in CZ-CPA 13 (CZK m)
4.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

Germany and Italy, i.e. demanding markets, have consistently been the largest foreign customers (see Chart 4.4.2). This proves the good quality of the division’s production. Exports of goods to Germany amounted to CZK 17.4 billion in 2016 (up 9.8% yoy), exports of goods to Italy amounted to CZK 7.4 billion (up about 3.4%), exports of goods to Poland were CZK 6.1 billion (up 15.5%), exports of goods to Slovakia were CZK 3.5 billion (down 2.1%), exports of goods to Romania were CZK 2.8 billion (up 9.1%) and exports of goods to Austria were 2.7 billion (up 3.6%).

Chart 4.4.2 Foreign trade with CZ-CPA 13 products

Imports are also dominated by Germany and Italy. In 2016, most textile goods were imported from Germany totalling CZK 17.0 billion (up 3.5% from 2015), from Italy totalling CZK 5.7 billion (up 8.3%), from China totalling CZK 4.8 billion (up 9.1%), from Turkey totalling CZK 2.6 billion (up 1.5%), from Poland totalling CZK 2.5 billion (up ca 36.5%) and from Belgium totalling CZK 2.4 billion (up 4.1% from 2015).

4.5 RESEARCH AND DEVELOPMENT

R&D expenditure in 2015 amounted to CZK 308 million, which accounted for 1.19% of total R&D expenditure in the manufacturing industry. Compared to other years, the volume of funds from public foreign sources increased significantly in this segment in 2015, but the bulk of the funds still consisted of business resource expenditures.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include NYKLÍČEK a spol. s.r.o., PEGAS NONWOVENS s.r.o. and STAP a.s.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation segment were allocated in 2015–2016 a subsidy amounting to CZK 257.1 million, which was divided among enterprises of varying sizes from about half of the Czech Republic’s regions. The largest beneficiary among the large enterprises was AstenJohnson, s.r.o. (project “New product lines of special industrial networks for pulp dewatering”) from the South Bohemian Region; among the medium enterprises it is WOMBAT, s.r.o. (project “Research and development of new lining for pipeline rehabilitation”) from the South Moravian Region. The Liberec Region dominates in terms of the number of beneficiaries – research projects of a total of 9 local micro-enterprises were selected.
This positive development is based on the effective application of research, development and innovation potential. Evidence of such application is the development of technical textiles, which have grown the most and fastest in recent years, and we can say that they have changed the overall character of this division. Today, technical textiles represent a significant majority of the outputs and revenues of textile production (70.0%), and with new markets opening up for new technical textile applications, its share will continue to grow in the future.

One way to increase the number of innovations or to initiate the emergence of new companies in the industry or to attract investment to the industry is the formation of clusters. For the textile industry in the Czech Republic, CLUTEX is very important; it is a cluster of technical textiles, which was established in 2006 and was awarded the title “Cluster of the Year” in that year, and was also declared a successful project of the programme “Clusters of the Operational Programme Entrepreneurship and Innovation”. CLUTEX is a member of the international TEXTILE 2020 project, whose mission is to create a European Cluster for Advanced Textile Materials. Cluster activities are primarily focused on projects concerning R&D and innovation, human resources development and promotion.

Current research and development focuses on the development of special fabrics for use in healthcare, protective clothing, environmental protection, etc.

*Chart 4.5.1 – Expenditure on research and development in CZ-NACE 13 (CZK m)*

<table>
<thead>
<tr>
<th>Year</th>
<th>Applied</th>
<th>Experimental</th>
<th>Basic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>139</td>
<td>61</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>139</td>
<td>73</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>66</td>
<td>76</td>
<td>0</td>
</tr>
<tr>
<td>2013</td>
<td>86</td>
<td>101</td>
<td>0</td>
</tr>
<tr>
<td>2014</td>
<td>209</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>2015</td>
<td>308</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: CZSO data, MIT calculations (for methodological reasons the figures may differ from the data published by the CZSO)

### 4.6 DIVISION SUMMARY AND PROSPECTS

Economic results indicate that the textile industry has been successful in recent years.

The textile industry in the EU, as well as in the Czech Republic, belongs to the traditional segments of the manufacturing industry. It is also a sensitive sector facing strong competition from third (especially Asian) countries on the global market, as well as unfavourable economic situation, because textile and clothing companies are among those most susceptible to economic downturn. Textile and clothing products are present in all areas of life.

A long-term vision for 2020 – transforming the current European textile and clothing industry into a stable and competitive player – is contained in the EU document “European Technology Platform for the Future of Textiles and Clothing”. It outlines three main trends in this production in Europe:
– Switching from commodity to specialty production with the help of high-tech processes, the use of new fibres and textiles with high functionality adapted to the purpose of use, using highly flexible technologies. Focus on the development of intelligent textiles using electronic components while maintaining easy maintenance by washing and ironing.

– Use and distribution of textiles as new (design) materials in different industrial sectors and user areas.

– The end of the mass production of textile products and the shift to industrial production focused on customers and their needs, flexible responses to demand with the use of intelligent logistics, distribution and service.

The programme of the Czech Technology Platform for Textile (CTPT), which was established in 2008, is based on the European Technology Platform. It focuses on two key innovation goals:

– Objective 1 – Innovation in the textile and clothing industry: innovation in textile materials (fibres, yarns, textile structures, etc.), innovation in textile technology, processes, multidisciplinary approach to research and development of textile materials.

– Objective 2 – Innovation on product output: based on outputs from Objective 1 and cooperation with other industries, development of new textile products; increasing product application in medicine, transport and other non-traditional areas and the search for new areas of textile application.

To accelerate the roll-out of innovation and to improve the economic efficiency of R&D in the textile and clothing industry, it is necessary to focus on co-operating with related user industries such as construction, military equipment, personal and professional protective equipment, healthcare and sports and outdoor equipment. In all the above areas there are requirements to provide for new functional properties of fabrics, or their combinations.

The way to an innovative product is not easy. On this way, it is necessary to have enough information, suitable partners and a favourable environment to be able to find an innovative topic based on cooperation with research organizations or other industrial enterprises (not only textile and clothing ones), where the companies:

– implementing this innovative topic will require sufficient skilled workers or new graduates of secondary and higher education institutions who will be able to take this innovative topic and develop it into an innovation plan;

– must be in an environment where public or private resources can be obtained to implement the innovation project;

– can, through standardized procedures, evaluate and measure the properties of the innovative product and thus determine its economic potential.

This concept is based on the premise that the development of an innovation environment will pave the way for the emergence of new, specialized small businesses and that as many textiles and clothing companies as possible will become involved in this process.
5.

CZ-NACE 14 MANUFACTURE OF WEARING APPAREL

5.1 DIVISION CHARACTERISTIC

CZ-NACE 14 division is broken down into the following groups:

- 14.1 Manufacture of wearing apparel, except fur apparel;
- 14.2 Manufacture of articles of fur;
- 14.3 Manufacture of knitted and crocheted apparel.

The manufacture of wearing apparel is labour-intensive, with a high share of manual work on the product. The manufacture of wearing apparel is characteristic for the creation of fashion collections depending on the seasons and customer’s requirements. Production in small series is prevalent, with increasing importance of custom-made ready-made production, including related services, such as fashion consultancy or alteration of garments. The division is export-oriented, although the value of exports is about 71% of the value of imports. The division is less important in terms of internal market security.

In the division, there are many micro-enterprises that occupy over 80% of units, one third of employed persons, but only less than one fifth of revenue and value added. In revenue and value added, the most significant are small and medium-sized enterprises, each of which accounts for about one-third of the division.

In terms of groups, the most significant is 14.1 Manufacture of wearing apparel, except fur apparel, which dominates in all monitored indicators, but mainly in the number of production units with a share of over 90% (Table 5.1.1). The group has a very small share of 14.2.

Table 4.1.1 – Shares of groups in CZ-NACE 14 division in 2016 (%; division = 100 %)

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.1</td>
<td>90.6</td>
<td>89.1</td>
<td>91.3</td>
<td>91.3</td>
<td>86.5</td>
<td>87.5</td>
<td>91.6</td>
<td>92.8</td>
</tr>
<tr>
<td>14.2</td>
<td>0.4</td>
<td>0.6</td>
<td>0.5</td>
<td>0.6</td>
<td>2.7</td>
<td>2.2</td>
<td>0.4</td>
<td>1.1</td>
</tr>
<tr>
<td>14.3</td>
<td>9.0</td>
<td>10.2</td>
<td>8.2</td>
<td>8.2</td>
<td>10.7</td>
<td>10.3</td>
<td>7.9</td>
<td>6.1</td>
</tr>
</tbody>
</table>

Source: CZSO, 2016, MIT calculations

5.2 DIVISION DEVELOPMENT

In the apparel sector, besides small production units, the companies that have succeeded are those that have adopted the so-called Northern European business model. This means that companies have retained control over important processes (such as design, business, finance, marketing, quality, etc.) and have moved production to more cost-effective regions. However, almost none of the significant apparel companies of the socialist era adopted this model, and therefore they ceased to exist. On the other hand, there are also new companies that are successful, such as Tonak, Blažek, Altreva, Kara, Koutný, to name a few.
The growing economy, investment in modern production, and the willingness of people to spend on Czech products also help domestic apparel companies. The year 2016 was also successful for companies that focus on men’s fashion, such as Koutný, Prostějov or the cooperative Vývoj in Třešť u Jihlavy. Many apparel companies have achieved results they last reported seven years ago. Although Czech apparel manufacturers are attracting more and more customers, the market continues to be dominated by foreign multinational chains that focus mainly on “fast fashion”, i.e. fashion that tries to copy catwalk trends and get them as quickly as possible to people at a low price. Czech companies are estimated to have a maximum of 20% of total sales. One of the major problems the division faces is the deteriorating age structure of the employees and the negative trend in education, especially in technical education. The reduction of disposable workers is felt by many companies in the apparel industry already, and this will become increasingly urgent with continued economic growth.

### 5.3 MAIN ECONOMIC INDICATORS

The year 2016 was successful for the division, with an increase in positive economic value added from 2015 due to the same impact of groups 14.1 and 14.3. The positive development of economic value added in the division and in section 14.1 and 14.3 was primarily due to increased investment in enterprises creating value for the owner. Economic value added was positively affected by an increase in labour productivity. Increasing the average wage, which always leads to a negative impact on economic value added, was not enough to eliminate the positive impact of labour productivity.

The number of units increased steadily between 2008 and 2016 (see Chart 5.3.1). In 2016, the number of production units was up 51.3% from 2008. Looking closer at the developments in individual groups, it can be stated that their number grew only in CZ-NACE 14.1, but in the other groups it had a decreasing trend. In CZ-NACE 14.2, the largest number of production units was in 2009, then they declined significantly and in 2016 their number was roughly the same as in 2008. In CZ-NACE 14.3, the number of production units was growing until 2012, when it peaked and started declining steadily.

**Chart 5.3.1 – Major economic indicators of CZ-NACE 14 division**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of units</th>
<th>Average number of employees</th>
<th>Sales (CZK m)</th>
<th>Value added (CZK m)</th>
<th>Average monthly wage (CZK)</th>
<th>Labour productivity from the VA (CZK/month)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>8 977</td>
<td>15 518</td>
<td>17 419</td>
<td>9 062</td>
<td>12 399</td>
<td>7 965</td>
</tr>
<tr>
<td>2009</td>
<td>9 054</td>
<td>15 643</td>
<td>17 450</td>
<td>9 441</td>
<td>12 790</td>
<td>8 131</td>
</tr>
<tr>
<td>2010</td>
<td>9 895</td>
<td>15 892</td>
<td>17 600</td>
<td>10 337</td>
<td>13 298</td>
<td>8 756</td>
</tr>
<tr>
<td>2011</td>
<td>10 394</td>
<td>16 981</td>
<td>18 231</td>
<td>11 025</td>
<td>13 910</td>
<td>9 359</td>
</tr>
<tr>
<td>2012</td>
<td>10 784</td>
<td>19 192</td>
<td>19 098</td>
<td>11 739</td>
<td>14 562</td>
<td>10 000</td>
</tr>
<tr>
<td>2013</td>
<td>10 789</td>
<td>19 098</td>
<td>19 098</td>
<td>11 739</td>
<td>14 562</td>
<td>10 000</td>
</tr>
<tr>
<td>2014</td>
<td>11 280</td>
<td>21 422</td>
<td>21 116</td>
<td>12 963</td>
<td>15 324</td>
<td>10 789</td>
</tr>
<tr>
<td>2015</td>
<td>11 739</td>
<td>22 116</td>
<td>22 116</td>
<td>13 324</td>
<td>15 789</td>
<td>11 361</td>
</tr>
<tr>
<td>2016</td>
<td>12 492</td>
<td>22 389</td>
<td>23 839</td>
<td>13 981</td>
<td>16 204</td>
<td>11 879</td>
</tr>
</tbody>
</table>

**Source:** CSO, MIT calculations

*This is a monthly aliquot share calculated from annual data.*

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82
The number of employed persons was declining until 2013, when it started to grow moderately. In 2016, the number of employees posted another year-on-year decline of 0.6%, and it was down 37.0% from 2008.

Revenues and value added declined in 2009 and then stagnated until 2013. Increase came only in 2014–2016. However, in terms of revenue growth, the sector’s importance in the manufacturing industry has decreased. Very favourable was the development in labour productivity, which grew steadily, and so did the average wage. The positive thing is that the division maintained the highly positive Spread.

Good economic results affected the increase in the average wage, which was CZK 16,056 in 2016, a year-on-year increase of 8.2%, and was up 31.3% from the beginning of the reference period in 2008. However, the average wage was low given the manufacturing industry average and, despite its growth, it still remains among the lowest wages in the manufacturing industry.

If we evaluate the CZ-NACE 14 division based on the main indicators, we can see that the situation improved in 2016 as there was an increase in revenues for the sales of own products in CZ-NACE 14 as a whole and also in individual groups, and there was also an increase in value added per employee.

Prices of CZ-CPA commodities were increasing in the reporting period. Stronger price increase over the whole reporting period (except in 2016) was reported by group 14.1 (Chart 5.3.2).

The development of financial results was paradoxical in CZ-NACE 14, when the return on equity began to rise dramatically after the onset of the crisis, which, together with decreased risk, led to a relatively very positive Spread from 2010. The ROE and Spread peaked in 2012; in the following years, the slight increase in risk was reflected in the reduction of these high positive values (see Chart 5.3.3).

**Chart 5.3.2 – Price development of CZ-CPA 14 (2005 = 100 %)**

**Chart 5.3.3 – Spread (ROE – re) CZ-NACE 14 (in %)**

Source: CZSO, MIT calculations
Note: Group 14.2 is not monitored

## 5.4 FOREIGN TRADE

### 5.4.1 DEVELOPMENT OF FOREIGN TRADE

Although the names are identical, foreign trade is not about production activity, i.e. CZ-NACE 14, but products, i.e. CZ-CPA 14.
Although the value of total exports increased throughout the reference period 2009–2016, the foreign trade balance in CZ-CPA 14 continued to be negative and was steadily rising, as the growing purchasing power of the population also increased the value of imports that still prevailed over the value of exports. Ever increasing external imports from China, Bangladesh, Turkey and India, i.e. countries of dumped imports, have a negative impact on the overall external trade balance.

In 2016, total foreign trade turnover amounted to CZK 111.8 billion, 25.0% more than in 2015 and 85.4% more than at the beginning of the reference period since 2009. Total exported goods amounted to CZK 46.25 billion, 31.6% more than in 2015, and imported goods amounted to CZK 65.5 billion, i.e. 20.6% more than in 2015. The negative balance in 2016 was CZK 19.3 billion, i.e. 0.5% more than in 2015.

In terms of foreign trade by individual groups, CZ-CPA 14.1 with the turnover of CZK 96.8 billion contributed most to the total turnover as in previous years; its share of the division turnover was 86.6%, its share of the exports was 87.5% and its share of the imports was 86.0%. In this group, the highest negative trade balance was also reached – CZK 15.9 billion.

**Chart 5.4.1 – Product export, import and balance of foreign trade in CZ-CPA 14 (CZK m)**

![Chart 5.4.1 – Product export, import and balance of foreign trade in CZ-CPA 14 (CZK m)](image)

*Source: CSO, data as of 3 May 2017*

### 5.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

The largest foreign customers have traditionally included Germany, with exported goods worth CZK 19.1 billion in 2016 (81.6% more than in 2015), Slovakia with goods worth CZK 4.4 billion (up 7.9%), Austria with goods worth CZK 3.6 billion (up 108.3%), Italy with goods worth CZK 3.2 billion (roughly the same as in 2015), and Poland with goods worth CZK 3.0 billion (down 21.2%).

**Chart 5.4.2 – Foreign trade with CZ-CPA 14 products**

![Chart 5.4.2 – Foreign trade with CZ-CPA 14 products](image)

*Source: CSO, data as of 3 May 2017*
In 2016, most CZ-CPA 14 goods were imported from China (CZK 16.6 billion, up 12.5% from 2015), from Bangladesh (CZK 9.6 billion, up 33.4%), from Germany (CZK 8.5 billion, up 22.6%), from Turkey (CZK 4.9 billion up 20.7%), and from India (CZK 3.0 billion, up 69.9% from 2015). As shown in the above overview, imports from third countries are starting to dominate strongly.

5.5 RESEARCH AND DEVELOPMENT

Division 14 is relatively smaller in terms of the volume of R&D expenditure, which amounted to CZK 12 million in 2015. Compared to 2011, total R&D expenditure decreased by 93%. However, this rapid decline was due to a one-off increase in public funds, namely from CZK 7 million to CZK 118 million between 2010 and 2011; in the following years, public expenditure declined rapidly in this division and declined until 2015.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include TONAK a.s., KNITVA s.r.o. and DEONA MEDI s.r.o.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research were allocated in 2015–2016 a subsidy amounting to CZK 21.2 million, which was divided among enterprises of varying sizes from about half of the Czech Republic’s regions, especially to small enterprises, the largest beneficiary of which is LASTING SPORT s.r.o. (a potential export potential project) from the Karlovy Vary Region, the second largest beneficiary being Brand Promotion CZ, s.r.o. (a project examining competitiveness in the European market) from the South Moravian Region.

Chart 5.5.1 – Expenditure on research and development in CZ-NACE 14 (CZK m)

Source: CZSO data, MIT calculations (for methodological reasons the figures may differ from the data published by the CZSO)

5.6 DIVISION SUMMARY AND PROSPECTS

The apparel and textile industry in the EU, i.e. also in the Czech Republic, is an important part of the European manufacturing industry and affects the economic and social situation in many EU-28 regions. Numerous EU studies show that the European apparel industry is the most creative industry and will continue to influence the EU’s lifestyle in the future. Clothing and fashion are among the largest categories of consumer goods, i.e. one of the reasons why virtually all EU member states, including the Czech Republic, maintain clothing and textile production. Apparel is also of strategic importance, with considerable investments being made in its
development, especially in workwear and military clothing markets. Nevertheless, these investments have been consistently declining in the Czech Republic.

According to Euratex data, in 2016 there were more than 121,000 companies in the apparel industry in the EU, about 1.3% more than in 2015, employing over one million people and reaching a total turnover of more than EUR 79.6 billion. Total exports of EU-28 apparel products in 2016 amounted to EUR 22.9 billion and grew by almost one percent year-on-year. Imports of clothing to the EU-28 also increased by about 0.2% to about EUR 81.0 billion. The trade balance of the EU-28 with apparel products is very negative; in 2016 the foreign trade balance amounted to EUR -58.0 billion, which represents a year-on-year decline of EUR 0.1 billion. In terms of the territorial structure of EU-28 foreign trade, in 2016 and 2015 the five major customers were: Switzerland, Russia, USA, Hong Kong and Japan. Most EU-28 apparel industry customers reported a rise in turnover, with the exception of Russia, where the decrease was about 2.0%. A decrease of imports from China to the EU-28 of about 7.5% was recorded in 2016, which was at the expense of increased imports from Bangladesh, which grew by approximately 8.4%.

The Czech Republic’s main partner in the foreign trade of CZ-CPA 14 products is still Germany with about 24.7% share of the total turnover of apparel products; therefore, the further development of the Czech apparel industry will depend mainly on developments in German apparel market, but also in other EU countries, whose economies are currently also picking up. It will also be important if our apparel companies can export their products to non-European markets.

The future of the Czech apparel industry will depend much on the further development of its competitiveness. To improve the competitiveness, it is necessary to primarily focus on:

– The manufacture of products with higher value added through the introduction of results of research, development and technological and non-technological innovations into production in small series with tailor-made adjustments according to the wishes and requirements of customers.

– Special apparel for demanding occupations and extreme conditions (uniforms, protective clothing for various demanding operations, as well as outdoor clothing for sport and leisure, as more people are actively spending their free time).

– Improvement in marketing activities and other direct market activities (business activity). A quick response is important as it decides on the added value margin. In terms of marketing, it is necessary to be able to assess the feasibility of market requirements on the demand side and to be able to work with information on value added of products in the form of new functional materials and new applications.

– One of the most interesting trends is intelligent clothing, which, in addition to protection against cold and bad weather, has many other features. It can be equipped with electronic sensors and components and can be used, for example, to monitor bodily functions in medical fields or, using integrated solar cells, to provide the thermal comfort of the wearer, or to communicate with mobile technologies, all this while maintaining easy maintenance by washing and ironing.

– Training of workers in the manufacture of wearing apparel and textiles. Although the number of employees in apparel production is declining, the demand for skilled and flexible workers is growing.
6. CZ-NACE 15 MANUFACTURE OF LEATHER AND RELATED PRODUCTS

6.1 DIVISION CHARACTERISTIC

CZ-NACE 15 division is broken down into the following groups:

- 15.1 Tanning and dressing of leather, dressing and dyeing of fur, manufacture of luggage and similar products;
- 15.2 Manufacture of footwear.

The division is characterized by a high proportion of manual work and lower technological intensity. By revenue, the size of the division is not significant. Imports are many times higher than revenue in this division. Typical for the division are micro-enterprises (including self-employed persons), which make up over 80% of the entities, but only 10% of revenues and 12% of employed persons. In terms of performance, the most significant are medium-sized enterprises accounting for 53% of revenues, 49% of value added and 48% of employees.

Group 15.1 represents approximately two-thirds to three-quarters (number of units) of the selected indicators. (Table 6.1.1). This group has also achieved a higher average wage (by 4 thousand) and labour productivity (by 30%) than group 15.2.

<table>
<thead>
<tr>
<th>Group</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.1</td>
<td>68.6</td>
<td>68.9</td>
<td>70.5</td>
<td>68.9</td>
<td>69.6</td>
<td>72.6</td>
<td>62.6</td>
<td>75.2</td>
</tr>
<tr>
<td>15.2</td>
<td>31.4</td>
<td>31.1</td>
<td>29.5</td>
<td>31.1</td>
<td>30.4</td>
<td>27.4</td>
<td>37.4</td>
<td>24.8</td>
</tr>
</tbody>
</table>

Source: CZSO, 2016, MIT calculations

6.2 DIVISION DEVELOPMENT

In 2016, the year-on-year generation of economic value added in the division slightly decreased, but was still positive, which means that the companies in the division created value for their owners. The decline in economic value added was due to a decrease in the value of the asset turnover indicator, which was due to a faster decline in the net turnover than the decline in the value of assets. However, it is positive that the decline in net turnover was due to the decline in other revenues. Conversely, revenues increased in the reference period.

In group 15.1 there was a decline in economic value added, but it remained positive. This decrease was due to a reduction in margin and in turnover of assets. Group 15.2 reported positive development, where the economic value added increased and reached positive values. This growth was mainly driven by an increase in both the margin and turnover of assets.
The ratio of labour productivity growth to average wage growth in the division did not have any effect on economic value added in the division; however, this effect was very negative in group 15.1, while in group 15.2 it was significantly positive.

Approximately 690 production units (i.e. a decrease of about 4.5% compared to 2015) and micro-enterprises with an average registered number of 4,864 employees (i.e. about 1% less than in 2015) became registered for the manufacture of leather and related products. In terms of the size of the manufacturing companies, only 66 have more than 20 employees. Production has gradually become a matter of smaller, often also family-owned companies, which clearly belong to small and medium-sized businesses.

The decline in footwear production continues to cause a decline in tannery production and other supply sectors. The result is that all materials and semi-finished goods for footwear production must be imported into the Czech Republic.

In spite of these difficult conditions, the number of smaller companies and family-type companied is increasing, focusing on specialized products. It is also positive that in recent years Czech manufacturers have been successful in the segment of high quality certified children’s footwear, because demand for it is growing in the Czech market.

6.3 MAIN ECONOMIC INDICATORS

Chart 6.3.1 – Major economic indicators of CZ-NACE 15 division

Source: CZSO, MIT calculations

* This is a monthly aliquot share calculated from annual data
For the reference period 2008–2016, the number of units and the number of employees grew. Revenues and value added also grew, although it was very modest growth. In particular, labour productivity increased, which on average grew at twice the rate of average wage in the reference period (Chart 6.3.1). The division shows certain stabilization, but its importance in the manufacturing industry is steadily declining.

Producer prices were rising slightly over the reference period (Chart 6.3.2). However, market prices are significantly distorted by the high volume of imports from China at dumped prices. Manufacturers have coped with price dumping, but at the cost of stagnating revenues. In terms of the development of value added, the volume of purchased material and services grew less.

Very positive is the development of Spread, which after 7 years of negative values created value for owners in 2015 (Chart 6.3.3). The division saw the departure of troubled businesses, improving ROE.

### 6.4 FOREIGN TRADE

#### 6.4.1 DEVELOPMENT OF FOREIGN TRADE

Both exports and imports increased in the period 2009–2016, but the external balance of the Czech Republic remained negative throughout (Chart 6.4.1). In 2016, the export prices per kg were 10% lower than the import prices. The difference was especially evident in group 15.1, where it was almost 40%. By contrast, in group 15.2, export prices exceeded import prices by 25%.

In the European context, the Czech Republic has a relatively small market for footwear sales. If manufacturers wish to fully use their capacity and not compete in the domestic market with very cheap Asian competition, they have to export. There are a number of manufacturing cooperation projects with Western partners. In addition, a number of companies are switching to more complex products with higher utility and modern design. Therefore, 70–80% of Czech shoemakers’ production is successfully exported.
6.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

The products are exported to demanding markets such as Germany, Austria, Italy, Slovakia, Great Britain, France, Poland and Hungary (Chart 6.4.2); the highest increase in exports was reported in 2016 to Germany by about 10% compared to 2015. In spite of rising prices, in 2016, too, the largest volume of imports was from China (a slight decrease of about 1% compared to 2015), mostly at dumped prices. Similar imports are also reported from Vietnam (an increase of about 3% compared to 2015) and other Asian countries (e.g. Cambodia and India). Conversely, products imported from Germany are better and therefore more expensive.

6.5 RESEARCH AND DEVELOPMENT

Expenditure on research and development is negligible given the revenue. Available information shows that most R&D funds are invested by the manufacturers of work and safety shoes, as well as manufacturers of sports shoes. Experience from abroad shows that one of the new ways is the use of 3D printing, for example for the production of soles.

Experimental research is dominant, i.e. a combining known facts into new prototypes and technological processes. The second important part is applied research aimed at acquiring new knowledge (Chart 6.5.1). The investment is primarily funded by enterprise resources.

Given that the R&D expenditure is relatively small, only one company can be found which received significant amount of special-purpose State budget support within the national programmes of the MIT (IMPULS, TIP,
TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) in the period 2004–2016. This company is GALA a.s. (the project: Research and development of nanomaterials in the manufacture of balls).

Under the announced OP EIC calls for the 2014–2020 programming period, no research, development and innovation projects are registered in 2015–2016.

**Chart 6.5.1 – Expenditure on research and development in CZ-NACE 15 (CZK m)**

![Expenditure on research and development in CZ-NACE 15 (CZK m)](chart)

Source: CZSO data, MIT calculations (for methodological reasons the figures may differ from the data published by the CZSO)

### 6.6 DIVISION SUMMARY AND PROSPECTS

Despite the decline in high imports of cheap footwear and other leather products from Asian countries, the main problem still remains in the Czech Republic, which is relatively low interest in Czech products and their offering through the retail networks. In spite of these difficult conditions, there are a number of successful smaller companies and family-type companies focusing on specialized products and perfect customer service. However, it also follows from the above-mentioned reports that the Czech shoemaking industry can still be regarded as a good and efficient exporter, especially with appropriate foreign cooperation.

Many manufacturers continue to build their own retail network and also try to contract outlets. Manufacturers increasingly use online sales through their own e-shops. Footwear manufacturers have significantly restructured their production and produce clothing accessories and footwear with a higher value added, especially in the segments of work shoes, protective and safety shoes, as well as orthopedic, health, prophylactic and quality children’s footwear. At present, they also produce quality leather ladies’ and men’s walking footwear. Despite the problematic social and economic situation in the Czech Republic, it is gratifying that many customers are returning to quality Czech footwear and demanding it from their retailers. This is most visible in children’s and health footwear segments.

The still persisting problem in the leather industry is the shortage of young skilled workers and the consequent rising average age of employees.

Important factors for maintaining the competitiveness of the manufacture of leather and related products (as in previous years) still include:
- creating favourable conditions for entry of foreign capital;
- presenting good business plans to obtain financial resources from EU funds, and their co-financing possibilities;
- improving education and cooperation with the Ministry of Education, which will lead to increased interest in study in leather industry;
- expanding cooperation with domestic and foreign scientific and technical organisations (research institutes, universities); introducing new knowledge into practice and applying it to product innovation;
- development of marketing services.
7.

**CZ-NACE 16 MANUFACTURE OF WOOD, PRODUCTS OF WOOD AND CORK, ARTICLES OF STRAW AND WICKER MATERIALS, EXCEPT FURNITURE**

7.1 DIVISION CHARACTERISTIC

*CZ-NACE 16 division is broken down into the following groups:*

- 16.1 Sawmilling and impregnation of wood;
- 16.2 Manufacture of wood, cork, wicker and straw products, except furniture.

The manufacture of CZ-NACE 16 products has had a long tradition in the Czech Republic. Wood and wood products are used in virtually all areas of life, in most divisions of the manufacturing industry and in construction and household sectors. Round wood, as a raw material, is intended for the woodworking industry, while fibre is used in the production of cellulose used for the production of medical products and paper, mainly for the printing industry and packaging. Lower-quality wood also serves as an ecological fuel. Given the gradual application of increasingly sophisticated technologies, wood is a material with a new future.

The forests of the Czech Republic produced a total of 17.61 million m³ of raw wood in 2016, which represents an increase of 1.45 million m³ year-on-year. To a great extent, this volume involved the processing of salvage logging in the amount of 9.4 million m³ of wood. The share of salvage logging in 2016 was 53.4%, and the initial conditions for planned forest management therefore continued to deteriorate. In terms of composition of harvested wood, the volume of coniferous wood increased by 1.54 million m³ to 15.92 million m³ compared to 2015. The share of coniferous wood harvesting in total volume harvested was around 90%. The ratio of broadleaved to coniferous wood is mainly due to the demand for raw wood, but also to the structure of the available felling reserves and the processing of salvage logging, especially the so-called bark beetle wood. The total reserves of wood in forests are increasing.

As in previous years, the largest share of forests (almost 50%) is owned by the State under the management of the state-owned enterprise Lesy ČR (Forests of the Czech Republic); other significant forest owners include private owners, municipalities and cities. The remaining owners are marginal and statistically insignificant. Recently there have not been any significant ownership changes, except returning property to churches.

*Table 7.1.1 – Shares of groups in CZ-NACE 16 division in 2016 (%), division = 100 %*

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.1</td>
<td>22,6</td>
<td>20,8</td>
<td>28,1</td>
<td>30,0</td>
<td>21,1</td>
<td>24,7</td>
<td>21,0</td>
<td>5,7</td>
</tr>
<tr>
<td>16.2</td>
<td>77,4</td>
<td>79,2</td>
<td>71,9</td>
<td>70,0</td>
<td>78,9</td>
<td>75,3</td>
<td>79,0</td>
<td>94,3</td>
</tr>
</tbody>
</table>

*Source: CZSO, 2016 calculations MIT*
The division is characterized by a high share of small and micro-enterprises. The group of micro-enterprises is especially important within the division. They account for 60% of the units, 42% of employed persons, but only 10% of revenues and 16% of the value added. Small businesses are significant in the division too, accounting for 23% of revenues, 25% of value added and 20% of employed persons. In terms of revenue share, the most significant group is medium-sized enterprises (38%), followed by large enterprises (28%).

In the woodworking industry, selected economic indicators and the number of units are dominated by CZ-NACE 16.2 Manufacture of products of wood, cork, straw and plaiting materials, except furniture (Table 7.1.1). Its dominant position is evident in all the indicators monitored.

### 7.2 DIVISION DEVELOPMENT

The division produces highly competitive products in both CZ-NACE 16 groups. The quality and price of domestic manufacturers is attractive not only in the Czech Republic, but also in the EU and in non-EU markets.

The indisputable competitive advantage of the division is sufficient domestic resources of renewable eco-friendly raw materials, which are a prerequisite for further development and increase in production volume and quality, even in sophisticated product categories. The division has seen an increase in wood products with a quality label; there is ongoing PEFC certification of the consumer chain of wood products. PEFC forest certification is one of the forest management processes aimed at achieving sustainable forest management in the Czech Republic which at the same time seeks to improve all forest functions to benefit the man and his environment.

On the other hand, the disadvantages of the division include the lack of processing capacities, both in terms of structure (several large foreign investors) and in terms of further processing. The Czech Republic is one of the largest European and, most probably, global exporters of raw wood.

### 7.3 MAIN ECONOMIC INDICATORS

The number of units grew until 2011 and then started to decline. The number of employed persons in 2008–2016 is constantly decreasing. Revenues peaked in 2008 and then stagnated. Added value had similar development, reaching its peak in 2016. Only labour productivity grew more markedly over the period. Average wage also grew, but significantly less (Chart 7.3.1).

Following a drop in 2009, the prices of CZ-CPA 16 producers jumped up in the following years (2011, 2014), mainly due to the development of prices of wood (the input raw material), both in the Czech Republic and abroad (Figure 7.3.2). The prices of product group 16.1 went below the 2005 level in 2008–2009, but from 2011 their growth dynamics outperformed prices in group 16.2.

The financial results of the division have been positively affected by growth in return on equity and labour productivity from 2013 onwards. The values of Spread thus turned positive from 2014 (see Figure 7.3.3).

In terms of revenue growth, the sector’s importance in the manufacturing industry has decreased. The development in efficiency due to the favourable development of Spread is positive.

In 2016, the division reached high economic value added, which increased year-on-year. The positive development of economic value added was due to the favourable development of all indicators in the pyramidal breakdown of economic value added. This is an unusually good situation in the division. This is also true for both groups, because the effect of indebtedness on economic value added in group 16.2 was virtually zero.
7.4 FOREIGN TRADE

Pramen: ČSÚ, výpočty MPO

* This is the aliquot monthly share calculated from annual data

Source: CZSO, MIT calculations

** Chart 7.3.1 – Major economic indicators of CZ-NACE 16 division **

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of units</th>
<th>Average number of employees</th>
<th>Sales (CZK m)</th>
<th>Value added (CZK m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>28.082</td>
<td>66.327</td>
<td>23.716</td>
<td>23.716</td>
</tr>
<tr>
<td>2009</td>
<td>27.415</td>
<td>64.220</td>
<td>22.659</td>
<td>22.659</td>
</tr>
<tr>
<td>2010</td>
<td>27.484</td>
<td>62.035</td>
<td>22.659</td>
<td>22.659</td>
</tr>
<tr>
<td>2011</td>
<td>27.767</td>
<td>60.853</td>
<td>22.659</td>
<td>22.659</td>
</tr>
<tr>
<td>2012</td>
<td>27.553</td>
<td>59.641</td>
<td>22.659</td>
<td>22.659</td>
</tr>
<tr>
<td>2013</td>
<td>27.602</td>
<td>58.288</td>
<td>22.659</td>
<td>22.659</td>
</tr>
<tr>
<td>2014</td>
<td>27.602</td>
<td>54.720</td>
<td>22.659</td>
<td>22.659</td>
</tr>
<tr>
<td>2015</td>
<td>27.602</td>
<td>53.131</td>
<td>22.659</td>
<td>22.659</td>
</tr>
<tr>
<td>2016</td>
<td>27.602</td>
<td>53.131</td>
<td>22.659</td>
<td>22.659</td>
</tr>
</tbody>
</table>

Source: CZSO, MIT calculations

** Chart 7.3.2 – Price development of CZ-CPA 16 (2005 = 100 %) **

Source: CZSO, MIT calculations

** Chart 7.3.3 – Spread (ROE – re) CZ-NACE 16 (v %) **

Source: CZSO, MIT calculations
7.4 FOREIGN TRADE

7.4.1 DEVELOPMENT OF FOREIGN TRADE

Development of foreign trade in CZ-CPA 16 commodities shows that during the period under review, the value of exports grew faster than the value of imports, so the positive balance gradually increased.

*Chart 7.4.1 – Product export, import and balance of foreign trade in CZ-CPA 16 (CZK m)*

7.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

Territorial distribution of foreign trade has seen little change over the long term. Among the largest foreign customers of CZ-CPA 16 products in 2016 are EU Member States such as Germany (41%), Austria (16%), Slovakia (8%), Italy (6%) and Poland (4%). Exports mainly to Germany mainly include cut timber, building joinery and pallets, Austria is most interested in round timber, cut timber, veneer, agglomerated products and plywood. Exports of CZ-CPA 16 products into EU countries account for about 83% of total production.

In 2016, most CZ-CPA 16 goods were imported from Germany (24%), followed by Poland (18%), Austria (16%) and Slovakia (9%).

*Chart 7.4.2 – Foreign trade with CZ-CPA 16 products*
7.5 RESEARCH AND DEVELOPMENT

R&D expenditure in 2015 amounted to CZK 58 million, with total R&D expenditure being up 39% from 2011. The bulk of the funds were expenditures from business resources. It can also be observed that the years 2011 and 2015 are specific in that the volume of funds in this division significantly exceeds the volume of expenditure in other years.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include Jesenická Biopaliva, spol. s r.o., České dřevařské závody Praha, a.s. and SLAVONA, s.r.o.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation segment were allocated in 2015–2016 a subsidy amounting to CZK 39.8 million, which was divided among enterprises from about half of the Czech Republic’s regions. A high percentage of micro-enterprises are among the beneficiaries, the most significant of which is the Central Bohemian Česká peleta, z.s.p.o. (the project Development of the Czech Pellet Cluster). Successful medium-sized enterprises include in particular TOPDOORS, s.r.o. (project investigating the innovation of production processes and products) from the Zlín Region. The largest beneficiary is by far the large South Bohemian enterprise Deufol Česká republika a.s. (a project to develop a new company SW).

Chart 7.5.1 – Expenditure on research and development in CZ-NACE 16 (CZK m)

Source: CZSO data, MIT calculations (for methodological reasons the figures may differ from the data published by the CZSO)

7.6 DIVISION SUMMARY AND PROSPECTS

The woodworking industry has a stable position within the manufacturing industry. The quality and price of domestic woodworking industry manufacturers makes their products attractive not only in the domestic market, but also in the markets of other EU countries and elsewhere in the world. A key issue for the further development of the wood industry is to increase the competitiveness of our producers through the introduction of the latest techniques and technologies and the application of modern management methods. There are also benefits to be gained in the area of strengthening R&D cooperation with foreign partner organizations. Following direct activities of the business sector, the modernization of production should be facilitated by new growth-enhancing measures to support small and medium-sized enterprises, but also support under Operational Programmes co-financed from EU structural funds.
The Czech Republic continues to lag behind advanced EU countries in the use of timber in the construction industry. In particular, it is necessary to increase the consumption of wood and its products in the relevant industrial groups, build more low-energy wooden family houses and extend the application of wooden elements such as complicated roof structures, atypical window frames, flooring and exterior walls to increase competitiveness against buildings from conventional building materials.

It will also be necessary to increase the share of production waste recovery, for example in the form of pellets. This goal should also be facilitated by expanding the activity of so-called “woodworking clusters”, which were set up with a view to the potential participation of foreign entities. So far, the potential of the woodworking industry has been sufficiently exploited in biomass, especially for energy purposes. Wood is still one of the cheapest fuels and, moreover, it is a domestic, renewable source. In connection with the expected large-scale harvesting due to bark beetle infestation, in 2017 the Czech Republic is at risk of an extraordinary crisis in the wood market, where the supply of spruce products has been increasing since the second half of 2015, especially in the case of low-quality roundwood and fibre. A very similar situation is also expected in the surrounding countries.

The Forestry-Woodworking Chamber came up with an idea to create a new fund to promote wood products, then to increase domestic demand and the associated higher volume of woodworking, establishment of new sawmills and other processing plants. In the long run, exports of unprocessed round wood could be reduced, and wood would find a new outlet on the domestic market.
8. CZ-NACE 17 MANUFACTURE OF PAPER AND PAPER PRODUCTS

8.1 DIVISION CHARACTERISTIC

CZ-NACE 17 division is broken down into the following groups:

- 17.1 Manufacture of pulp, paper and paperboard;
- 17.2 Manufacture of articles of paper and paperboard.

The production of paper and paper products is a relatively important part of the Czech Republic’s manufacturing industry with good environmental performance because paper production is based on renewable sources (recycling of old paper, cellulose fibre which is capable of multiple recycling, etc.). For example, the value of pulpwood, as the basic raw material of the paper industry, is increased at least 6 times.

Paper products are used in all other manufacturing industries, particularly in the printing industry and manufacture of packaging, including recyclable packaging. Production within this division is based on renewable raw materials (wood mass) and secondary raw materials (recovered paper), mainly of domestic origin. The production of pulp and paper takes place in a closed cycle, with a strong emphasis on reducing all types of emissions; it is investment-intensive and uses investment incentives. High energy consumption is largely covered by renewable sources and by waste heat from own production.

The division is dominated by large enterprises with over 55% of revenues, value added and one third of the employed persons. Medium-sized enterprises account for about a third of revenues and value added and 40% of employed persons. Others are small and micro-enterprises, i.e. about 11% of revenues and value added and 23% of employed persons. Table 8.1.1 gives information on the shares of both groups.

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.1</td>
<td>19,8</td>
<td>33,6</td>
<td>33,7</td>
<td>35,1</td>
<td>38,9</td>
<td>42,4</td>
<td>16,2</td>
<td>28,6</td>
</tr>
<tr>
<td>17.2</td>
<td>80,2</td>
<td>66,4</td>
<td>66,3</td>
<td>64,9</td>
<td>61,1</td>
<td>57,6</td>
<td>83,8</td>
<td>71,4</td>
</tr>
</tbody>
</table>

Source: CZSO, 2016 calculations MIT

8.2 DIVISION DEVELOPMENT

The division as a whole and its individual groups was relatively successful in 2016, as evidenced by most of the main economic and financial indicators. This is especially evident from economic value added, which was positive from 2014 to 2016 in all groups of the division. The companies of the division were creating value to their owners. Also, the year-on-year development of economic value added in the division was very
favourable. This was positively affected by labour productivity growth leading ahead of the average wage growth.

The manufacture of paper and paper products is based on the processing of renewable raw materials of predominantly domestic origin (wood) and recyclable secondary raw materials (recovered paper). For many years, the strategy of sustainable development has been actively pursued in this field, and the production of pulp and paper takes place in a virtually closed cycle. However, the processing of recovered paper is lower than required in the Czech Republic and most of the collected paper intended for paper recycling is exported (803,000 tonnes out of 950,000 tons collected, i.e. 84.5%). The production of fibre is demanding for the amount of water and energy (electricity, heat), which are, however, significantly covered by own resources based on pulp, groundwood pulp and paper waste recovery. Severe climatic fluctuations have been a major problem in recent years, making it impossible for wood to be harvested continuously.

The Czech paper industry, which is now an integral part of the European paper industry (a member of CEPI), is still affected by the important fact that it is conceived as a Czechoslovak industry. This still significantly influences the current production capacities and, above all, the coverage of consumption from domestic sources. The Czech paper industry is characterized by production specialising in packaging and wrapping papers, which are then massively exported in the case of some products. However, the bulk of domestic paper and cardboard consumption still has to be covered by imports (1,444 million tonnes in 2015), which is almost double compared to domestic production (740,000 tonnes). In particular, graphic papers and hygienic papers are imported, as well as some materials for the production of corrugated cardboards.

8.3 MAIN ECONOMIC INDICATORS

Between 2008 and 2016, with the exception of 2009, sales grew, and the share of the division in the manufacturing industry slightly increased. Added value and average wage also grew. The number of units in the division was increasing until 2011, falling in 2012 and 2013, and since 2014 there was again an increase in the number of companies in the division. The number of employed persons formed a very moderate W, with peaks in 2008, 2012 and 2016 (Chart 8.3.1).

Industrial producer price indices developed differently over the reference period. While in relation to the high prices of basic raw materials, mainly pulp, the index of product group 17.1 was above the 2005 level over the whole period (excluding 2009), the index of product group 17.2 was around 100% (Chart 8.3.2).

Spread was fluctuating between positive and negative values between 2009 and 2013 (Chart 8.3.3). Since 2014, there has been a robust growth in Spread, driven primarily by flying growth in ROE.
Chart 8.3.1 – Major economic indicators of CZ-NACE 17 division

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of units</th>
<th>Average number of employees</th>
<th>Sales (CZK m)</th>
<th>Value added (CZK m)</th>
<th>Labour productivity from the VA (CZK/month)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>103</td>
<td>10 095</td>
<td>14 357</td>
<td>15 001</td>
<td>1835</td>
</tr>
<tr>
<td>2009</td>
<td>112</td>
<td>12 794</td>
<td>11 630</td>
<td>14 831</td>
<td>2583</td>
</tr>
<tr>
<td>2010</td>
<td>120</td>
<td>12 544</td>
<td>11 498</td>
<td>14 117</td>
<td>1892</td>
</tr>
<tr>
<td>2011</td>
<td>127</td>
<td>12 317</td>
<td>11 376</td>
<td>14 076</td>
<td>1839</td>
</tr>
<tr>
<td>2012</td>
<td>130</td>
<td>12 181</td>
<td>11 334</td>
<td>14 005</td>
<td>1972</td>
</tr>
<tr>
<td>2013</td>
<td>134</td>
<td>12 154</td>
<td>11 292</td>
<td>13 959</td>
<td>1839</td>
</tr>
<tr>
<td>2014</td>
<td>137</td>
<td>12 066</td>
<td>11 250</td>
<td>13 906</td>
<td>1839</td>
</tr>
<tr>
<td>2015</td>
<td>140</td>
<td>12 017</td>
<td>11 208</td>
<td>13 863</td>
<td>1839</td>
</tr>
<tr>
<td>2016</td>
<td>143</td>
<td>11 970</td>
<td>11 166</td>
<td>13 815</td>
<td>1839</td>
</tr>
</tbody>
</table>

Source: CZSO, MIT calculations

* This is the aliquot monthly share calculated from annual data

Chart 8.3.2 – Price development of CZ-CPA 17(2005 = 100 %)

Source: CZSO, MIT calculations

Chart 8.3.3 – Spread (ROE – re) CZ-NACE 17 (in %)

Source: CZSO, MIT calculations
8.4 FOREIGN TRADE

8.4.1 DEVELOPMENT OF FOREIGN TRADE

The value of CZ-CPA 17 imports has consistently exceeded the value of exports, but given the export growth leading ahead of import growth, from 2010 the negative trade balance of foreign trade is decreasing (Chart 8.4.1). The negative balance stood at CZK -1.2 billion in 2016. Exports amounted to CZK 56.5 billion and imports to CZK 57.7 billion.

Chart 8.4.1 – Product export, import and balance of foreign trade in CZ-CPA 17 (CZK m)

Source: CSO, data as of 3 May 2017

8.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

The largest CZ-NACE 17 customer is traditionally Germany (21%), followed by Poland (12%) and Slovakia (9%). In terms of imports, our largest supplier is Germany (33%), Poland (13%) and Austria (8%). The territorial structure of foreign trade in paper products has been relatively stable in the long run, the main trading partners remaining the same (Chart 8.4.2).

Chart 8.4.2 – Foreign trade with CZ-CPA 17 products

Source: CSO, data as of 3 May 2017
8.5 RESEARCH AND DEVELOPMENT

Division 17 is relatively small in terms of the volume of R&D expenditure with CZK 55 million in 2015 and accounted for 0.13% of total R&D expenditure in the manufacturing industry. In 2015, compared with other years, the total financial resources in this sector increased significantly; this increase was mainly due to the increase in expenditures from entrepreneurial sources.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include Obchodní tiskárny, akciová společnost (dnes OTK GROUP, a.s.), Hostýnské papírny s.r.o., IQ Structures s.r.o., SPM - Security Paper Mill, a.s. and CIUR a.s.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation segment were allocated in 2015–2016 a subsidy amounting to CZK 61 million, which was divided among enterprises of varying sizes from most of the Czech Republic’s regions. Beneficiaries are predominantly medium-sized enterprises, the most important of which is S&K LABEL spol. s r.o. (DIGI Innovation Project) from the South Moravian Region. In terms of the total volume of subsidies, the largest beneficiary is OP Papírna, s.r.o., a large enterprise from the Olomouc Region (the project PS5 Paper Machine Innovation).

8.6 DIVISION SUMMARY AND PROSPECTS

In the coming years, it seems necessary to ensure consistent non-discrimination of all energy sources and a balanced design of systemic changes to avoid inefficient growth of enterprise costs and discouraging of foreign investors from doing business in the paper sector in the Czech Republic. This involves in particular risks to the availability of the basic raw material – wood – for the paper industry, which may materialise if wood is used for the production of renewable energy. At the same time, it is necessary to avoid reducing the competitiveness of Czech enterprises in the European market by creating unequal conditions. Environmental objectives in the paper industry need to be assessed with regard to their economic and social impacts. In doing so, optimal measures must be found both in the economy, employment and in the environment. This approach reflects the principle of sustainable development based on the dynamic balance of the economic, social and environmental pillars. The Czech paper industry has adopted this approach together with other member countries of the Confederation of European Paper Industries (CEPI).
Despite the dynamic growth in paper and cardboard consumption, the Czech Republic still does not reach the levels of advanced EU countries, but this indicator is expected to increase further over the next few years up to the consumption of 180 kg per capita. This would be equivalent to the total domestic consumption of paper and cardboard of approximately 2 million tonnes per year. However, reaching this level only by another absolute increase in imports is not an economically efficient solution and larger investments should be considered (also in connection with a large surplus of recovered paper in the Czech Republic which is exported). The optimistic outlook for the paper sector is significantly affected by the fact that it is a sector based on renewable sources abundant in the Czech Republic which can be easily recycled and are generally seen as environmentally friendly.
9. **CZ-NACE 18 PRINTING AND REPRODUCTION OF RECORDED MEDIA**

### 9.1 DIVISION CHARACTERISTIC

*CZ-NACE 18 division is broken down into the following groups:
- 18.1 Printing and service activities related to printing;
- 18.2 Reproduction of recorded media.*

CZ-NACE 18 Printing and reproduction of recorded media includes the printing of newspapers, books, periodicals (magazines, journals), business forms, postcards and other materials and related activities such as book binding, production of printing plates and data capture. Production processes used in the printing industry include various methods for transferring images from plates, screens or computer records to media such as paper, plastic, metal, textile or wood. Its products are used in all other divisions of the manufacturing industry (MI) as well as in culture and education.

The division is dominated by medium-sized enterprises, which account for 31% of revenues, 30% of value added and 26% of employed persons. Small enterprises account for 27% of revenues, 28% of value added and 26% of employed persons. Large enterprises are similar to small enterprises with 27% of revenues, 26% of value added and 20% of employed persons. Micro enterprises are the most numerous (over 80% of units), account for only 15% of sales and 16% of added value but 28% of employed persons.

The most significant group in the division is 18.1, which accounts for around 80% of the value added, revenue, net turnover and assets and over 80% of the personnel cost of equity, number of employees and number of units (Table 9.1.1).

<table>
<thead>
<tr>
<th>Group</th>
<th>CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.1</td>
<td>87,3</td>
<td>80,5</td>
<td>79,9</td>
<td>78,5</td>
<td>82,9</td>
<td>79,5</td>
<td>87,7</td>
<td>83,6</td>
<td></td>
</tr>
<tr>
<td>18.2</td>
<td>12,7</td>
<td>19,5</td>
<td>20,1</td>
<td>21,5</td>
<td>17,1</td>
<td>20,5</td>
<td>12,3</td>
<td>16,4</td>
<td></td>
</tr>
</tbody>
</table>

*Source: CZSO, 2016 calculations MIT*

### 9.2 DIVISION DEVELOPMENT

The developments in the production characteristics of the division reflect structural changes that take place both inside the division and in the economy as a whole. Within the section, printing activities are still experiencing a downturn; in 2016 their sales were 17.8% lower than in 2008. CZ-NACE 18.1 is still facing the pressure of competing media types and is also trying to cope with changing lifestyle of its consumers. For the
time being, the group is able to cope with declining sales and maintains the position of a medium with great reach, not only as a leisure companion but also as an irreplaceable source of information on current events.

The opposite trend is seen in CZ-NACE 18.2 Reproduction of recorded media, where revenues in 2016 are 56% higher than in 2008. In the context of the ongoing progressive technical and technological change, where traditional media are gradually being replaced by modern technologies and media, the partial downturn in the manufacturing industry is offset by the development of information and communication activities in services.

CZECH PRINT CENTER a.s. continues to be the largest media company in the Czech printing market, followed in terms of the number of employees by Státní tiskárna cenin s. p., MORAVIAPRESS s.r.o., EUROPRINT a.s., GRASPO CZ a.s., Svoboda Press s.r.o., SEVEROTISK, Typos tiskářské závody, FINIDR s.r.o. and CPI Moravia Books s.r.o.

In relation to the reproduction of recorded media, the largest companies (in terms of the number of employees) include GZ Media a.s., FERMATA a.s., GZ Recordable s.r.o., Mentor Media Czech s.r.o., NORTH VIDEO s.r.o., digital cinema utd CEE s.r.o., HAPPY RIDES s.r.o., HOMO DEVELOPUS s.r.o. and Redbloom s.r.o. This group is influenced by the continued trend of revival of vinyl records, which solidifies GZ Media’s position as the world’s largest producer of vinyl records and ranks it among Europe’s best in print and packaging production. The global vinyl boom also benefits SEV Litovel, a producer of record players; however, it must cope with increasing competition.

9.3 MAIN ECONOMIC INDICATORS

The importance of the division in the manufacturing industry is decreasing. Revenues declined steadily from 2008 to 2013, with growth starting only in 2014. However, revenues in 2016 did not reach 2008 levels. Added value had a similar trend, its minimum being in 2012 and exceeding the 2008 level in 2016. The number of employed persons was declining until 2014, when it started to grow moderately. The number of units in 2008–2016 was fluctuating and reached 9,085 units in 2016. Labour productivity rather stagnated until 2012, but then started to grow significantly. The average wage was growing slightly in the reference period (Chart 9.3.1).

As can be seen from Chart 9.3.2, the prices in the segment are decreasing over the reference period. Industrial producer prices in 2008–2016 did not reach the 2005 level and were influenced by a number of factors, such as higher supply than demand, stiff competition between printing companies, the development of the Internet and electronic media, the high number of titles published at ever lower costs, etc.

Spread, i.e. the relative economic value added, positive in 2008, was falling steadily until 2011. In 2012 there was a change and from this year Spread was again positive (Chart 9.3.3). Interestingly, the change in revenues and value added only occurred in 2013 or 2014, labour productivity changed in 2013, but Spread improved already in 2012 and 2013. There were other factors such as falling personal costs, depreciation, etc., which caused margin growth. Since 2014, the developments in Spread, revenues, value added and productivity have been the same.
Chart 9.3.1 – Major economic indicators of CZ-NACE 18 division

- **Number of units**
- **Average number of employees**
- **Sales (CZK m)**
- **Value added (CZK m)**
- **Average monthly wage (CZK)**
- **Labour productivity from the VA (CZK/month)**

Source: CSO, MIT calculations

*This is the aliquot monthly share calculated from annual data*

Chart 9.3.2 – Price development of CZ-CPA 18 (2005 = 100 %)

- **Cenový vývoj CZ-CPA 18 (2005 = 100 %)**

Source: CSO, MIT calculations

Note: The data was not gathered for group 18.2 in 2008 to 2011

Chart 9.3.3 – Spread (ROE – re) CZ-NACE 18 (in %)

Source: CSO, MIT calculations

Note: The data was not gathered for group 18.2 in 2008 to 2011
9.4 FOREIGN TRADE

Trade with CZ-CPA 18 products is negligible as most products are intended for the domestic market. Exports in 2016 rose by 7.8% compared to 2015 and were fluctuating over the whole reference period. Imports decreased by 13.3% year-on-year and the positive external trade balance grew by 55.4% (Chart 9.4.1).

9.4.1 DEVELOPMENT OF FOREIGN TRADE

Chart 9.4.1 – Product export, import and balance of foreign trade in CZ-CPA 18 (CZK m)

Source: CSO, data as of 3 May 2017

9.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

The largest volume of CZ-CPA 18 products is traditionally exported to Germany. In 2016, exports to this country accounted for 59% of total exports, which is 2% more year-on-year. Other major territories include: The Netherlands, Poland, Slovakia, Hungary, Austria, Sweden and Switzerland (Chart 9.4.2).

A similar situation is with imports, which were dominated in 2016 by products from Germany with 44%, a year-on-year decrease of 3%. Other major import territories include: Japan, China, Switzerland, Belgium, USA, Poland and Vietnam.

Chart 9.4.2 – Foreign trade with CZ-CPA 18 products

Source: CSO, data as of 3 May 2017
Division 18 is relatively small in terms of R&D expenditures. R&D expenditure in 2015 amounted to CZK 11 million. Most funds were spent on applied research, while expenditure on experimental and basic research are minimal. In terms of ownership, in 2015 R&D expenditures were provided from business resources, while domestic and foreign public expenditures were negligible.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include Polygra a.s. a NOVATISK, akciová společnost. There are two companies in this sector which are involved in Horizon 2020 projects: A-ETC, s.r.o., which is a member of the consortium and eponymous project BIOWYSE and T.S.R.ACT, s.r.o., which is involved in BrainHack.

Under the announced calls for the OP EIC for the 20142020 programming period, projects focusing on research, development and innovation segment were allocated in 2015–2016 a subsidy amounting to CZK 72.8 million, which was divided among a smaller number of enterprises from two of the Czech Republic’s regions. In terms of the total volume of subsidies, the largest beneficiary is the medium-sized enterprise BOOM TISK, spol. s r.o. (project “Documatch Project – Manuals with personalized content”).

**Chart 9.5.1 – Expenditure on research and development in CZ-NACE 18 (CZK m)**

![Chart 9.5.1 – Expenditure on research and development in CZ-NACE 18 (CZK m)](chart)

*Source: CZSO data, MIT calculations (for methodological reasons the figures may differ from the data published by the CZSO)*

**9.6 DIVISION SUMMARY AND PROSPECTS**

CZ-NACE 18 is a field with high competition among different product types, and its character is changing with the advent of modern technologies, increased use of the Internet and the development of social networks. In order to maintain the competitiveness of CZ-NACE 18, it will be important for the division to cope with the pressures of other media types and modern technologies and to adapt to the lifestyle of users. A number of original classical printed products is getting a multimedia form, that is, in addition to the printed form, they are also published electronically or they are replaced by electronic media. While the number of printed products is decreasing, the demand for packaging and labels is growing.

The year 2016 was quite successful for this division, as economic value added was positive, labour productivity grew and so did revenues. The printing industry in the Czech Republic and in the world is recovering from the double impact of the global economic recession and of digital communication; however, the prospects...
of the global market are relatively positive. This follows from the recently published market surveys (4th drupa Global Trends report 2017 and The Future of Digital vs. Offset Printing to 2022) which see optimistic prospects for the global printing market. All printing and media companies must adapt to new challenges in the future. This puts pressure on the efficiency and necessity of automation, while learning new skills and developing new value-added services. As follows from the world’s largest press and media trade fair “drupa 2016”, held in Düsseldorf in May 2016, the digital press is clearly dominating among current trends. It will therefore be interesting in the future to monitor the share of digital technology in the total volume of print. The use of modern digital technologies also applies to the Czech Republic where, according to the chairman of the Association of Printing Industry Entrepreneurs (APIE), technological equipment level is very good. According to the APIE, digital printing has potential in the packaging industry as well as in the field of functional printing. In addition, investment in textile printing technologies is also significant. There is also potential in the use of large-format digital installations. In terms of investment trends in printing, No 1 in the Czech Republic and in the world are finishing technologies, followed by printing technologies and software. To maintain competitiveness, therefore, it is necessary to invest in IT technologies and IT professionals. The printing industry in the Czech Republic basically follows the global trends of this industry and this will remain unchanged in the near future.
10.

**CZ-NACE 20 MANUFACTURE OF CHEMICALS AND CHEMICAL PRODUCTS**

10.1 DIVISION CHARACTERISTIC

*CZ-NACE 20 division is broken down into the following groups:*

- 20.1 Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms;
- 20.2 Manufacture of pesticides and other agrochemical products;
- 20.3 Manufacture of paints, varnishes and similar coatings, printing ink and mastics;
- 20.4 Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations;
- 20.5 Manufacture of other chemical products;
- 20.6 Manufacture of man-made fibres.

CZ-NACE 20, the manufacture of chemicals and chemical products, occupies an important position in the Czech Republic’s economy as chemical products are used in all areas of the economy. The chemical sector is strongly interlinked with other manufacturing industries such as plastics and rubber, textile, electronics, construction, paper and pulp industries, the automotive industry and others, and is an important subcontracting sector for them. The chemical industry consists of inorganic and organic chemicals, industrial fertilizers, basic petrochemical products, plastics in primary form and synthetic resins, synthetic rubbers, paints, dyes and pigments, agrochemicals, cosmetic and cleaning products, chemical fibers and many other chemical products (photochemicals, adhesives, explosives, etc.). The chemical industry in the Czech Republic is primarily concentrated in three regions – the Ústí, Moravian-Silesian and Central Bohemia regions.

It is a division dominated by large businesses, which account for 70% of revenues and about 50% of value added and persons employed. The second largest group are medium-sized enterprises, which account for 20% of sales and for about one third of value added and persons employed.

The division is clearly dominated by group 20.1, representing 54% of all employees and 79% of net turnover, and also includes the ten largest and most important chemical companies in the Czech Republic.

It is followed by group 20.5 representing the production of explosives, detonators, glues, essential oils, chemically transformed oils and fats, methyl esters of fatty acids for the propulsion of engines, powders and pastes used for soldering or welding, auxiliary preparations for coating metals, cement additives, activated carbon, lubricating oil additives, vulcanization accelerators, catalysts, anti-knock preparations, antifreeze and de-icing products, transmission liquids and many other chemical products. Next is group 20.4, which includes manufacturers of soaps and detergents, cleaning and polishing agents, perfumes and toilet preparations. In terms of CZ-NACE 20 revenues in 2015, CZ-NACE 20.1 accounted for more than 3/4 of all the revenues in the division. CZ-NACE 20.1, which includes the manufacture of basic chemicals, fertilizers and nitrogen compounds, plastics and synthetic rubber, also dominates clearly in all other economic indicators.

The least significant group in this section is Group 20.2 (Table 10.1.1).
Table 10.1.1 – Shares of groups in CZ-NACE 20 division in 2016 (%; division = 100 %)

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
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<td>0,8</td>
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<td>2,1</td>
</tr>
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<td>5,8</td>
<td>4,2</td>
<td>4,4</td>
<td>5,3</td>
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<td>7,2</td>
<td>4,0</td>
</tr>
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<td>15,5</td>
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</tr>
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<td>6,1</td>
<td>9,7</td>
<td>17,7</td>
<td>17,2</td>
</tr>
<tr>
<td>20.6</td>
<td>2,8</td>
<td>2,2</td>
<td>1,6</td>
<td>1,4</td>
<td>1,2</td>
<td>1,5</td>
<td>3,2</td>
<td>0,5</td>
</tr>
</tbody>
</table>

Source: CZSO, 2016, MIT calculations

10.2 DIVISION DEVELOPMENT

The development in the Czech chemical industry was influenced by external and internal factors in 2016. Among the external ones are the economic development in the EU-28 brought about by an improving situation in some EU countries and increasing demand for chemicals. The internal factors were mainly the consequences of the ethylene unit accident in Litvínov in August 2015, the operation of which was subsequently resumed in October 2016. This event was negatively reflected in sales of products and services in this sector and its share in the revenues of the chemical industry as a whole (including pharmaceuticals, plastics and oil processing).

The share of the CZ-NACE 20 division in the Czech Republic's manufacturing industry turnover was around 5% in 2015; however, due to the effects mentioned above, in 2016 the share amounted to about 4.3%. Many industrial and financial indicators declined compared to 2015; in 2016, the book value added declined by more than 13% and there was a 5% decrease in export volumes. Compared to the pharmaceutical industry (CZ NACE 21) and the rubber and plastics industry (CZ NACE 22), there was a significant increase in investment activity (37% year-on-year).

Economic value added has declined significantly in 2016 compared to 2015, largely due to the repair of an ethylene unit in the area of Unipetrol in Záluží u Litvínova, which lasted more than ten months and cost CZK 4 billion. However, the EVA still remained positive, meaning that the companies of the division create value for their owners. The decline in economic value added was driven by groups 20.5 and 20.1. Other groups in the division posted an increase in economic value added. The developments in economic value added were mainly due to the decline in labour productivity.

Today, the European chemicals industry directly provides more than 1.1 million jobs and accounts for about 1.1% of EU GDP. Although the number may appear to be small, account must be taken of the declining share of industry in GDP creation in developed countries and the growth in the share of the services sector. Also, we find chemical products in virtually all areas of the economy. Significant purchasers of chemicals are rubber and plastics, construction, the paper and pulp and automotive industries. Nearly two-thirds of chemicals in the EU are used in the industrial sector, including construction, while more than one third are intended for other sectors of the economy, such as agriculture, services, etc.

10.3 MAIN ECONOMIC INDICATORS

The number of units was increasing from 2008 to 2012. In 2013 it declined and then remained stable. The number of employed persons saw a large decline in 2009 and then was more or less stable until 2014. In 2015, there was a slight increase. However, crucial for the division is the development of revenues and value added.
Revenues as well as the value added dropped significantly to their minimum in the crisis year of 2009. Then, there was a three-year growth period followed by a decline in revenues in 2013. In 2014 revenue peaked, followed by a decline in 2015 and a renewed growth in 2016. Added value also saw fluctuations, peaking in 2015.

CZ-CPA 20 price developments were significantly affected by CZ-CPA 20.1, whose prices grew dramatically after 2009, but the growth slowed down from 2013 and fell dramatically in 2016 (see Chart 10.3.2). Lower and relatively stable price growth was seen in CZ-CPA 20.3, while CZ-CPA 20.4 prices were oscillating, and in CZ-CPA 20.5 they began to decline steadily from 2012.

The financial situation of the division has been gradually improving, with return on equity gradually increasing (with fluctuations in some years) while risk is decreasing, so the Spread has turned to positive since 2014. However, Spread declined in 2016 due to lower ROE, which was mainly due to a fall in labour productivity.

**Chart 10.3.1 – Major economic indicators of CZ-NACE 20 division**

![Chart showing major economic indicators of CZ-NACE 20 division.](source: CZSO, MIT calculations)

* This is a monthly aliquot share calculated from annual data.
10.4 FOREIGN TRADE

10.4.1 DEVELOPMENT OF FOREIGN TRADE

The CZ-CPA 20 product group has consistently reported higher imports than exports; its negative balance has doubled in the last five years. In 2016, foreign trade in chemical products followed the development of the Czech economy due to the increasing demand for chemicals, especially in the Czech Republic. In 2016, exports were down almost 5% to CZK 152.0 billion year-on-year, while imports increased by 3% to CZK 268.5 billion. The already high negative balance of CZ-CPA 20 increased year-on-year by CZK 14.8 billion, i.e. by 14.5%, to CZK 116.5 billion.

Source: CZSO, MIT calculations
Note: Groups 20.2 and 20.6 are not monitored.

Source: CZSO, data as of 3 May 2017
10.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

The Czech Republic’s exports and imports of chemical products continued to be dominated by EU-28 in 2016. The share of EU-28 in the total turnover of foreign trade in chemicals in 2016 was over 80%. Deliveries of chemicals and chemical products to EU Member States have more than doubled in the last eighteen years. The European internal market has had a very positive impact on the development of the sector and it is the key factor in its competitiveness and development.

Most chemicals and chemical products were traditionally exported to Germany (22%), followed by Poland and Slovakia (12%). Other major markets included Hungary (7%), Italy (6%), Austria (4%), and USA and France (3%) (Chart 10.4.3). CZ-CPA 20.1 accounts for the largest share of exports.

Germany accounted for the largest share of imports as well as exports with 30%, followed by Poland (8%), France, the Netherlands and Italy (6%), Belgium (5%), Slovakia (4%) and Russia (3%). CZ-CPA 20.1 had the largest share of exports.

Chart 10.4.2 – Foreign trade with CZ-CPA 20 products

![Chart showing import and export territories in 2016]  
Source: CZSO, data as of 3 May 2017

10.5 RESEARCH AND DEVELOPMENT

R&D expenditure in 2015 in Division 20 amounted to CZK 1,166 million, with total R&D expenditure in this division being up 15% from 2011. Since 2012, the total R&D expenditure in this division has grown and the bulk of the funds were business expenditures. The amount of support from the State budget was relatively stable in the monitored period; on the contrary, foreign public resources from abroad saw largest fluctuations.

The companies with CZ-NACE 20 as their main economic activity that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include GeneProof a.s., Contipro Biotech s.r.o., BOCHMIEI a.s., Lučební závody Draslovka a.s. Kolín, and Synthesia, a.s. There are two companies in this sector which are involved in Horizon 2020 projects: Contipro a.s., a member of the DRIVE project, and RANIDO, s.r.o., a participant in the BioMates project.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation with CZ-NACE 20 as the main segment were allocated in 2015–2016 a subsidy amounting to CZK 267.8 million, which was divided among several dozen enterprises from most of the Czech Republic’s regions. Interesting is the high percentage of small enterprises and micro-enterprises,
the largest beneficiary of which is Therapharm, a.s. (the project “Expansion of the Equipment Portfolio of the Internal Centre for Nanotherapeutical Research) from the Central Bohemian Region. As expected, much of the subsidy goes to the Usti and Pardubice regions to Euro Support Manufacturing Czechia, s.r.o. and Explosia a.s.

To ensure the competitiveness of the chemical industry in the future, it is crucial to secure the necessary investment in research, development and innovation. Innovation in the chemical sector is also key to the entire EU manufacturing industry. In absolute numbers, R&D costs in the European chemical industry hovered around EUR 8.3 billion annually between 2005 and 2015, while they were EUR 6.7 billion in the U.S. and EUR 5.9 billion in Japan in the same period.

Chart 10.5.1 – Expenditure on research and development in CZ-NACE 20 (CZK m)

Source: CZSO data, MIT calculations (for methodological reasons the figures may differ from the data published by the CZSO)

10.6 DIVISION SUMMARY AND PROSPECTS

The chemical industry continues to form an indispensable part of the manufacturing industry and the economy both in Europe and the world. Given that the European chemical industry currently accounts for around 1.1% of EU GDP and directly provides more than 1.1 million jobs, it is one of the key sectors contributing to growth and employment. There are other important links with the agriculture and services sectors.

The EU chemical industry is energy intensive and subject to strong competitive pressures. It faces challenges such as increased international competition, rising prices of energy and inputs, pressure to more efficiently use resources, significant cumulative regulatory costs, especially in the area of emissions and new chemical legislation, and the need for innovation. As an energy-intensive industry, the chemical sector is dependent on the requirements related to climate change and energy policies. In addition, the chemical sector is highly regulated to protect the health of its employees and consumers, and the environment.

The challenge for the entire chemical industry in Europe will be to secure the necessary investment in its development to succeed in global competition. According to the European Chemical Industry Council (CEFIC), investment in the chemical industry in the EU increased from EUR 17.2 billion to EUR 20.7 billion between 2005 and 2015, while in the same period it grew from EUR 9.8 billion to EUR 32.5 billion in the U.S. (due to the development of shale gas), and EUR 14.4 billion to EUR 95.6 billion in China, i.e. more than six times. Also, Europe is lagging far behind China in investing in R&D in the chemicals sector. Another challenge will be to focus the chemical industry towards a circular economy and increased use of chemicals and preparations in recycle streams, in transport or, for example, as part of energy-efficient buildings. Therefore, opportunities will also be provided by Industry 4.0. According to CEFIC, mergers represent a current and future trend in the chemical sector (for example, Clariant and Huntsman).
Despite the decline in some economic and financial indicators in the Czech Republic, the development has been relatively favourable, and regardless of the impact on the indicators by production limitations of one key sector representative, the chemical industry remains one of the most important industrial sectors for the stability and growth of the Czech economy. Further development of the chemical sector in the Czech Republic will require securing the necessary investment in R&D and innovation, and ensuring a predictable, less complex regulatory framework that will reduce the cumulative regulatory costs and encourage investment. For example, it is currently very expensive for small and medium-sized companies to register under REACH. In relation to energy and climate change, the conditions for trading in greenhouse gas emissions will have a significant impact on Czech chemical companies.
11.
CZ-NACE 21
MANUFACTURE OF BASIC PHARMACEUTICAL PRODUCTS AND PHARMACEUTICAL PREPARATIONS

11.1 DIVISION CHARACTERISTIC

CZ-NACE 21 division is broken down into the following groups:

- 21.1 Manufacture of basic pharmaceutical products;
- 21.2 Manufacture of pharmaceutical preparations.

The pharmaceutical industry makes a significant contribution to the development of the global economy. It is a strong sector that is one of the pillars of industrialized economies and is increasingly seen as an important sector in developing countries as well. It contributes to employment, trade, R&D and technology capacity building.

The pharmaceutical industry is among hi-tech, most R&D-intensive processing divisions, with large amounts of money being invested into the development of new drugs every year (mostly 15 to 20% of annual revenues). Its production portfolio is very wide and it is made up of original medicines which are patent-protected, and generic medicines whose patent-protection has ended. In the Czech Republic, the key producers concentrate, mainly due to high costs, on generics; the Czech Republic is among the leading producers of generic drugs.

The division is dominated by large enterprises, which account for over 77% of revenues, 74% of value added and 68% of employed persons. The second largest group are medium-sized enterprises covering 20% to 25% of these indicators.

Group 21.2 dominates in total revenues with a 93.1% share in 2016, and also clearly dominates other indicators (Table 11.1.1).

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
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<tr>
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<td>88,7</td>
<td>89,9</td>
<td>91,2</td>
<td>81,3</td>
</tr>
</tbody>
</table>

Source: CZSO, 2016 calculations MIT

11.2 DIVISION DEVELOPMENT

The economic value added increased significantly in 2016 compared to 2015, when it reached solid positive values. Group 21.1 saw an enormous growth in economic value added from a negative value in 2015 to positive
in 2016. Group 21.2 recorded a slight decline in economic value added, but in last two years, however, it has reached good positive values. We can say that the division is doing well and improving economically. The main sequence of indicators affecting economic value added is: improvement in productivity – improvement in margins – improvement in production capacity – improvement in return on equity.

The leading position on the pharmaceutical market in the Czech Republic is held by Zentiva, owned by the pharmaceutical group Sanofi. Sanofi was formed by the gradual merger of pharmaceutical companies at international level with operations in the Czech Republic since the early 1990s. Zentiva, a subsidiary acquired by Sanofi in 2009, operates in over 50 countries in Europe, the Middle East and Africa. Zentiva’s net profit grew to CZK 198.7 million in 2015 according to the company’s annual report published in the Collection of Documents. Zentiva’s factory in Dolní Měcholupy has been producing medicinal products since 1930; its headquarters and R&D centre are in Prague. Zentiva Group a.s. is a different company which is responsible for the support of the Zentiva brand in the Czech Republic. Last year, the Sanofi pharmaceutical group announced the sale of its generic medicine business in Europe. This also includes Zentiva. The company uses the brand Zentiva in dozens of countries, not only in Europe but also in Africa and the Middle East. In the Czech Republic, the Zentiva brand is on every fifth drug package sold. Sanofi is facing the end of patent protection of its best-selling medicines and its revenues dropped to EUR 8.1 billion in Q2 2016.

Another company operating in the Czech Republic is Teva Czech Industries s.r.o., formerly known as Galena, now owned by the Israeli multinational corporation Teva. It is a major pharmaceutical manufacturer with a very long history. Its headquarters are located in Opava – Komárov, in the northeast of the Czech Republic. In its broad portfolio, it has generic medicinal products (in particular antiasthmatics, cytostatics, immunosuppressants, hypolipidemics, antihypertensives, etc.) in the form of tablets, capsules and liquid forms, as well as OTC drugs, APIs and plant extracts. The products meet recognized quality standards and are exported to a number of countries around the world, including the US and Western Europe. More than 1 500 employees are involved in company successes and in working towards its ambitious objectives. In 2006, the company became part of the multinational Teva Group. Teva’s profit amounted to approximately USD 1.4 billion in Q4 2016. In the Czech Republic, the company has been successful several times in obtaining support for its development projects from subsidy funds. This included, for example, the construction of a new plant for solid pharmaceutical forms with an investment incentive provided by CzechInvest, the construction of a new training center with subsidy from the European Regional Development Fund, and last time it was successful in obtaining financial participation for training programmes for its employees from the Adaptability and Competitiveness Global Grant from the Operational Programme Human Resources and Employment.

11.3 MAIN ECONOMIC INDICATORS

Pharmaceutical division has a distinct trend in revenue from most other divisions. Very small growth in the period 2008 to 2016 (on average 2.1% per year) was affected by three revenue drops in 2009, 2012 and 2016. The highest revenue was achieved in 2015. The development of value added was similar, although here its drop occurred together with revenues in 2009 and its highest value was reached in 2014. The development of labour productivity was similar to that of value added combined with the development of employed persons. In the manufacturing industry, this is the section with the smallest number of units. Their numbers grew modestly between 2008 and 2010, which was followed by a small decline and again a moderate growth, which turned into a decline until the end of the reference period. A relatively smoother development was seen in the number of employed persons, which gradually declined until 2012; in 2016, the number of employed persons increased. The only indicator with a steady growth trend from 2008 to 2016 was the average wage (Chart 11.3.1).

Price developments were moderate; after a fluctuation in 2009, prices alternated every two years between growth and decline, reaching their peak in 2012. The decline in prices over the last few years has been triggered by the situation in the pharmaceutical market, which has been slightly declining. This fact was mainly caused by the persistent pressure on prices and reimbursement of medicines and the limited entry of new drugs on the market (Chart 11.3.2).
The volatile development in revenues and value added was also reflected in the volatile development of Spread (Chart 11.3.3). The efficiency of the division was highest in 2008. Until 2011, the division saw alternating positive and negative values of Spread. In 2012 and 2013, it was slightly below zero. In 2014–2016, there was a positive growth trend and the Spread returned to positive.

**Chart 11.3.1 – Major economic indicators of CZ-NACE 21 division**

**Chart 11.3.2 – Price development of CZ-CPA 21 (2005 = 100 %)**

**Chart 11.3.3 – Spread (ROE – re) CZ-NACE 21 (in %)**

Source: CZSO, MIT calculations

* This is a monthly aliquot share calculated from annual data.

Note: Group 21.1 is not monitored
11.4 FOREIGN TRADE

11.4.1 DEVELOPMENT OF FOREIGN TRADE

In the case of pharmaceutical commodities, the value of imports dominates over that of exports; in 2016 an increase in both values is visible, the negative balance also slightly increased as a result of higher import values.

Chart 11.4.1 – Product export, import and balance of foreign trade in CZ-CPA 21 (CZK m)

11.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

In 2016, the export of CZ-CPA 21 products was CZK 60.6 billion. Traditionally, the largest customers include Germany (in particular medicines and pharmaceutical products such as cotton, gauze, or bandages) with a share of 26%, followed by Denmark (medicines, antiserums) with 14% and Slovakia (medicines, pharmaceutical products) with 12%. Another major outlet was the US (pharmaceutical products such as cotton, gauze, and bandages) with 5% share, followed by Russia (medicines), United Kingdom and Poland, all with a 4% share.

Imports grew to CZK 104.7 billion in 2016. Again, Germany has the largest share (19%, mainly medicines and vitamins), followed by France (medicines) with 9%, Switzerland with 6%, followed by the United States, Italy, UK, Ireland and the Netherlands with a 5% share.

Chart 11.4.2 – Foreign trade with CZ-CPA 21 products

Source: CSO, data as of 3 May 2017

Source: CZSO, data as of 3 May 2017
11.5 RESEARCH AND DEVELOPMENT

R&D expenditure in 2015 amounted to CZK 1,124 million, with total R&D expenditure in this division being up 4 % from 2011. In the reference years, except for 2013, the R&D expenditure exceeded CZK 1,000 million per year. The bulk of the funds were expenditures from business sources; the least stable component was public expenditure from abroad – these fluctuations were mainly due to the end of the programming period, and it can be assumed that these expenditures will again increase after 2016 due to the funds from the new operational programmes.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include VAKOS XT a.s., SEVAPHARMA a.s., RadioMedic s.r.o., DYNTEC spol. s r.o. and also e.g. BioVendor - Laboratorní medicína a.s., which is involved in the DIAGORAS project (Horizon 2020).

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation with CZ-NACE 21 as the main segment were allocated in 2015–2016 a subsidy amounting to CZK 160 million, which was divided among several small enterprises from two of the Czech Republic’s regions. The largest beneficiary among the large enterprises was SOTIO a.s. (the project “Establishment of the development center of modern cell therapies”) from the Central Bohemian Region; among small enterprises also the Central Bohemian EXBIO Praha, a.s., which succeeded with two of its projects.

Chart 11.5.1 – Expenditure on research and development in CZ-NACE 21 (CZK m)

Source: CZSO data, MIT calculations (for methodological reasons the figures may differ from the data published by the CZSO)

11.6 DIVISION SUMMARY AND PROSPECTS

The European pharmaceutical industry is the fifth largest division within the EU manufacturing industry. The pharmaceutical industry is among hi-tech divisions with the highest value added per employee, substantially higher than the hi-tech divisions of the manufacturing industry. At the same time, the pharmaceutical industry is the sector with the highest share of R&D investment from net sales.
Sanofi, the multinational pharmaceutical group, is currently changing its strategy and last year announced the sale of a part of the company that sells generic medicines in Europe. It can be assumed that this will also include Zentiva, a producer with a long tradition and a net profit of approximately CZK 200 million.

The largest manufacturer of generic medicines in the world – Teva, currently the owner of the former Galena and Pliva-Lachema, has lost a very significant part of its value on the New York Stock Exchange this year. Teva faces the current crisis with no permanent leadership, and the current management does not expect any improvement in the situation. The reason for this is the drop in prices that American pharmacies pay for generics. The company also faces heavy debt in connection with the acquisition of Allergan. The company has begun layoffs.

MSD, one of the largest pharmaceutical companies, is roughly doubling the size of its innovative IT center opened in Prague last year. This company has been operating in the Czech Republic since 1992. It focuses on biological treatment, vaccines, treatment of diabetes and other diseases. MSD is the trade name of Merck & Co, headquartered in New Jersey, USA. Medicine and its digitization will be one of the key aspects for the future development of business of the information technology segment, growing gradually to tens to hundreds of billions of dollars a year.

The pharmaceutical industry makes a significant contribution to the welfare of both Europe and the world by ensuring the availability of medicines and fostering economic growth and sustainable employment and, as a strong sector, it is a prerequisite for successful future development.
12.

**CZ-NACE 22 MANUFACTURE OF RUBBER AND PLASTIC PRODUCTS**

### 12.1 DIVISION CHARACTERISTIC

*CZ-NACE 22 division is broken down into the following groups:*

- 22.1 Manufacture of rubber products;
- 22.2 Manufacture of plastic products.

CZ-NACE 22 Manufacture of rubber and plastic products belongs to important divisions of the Czech economy. Plastics and rubbers have a wide range of uses: for packaging materials, in construction, automotive or the electrical industries.

Plastics also have great use after recycling. Recycled plastic is used for example for the manufacture of car parts, design furniture and home accessories, textiles, shoes and bags, packaging materials and many other products.

Rubber is a material that is unique and irreplaceable. Rubber products are an essential part for the manufacture of products in other sectors of the manufacturing industry. Rubber is a material that is flexible, durable and safe even at low temperatures. Because of its properties ensuring that it endures very low and very high temperatures, it is used for example in the aerospace industry. Up to 60% of rubber products are used for components in different types of vehicles.

This is a sector dominated by large and medium-sized enterprises. Large enterprises and medium-sized enterprises have consistently made up almost two thirds and over a quarter of its revenues, respectively. In value added, the situation is similar. Large enterprises make up half and medium-sized enterprises make up a third of the number of employed persons in the division.

The division is dominated by the production of plastic products – CZ-NACE 22.2. It is mainly dominant in terms of the number of units and the number of employees; in other characteristics its dominance over the production of rubber products is more moderate (Table 12.1.1).

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.1</td>
<td>27,1</td>
<td>41,6</td>
<td>41,4</td>
<td>46,0</td>
<td>40,7</td>
<td>38,3</td>
<td>24,8</td>
<td>19,9</td>
</tr>
<tr>
<td>22.2</td>
<td>72,9</td>
<td>58,4</td>
<td>58,6</td>
<td>54,0</td>
<td>59,3</td>
<td>61,7</td>
<td>75,2</td>
<td>80,1</td>
</tr>
</tbody>
</table>

*Source: CZSO, 2016 calculations MIT*
12.2 DIVISION DEVELOPMENT

It is one of the most efficient divisions. In 2015 and 2016, it posted strong positive economic value added, although its year-on-year growth was rather small.

Saar Gummi Czech from Červený Kostelec (SGC) raised sales last year by 19% to CZK 3.4 billion. SGC, which is one of the European leaders in the production of automotive seals, invests in the construction of a new hall and an expansion of production by CZK 350 million. They anticipate the use of these capacities, for example, for new contracts for the production of seals for the new Škoda Octavia and Volkswagen Golf models, which will be produced from 2019. The company is one of the key plants of the Saar Gummi global group, which has since 2011 belonged to the Chinese group CQLT. Its economic results earned the company the title “Enterprise of the year 2016 in the Czech automotive industry”. SGC supplies seals to every fourth vehicle produced in Europe, mainly door and bonnet seals made from technical rubber by extrusion technology.

In 2016, Continental Barum, a tyre manufacturer from Otrokovice, saw its revenues decrease to CZK 56.4 billion, from CZK 57.7 billion in 2015. Continental Barum’s revenues had been growing from 2009, when the company grossed CZK 35 billion. The company completed a major investment, opening a renovated tyre production hall in October. The construction and new technologies cost around CZK 4 billion, the largest investment project of the Continental Group in the Otrokovice plant. Continental Barum has been a member of the Group since 1993.

Gumotex, a company from Břeclav, increased its revenues last year by almost a tenth to more than CZK 2.7 billion. Last year and the year before were successful in terms of profits due to low prices of raw and other materials. An increasing share of revenues is made up of products for the automotive industry, such as sun visors and some other plastic interior parts; at present the share is roughly two-thirds. The new BMW 5 Series models will be equipped with an armrest made in Gumotex. The remaining third consists of traditional production such as inflatable boats, rescue systems, or inflatable mattresses.

Mitau, a rubber company, plans to expand its plant in Serbia and increase its production capacity. Mitau, Rubena and Savatech belong to the ČGS holding, which was bought by the Swedish Trelleborg Group. Trelleborg, the parent company, is expanding its production capacities in anticipation of larger sales of its production. Mitau, which accounts for approximately two-thirds of the CGS holding turnover, is a producer of renowned brands of specialty tyres for the mid segment of machines and has a great name especially in the field of agricultural machinery tyres. The offer of special tyres is complemented by polymer solutions by Rubena and Savatech, which develop and produce a wide range of industrial polymer products, including polymer seals, polymer sealing profiles, special conveyor belts, and artificial fabrics.

Revenues of Viscofan, a significant member of the product group CZ-NACE 22.2, amounted to CZK 6.11 billion last year. Gross profit of CZK 1.2 billion decreased by 2% year-on-year. In 2016, a slight decline followed after a period of long-term growth. Greater competition and therefore higher pressure on margins is behind the reduction in revenue and profit of Viscofan, a company based in České Budějovice, as well as of Devro, a company from Jilemnice which produces various kinds of food casings. In 2016, the Viscofan Group acquired Vector, a US-Dutch company, and it can be expected to utilise its production capacities.

Fatra, a company from Napajedla, reached a total of CZK 3.7 billion in revenues in 2016 and earnings before tax rose to CZK 366 million, marking the most successful year in the company’s history. Particularly successful segments were flooring, special products and BOPET films.
12.3 MAIN ECONOMIC INDICATORS

Production characteristics indicate that this is one of the most stable segments. Revenues fell only in 2009 and were otherwise growing steadily. Value added, labour productivity and average wage were also growing in 2009–2016. The number of employed persons, following a larger decline in 2009, showed moderate declines in 2012 and 2013. In other years, the number of employed persons grew and reached its peak in 2016. The number of units recorded a sharp increase in 2010; in the following years it was rather decreasing (Chart 12.3.1).

Industrial producer prices for CZ-CPA 22 commodity continued to decrease year on year in 2008–2010 and reached their minimum in 2010. The prices of this product group were mainly influenced by the prices of rubber on international markets and were thus much higher than in CZ-CPA 22.2. The prices in CZ-CPA 22.2 grew more slowly year-on-year (Chart 12.3.2).

The development of Spread was very positive in this division. In 2008–2015, it grew steadily, becoming positive for the first time in 2010. This was due to a fairly balanced risk reduction and increasing return on equity. In 2016, there was a slight decrease in Spread (Figure 12.3.3).

**Chart 12.3.1 – Major economic indicators of CZ-NACE Division 22**

![Bar charts showing major economic indicators](image)

Source: CZSO, MIT calculations

*This is the aliquot monthly share calculated from annual data
12.4 FOREIGN TRADE

12.4.1 DEVELOPMENT OF FOREIGN TRADE

The CZ-CPA 22 commodity exports amounted to CZK 184.7 billion in 2016 and grew by 1.3% year-on-year. Export of CZ-CPA 22 production has been consistently growing for both plastic and rubber products. CZ-CPA 22.2 Plastic products (56%) contributed slightly more to exports in 2016.

Imports grew by 4% to CZK 172.4 billion in 2016, mainly thanks to imports of plastic products. They account for more than two-thirds of total CZ-CPA 22 exports.

The positive balance fell in 2016, just like two years before. This was mainly due to CZ-CPA 22.2 products, which had negative balance for the whole of the reference period and where the import of plastic products grew significantly. On the other hand, the balance of CZ-CPA 22.1 has consistently been positive, with the exception of 2016, and has contributed significantly to the overall positive balance.
12.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

Germany has traditionally been the largest outlet for rubber and plastic products with 33% share (mainly waste, fragments, plastic cuttings, pipes, hoses, plates, sheets, foils, bags, sacks, bottles, goods for the transport and packing of goods, other plastic products, plates, sheets, rubber belts, tyres for cars, buses, lorries and agricultural vehicles and other rubber products) followed by Slovakia with 9% share (e.g. plates, bottles, flasks, demijohns, plastic products, passenger car tyres) and Poland with 7% share (e.g. pipes, plastic hoses, rubber, passenger car tyres). Other export outlets for this commodity were: France (mostly passenger car tyres), United Kingdom (passenger car tyres), USA (passenger car tyres, rubber), Austria (bottles, plastic products, tyres) and Hungary (bottles, boxes, plastic crates, tyres).

Largest contributors to exports were Germany with 37% (mainly waste, fragments, plastics cuttings, monofilaments, rods, plates, sheets, foils, boxes, bags, plugs, lids, caps, passenger car tyres), followed by Poland with a 9% share (e.g. plates, boxes, crates, plugs, lids and other plastic products, passenger car tyres), China (sanitary and toilet articles of plastics) and Italy (waste, fragments, films, bottles) with a 5% share.

The export of passenger car tyres from the Czech Republic last year exceeded CZK 4.6 billion, which is 175% more than a decade ago.

Chart 12.4.2 – Foreign trade with CZ-CPA 22 products

Source: CSO, data as of 3 May 2017

12.5 RESEARCH AND DEVELOPMENT

R&D expenditure in 2015 in Division 22 amounted to CZK 1,204 million, with total R&D expenditure in this division being up 73% from 2011. The bulk of the funds were expenditures from business resources. In addition, public foreign spending between 2010 and 2015 was increasing year-on-year at a rapid pace, mainly due to the drawing of public funds from the OPEI; it may be expected that the pace of growth may moderate slightly after 2016. However, if companies are successful in obtaining projects from new operational programmes (OP EIC and OP RDE), there may not be any significant shortage of funds from abroad.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include ASIO, spol. s r.o., INVOS, spol. s r. o., Fatra, a.s., Promens, a.s.
Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation with CZ-NACE 22 as the main segment were allocated in 2015–2016 a subsidy amounting to CZK 155.5 million, which was very evenly divided among several dozen enterprises from most of the Czech Republic’s regions. In terms of the total volume of subsidy, the largest beneficiary is KOH-I-NOOR Mladá Vožice a.s., a large South Bohemian enterprise (the project “New BOV, female”); the second largest beneficiary is HECKL s.r.o., a medium-sized enterprise (a project examining the possibilities of manufacturing innovations) from the Ústí Region. The highest beneficiary from among small and micro-enterprises is the South Moravian TECHNOFIBER, s.r.o. (the project “Advanced concrete elements with woven reinforcement”).

12.6 DIVISION SUMMARY AND PROSPECTS

The plastics industry is one of the main pillars of the European economy, with over 60,000 companies employing over 1.5 million Europeans. In the Czech Republic, this sector has become one of the most important players.

The domestic plastics industry has the main customers in the automotive and electronics industries. European consumption has a significant share in packaging materials and construction, followed by the automotive and construction industries. Foreign capital has a strong presence in the production of rubber products. One of the most important companies in this division is Barum Continental.

By application segments, most of the plastics manufactured in Western Europe and Central Europe are used in packages. Globally, there are 80 million tonnes of packages, with a view of 318 million tonnes in 2050. According to the German Packaging Institute, e-shops are also behind the growth of the packaging market. Plastics manufacturers and compounders regularly innovate their products. At Chinaplas 2016 exhibition, Exxon Mobil introduced a new type of PE-Exceed with 30% higher protective properties against shocks when packaging food, liquids and in agriculture.

According to an analysis by Ceresana, a worldwide increase in consumption can be expected in the construction industry to 73 million tonnes in 2023. European construction sector consumes 19.7% of all plastics, with PVC dominating with more than 30% share.

In February 2012, a definitive Bioeconomy for Europe strategy was launched, which aims to move from fossil to low-carbon sources using natural materials such as biomass for use in energy, bio-products as an
alternative to the chemical industry and biofuels for cars. Data from the conference European Bioplastics 2015 show that the bioplastic growth between 2014 and 2019 is driven by partial bio-PET where 30% of the petroleum-based ethylene is replaced by a plant-based product. European consumption of biodegradable and compostable substances has the potential for significant growth. At present, the use of bioplastics is also used as a marketing tool.

The development of the US plastics industry is focused on shale gas. This year, a new shale gas ethylene plant (Dow, Exxon Mobil and Chevron) will be launched in the US. Nova commissioned a 450,000-tonne shale gas LLDPE production unit in Canada; Ineos commissioned a similar unit in the US with a capacity of 470,000 tonnes.
13. CZ-NACE 23 MANUFACTURE OF OTHER NON-METALLIC MINERAL PRODUCTS

13.1 DIVISION CHARACTERISTIC

CZ-NACE 23 division is broken down into the following groups:

- 23.1 Manufacture of glass and glass products;
- 23.2 Manufacture of refractory products;
- 23.3 Manufacture of clay building materials;
- 23.4 Manufacture of other porcelain and ceramic products;
- 23.5 Manufacture of cement, lime and plaster;
- 23.6 Manufacture of articles of concrete, cement and plaster;
- 23.7 Cutting, shaping and finishing of stone;
- 23.9 Manufacture of abrasive products and non-metallic mineral products n.e.c.

The Czech glass industry and industrial production of building materials have a long tradition and a relatively high quality. In addition to the glass and building materials industries, the division includes a range of ceramic and porcelain products. The main export items continue to be glass, ceramic and porcelain goods and a selection of concrete prefabrication products. The groups of the “manufacture of building materials” and “manufacture of flat glass” divisions depend mainly on the developments in the construction industry and the automotive industry, which have a major impact on their production characteristics.

In the Czech Republic, these groups benefit from a good raw materials base and modern production units. Despite its increasing share in total exports, most building materials (cement, lime, plaster, bricks, ceramic roof tiles, natural stone and concrete products) are mainly intended for the domestic market and form the foundation of building production.

The division is characteristic for large enterprises that account for approximately half of the revenue, value added and employees of the division. Mid-sized enterprises account for about a third of sales and value added and almost 30% of employees. Micro-enterprises make up the dominant number of units, but the shares of revenue and value added are insignificant. Micro-enterprises have the largest share in employment and other production characteristics in group 23.1 Manufacture of glass and glass products, followed by group 23.6 Manufacture of articles of concrete, cement and plaster. They have lower shares in group 23.4 Manufacture of other porcelain and ceramic products, 23.2 Manufacture of refractory products, 23.3 Manufacture of clay building materials and 23.5 Manufacture of cement, lime and plaster. Their lowest share is in group 23.7 Cutting, shaping and finishing of stone (Table 13.1.1).
Table 13.1.1 – Shares of groups in CZ-NACE 23 division in 2016 (%), division = 100 %

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.1</td>
<td>38,7</td>
<td>36,3</td>
<td>33,5</td>
<td>34,2</td>
<td>36,3</td>
<td>37,1</td>
<td>41,2</td>
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</tr>
<tr>
<td>23.2</td>
<td>5,8</td>
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<td>4,5</td>
<td>4,6</td>
<td>4,4</td>
<td>3,8</td>
<td>5,7</td>
<td>0,7</td>
</tr>
<tr>
<td>23.3</td>
<td>6,0</td>
<td>6,5</td>
<td>6,6</td>
<td>6,7</td>
<td>6,3</td>
<td>6,6</td>
<td>6,0</td>
<td>3,4</td>
</tr>
<tr>
<td>23.4</td>
<td>7,0</td>
<td>4,8</td>
<td>4,5</td>
<td>4,4</td>
<td>4,0</td>
<td>3,6</td>
<td>8,8</td>
<td>20,3</td>
</tr>
<tr>
<td>23.5</td>
<td>5,6</td>
<td>10,3</td>
<td>7,4</td>
<td>8,3</td>
<td>12,1</td>
<td>11,7</td>
<td>3,2</td>
<td>0,2</td>
</tr>
<tr>
<td>23.6</td>
<td>29,1</td>
<td>27,2</td>
<td>32,6</td>
<td>30,9</td>
<td>25,0</td>
<td>27,9</td>
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<tr>
<td>23.7</td>
<td>1,4</td>
<td>1,7</td>
<td>1,3</td>
<td>1,1</td>
<td>0,9</td>
<td>1,1</td>
<td>2,2</td>
<td>24,2</td>
</tr>
<tr>
<td>23.9</td>
<td>6,4</td>
<td>8,3</td>
<td>9,5</td>
<td>9,8</td>
<td>11,0</td>
<td>8,2</td>
<td>6,0</td>
<td>2,5</td>
</tr>
</tbody>
</table>

Source: CZSO, 2016 calculations MIT

13.2 DIVISION DEVELOPMENT

The manufacture of building materials was markedly affected by unfavourable development in construction output last year, which fell behind the expectations compared to the year before, especially in civil engineering due to the unpreparedness of transport works. According to the results for 01/2016 – 12/2016, construction output fell by 5.9% year-on-year (0.8% in building construction and 15.9% in civil engineering).

The brick industry, as well as the producers of insulating materials for thermal insulation of buildings, posted a decrease in the sales of their products last July and August, when construction activity was to be highest. However, because in the Czech Republic the production of building materials is concentrated in large international companies, which are better suited to compete on the European market, these companies increased exports of their products. Many companies also decided to upgrade their technologies by introducing automation and new innovative approaches to managing business and manufacturing processes.

In addition to the production of cement, the production of ceramic tiles and floor tiles and the manufacture of concrete products including aerated concrete and the manufacture of refractory materials have been the most successful in the past two years.

Most notably, this rise is evident in the production of cement, which is an unofficial barometer on the development of building and investment construction. The latest data from the Czech Cement Manufacturers Association show that the decline in cement production in 2013 was halted in 2014 and 2015, with a gradual increase in 2016. Cement production in the Czech Republic amounted to 3,433 million tonnes in 2012, 3,211 million tonnes in 2013, 3,511 million tonnes in 2014 and 3,781 million tonnes in 2015. In the first half of 2016, it reached 1,756 million tonnes compared to 1,721 million tonnes in the first half of 2015.

The cement industry in the Czech Republic is currently benefiting from a high-quality national raw material base with the world’s leading clinker and cement manufacturing technology. Domestic production plants are part of European and global cement groups that guarantee high social standards and environmental friendliness and quality assurance of production.

The cement industry, as an energy-intensive industry dependent on an appropriate raw material base, is aware of its importance for the national economy and its position in each region, and acts as a long-term investor, implementer and employer in its place of operation. Cement production units allow not only the careful use of low-density limestone deposits but also the use of many alternative raw materials and fuels. In addition, cement plants introduce and apply the best environmental techniques required, which make them an eco-friendly place offering the recovery of a wide range of wastes in its region.
However, support for construction in the form of European project systems, i.e. in particular financial support, should be accompanied by long-term legislative stability. It was neglected in the past and it is now difficult to restore, especially in the area of environmental permits for important line structures. Even for the cement industry, the cement plants now produce cements with special properties and work on their further improvement.

In terms of the developments in the division, the manufacture of glass is constantly increasing (annually by about five percent on average in recent years). The volume of revenues has already reached pre-crisis levels – around CZK 43 billion, with about 80% of production intended for export. Further growth in glassmaking is facing headwinds due to the shortage of people in the labour market.

Dominant are manufacturers of flat glass for the automotive and construction industries. These manufacturers also invest heavily in expanding their production.

### 13.3 MAIN ECONOMIC INDICATORS

The division is economically successful; in 2016 and 2015, it had a positive economic value added, which grew by more than 44% year-on-year. In groups, the developments in economic value added were different. The largest drop was reported in group 23.1 and the highest increase in group 23.6. Other groups posted an increase in economic value added. The main reason for the increase in the economic value added of the division was the risk area and the decrease in the share of equity and other interest-bearing resources in assets. An increase in the share of accounting period profits in pre-tax profits was also a significant contributor.

In 2008–2016, labour productivity was mostly slightly increasing. On the other hand, the average wage was increasing throughout the period. The number of employed persons declined sharply during the crisis. Since 2010, it has grown very moderately on average. Until 2011, the number of units grew and then declined until 2016, when it grew again by 4 units (Chart 13.3.1).

In 2016, the price of CZ-CPA 23 products was relatively volatile in individual commodity groups. Although CZ-CPA 23 output prices increased by 5.0% overall (compared to 2005), product group 23.2 prices increased by 12.9%, product group 23.6 prices increased by 7.6% and product group 23.9 prices even increased by 29.7%. On the other hand, prices in product groups 23.3, 23.5 and 23.7 decreased (Chart 13.3.2).

The efficiency in the division, as measured by Spread, is affected by the developments in revenues, value added and labour productivity. In 2008–2013, the division was not successful, the Spread being negative. An increase in these three indicators since 2014 has led to an improvement in the Spread into black numbers (see Chart 13.3.3).
Chart 13.3.1 – Major economic indicators of CZ-NACE 23 division

Source: CZSO, MIT calculations

* This is the proportional monthly share calculated from yearly data

Chart 13.3.2 – Price development of CZ-CPA 23 (2005 = 100 %)

Source: CZSO, MIT calculations

Note: Group 23.4 is not monitored

Chart 13.3.3 – Spread (ROE – re) CZ-NACE 23 (in %)

Source: CZSO, MIT calculations
13.4 FOREIGN TRADE

13.4.1 DEVELOPMENT OF FOREIGN TRADE

The division is significantly export-oriented. The share of exports to revenues is more than 50%, including re-exports, which, however, are not large. For the manufacturers of building materials (CZ-NACE 23.2 to 23.7), the share of exports to revenues is more than 30%, and for the manufacture of glass and other products the share of exports to revenues is more than 75%. This shows both the quality of the products and the excellence of this segment, whether this concerns aggregates, cements, ceramics, prefabricated concrete and aerated concrete, bricks or sand, flat glass and other products. However, plasterboard, dry plaster mixtures and new progressive building chemistry products (skim coat, adhesives) are also suitable for export. Foreign trade in the production of building materials, flat glass and other products of this division within the EU countries is based on applicable European prices.

Chart 13.4.1 – Product export, import and balance of foreign trade in CZ-CPA 23 (CZK m)

Source: CZSO, data as of 3 May 2017

13.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

Germany is the Czech Republic’s largest trading partner in both the exports and imports of virtually all the products in this division.

Given the unfavourable share of transport costs to the resulting product price, the importance of other neighbouring countries increases. That is why Slovakia, Poland and Austria are also important trading partners for the exports of building materials. Also in these countries, construction saw black numbers last year.

Exports of glass production are expanding and increasing not only within European countries, but also increasingly to the Far East and the U.S. One of the key elements for the expansion of foreign trade is the opening of sales offices.
13.5 RESEARCH AND DEVELOPMENT

The companies with CZ-NACE 23 as their main economic activity that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include BETOSAN s.r.o., CRystalex a.s. and ŽPSV a.s.

Under the announced calls for the OP EiC for the 2014–2020 programming period, projects focusing on research, development and innovation with CZ-NACE 23 as the main segment were allocated in 2015–2016 a subsidy amounting to CZK 90 million, which was divided among enterprises of varying sizes from most of the Czech Republic’s regions. Among large enterprises, the largest beneficiary is Sedlecký kaolin a.s. (the project “Kaolin Whiteness Increase”) from the South Moravian Region. However, the largest grant in terms of volume was awarded to Redrock Construction s.r.o. (the project “Research and Development of mechanically and chemically resistant composites based on cement and non-cement binders and secondary raw materials”).

In 2013–2015, division 23 R&D expenditure was mainly channelled into experimental research, funded mainly by the business sector (see Chart 13.5.1).

Building materials also play an important role in sustainable development thanks to their energy performance and durability, which determines the energy consumption of buildings throughout their life. By researching the materials used and their combinations, significant improvements in the environment and the quality of life can be achieved. It is clear that the production of building materials, which also includes consumed energy and raw materials, has a major impact on the environment.

Recent advances in nanotechnology, modelling, analytical disciplines and many other technologies bring hope of discoveries of breakthroughs in the production, properties and use of building materials.

New technologies and analytical tools offer a wide range of options for further improvement. One of the main obstacles to effective knowledge development has so far been the fragmentation of research activities, both at the industrial and academic levels. Improving the coordination of R&D activities and cooperation between all stakeholders can therefore lead to the development of mutual communication and understanding, which also entails the potential for breakthrough innovation solutions.

The development in glass production is mainly focused on improving glass properties. Flat glass manufacturers focus on increasing the durability of safety glass, and surface treatments such as anti-reflective or antibacterial treatment which are used for example in sanitary facilities. As a result of pressure to reduce lead glass
production, household glass manufacturers concentrate on replacing lead or increasing glass strength and protecting it against damage.

In this division, the Research Institute of Building Materials in Brno (Výzkumný ústav stavebních hmot v Brně, a.s.) implemented or is implementing the following publicly co-funded research projects:

Projects of the Technology Agency of the Czech Republic (of the Academy of Sciences):
- TA04020835 “Hydraulic binders prepared on the basis of secondary raw materials” (2014–2017);
- TE02000162 “Centre of advanced materials and technologies for security and increased protection” (2014–2019);
- TH02010085 “Development of fibre-cement plates with embossed structure and comprehensive technology innovation” (2017–2019);

MIT projects:
- FV10304 “The use of heating plant slag in the production of concrete goods” (2016–2019);
- FV10297 “Active roofing system reducing the energy efficiency of buildings” (2016–2019);

Projects of the Grant Agency of the Czech Republic:
- GC16-O8959J “Research and development of highly reactive, low-energy cements based on belite stabilised by foreign ions” (2016–2018, GA0/GC);
- GAP104/12/1494 “Special cement binders for the immobilization of toxic elements” (2012–2015);

**Chart 13.5.1 – Expenditure on research and development in CZ-NACE 23 (CZK m)**

Source: CZSO data, MIT calculations (for methodological reasons the figures may differ from the data published by the CZSO)

### 13.6 DIVISION SUMMARY AND PROSPECTS

The competitiveness of the Czech glass industry and the building materials industry can be assessed as promising and well placed to further maintain and improve their starting position in the competitive European market.
Trends must include the development of new quality materials with functional and aesthetic value. The pressure of stiff competition also pushes for further concentration among manufacturers, i.e. the linking of chains in production, trade and marketing. Companies also focus on their strengths, i.e. they concentrate production, maximize the use of modern lines to produce competitive products, cooperate in production, considerably innovate, dynamically expand or reduce their product range according to the current market needs and the conditions for the development of internal exchange within larger organizational units with capital links.

Trading in and marketing of building materials and products on the European market is governed by uniform European rules. These are laid down in Regulation (EU) No 305/2011 of the European Parliament and of the Council, laying down harmonized conditions for the marketing of construction products. Based on this Regulation, harmonized European standards are the main source of criteria and methods for assessing the properties of building materials and products. The use of these harmonized standards (approx. 460 standards quoted in the Official Journal of the European Union) is mandatory. If a building material or product falls within a harmonized area, a declaration of performance and CE marking is necessary in order to place it on the single market. Member States use harmonized standards when setting requirements relating to the use of building materials and products in buildings.

The trends that research and development of building materials should focus on in the coming period will also include new or improved building products for building adaptation to climate change.

According to data currently known, the Czech Republic will not be among the countries most affected by climate change, but its effects will still cause a number of problems. The most important negative impacts of climate change are to include increased average annual outdoor air temperature and the associated increase in the number of tropical days and nights and the increase in their continuous duration. The change in the amount and distribution of rainfall, which on the one hand will prolong dry periods and, on the other hand, increase the number of torrential rains can also be considered very important.

Building and engineering measures to adapt buildings to climate change include improving the thermal and technical properties of building envelope, implementing measures to avoid interior overheating, streamlining the existing energy management of buildings, ensuring efficient water management, and overall landscaping adjustment around buildings so as to prevent deterioration of local climatic conditions, such as strengthening the phenomenon known as urban heat island.

Important factors for maintaining the competitiveness of the sector must also include:
– creating favourable conditions for entry of foreign capital;
– presenting good business plans to obtain financial resources from EU funds, and their co-financing possibilities;
– improving education and cooperation with the Ministry of Education, which will lead to increased interest in study in the technical and technological fields of the building materials industry, in construction and glass industry;
– expanding cooperation with national and foreign scientific and technical facilities (research institutes, universities);
– introducing new knowledge into practice and using them in product innovation;
– development of marketing services.

In line with the Communication COM(2014) 445 on resource efficiency opportunities in the building sector, emphasis will also be placed on better use of secondary raw materials. The aim is to reduce the environmental impact of new and renovated buildings and building demolitions by making more efficient use of resources, and to promote the competitiveness of the European building sector. This involves, in particular, lower resource use in buildings, the introduction of a common European approach to assessing the environmental performance of buildings and the creation of a better functioning market for recycled building materials.
14. CZ-NACE 24 MANUFACTURE OF BASIC METALS, METALLURGY; CASTING OF METALS

14.1 DIVISION CHARACTERISTIC

CZ-NACE 24 division is broken down into the following groups:

- 24.1 Manufacture of iron, steel and ferro-alloys and sheet products, hot shaping of products;
- 24.2 Manufacture of alloy and steel pipes and tubes;
- 24.3 Manufacture of other products of first processing of iron and steel;
- 24.4 Manufacture and first processing of non-ferrous metals;
- 24.5 Casting of metals.

Metallurgical production is a highly material- and energy-intensive division. In the Czech Republic, it is concentrated in virtually one region (almost 98% of iron and steel production comes from the Moravian-Silesian Region). Czech, as well as European metallurgy is undergoing structural developments that started together with the global crisis. However, since 2013, there has been a turning point in growth, and although steel production is unlikely to return to the pre-crisis level, production and consumption are rising and should continue to do so.

Almost one-third of metallurgical supplies are exports, two-thirds are used for intermediate consumption where main customers are within the same CZ-NACE 24, followed by CZ-NACE 28 (Manufacture of machinery and equipment) and CZ-NACE 25 (Manufacture of fabricated metal products).

In terms of size, large enterprises (up to three-quarters of the division) and medium-sized enterprises (up to a quarter of the division) are the most significant.

In terms of groups, CZ-NACE 24.1 has the largest share (50% of revenues). The share of CZ-NACE 24.4 and CZ-NACE 24.5 is similar and represents approximately 14% to 15% of revenues, followed by CZ-NACE 24.2 and CZ-NACE 24.3, which account for about 10% of the revenue of the division (Table 14.1.1).

Table 14.1.1 – Shares of groups in CZ-NACE 24 division in 2016 (%), division = 100 %

<table>
<thead>
<tr>
<th>Group</th>
<th>CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
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<tr>
<td>24.1</td>
<td>24,1</td>
<td>44,7</td>
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<td>3,1</td>
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<tr>
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<td>15,3</td>
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<td>14,8</td>
<td>31,5</td>
<td>74,9</td>
</tr>
</tbody>
</table>

Source: CZSO, 2016 calculations MIT
14.2 DIVISION DEVELOPMENT

Czech, as well as European metallurgy is undergoing structural developments that started together with the global crisis. CZ-NACE 24 forms the basis for deliveries to other manufacturing sectors. The division will bring approximately CZK 15 billion annually to the public budgets.

Statistical data on steel for the period from 1970 to this year demonstrably show that the sector which has since 2008 been hit by decreased demand:
– will never restore its production to pre-2007 levels;
– has 20% of overcapacity in the sector;
– is predicted to go completely towards higher value added and sophisticated production.

The global recession in the metallurgy sector brought about the biggest drop in value added and revenues in 2009.

The decline in employment and assets was slower. The promising recovery in 2010 (excluding employment) culminated in all indicators in 2011, but did not reach the 2008 level. The second wave of recession in 2012 was moderate and in revenues continued into 2013, while value added posted year-on-year growth, with stagnating employment. By 2014, all indicators had grown, with very significant growth in value added. In 2015, the dynamics in CZ-NACE 24 was not so favourable, as production declined by 1% year on year. The favourable relationship between labour productivity and average wage from 2008 has not been reached over the whole of the reference period, the year 2014 being the closest. With a steady year-on-year rise in average wages, labour productivity increase accelerated in 2011 and 2014, but declined in the following years, so the relationship between these indicators was unfavourable in 2012 and 2015.

14.3 MAIN ECONOMIC INDICATORS

The development of the division is not favourable, as shown by selected indicators in the period 2008–2016. Revenues, value added, and the number of employed persons saw a sharp drop in 2009 and now are far from where they were in 2008. There have been periods of growth and decline, but the division has continuously lost its share of the manufacturing industry. Labour productivity was similarly unbalanced; however, in 2014 and 2015 it exceeded 2008 levels. Only the average wage has been growing. The number of units was extreme in 2010, probably due to the addition of small enterprises (Chart 14.3.1).

CZ-CPA 24 product prices reflected the weight of steel producers (CZ-CPA 24.1 to CZ-CPA 24.3), whose prices fell in 2009, then grew for two years year-on-year, peaked in 2011 and subsequently declined, with the exception of 2014. The prices of tubular products (CZ-CPA 24.2) was above those of other steel products. Prices of precious and non-ferrous metals (CZ-CPA 24.4) increased more markedly after the fall in 2009 to first peak in 2011 and then, except in 2012, they were growing again with the second peak in 2015. Prices of casting production (CZ-CPA 24.5) had the most balanced development, with a gradual growth tendency. All prices fell in 2016 compared to 2015 (Chart 14.3.2).

The financial position of the division was affected by the return on equity, which was in the form of the W curve (Chart 14.3.3), when in 2009 and 2012 its value was in red numbers. The Spread reached the two lowest values in these years. It was slightly positive only in 2014, thanks to increased profitability. In 2015 and 2016, Spread was negative with moderate growth in 2016. The efficiency of the section is inadequate.
Pramen: ČSÚ, výpočty MPO

Graf 14.3.2 - Graf 14.3.1 -

*This is the proportional monthly share calculated from yearly data

Source: CZSO, MIT calculations

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**Chart 14.3.1 – Major economic indicators of CZ-NACE 24 division**

*Graph 14.3.1 - Main economic indicators of division CZ-NACE 24

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**Chart 14.3.2 – Price development of CZ-CPA 24 (2005 = 100 %)**

**Chart 14.3.3 – Spread (ROE – re) CZ-NACE 24 (in %)**

Source: CZSO, MIT calculations

*This is the proportional monthly share calculated from yearly data

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Source: CZSO, MIT calculations

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14.4 FOREIGN TRADE

14.4.1 DEVELOPMENT OF FOREIGN TRADE

The volume of total imports of metallurgical materials from third countries and imports from EU countries increased by 5.8% in year-on-year terms, of which imports from EU countries decreased by 0.1% but imports from third countries increased by 50.7%. The most significant contributor to this increase was the increase in import volume of ingots and semi-finished products globally (by 56.5%), most of them from third countries (by 138.3% – mainly duplicate semi-finished products for Vítkovice Steel as a result of shutdown of steel production), as well as long rolled products (reinforced concrete steel, rolled wire), flat products (hot-rolled sheets and cold rolled sheets and strips), steel tubes (mainly welded) and drawn wire and metallised tapes.

In terms of the largest imports and foreign supplies to the Czech Republic, imports from third countries outside the EU in 2016 placed 5th, 10th, 11th and 13th from the Russian Federation, Ukraine, Republic of Korea and China, respectively. The main problem is imports from third countries not directly to the Czech Republic, but to the whole of the European Union, as is clear from EUROFER data. These imports are cheap and displace the traditional production from the Czech Republic and, on the single European market, they are likely to spread to other EU countries, including the Czech Republic.

It is clear that in 2016 the volume of the negative foreign trade balance in steel products decreased year-on-year. In terms of volume, the negative trade balance is due both to a more significant year-on-year increase in total imports compared to exports and to the product composition of imports and exports.

Czech metallurgical companies compete with imports from European Union countries, representing 83.6% of all metallurgical materials coming from abroad to the Czech Republic, only with targeted business and marketing strategies in order to satisfy the growing demands of domestic customers.

Chart 14.4.1 – Product export, import and balance of foreign trade in CZ-CPA 24 (CZK m)

Source: CZSO, data as of 3 May 2017

14.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

Almost 90% of the total volume of imports in 2016 was from European countries (Germany, Poland, Slovakia, Italy, and Austria). A significant year-on-year increase was recorded in the volume of imports from Russia (mainly semi-finished products). Imports from China to the domestic market in 2016 accounted for less than 1% of total import volumes. These imports threaten the domestic market indirectly, as imports to other EU countries, especially those with access to the sea, are rising sharply, thus limiting the possibilities for supplies from the Czech Republic to EU countries. Furthermore, imports from China displace our exports to countries outside the EU, especially to the Middle East.
More than 92% of the total volume of exports in 2016 was to European countries (Germany, Poland, Slovakia, Italy, Hungary and Austria).

Chart 14.4.2 – Foreign trade with CZ-CPA 24 products

Source: CZSO, data as of 3 May 2017

14.5 RESEARCH AND DEVELOPMENT

In order to maintain future competitiveness, the CZ-NACE 24 division must continuously focus on development and adequately and comprehensively respond to the restructuring and modernization of product and technology structures, including the rationalization of labour consumption.

The applied research and development in the field of metallurgy aims to meet increasingly strict criteria for quality, to respond to the demand for new products and innovations and to offer, for example, lighter material with the same mechanical properties as the original material. It is therefore advisable to focus on the application of new technologies through research and development, the purchase and installation of new equipment, machines, etc., with the subsequent development and optimization of procedures for meeting the above objectives. This will help the Czech Republic compete with global companies in product quality.

One of the global trends is also the use of new means, technological processes, and technological equipment to increase production, reduce production costs, or reduce the amount of energy and material consumed. In metallurgy and casting, it is therefore necessary to constantly improve the efficiency of processes by combining input raw materials, energy consumption for production, etc. This will help the Czech Republic to compete with global companies in the area of product price.

Other sub-objectives of applied research and development in metallurgy are light alloys, extreme alloys and composites, new and improved steels, advanced superconductors, scalable thermoelectrics, biocompatible metallurgy, 3D microparticles and sensors, automated additive production, development of combinatorial alloys, coating and surface protection, powder metallurgy, predictive modelling, metrology, recycling, refining and reuse of critical and high-value metals.

The research and development objectives are based on the annex to the National RIS3 Strategy, which responds to the priorities contained in the List of Comprehensive Scientific Themes prepared by the umbrella organization Hutnictví železa, a.s.

R&D expenditure in 2015 in Division 24 amounted to CZK 322 million, with total R&D expenditure in this division being up 9.5% from 2011. The bulk of the funds were expenditures from business resources (Chart
Compared to the other divisions in the manufacturing industry, CZ-NACE 24 had relatively high public expenditures; in 2011 the amount of these expenditures was even CZK 109 million, which was more than one third of the total R&D expenditures in that year.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include ŽÍKAS, a.s., TŘINECKÉ ŽELEZÁRNY, a. s., PILSEN STEEL s.r.o., VÚHŽ a.s. and ArcelorMittal Ostrava a.s.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation segment were allocated in 2015–2016 a subsidy amounting to CZK 155.5 million, which was divided among a smaller number of enterprises from five of the Czech Republic’s regions. In terms of the total volume of subsidies, the largest beneficiary is the South Moravian large enterprise První brněnská strojírna Velká Bítěš, a.s. (the project “Research and development of advanced technologies for the precision casting of new types of castings of thermally exposed turbocharger parts from nickel-based superalloys”). The most important beneficiary among medium-sized companies is TOP ALULIT s.r.o. (a project exploring the possibilities of product and process innovation) from the Central Bohemian Region. Only a fraction of the projects in this professional group are implemented by small enterprises.

14.6 DIVISION SUMMARY AND PROSPECTS

To assess the prospects of the Czech steel industry, it is necessary to emphasize that it is a sector with high energy intensity, whose existence is tied to addressing environmental burdens and impacts. It is also a crucial sector in terms of employment with a significant regional aspect.

The way to achieve and maintain competitiveness of the steel industry in the Czech Republic is:
– research, development and innovation
– optimizing the portfolio of capacities (in terms of market, orders and concentration of production to the most progressive technologies);
– the direction of vertical integration (to raw materials and energy) has a higher priority today than the horizontal direction of cooperation and capital merger.
Future successful development of steelmaking requires special attention to environmental issues. In some aspects, this could pose risk to the very existence of the steel industry in the Czech Republic. For equivalent conditions, it is necessary to:

– establish and maintain fair conditions in the field of environment and energy;
– in this sense, promote solutions that do not harm and endanger industrial companies;
– prevent the adoption of legislation that does not affect all sources of pollution (air, waste, water) and is discriminatory to the industrial sectors.

The biggest threats to the steel industry are:

– ineffective anti-dumping and anti-subsidy measures by the European Commission against imports of metallurgical material from third countries;
– reducing investment in the energy sector;
– continued downward pressure on steel prices resulting from excess supply over demand and a fall in oil prices (lower investment in production and transport capacities);
– setting unrealistic targets in the greenhouse gas trading system (EU ETS) by 2030; it can lead to the elimination of the sector and its relocation outside the EU to countries and regions with inadequate or no climate protection policy.

Note: Photo Petr Tkáč for Třinecké Železárny
Note: Photo Petr Tkáč for Třinecké Železárny
15.

**CZ-NACE 25 MANUFACTURE OF FABRICATED METAL PRODUCTS, EXCEPT MACHINERY AND EQUIPMENT**

15.1 DIVISION CHARACTERISTIC

*CZ-NACE 25 division is broken down into the following groups:*
- 25.1 Manufacture of structural metal products;
- 25.2 Manufacture of radiators and boilers for central heating, metal reservoirs and containers;
- 25.3 Manufacture of steam generators, except central heating hot water boilers;
- 25.4 Manufacture of weapons and ammunition;
- 25.5 Forging, pressing, stamping and roll-forming of metal; powder metallurgy;
- 25.6 Treatment and coating of metals; machining;
- 25.7 Manufacture of cutlery, tools and general hardware;
- 25.9 Manufacture of other fabricated metal products.

Division CZ-NACE 25 includes the manufacture of “purely” metal products, which are usually static, as well as the manufacture of weapons and ammunition.

The breadth of products and technologies that are included in this division is tremendous – from pins to nuclear reactors. Despite the variety of products of CZ-NACE 25, however, all production groups in the division have a unifying feature in that the original material input consists of traditional metal semi-finished products manufactured in CZ-NACE 24 Manufacture of basic metals, metallurgical metal processing and foundry industry. A closer analysis of the production of individual manufacturing companies involved in metalworking reveals that many companies seek to further increase the added value of their products by focusing on the subsequent assembly of their metalworking products into engineering assemblies, and thus these companies have much more of a character of engineering manufacturers.

*Table 15.1.1 – Shares of groups in CZ-NACE 25 division in 2016 (%), division = 100 %*

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
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<td>18.9</td>
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<td>25.4</td>
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<td>20.5</td>
<td>3.7</td>
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</tbody>
</table>

*Source: CZSO, 2016 calculations MIT*
Most significant for the division are medium-sized enterprises with a share of more than one third of revenues, value added and employed persons. Large enterprises account for a smaller share of the division. Small enterprises make up approximately 20% of the division.

Groups 25.9, 25.7 and 25.6 contribute most to the division’s revenues, and their significance is quite similar. Group 25.1 has a slightly lower share. The significance of the individual groups in other indicators is shown in Table 15.1.1.

### 15.2 DIVISION DEVELOPMENT

In 2016, as in 2015, the generation of economic value added grew and reached positive values, i.e. the enterprises in the division created value for their owners. The main cause of the favourable development of economic value added was the development of labour productivity, which continued to grow. The largest improvements in economic value added were seen in groups 25.9, 25.7, 25.1 and 25.3. By the end of 2016, all groups achieved positive economic value added (except group 25.3).

CZ-NACE 25 ranked sixth in revenues for own products and services within the manufacturing industry (enterprises with 50+ employees), with a share of 4.9% in 2016. In terms of the average number of employees in the manufacturing industry, its share was 10.9%, the third highest.

### 15.3 MAIN ECONOMIC INDICATORS

The development of selected economic indicators (Chart 15.3.1) in 2008–2016 is very positive. After the values dropped in 2009, they rose for all indicators.

The development of the CZ-CPA 25 commodity price index in the table clearly reflects the influence of the prices of the input material, with CZ-CPA 25.1 and 25.2 (with relatively high weight of processed material, mostly steel) being unstable as opposed to groups with a higher share of different technologies (CZ-CPA 25.5, 25.7). In 2013, price formation was influenced by a significant change in the EUR/CZK exchange rate. Since 2014, prices have stabilized or slightly decreased (Chart 15.3.2).

The development of Spread, the relative economic profit indicator, suggests a very progressive improvement in the economic position of the division; from very negative values in 2009, it started gradually rising in 2012 towards positive values, which were improving year-on-year in the following years, especially between 2014 and 2016. With reduction of risk, this was especially due to increased return on equity. Developments in Spread show a very favourable development of revenues, added value and labour productivity (Chart 15.3.3).
**Chart 15.3.1 – Major economic indicators of CZ-NACE 25 division**

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<td>Value added (CZK m)</td>
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<td>Average number of employees</td>
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</tbody>
</table>

**Source:** CZSO, MIT calculations

*This is the proportional monthly share calculated from yearly data*

**Chart 15.3.2 – Price development of CZ-CPA 25 (2005 = 100 %)  Chart 15.3.3 – Spread (ROE – re) CZ-NACE 25 (in %)**

**Source:** CZSO, MIT calculations

Note: Groups 25.3, 25.4 and 25.6 are not monitored
15.4 FOREIGN TRADE

15.4.1 DEVELOPMENT OF FOREIGN TRADE

After a drastic year-on-year decrease in the CZ-CPA 25 imports into the Czech Republic in 2009, the year-on-year growth recovered in the following years but its dynamics was moderated. In 2016, imports amounted to more than CZK 166 billion, up by 4.8% year-on-year. Exports amounted to CZK 229.5 billion, up 4.2% from 2015. The foreign trade balance is positive throughout the monitored period, reaching more than CZK 63 billion in 2016 (see Chart 15.4.1).

CZ-NACE 25 enterprises are significantly involved in the export of investment units. As part of export promotion provided by the Ministry of Industry and Trade, members of the Association of Suppliers of Investment Units use the programme of Czech official participation at international trade fairs and exhibitions.

Chart 15.4.1 – Product export, import and balance of foreign trade in CZ-CPA 25 (CZK m)

Source: CSO, data as of 3 May 2017

15.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

Both in the export and import of CZ-CPA 25 products, traditionally the largest trading partner of the Czech Republic is its closest western neighbour – Germany (see Chart 15.4.2). Germany’s import and export shares hovered slightly below 40% over the years. This is due to the mutually beneficial geographic position of both countries and economic links (the same multinational companies operating in the territories of the two states).

Chart 15.4.2 – Foreign trade with CZ-CPA 25 products

Source: CZSO, data as of 3 May 2017
15.5 RESEARCH AND DEVELOPMENT

R&D expenditure in 2015 in Division 25 amounted to CZK 1,207 million, with total R&D expenditure in this division being up more than 56% from 2011. The bulk of the funds were expenditures from business resources. In addition, from 2012 until 2014 the expenditures from public foreign sources increased, reaching almost CZK 100 million in 2014. By contrast, national public spending has been declining since 2010.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include VÍTKOVICE POWER ENGINEERING a.s., První železářská společnost Kladno, s.r.o., ATOMA - tepelná technika, s.r.o. and ŠKODA JS a.s. Also, AdvaMat s.r.o. is involved in the ICARUS project (Horizon 2020).

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation segment were allocated in 2015–2016 a subsidy amounting to CZK 487.2 million, which was divided among almost 80 enterprises of varying sizes from the entire Czech Republic. The highest support in terms of the total volume of the subsidy was granted to a small enterprise KNOMI, s.r.o. (a project investigating the possibilities of innovation in the production of adjustable connections of hydraulic circuits). Among the beneficiaries is a high percentage of medium-sized enterprises, the most important of which is TGS nástroje-stroje-technologické služby spol. s.r.o. (the project “Construction of a Technological Centre”) from the Pilsen Region. The largest beneficiary among large enterprises is ALUKOV a.s. (the project “Construction of a Research and Development Centre”) from the Pardubice Region.

**Chart 15.5.1 – Expenditure on research and development in CZ-NACE 25 (CZK m)**

Source: CSO, MIT calculations (for methodological reasons the figures may differ from the data published by the CSO)

15.6 DIVISION SUMMARY AND PROSPECTS

Metalworking as well as mechanical engineering have had a long-standing tradition in the Czech Republic. The need to use metals in the production of components for final product assembly and manufacture increases.

This is due to the utility properties of metals. With the development of the engineering industry and with the support of primarily the automotive industry, the demand in the Czech Republic for metal components in these divisions, for joining material and for increasingly technologically complex tools is increasing. Another major buyer of metalworking products is the construction industry. Metal constructions and prefabricated
components are becoming increasingly popular in the building industry and are an integral part of virtually every investment assembly.

CZ-NACE 25 is not among significant environmental polluters (although the division includes surface treatment and metal refining technologies which use environmentally hazardous chemicals); the businesses treat their waste in accordance with applicable legislation.

With the rising standard of living, variety of supply and quality of final products in the Czech Republic, sales of metal products for ordinary consumers have also increased. In the global competitive environment, companies have succeeded in the last few years in winning larger as well as smaller contracts within investment assemblies. Many companies have maintained and further expanded their markets.

For these reasons, manufacture of metal structures and metalworking products in the Czech Republic has very good prospects for further development in a challenging competitive environment.
16.

CZ-NACE 26 MANUFACTURE OF COMPUTER, ELECTRONIC AND OPTICAL PRODUCTS

16.1 DIVISION CHARACTERISTIC

CZ-NACE 26 division is broken down into the following groups:
- 26.1 Manufacture of electronic components and boards;
- 26.2 Manufacture of computers and peripheral equipment;
- 26.3 Manufacture of communication equipment;
- 26.4 Manufacture of consumer electronics;
- 26.5 Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks;
- 26.6 Manufacture of irradiation, electromedical and electrotherapeutic equipment;
- 26.7 Manufacture of optical instruments and photographic equipment;
- 26.8 Manufacture of magnetic and optical media.

The CZ-NACE 26 division has long been one of the key sectors of the Czech economy and is one of the most important and decisive sectors of the manufacturing industry. Electronics and electrical engineering is a subcontractor for many other sectors, in particular the automotive and engineering industries. The division includes labour-intensive production as well as highly productive automated production.

The division is dominated by large enterprises, which account for over 83% of revenues, 65% of value added and 60% of employed persons. Large enterprises are followed by medium-sized enterprises, which account for 11% of revenues, 22% of value added and 23% of employed persons.

The shares of the individual groups in the division are different for selected indicators. Group 26.5 has the largest share in the number of employees and value added, but its share of revenues is half. Group 26.2 has the largest share in revenues, but its share in value added is rather smaller. Shares of other groups in individual indicators are shown in Table 16.1.1

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
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<td>0,9</td>
<td>0,3</td>
<td>0,2</td>
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<td>3,6</td>
</tr>
<tr>
<td>26.8</td>
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<td>0,2</td>
<td>0,3</td>
<td>0,1</td>
<td>3,9</td>
</tr>
</tbody>
</table>

Source: CZSO, 2016 calculations MIT
16.2 DIVISION DEVELOPMENT

The most important producers of the CZ-NACE 26 division are ON Semiconductor Czech Republic, s.r.o. in group 26.1., Foxconn CZ s.r.o. and Inventec (Czech) s.r.o. in group 26.2, CommScope Czech Republic s.r.o. and ADC Czech Republic, s.r.o. in group 26.3, Panasonic AVC Networks Czech, s. r. o. in group 26.4, Continental Automotive Czech Republic s.r.o., Fei Czech, s.r.o and TESCAN Brno, s.r.o. in group 26.5, UJP Praha in group 26.6 and Meopta-optika s.r.o. in group 26.7.

The FOXCONN CZ s.r.o. (CZ-NACE 26.2) was fifth in “TOP 100 Czech Companies in 2016” in terms of revenues, which were approximately CZK 118 billion; this company from Pardubice has the most significant influence on CZ-NACE 26.2.

For the entire year 2016, the turnover of the domestic electronics and appliances market amounted to CZK 74.38 billion, which is 2.2% more than in 2015. Trends in individual segments were long-lasting. The sales of smartphones, telecommunication devices, and large and small household appliances are growing. On the other hand, the market for office equipment and cameras declined last year. There was only moderate growth last year in consumer electronics.

Sales (not production) of computers, laptops and tablets in the Czech Republic dropped 18% to 944,000 units last year. Sales of computer manufacturers have been declining since 2012. Gartner surveys show that users no longer want to change their PCs so often. The situation has not even improved with the emergence of hybrid PCs, i.e. touch tablets with a separable keyboard and Windows operating system, which can replace notebooks and tablets. The decline in traditional forms is likely to continue, but this year, improvements should be made thanks to new technologies. These include, for example, gaming laptops and desktops that make up for the slump in the traditional segment.

IDC has released a report on the development of the Czech smartphone market in 2016, which says that the market grew by 2.4%. 2.7 million new phones were imported to the Czech Republic in 2016. Approximately 80% of phones delivered to the Czech Republic in the fourth quarter of 2016 supported the LTE standard. The average LTE phone price dropped by 7.9% year-on-year. In terms of manufacturers, the market was divided among four large brands, Samsung, Huawei, Lenovo and Apple, with Samsung holding the top spot with a market share of about 30%.

16.3 MAIN ECONOMIC INDICATORS

In 2016, the segment reported positive economic value added. The change in economic value added over the period from 2014 to 2016 was driven by improvements in risk and indebtedness. In groups 26.2 and 26.5 there is a difference in the generation of economic value added. Group 26.2 recorded year-on-year decline in 2016 and posted negative economic value added. On the other hand, group 26.5 has achieved positive economic profit in this period and increased its value year-on-year. One of the highlights of the group is that every third electronic microscope is produced in the Czech Republic.

The development of selected indicators, such as revenues, number of employees and added value and labour productivity, has the form of a W-wave. Lower values of indicators were mostly recorded in 2009 and 2013. Revenues and value added have exceeded 2008 levels. Average wages and labour productivity were increasing throughout the entire period. The number of units was practically the same throughout the period (Figure 16.3.1).

In 2016, a total of 3,255 businesses were operating in CZ-NACE 26, with revenues of more than CZK 309 billion, employing 44,267 people, and creating book value added of CZK 36.3 billion.
Producer prices in the CZ-NACE 26 division show a downward trend, which is generally attributable to the increase in utility value while simultaneously reducing prices as a result of increased production. Due to the considerable influence of transnational chains in this sector, there is also the effect of transfer pricing policies between parents and their subsidiaries. However, they did not reach the 2005 level for the entire division. (Chart 16.3.2).

Efficiency measured by Spread shows an improving trend that has been driven by improving return on equity; ROE became positive in 2012, while Spread in 2014. However, the decline in profitability in 2015 dragged Spread back to red (Chart 16.3.3). The overall result is negatively affected by group 26.8 Manufacture of magnetic and optical media and 26.4 Manufacture of consumer electronics, which had negative Spread throughout the reference period. In 2016 Spread improved very slightly (Chart 16.3.3).
16.4 FOREIGN TRADE

16.4.1 DEVELOPMENT OF FOREIGN TRADE

In 2016, exports of CZ-CPA 26 products were almost CZK 562.7 billion, i.e. a year-on-year decline of 2.0%. Export commodity structure is dominated by the dynamically developing product group 26.2 Manufacture of computers and peripheral equipment with 47%, followed by group 26.3 Manufacture of communication equipment with a share of 22%. Similar situation is in imports, where product group 26.2 accounts for almost 40% and group 26.3 accounts for almost 26%. Total imports fell to almost CZK 557.6 billion, i.e. a decrease of almost 8% compared to 2015. This results in a slightly positive trade balance (Chart 16.4.1).

The positive balance was also recorded in this commodity group between 2011 and 2014 and is strongly influenced by the transfer pricing policy of multinationals. The positive balance has been consistently reported only by the product group 26.2 Manufacture of computers and peripheral equipment and group 26.4. Manufacture of consumer electronics.
16.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

The territorial structure of foreign trade is shown in Chart 16.4.2. The balance with Asia in 2016 was significantly negative – CZK -300 billion (exports of only CZK 25 billion, imports of about CZK 325 billion). Germany continues to have dominant position in exports (CZK 178 billion), which is mainly due to the ownership of companies under foreign control, followed by the United Kingdom (CZK 42.5 billion), France (CZK 37 billion), the Netherlands (CZK 32 billion) and Slovakia (CZK 28.6 billion). The largest import territory is China (CZK 255.5 billion), followed by Germany (CZK 63.3 billion), the United Kingdom (CZK 27.9 billion), the Netherlands (CZK 24.7 billion) and Ireland (CZK 17.8 billion).

Chart 16.4.2 – Foreign trade with CZ-CPA 26 products

16.5 RESEARCH AND DEVELOPMENT

R&D expenditure in 2015 in Division 26 amounted to CZK 1,975 million; since 2011, the total R&D expenditure has been increasing. The increase in total R&D expenditure in this division between 2011 and 2015 was 71%. The bulk of the funds were expenditures from business resources. It can be said that between 2011 and 2015 the division maintained a relatively stable level of public funds from abroad.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include UJP PRAHA a.s., ON SEMICONDUCTOR CZECH REPUBLIC, s.r.o., TESCAN Brno, s.r.o. a TTC TELEKOMUNIKACE, s.r.o. There are two companies involved in Horizon 2020 projects in this sector. FEI Czech Republic s.r.o. is a member of the SeNaTe project and also the PSI (Photon Systems Instruments), spol. s r.o. is involved in the SE2B project.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development segment were allocated in 2015–2016 a subsidy amounting to CZK 435.5 million, which was divided among approximately 50 enterprises of varying sizes from most of the Czech Republic’s regions. The highest support in terms of the total volume of the subsidy was granted to FEI Czech Republic s.r.o., a large enterprise from South Moravian Region (the project “Small dual beam, research and development”). A high percentage of small enterprises and micro-enterprises are among the beneficiaries, the most significant of which is the South Bohemian DataPartner s.r.o. (the project “Research of high-precision measuring methods and development of instruments for evaluation of nuclear-physical quantities and safe management of critical processes”).

Source: CZSO, data as of 3 May 2017
Companies in CZ-NACE 26 are dependent on a sufficient number of technically-educated people. For this reason, it is also necessary in the future to support education in technical fields, to effectively support research projects and to invest in science and innovation. Similarly, the inflow of foreign direct investment, especially with higher value added, should be further stimulated.

Further development of the division, which depends on the economic development of the whole European Union (especially Germany), is predicted by analysts as follows: In the early periods, IT markets were dominated by large servers, storage and consulting services. These devices and services will still be needed, along with mobile phones and PCs. According to Gartner, however, the cloud will be the basis for all digital business activities. Gartner points to the progressive digitization of businesses that brings opportunities for the main “digital giants” i.e. Google, Apple, Facebook, Amazon, Baidu, Alibaba and Tencent. In 2021, probably one fifth of all individual activities will in some way be linked to the services of at least one of these companies. These companies are already becoming an intermediary between the overwhelming majority of consumer-focused businesses and their customers. It is expected that customers will want in the coming years to save on the operation of their computers, as well as their slower obsolescence, new security options and, of course, high-quality service.

In its forecast, Context talks about the global promising future of the 3D printer market. This applies especially to the industrial segment. The segment of desktop 3D printers, which has grown strongly in recent years, is expected to continue this year and show a year-on-year increase in sales of 40%. Overall, 39% more 3D printers are to be sold this year than in 2016, and Context expects the market to keep this growth rate for the years to come. According to Contex, the return of growth to the industrial segment will be underpinned by new technologies and ways of using 3D printing. Specifically, this should entail a greater availability of metal 3D printers and the growing interest of specific sectors such as the aerospace industry, the automotive industry or the health sector.

Another forecast (IDC) expects an overall increase in sales of “wearable electronics” by 18.3% per year by 2021. The sale of smart clothes and headphones should be particularly strong. At the same time, analysts are talking about the gradual segmentation of individual categories and the emergence of models targeting more specific user groups.

As mentioned above, an increasing number of companies will be dealing with the repeated use of materials. The transition from linear to circular economy is a prerequisite for the sustainable development of our society. The circular economy requires innovation in the reuse of materials, components, products and related business strategies.
17. CZ-NACE 27 MANUFACTURE OF ELECTRICAL EQUIPMENT

17.1 DIVISION CHARACTERISTIC

CZ-NACE 27 division is broken down into the following groups:

- 27.1 Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus;
- 27.2 Manufacture of batteries and accumulators;
- 27.3 Manufacture of optical and electrical cables, electric conductors and electrical wiring equipment;
- 27.4 Manufacture of electric lighting equipment;
- 27.5 Manufacture of domestic appliances;
- 27.9 Manufacture of other electrical equipment.

Manufacture of electrical equipment is a historically important industry within the manufacturing industry. It has a very strong position in the Czech economy and a wide range of products. The complementary character of the production of the electrical engineering industry creates conditions for the competitiveness of other branches of the manufacturing and energy industries. Its products are also used in transport and communications or in the consumer sector. This division is one of the largest employers in the manufacturing industry.

The division is characteristic for large businesses, which account for 3/4 of revenues, almost 70% of value added and employ 60% of persons. Medium-sized enterprises and small and micro-enterprises account for the rest of the indicators in this division.

The most important group, as measured by revenue share, is 27.1. Other major groups are 27.4 and 27.3. The importance of the groups is shown in Table 17.1.1.

Table 17.1.1 – Shares of groups in CZ-NACE 27 division in 2016 (%; division = 100 %)

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>27.1</td>
<td>50,4</td>
<td>50,7</td>
<td>44,7</td>
<td>42,8</td>
<td>41,2</td>
<td>47,0</td>
<td>47,8</td>
<td>70,7</td>
</tr>
<tr>
<td>27.2</td>
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<td>6,1</td>
<td>4,5</td>
<td>1,3</td>
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</tr>
<tr>
<td>27.3</td>
<td>14,7</td>
<td>12,8</td>
<td>14,6</td>
<td>14,7</td>
<td>10,8</td>
<td>11,9</td>
<td>16,3</td>
<td>2,5</td>
</tr>
<tr>
<td>27.4</td>
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<td>18,3</td>
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<td>12,4</td>
<td>13,1</td>
<td>19,4</td>
</tr>
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</table>

Source: CZSO, 2016 calculations MIT
17.2 DIVISION DEVELOPMENT

Overall, the division was successful in 2016. In 2016, the share of CZ-NACE 27 in the manufacturing industry’s total revenue was the same as in previous years, i.e. 6.7%, which is the 5th position among the sectors. The labour productivity was slightly below the manufacturing industry average, and the division accounted for approximately 8.1% of the number of employees.

In 2016, a total of 12,257 businesses were operating in CZ-NACE 27, with total turnover of more than CZK 291 billion, employing more people than the year before, i.e. 101,773 persons, and creating higher book value added of CZK 77 billion.

Among the most important companies are: 27.1 - Siemens, s.r.o., ABB s.r.o., 27.2 - Johnson Controls Autobaterie spol. s r.o., 27.3 - nkt cables s.r.o., MD Elektronik s.r.o., 27.4 - Automotive Lighting s.r.o., HELLA AUTOTECHNIK NOVA, s.r.o., 27.5 - Miele technika s.r.o., Mora Moravia, s.r.o., 27.9 - AVX Czech Republic, s.r.o.

17.3 MAIN ECONOMIC INDICATORS

The division posted a positive economic value added, but its creation declined a little year-on-year. The increase in economic value added was largest in group 27.1. In other words, the development of economic profit was influenced by its development in the most important groups of the division. This is also evident from the position of companies in the top 100 Czech companies list 2016, which presents to the public the economic results of the participating companies. The most successful was a group 27.1. company, Siemens s.r.o., which placed 22nd. Another important player in this group ABB s.r.o., which placed 44th, taken over this year by Automotive Lighting s.r.o. which placed 31st. Other top 100 companies include Tyco Electronics Czech s.r.o. (74th) and Miele technika s.r.o. (81th).

It can be said that in the economic indicators under evaluation, the division developed favourably in 2016. Revenues and value added continued to grow, except for 2009, reaching significantly higher levels in 2016 than in 2008. Labour productivity and average wage indicators also grew and reached much higher values in 2016 than in 2008. The number of employed persons rose very slightly, except declines in 2009 and 2012. The number of units was increasing until 2010 and then started declining (Chart 17.3.1).

The overview of indices of industrial producer prices in 2008–2016 shows the highest increase in prices in 2011 in group 27.3, when they reached maximum and then were declining year-on-year until 2014 (Chart 17.3.2). The prices in other groups were rather fluctuating, but without significant spikes. Prices were pushed down by high competition. For example, in group 27.4, there has been strong competition in the market (especially due to Chinese imports) in recent years, leading the manufacturers to more frequent innovations and lower prices for older products.

The Spread indicator has been positive since 2010, indicating the very high efficiency of the industry. This was due to ROE, which has long been positive, as well as the risk rate of CZ-NACE 27, as measured by the alternative cost of capital re, which has been steadily decreasing (see Chart 17.3.3).
**Chart 17.3.1 – Major economic indicators of CZ-NACE 27 division**

- **Number of units**
- **Average number of employees**
- **Sales (CZK m)**
- **Value added (CZK m)**

**Chart 17.3.2 – Price development of CZ-CPA 27 (2005 = 100 %)**

**Chart 17.3.3 – Spread (ROE – re) CZ-NACE 27 (in %)**

*This is the proportional monthly share calculated from yearly data*

**Source:** CZSO, MIT calculations

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**Chart 17.3.1 – Major economic indicators of CZ-NACE 27 division**

<table>
<thead>
<tr>
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<td>13,773</td>
<td>13,208</td>
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<td>Average number of employees</td>
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<td>93,072</td>
<td>90,726</td>
<td>95,317</td>
<td>93,283</td>
<td>94,179</td>
<td>97,803</td>
<td>99,112</td>
<td>101,773</td>
</tr>
</tbody>
</table>

**Source:** CZSO, MIT calculations

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**Chart 17.3.2 – Price development of CZ-CPA 27 (2005 = 100 %)**

**Chart 17.3.3 – Spread (ROE – re) CZ-NACE 27 (in %)**

**Source:** CZSO, MIT calculations

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**Plot 17.3.1 – Main economic indicators of division CZ-NACE 27**

**Plot 17.3.2 – Price development CZ-CPA 27 (2005 = 100 %)**

**Plot 17.3.3 – Spread (ROE – re) CZ-NACE 27 (in %)**

**Source:** CZSO, MIT calculations
17.4 FOREIGN TRADE

17.4.1 DEVELOPMENT OF FOREIGN TRADE

The commodity structure of exports was clearly dominated by product group 27.1 Manufacture of electric motors, generators, etc., with a 33% share, followed by the product group 27.3 Manufacture of wiring and wiring devices with 19% share. The situation was similar for imports where product group 27.1. accounted for 35%. However, it was followed by product group 27.9 Other electrical equipment with a share of 20%, which was followed by product group 27.3 with almost the same share. Since 2012, group 27.5 Manufacture of domestic appliances has had a positive foreign trade balance, although many of the products are imported from Asia.

![Chart 17.4.1 – Product export, import and balance of foreign trade in CZ-CPA 27 (CZK m)](image)

Source: CZSO, data as of 3 May 2017

The total export from this division in 2016 was CZK 362.8 billion, most of which was directed to EU countries (82%). Exports to Asia were only around 5%. Imports totalled nearly CZK 277 billion, of which approximately CZK 180.5 billion (65%) was imported from the EU, while Asia amounted to around CZK 75 billion (27%).

17.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

The dominant position was held by Germany, which is mainly due to the ownership relations of companies under foreign control. Germany is also one of the largest import territories. In 2016, turnover with Germany reached CZK 229 billion, the balance with Germany was positive at CZK 56.2 billion (imports of CZK 86.5 billion and exports of CZK 142.7 billion). In imports, Germany was followed by China, Poland, Italy, Hungary and Austria. Except for Germany, the Czech Republic also had trade surplus with France, Slovakia, the UK and Russia. Balance was negative especially with China, with a turnover of CZK 53.4 billion (of which imports of CZK 45.8 billion and exports of CZK 7.6 billion). The negative balance increased again compared to the previous year.
17.5 RESEARCH AND DEVELOPMENT

R&D expenditure in 2015 in Division 27 amounted to CZK 3,351 million, with total R&D expenditure in this division being up more than 100 % from 2011. The bulk of the funds were expenditures from business resources; between 2011 and 2015 the amount of national public support amounted to CZK 115 million on average and the average amount of public expenditure from abroad was around CZK 26 million.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include VUES Brno s.r.o., ČKD ELEKTROTECHNIKA, a.s., ATAS elektromotory Náchod a.s. and Siemens Electric Machines s.r.o.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development segment were allocated in 2015–2016 a subsidy amounting to CZK 362.9 million, which was divided among approximately 50 enterprises of varying sizes from most of the Czech Republic’s regions. The highest support in terms of the total volume of the subsidy was granted to CLASIC CZ, spol. s r.o., a small enterprise from Central Bohemia (the project “Research and development of a complex technology for the production of special tungsten alloys based on powder metallurgy”). The most important beneficiary among medium-sized companies is CONTEG, spol. s r.o. (the project “Implementation of the production of innovative industrial switchboards and cooling systems) from the Vysočina Region; among large companies, it was NKT CABLES AUTOMOTIVE s.r.o. (the project “Special technology for the manufacture of new conductors”) from the Hradec Králové Region.

Electrical engineering is a field that is very global, our companies can get contracts around the world, but they also have global competitors. In addition, it is closely related to all industrial fields. However, only those companies that focus on research and development can stay on the cutting edge of the industry.

The main challenge concerns the organization of research in Industry 4.0. A system of applied research centers is being built at the national level with the responsibility for technological support for meeting the objectives of Industry 4.0 as the backbone of the whole implementation. There is a sufficient number of research topics, from the construction of collaborative and mobile transport robots, through technical connection of machines, equipment and people to communication networks, security and interfaces. Another important topic for research is the issue of cybernetic aspects of managing complex systems and system integration. Czech research organizations and companies are among the best, for example, in the use of machine vision, artificial intelligence or big data.
17.6 DIVISION SUMMARY AND PROSPECTS

The CZ-NACE 27 division is significant due to its share of imports of materials, components and parts for production and assembly, a wide range of technological processes, a significant share of transnational capital for new investments, the use of progressive technologies, but also the use of logistics networks of multinationals and the need for highly qualified research, development and production workers. Strong competition forces the manufacturer to constantly innovate its products, look for production savings and new trends in the industry. Further development and expansion of this division depends on sufficient number of qualified technical experts, which is supported by the Ministry of Industry and Trade.

In the following years, also in relation to the “fourth industrial revolution”, the electrical engineering industry will be characterized by the creation of new jobs and the extinction of old ones. Less qualified professions will be gradually pushed out of the market. In countries where the electrical engineering industry is built on services with high added value and on research and development, university graduates account for 30-50% of all jobs in the sector. In the Czech Republic, this number is so far much smaller. The key feature of the fourth industrial revolution is digitization – of the product, the manufacturing process and the subsequent operation of the product. It will increase production flexibility and shorten the innovation cycle. In a virtual environment, it is possible to create prototypes, simulate their functionality and operating parameters, i.e. create a “digital twin”, which allows the use of flexible automation elements and autonomous robots. It is and will be important for companies to quickly innovate and respond to customer demand.
18.

CZ-NACE 28 MANUFACTURE OF MACHINERY AND EQUIPMENT N.E.C.

18.1 DIVISION CHARACTERISTIC

CZ-NACE 28 division is broken down into the following groups:
- 28.1 Manufacture of general-purpose machinery;
- 28.2 Manufacture of other general-purpose machinery;
- 28.3 Manufacture of agricultural and forestry machinery;
- 28.4 Manufacture of metal forming machinery and machine tools;
- 28.9 Manufacture of other special-purpose machinery.

An important part of the Czech manufacturing industry is CZ-NACE 28 Manufacture of machinery and equipment n.e.c. It covers a very wide range of equipment that subject materials to mechanical or thermal effects or perform manufacturing processes on materials (e.g. handling, spraying, weighing or packing), including the manufacture of components that produce and use power. It also includes specially manufactured parts for these machines and equipment. This division also includes fixed, movable or manually operated equipment, whether for industry, craft, construction, agriculture or household use. The division also covers the manufacture of special equipment for passengers or freight.

In 2015, this division accounted for almost 8% of revenues for own products and services of the manufacturing industry (MI), thus placing third in the manufacturing industry (following CZ-NACE 29 Manufacture of motor vehicles and CZ-NACE 26 Manufacture of computer electronic and optical products).

The division is dominated by large and medium-sized enterprises. Large enterprises account for 56% of revenues, 52% of value added and 48% of employed persons. The shares of medium-sized enterprises ranged from 31% to 36%.

The most important group is group 28.2, which accounts for approximately one-third of the selected indicators in the division, with the exception of the number of units, which make up nearly two-thirds. Groups 28.1 and 28.9 account for, save for exceptions, less than a quarter of the section. Other groups are less significant in terms of their size (Table 18.1.1).

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
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<tbody>
<tr>
<td>28.1</td>
<td>24,4</td>
<td>23,3</td>
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</tr>
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<td>28.3</td>
<td>6,0</td>
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<td>5,5</td>
<td>6,2</td>
<td>6,6</td>
<td>5,0</td>
</tr>
<tr>
<td>28.4</td>
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<td>9,3</td>
<td>8,2</td>
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<td>10,6</td>
<td>9,5</td>
<td>4,6</td>
</tr>
<tr>
<td>28.9</td>
<td>24,5</td>
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<td>21,9</td>
<td>17,5</td>
<td>19,6</td>
<td>25,0</td>
<td>17,1</td>
</tr>
</tbody>
</table>

Source: CZSO, 2016 calculations MIT
18.2 DIVISION DEVELOPMENT

An important representative of the economically successful group 28.2, which accounts for 52.1% of revenues for own products and services of the whole group, is class 28.25 Manufacture of non-domestic cooling and ventilation equipment, which also places first in CZ-NACE 28, not only in revenues, but also in the number of business entities with more than 50 employees. Cooling technology has a large industrial base in the Czech Republic, new knowledge is directly applicable in science and industrial practice. Successful R&D solutions in the field of cooling are a potential stimulus for the export of Czech technologies and other innovations. The Czech Republic is a member of the International Institute of Refrigeration, which provides the Member States with the latest knowledge in the fields of: cryotechnology, gas liquefaction and separation, heat and mass transfer, refrigeration equipment, cryobiology, cryomedicine, food technology, refrigerators and freezers, refrigerated land transport, air conditioning, heat pumps and energy recovery.

18.3 MAIN ECONOMIC INDICATORS

In 2015 and 2016, the division enjoyed high positive economic value added and even improved its growth year on year. This was due to the favourable development of the risk and indebtedness of the division. Group 28.2 is not only the most significant, it also reaches the highest values of economic value added and recorded its largest increase in the division. On the other hand, groups 28.1 and 28.9 experienced a drop in economic value added.

The fall in economic value added in groups 28.1 and 28.9 in 2016 was due to unfavourable developments in the largest Czech engineering holding – VÍTKOVICE MACHINERY GROUP, which is the most significant Czech engineering group with a strong position in selected segments of engineering production and supply of large investment assemblies. It includes around thirty companies, of which, in 2016, following long-term problems related to the construction of the Yunus Emre thermal power plant in Turkey. The unfavourable situation of VÍTKOVICE MACHINERY GROUP had a negative impact on the financial situation of some of the subcontractors from groups 28.1 and 28.9.

The year 2016 was also unfavourable for KOVOSVIT MAS, a.s., which is a significant and traditional manufacturer of machine tools. The critical situation was resolved after the entry of a new investor, which, during the second half of 2016, allowed the payroll debt towards employees to be settled and the production to be resumed.

2009 was a critical year for the division due to a fall in revenues and value added. Since 2014, these indicators have been increasing. In 2016, however, revenues very moderately declined. Labour productivity has steadily increased. The average wage increased throughout the period. The number of units peaked in 2010 and was then declining (Chart 18.3.1). The development of the division was favourable in 2008–2016.

Producer prices oscillated with moderate growth; CZ-CPA 28.2 reported highest indices, CZ-CPA 28.1 reported lowest indices, while CZ-CPA 28.9 was stagnant to declining (Chart 18.3.2).

The financial position expressed by Spread had an upward trend; in 2010 and 2011 the division reduced its negative values and moved to positive in 2012. In 2013, however, it rebounded slightly back to negative, due to a fall in return on equity (Chart 18.3.3). The year-on-year decline in profitability in 2015 and 2016 was reflected in the decrease of the positive value of Spread.
Chart 18.3.1 – Major economic indicators of CZ-NACE 28 division

**Graph 18.3.1** – Major economic indicators of CZ-NACE 28 division
- **Number of units**
- **Average number of employees**
- **Sales (CZK m)**
- **Value added (CZK m)**

*This is a monthly aliquot share calculated from annual data.*

**Chart 18.3.2** – Price development of CZ-CPA 28 (2005 = 100 %)

**Chart 18.3.3** – Spread (ROE – re) CZ-NACE 28 (in %)

*This is a monthly aliquot share calculated from annual data.*

Source: CZSO, MIT calculations

Source: CZSO, MIT calculations

Source: CZSO, MIT calculations

Source: CZSO, MIT calculations

Source: CZSO, MIT calculations
18.4 FOREIGN TRADE

18.4.1 DEVELOPMENT OF FOREIGN TRADE

The positive balance and gradually increasing export volumes of CZ-CPA 28 products are indicative of the continuous improvement of the quality, technical level and competitiveness of the products. The positive development of export performance, which is based on R&D investment, increasing employee qualification and company adaptation to increasingly competitive environments, continues.

In the commodity structure of both exports and imports, CZ-CPA 28.1 dominates significantly (in 2016 exports of CZK 172.1 billion, imports of CZK 123.6 billion) and CZ-CPA 28.2 (exports of CZK 174.7 billion, imports of 109.4 CZK billion).

Chart 18.4.1 – Product export, import and balance of foreign trade in CZ-CPA 28 (CZK m)

Source: CSO, data as of 3 May 2017

18.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

The largest volume of machinery and equipment is traditionally exported to Germany. In 2016, exports to this country (as in 2015) accounted for 32% of the total volume of exports. A similar situation is with imports, where imports from Germany traditionally dominate again; in 2015, the share of imports from Germany stood at 39%; in 2016 it accounted for 38% of total imports.

There are no significant changes in shares in other territories which have been steady for several years, with France accounting for 6% of exports. Other traditional countries are Slovakia, the United Kingdom, Poland, Italy and others, ranging from 4% to 5% of total exports.

Chart 18.4.2 – Foreign trade with CZ-CPA 28 products

Source: CSO, data as of 3 May 2017
Import territories have not changed significantly in recent years either. Czech producers are interested in exporting to East Asian countries and negotiations on exports to South American countries are under way.

18.5 RESEARCH AND DEVELOPMENT

Division 28 is among the largest in terms of R&D expenditures. In 2015, R&D expenditures amounted to CZK 3,893 million. Compared to 2011, total R&D expenditures increased in this division by almost 33%. After 2012, there was a significant drop in national public funds. This drop was offset by an increase in business financial resources.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include TOS KUŘIM - OS, a.s., AMF Reece CR, s.r.o., Doosan Škoda Power s.r.o., TAJMAC-ZPS, a.s., and ELMARCO s.r.o. There are four companies involved in Horizon 2020 projects, namely Jihostroj a.s., FOTON, s.r.o., Mavel, a.s. and Doosan Škoda Power s.r.o.

Under the announced calls for the OP EIC for the 2014-2020 programming period, projects focusing on research were allocated in 2015–2016 a subsidy amounting to CZK 1,008.3 million, which was divided among almost 100 enterprises of varying sizes from the entire Czech Republic. The highest support in terms of the total volume of the subsidy was granted to a small South Moravian company EVECO Brno, s.r.o. (project EVELINE – Modern and environmentally friendly energy source running on fuel mix). The most important beneficiary among large companies is VALEO VÝMĚNÍKY TEPLA s.r.o. (the project Introduction of a new production of EGR coolers in EU+other international organisations)

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18.6 DIVISION SUMMARY AND PROSPECTS

One of the important parts of Czech general mechanical engineering is energy engineering, which is currently experiencing development due to increasing global demand for energy. Energy engineering includes the production and supply of equipment across a wide range of industries across general engineering, from the production of turbines, fittings, compressors and pumps to lifting and handling equipment.
The involvement of Czech power equipment manufacturers in supplier consortia is often easier if they are owned by multinational companies which, through their connections and influence, open the way to foreign contracts. At the same time, many purely Czech companies are successful exporters of energy equipment thanks to the many years of tradition and rich references.

As already stated above, the manufacture of non-domestic cooling and ventilation equipment is a class with good prospects for the future, as cooling is involved in all branches of human activity, including safety and quality of food in the chain from harvest to the consumer, air-conditioning ensuring building comfort, pharmaceutical production and health care, low temperature and gas liquefaction techniques or refrigeration equipment in all industries.

The tradition and the current level of manufacture of machine tools, which forms an integral part of the division, creates the conditions for further successful development of the group.

The development, manufacture and sale of machinery and equipment is an indicator of the state and further development of the Czech economy. Division products form an integral part of every investment unit, implicitly expressing the perspectives of this division.
19.

CZ-NACE 29 MANUFACTURE OF MOTOR VEHICLES
(EXCEPT MOTORCYCLES), TRAILERS
AND SEMI-TRAILERS

19.1 DIVISION CHARACTERISTIC

CZ-NACE 29 division is broken down into the following groups:
- 29.1 Manufacture of motor vehicles and engines;
- 29.2 Manufacture of bodies for motor vehicles; manufacture of trailers and semi-trailers;
- 29.3 Manufacture of parts and accessories for motor vehicles and their engines.

The automotive industry (AI) significantly contributes to the overall economic performance of the Czech Republic. Its share in the manufacturing industry, revenues, number of employees and exports are steadily rising. Large businesses are typical for this segment and make up about 95%.

This segment includes, depending on the nature of the production programme, the following product composition: passenger cars, light commercial vehicles and trucks, buses and trolleybuses, snowmobiles, golf carts, amphibious vehicles, fire trucks, trailers and semi-trailers and manufacture of auto parts.

The AI purchases products and services from other manufacturing industry branches, e.g. electrotechnical, metallurgical, chemical, plastics, glass, textile and general engineering branches, and from other related industries and services. For example, in 2016, Barum Continental produced 16.63 million tires for passenger cars, roughly 1.15 million truck tyres, and another 117,000 industrial tyres (the Czech Republic is the 10th largest tyre exporter). AGC Automotive Czech has produced a record-breaking 32 million auto glasses and is one of the largest auto glass plants in Europe. Car lighting makers (Hella, Automotive Lighting, Varroc and Koito) produced about 19 million units. For example, the Czech AI also produced over 2 million steering boosters, more than 14 million car springs, over 3 million air conditioning units, as well as millions of condensers, evaporators, coolers and radiators, over 20 million filters and millions of other components.

At the end of 2016, there were over 5.3 million passenger cars (PCs), 547,000 light commercial vehicles, 20,000 buses and 183,000 trucks registered in the Czech Republic (in the EU in 2015 there were 256 million passenger cars, 38 million light commercial vehicles, 820,000 buses and 36 million trucks).

In the year 2016, 700,000 used passenger cars were sold in the Czech Republic, which represents an increase of more than 6% compared to 2015. At the average price of CZK 190,900 per vehicle, the total volume of the used car market was almost CZK 134 billion. The number of used car vendors in the Czech Republic is declining. Over five years, their number fell by 279 to 338.

After the end of its life, a vehicle becomes “waste”, which is the source of materials for recovery (iron, plastics, glass, non-ferrous metals, precious elements and others). In the Czech Republic, over 340,000 motor vehicles (passenger cars, trucks and buses) were disposed of in eco-friendly manner in 2016 (more than
6 million vehicles in the EU). Over 36,000 tons of worn tyres were delivered for further treatment (members of the Eltma collective system). This is the equivalent of all tyres of 1.3 million passenger cars. Car batteries also represent an important commodity (Kovohutě Příbram recycled over 77 tons of lead batteries).

The most significant group in the division is 29.3, which accounts for more than 50% of revenues, net turnover, value added and total assets. It even accounts for three quarters of all the persons employed and two thirds of the personal costs in the segment (Table 19.1.1). The number of employees in the automotive industry has been growing since 2009, mainly thanks to component manufacturers.

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>29.1</td>
<td>29,5</td>
<td>47,9</td>
<td>45,6</td>
<td>46,4</td>
<td>53,9</td>
<td>47,7</td>
<td>21,7</td>
<td>7,8</td>
</tr>
<tr>
<td>29.2</td>
<td>1,7</td>
<td>1,1</td>
<td>0,8</td>
<td>0,8</td>
<td>0,9</td>
<td>0,9</td>
<td>2,1</td>
<td>16,8</td>
</tr>
<tr>
<td>29.3</td>
<td>68,8</td>
<td>51,0</td>
<td>53,5</td>
<td>52,8</td>
<td>45,2</td>
<td>51,5</td>
<td>76,2</td>
<td>75,4</td>
</tr>
</tbody>
</table>

Source: CZSO, 2016 calculations MIT

19.2 DIVISION DEVELOPMENT

The automotive industry has a rich history. Some of the historical landmarks include: 130 years since the birth of Count Alexander Kolowrat-Krakowski, a successful racer and member of the board of Laurin & Klement (significantly helped the development of Austria-Hungary’s largest automaker), 105 years since the foundation of Walter, 105 years since the first concessions for bus traffic Czech lands by the then Austrian authorities, 90 years since the founding of Magnetov, 80 years since the manufacture of the first trolleybus in our territory, 80 years since the second place in the Monte Carlo Rally by Zdeněk Pohl / Jaroslav Hausman with ŠKODA Popular in the class up to 1,500 cm³, 70 years since the start of production of Avia trucks, 65 years since the foundation of LIAZ, 50 years since the premiere of Škoda 1000 MBX (443,000 units produced) and the delivery of the unique semi-automatic transmission line LSD 012 (by the then factory Strojírna of the State-owned company České závody motocyklové Strakonice) to the automaker Tatra in Kopřivnice for the machining of blocks of Tatra 128 six-cylinder engines and Tatra 138 eight-cylinder engines (the line weighed 320 tonnes in total), 45 years since the foundation of the Bratislava automotive factory, 40 years since the start of production of Škoda 742 production (commercially known as Škoda 105, Škoda 120, Škoda 125, and Škoda 130 – more than 2 million units produced), the 30th anniversary of the first participation of TATRA vehicles at the Dakar Rally, 25 years of the union between ŠKODA and Volkswagen and the establishment of TEDOM a.s., 15 years since the foundation of DENSO MANUFACTURING CZECH s.r.o. and Toyota Tsusho Europe S.A., Czech.

We have also recorded sales or production milestones: Škoda has manufactured its 18 millionth vehicle, Hyundai Motor Manufacturing Czech s.r.o. (HMMC) has manufactured its 2 millionth vehicle, and Škoda has manufactured its millionth DQ200 transmission in Vrchlabí. Brano opened a new plant for the manufacture of automotive components in Russia.

It is the segment making the most economic value added in the entire manufacturing industry. In 2016/2015, the generation of economic value added increased significantly year-on-year, mainly due to the increase in labour productivity. All groups show positive economic value added and its growth. The main increase was posted by group 29.3. In all groups, the main driver behind the increase in economic value added was labour productivity. Auto part manufacturers are trying to increase their productivity by automating and robotizing production. Company revenues are rising faster than wages.
19.3 MAIN ECONOMIC INDICATORS

It is the most successful segment of the manufacturing industry. The evolution of revenue and value added in 2008–2016 is exemplary. With the exception of 2009, revenues have steadily increased, as the Czech Republic benefits from growing interest in new vehicles, especially in the European Union, where car registrations have increased year on year.

Similarly, value added has also increased, except in 2009 and 2012. Labour productivity has seen three stages: it grew slightly between 2008 and 2009, stagnating between 2010 and 2012 and rising again from 2013 onwards. The development of labour productivity was also influenced by the development in the number of employed persons, which was steadily growing after the decline in 2009. The Czech Republic still benefits from lower wage costs, which is used by foreign investors to expand existing production capacities or to build their own capacities.

The long-term trend of all economic indicators is unique among the segments of the manufacturing industry. The average wage increased steadily between 2008 and 2016 and is one of the highest. According to the annual report of the Automobile Industry Association, the average wage of its members in 2016 reached CZK 34,820 (up by 3.7% year on year, i.e. CZK 1,231). This is 30% more than the national average. For example, the average gross wage in 2016 was EUR 1,800 in VW Bratislava, EUR 1,395 in PSA Trnava, EUR 1,354 in KIA Slovakia, and EUR 1,044 in Dacia, including benefits. Jaguar reports average wage of EUR 1,225. In the US, the average hourly wage was USD 21.63 (equivalent to the beginning of 2007), with the average hourly wage of about USD 10 in Mexico.

![Chart 19.3.1 – Major economic indicators of CZ-NACE 29 division](image)

Source: CSO, MIT calculations

* This is the aliquot monthly share calculated from annual data
In 2016, the automotive industry faced a shortage of skilled workers, especially in technically oriented fields (according to information from the Confederation of Industry and Transport, Czech industry currently lacks 140,000 employees, of which about 20,000 are demanded by the automotive industry). This sector has had a long-term shortage of technically oriented employees with secondary and tertiary education. Also, the number of new graduates is insufficient. Due to the lowest unemployment in the Czech Republic in the last few years, companies have been increasing wages and are trying to recruit workers from abroad, which is often a lengthy procedure. The cooperation of companies with educational institutions is increasing, but the number of students interested in technically oriented fields is lower than that needed by industrial companies. Companies are also experiencing a lack of drivers. Because many of these positions remain vacant, many companies are unable to fulfill their orders. For these reasons, companies hire agency workers, which is often problematic both in terms of qualifications and language barriers. A partial solution is to accelerate the issuing of work permits to foreigners.

Digitization and robotization of industry will bring about a radical change in the organization of work, many jobs will disappear, especially for the low skilled labour force. It is estimated that in the Czech Republic up to 53% of jobs will disappear. It will also be necessary to adapt the curriculum accordingly. Already, carmakers are calling for changes in the face of rising electromobility, requiring more skilled people with electrotechnical education not only in manufacturing, but also in service and repair. Also, the rescue system staff will have to be trained in how to proceed in the event of traffic accidents involving such vehicles.

In the EU, about 2.49 million people were employed in the automotive industry in 2015, most of them in Germany (over 850 thousand), followed by France (225 thousand) and Poland (169 thousand). The Czech Republic is sixth with 149 thousand persons. Compared to 2005, the total number of people in this sector grew by almost 250 thousand in 2016, mainly thanks to the new Member States. In Romania, employment grew by 100,000 (over the last 10 years, about 600 companies built their auto part production plants), in Poland by 70,000, in Slovakia and Hungary by about 45,000 and in the Czech Republic by 34,000 persons. In the EU-15, on the other hand, there was a reduction of 150,000 workers in the industry. Most of these were in France (reduction of 52,000 persons) which reduced its vehicle production by one third to 2 million units between 2005 and 2015, and then in the UK (reduction of 24,000) and in Sweden and Spain (reduction of 17,000 in both).

In 2013–2015, the average prices of new cars of all makes increased in the EU. This is due to the growing interest in new cars, especially in Western Europe. People are buying cars of higher classes, and there is also growing interest in alternative drive vehicles.

The financial position, as measured by the Spread indicator, had a positive development and has been in black numbers since 2010. After a more pronounced increase in 2011, positive Spread values declined in the following two years, but in the years 2014–2016 there was a significant year-on-year increase (Chart 19.3.3). This development was in close correlation with return on equity. The best performance was posted by group 29.1.
The foreign trade indicators presented in Chart 19.4.1 almost doubled between 2009 and 2016. Exports amounted to almost CZK 1 trillion. Czech companies benefit in particular from a recovery in demand in the EU, where over 80% of vehicles from the Czech Republic are headed. Domestic car makers are among the best-selling in many European countries. For example: The Škoda Octavia was the best-selling model in Switzerland, Estonia and Finland, Škoda Fabia in Poland and Slovakia, Hyundai Tucson in Ireland (3rd place in the SUV category worldwide). In terms of best-selling passenger car models in Europe, Škoda Octavia placed 7th, Škoda Fabia placed 20th and Hyundai Tucson placed 21st. Also, neighbouring countries produced about 400 thousand more vehicles in 2016 than in 2009 (Germany and the Visegrad Four countries produce more than half of motor vehicles in the EU). Many car makers also use Czech suppliers. Some of them have almost 100% of their production for a foreign buyer. Škoda has consistently been the largest exporter. Also in the neighbouring countries, automakers are export leaders. In Germany, the first three positions were taken by the Volkswagen Group, Daimler and the BMW Group.

In 2016, component exports posted a historic maximum of CZK 309 billion. This represents more than 61% of the segment’s exports. The Czech Republic is the 8th largest global exporter of auto parts. Exports of auto parts have long dominated over exports of finished vehicles, although the exports of vehicles have been growing steadily in recent years, and in 2016 they approached 1.25 million units.

Imports are mainly driven by growth in sales of new vehicles. Domestic car makers have consistently maintained a 40% share of registrations for new passenger cars, 50% for new buses and 2.5% for trucks. Domestic car makers benefit from deliveries of auto parts from abroad, such as engines (from Poland, Hungary, France, Germany, South Korea and Italy) or transmissions (from Slovakia, Poland and South Korea). Imports of used vehicles are also growing. In 2016, it was over 180 thousand vehicles (up 16 thousand vehicles year-on-year). Compared to 2010, the number is up 30 thousand vehicles.
19.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

Germany strengthened its position as the largest importer, when imports grew year-on-year by CZK 26 billion (of which 19 billion were auto parts) to approximately CZK 175 billion. Changes in imports from other countries were minimal. Poland and Romania improved by one percentage point (both countries had a significant increase in component imports). On the other hand, Slovakia, South Korea and Hungary were down one percentage point.

If we divide imports into vehicles and components, we can say that 33% of vehicles (according to their total price) were imported from Germany, over 11% from Slovakia and 9.67% from Poland. In the case of auto parts, Germany (36%), South Korea (10.3%), Poland (10.1%) and Slovakia (8.2%) are the largest importers.

In exports, Germany again strengthened its dominant position, with its exports increasing by 2 percentage points (i.e. by CZK 51 billion) to CZK 334 billion. Germany covered half of year-on-year growth in exports from the Czech Republic. As already mentioned, Škoda and Hyundai are among the best-selling ones on the German market. Both carmakers exported over 210 thousand vehicles to Germany. Germany is also the largest market in the EU. Every year, almost a quarter of new passenger cars in the EU are registered in Germany, and at the same time this country produces a third of motor vehicles in the EU. For Iveco Czech, Germany is the second largest export country to which it exported 620 buses (about 15% of production). Thanks to the imports of vehicles and components, in 2016 Germany had a negative external balance with the Czech Republic amounting to USD 7.6 billion. The United Kingdom retained its second position, also due to the fact that it is the largest outlet for TPCA (29% of production was exported to UK customers in 2016); it is the third largest market in the EU for Škoda (over 80,000 vehicles) and the second largest market for HMMC (52,000 vehicles). Also, Slovakia has traditionally been an important business partner where Škoda is one of the best-selling cars, and it is the export destination of components for automakers that produced more than 1 million vehicles in 2016. Almost 90% of exports to South Korea are vehicle components. More than 40% of Czech Iveco buses (1,556 units) were exported to France. Car components worth more than CZK 12.5 billion were exported to Spain, accounting for over 60% of total exports to this country. In Romania and Hungary, car parts also dominate over vehicles, representing about 90% and 60% of exports to these countries, respectively.

Exports of motor vehicles account for 4.7% of global exports in 2016. Statistics for the EU shows that this year 6.1 million new vehicles were exported and 3 million new vehicles were imported.

The automotive industry is among the largest exporters in many countries and is linked to logistics (e.g. in 2016 European ports report over 22 million vehicles that were loaded or unloaded).
19.5 RESEARCH AND DEVELOPMENT

The automotive industry is also one of the most important sectors in research and development. In 2015, it employed over 2,100 people in R&D.

In 2015, R&D expenditures amounted to CZK 7,100 million, accounting for 13.72% of the total R&D expenditures in the Czech Republic. According to the revised CZSO data, total R&D expenditure was up 78% in this sector compared to 2011. The bulk of the funds were expenditures from business resources.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include TATRA, a.s., Technic Tube, a.s. (formerly ZKL Hanušovice, a.s.), TESLA BLATNÁ, a.s., BRANO a.s. and SVOS, spol. s r.o. In this segment there are three companies participating in Horizon 2020 projects, namely Senior Flexonics Czech s.r.o., Škoda Auto, a.s. and VALEO AUTOKLIMATIZACE k.s.

As part of the investment incentives, support was provided in the past to technology centres of companies such as Behr, Bosch, Ricardo, Continental Teves, Indet Safety Systems, Mercedes Benz, Rieter, Siemens, Škoda Auto, TRW, Kostal, Tyco, Valeo, Visteon etc. In 2016, 3M, a technology company, opened its second innovation centre in the Czech Republic.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation with CZ-NACE 29 as the main segment were allocated in 2015–2016 a subsidy amounting to CZK 293.5 million, which was divided among a smaller number of enterprises from more than half of the Czech Republic’s regions. The highest support in terms of the total volume of the subsidy was granted to Magna Exteriors (Bohemia) s.r.o., a large enterprise from the Liberec region, (the project Composite frame construction of rear car door); the second highest support was granted to AUFEER DESIGN, s.r.o., a medium-sized enterprise from Central Bohemia (the project Centre for industrial research and verification of comprehensive units through modular technology). Among small businesses, the most successful was FCC Industrial Systems s.r.o. from the Ústí Region (the project Robotic workplace for surface inspection of uneven varnished parts in industrial production).

Škoda has consistently been the biggest R&D investor within this industry; it has a development centre in Mladá Boleslav, which it constantly expands. In the field of emissions measurement, the construction of a new emission measurement centre commenced in 2016, with investment costs exceeding EUR 11 million. The facility will be used for testing new combustion engines as well as electric cars. In addition, it would like to test autonomous vehicles in the Czech Republic.
Other companies also reported the construction or expansion of R&D centres, for example:
– in Prague Hostivař, Valeo will open a brand new R&D centre for CZK 600 million for up to 600 employees; the centre will focus on the most advanced security and assistance systems;
– Škoda and BMW have reported the testing of autonomous vehicles in the Czech Republic.

Table 19.6.1 – Production of vehicles in the Czech Republic, 2011–2016

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger cars and light commercial vehicles</td>
<td>1,194,981</td>
<td>1,174,267</td>
<td>1,128,473</td>
<td>1,246,506</td>
<td>1,298,236</td>
<td>1,344,182</td>
</tr>
<tr>
<td>Trucks</td>
<td>1,302</td>
<td>1,499</td>
<td>767</td>
<td>821</td>
<td>850</td>
<td>1,326</td>
</tr>
<tr>
<td>Buses</td>
<td>3,562</td>
<td>3,229</td>
<td>3,691</td>
<td>3,893</td>
<td>4,517</td>
<td>4,388</td>
</tr>
</tbody>
</table>

Source: Automotive industry association (AIA)
As part of the production of car parts, not only in CZ-NACE 29, but also in other related branches, there was an increase in revenues, employment and export, as also confirmed by the Annual Report of the Automobile Industry Association.

In terms of investment, one hundred firms received an investment incentive in 2016, of which 21 were from the automotive industry. Of the total promised investments of over CZK 64 billion, 10 investments will be directed to this sector. It is estimated that the investments will create about 12,000 new jobs, of which about 1,700 jobs in the automotive industry. One of the largest investments was promised by Karsit Automotive, s.r.o., Benteler International Aktiengesellschaft and Robert Bosch spol. s r.o. It is assumed that in the context of the start of production of Jaguar in Slovakia, Czech component manufacturers will become their suppliers and expand their production capacities.

The issue of emissions is important and addressed on an ongoing basis. The CO2 emissions of new passenger cars dropped again in 2015 to 119.5 g CO2/km (8.0% below the 2015 target). In 2020, the average emissions of vehicles in the EU will have to be lower than 95g of CO2/km. For this reason, automakers are urging States to provide more support for alternative propulsion vehicles. About 432 thousand electric and hybrid vehicles and 172 thousand CNG, LPG and E85 vehicles were sold in the EU in 2016.

With regard to “Dieselgate” and the difference in the consumption figures provided by manufacturers and those in real-world traffic, the European Commission has introduced a new vehicle emission measurement methodology, the “Worldwide harmonized Light vehicles Test Procedure” (WLTP). It should again guarantee that test results will better match the conditions of real driving and technological progress in car production. These are not real-time tests but improved laboratory testing. Following the vote in the European Technical Committee for Motor Vehicles (TCMV), the new system came into force early this year. It was decided to replace NEDC with WLTP for new types of cars by September 2017, and a year later, from September 2018, it would apply to all newly manufactured passenger cars.

Approved deployment schedule for The Real Driving Emissions (RDE) and WLTP:
- September 2017: WLTP and Step 1 of RDE will apply to new car models;
- September 2018: WLTP will start to apply to all newly manufactured cars;
- September 2019: Step 1 of RDE will start to apply to all newly manufactured cars;
- January 2020: Step 2 of RDE will apply to new car models;
- January 2021: Step 2 of RDE will start to apply to all newly manufactured cars

Also interesting are the data of the global production / registration of vehicles. In 2016, over 94 million vehicles were sold worldwide. Since 2010, the largest market is China, which in 2016 accounted for over 30% of global sales (about 28 million vehicles). The EU accounts for about 18% of global vehicle registrations (about 17 million vehicles). In South Korea, production has fallen due to lower vehicle exports to foreign markets and growth in production in China. In Russia and Brazil, production also declined due to sanctions and a decline in their currency exchange rate. India increased production due to sales growth by up to two-thirds. In Iran, the embargo was lifted and the increase in production was practically covered by the growth in domestic demand. European countries benefit from growth in sales in the EU.

In 2016, VW became the largest carmaker when it surpassed 10.3 million of vehicles sold. The second largest manufacturer was Toyota, which sold about 150,000 fewer vehicles, followed by General Motors (GM), which sold 9.8 million vehicles. In terms of the number of vehicles produced, Škoda placed approximately 20th.

Both VW and GM have the largest sales and production in China, which makes up about 1/3 of their registrations for both auto makers. When comparing countries, more than a third of passenger cars were produced in China (about 24 million, of which about 1 million units were exported). The US has a higher production than China only in light commercial vehicles. The US accounts for over 40% of the production of these vehicles, approximately 9.1 million units, and over 45% of global sales (in 2016 it imported over 1 million units). For trucks and buses, Germany, France and Sweden stopped publishing their production in 2011, so available data show that China accounts for over 40% of the world’s production of trucks (about
1.4 million units). For buses, Germany, France, Sweden, the Netherlands and Argentina do not publish their production. In this category, China accounts for more than half of global production, i.e. over 150,000 buses per year (almost all buses operated in the V4 countries; there are over 840,000 buses in the EU).

In 2006, 69 million vehicles were produced worldwide (in 2006–2016, production increased by almost 26 million units). Most countries recorded a rise in production during this period. China’s production increased by more than 20 million units in that period, India increased its production by 2.5 million units, Mexico by 1.5 million units (expanding production mainly for exports to the USA, e.g. Audi, Toyota, GM, VW). Also in Indonesia, Slovakia and Thailand, production increased by more than 750 thousand units. In Japan, conversely, production fell by 2 million units, which is due to the construction of new Japanese automobile plants, especially in China and Mexico. In France, too, there was a decrease in production by about 1 million vehicles (in 2011 France stopped reporting production of trucks and buses; production was stopped in several factories, Renault increased production in Romania and Morocco, and PSA in Slovakia).

According to statistics for the first half of 2016, the Chinese sales of new passenger cars were up 1.6% year-on-year to 11.25 million units, and production by 3.2% to 11.48 million units. Following the restrictions of Chinese authorities, the sales of low-emission vehicles, especially electric vehicles, are growing, with over 300,000 sold in 2016 (the largest market).

According to statistics, in the first half of 2017, the registration of new PCs in the EU increased by almost 5% to 8.2 million, the registration of new light commercial vehicles increased by 4.7% to 1.01 million, the registration of new trucks increased by about 2.0% to 187,000 and the registration of new buses increased by 1.8% to 20,000. In 2017, the sales of new cars should increase by 1.0–2.0% year-on-year in the EU, which is a good news for domestic auto makers. Also the Russian market is recovering after a four-year decline.

At present, the automakers themselves receive the greatest added value, which about to change in the near future. The car will be increasingly equipped with electronics, software and we must not forget about electric cars, where the batteries currently constitute up to a third. In the meantime, despite falling battery prices (prices fell to almost a fifth from 2010), electric cars are not profitable and, despite the various incentive programmes, their sales are not high. Tesla has consistently reported losses, and GM has admitted to selling Chevrolet Bolt EV at a loss (it is not clear how much but the talk is of up to USD 9,000), although its price before incentives starts at USD 38,000, i.e. roughly around CZK 900,000. Electromobility can especially benefit from falling cost of batteries, which is key for these cars.

With the advent of autonomous vehicles, it is necessary to determine whether liability for accidents will lie with the driver or the software. Manufacturers are relying on autonomous vehicles to reduce the number of accidents and congestions, while reducing the amount of work to be done by the transport police, insurance companies, spare parts manufacturers and car repair companies.
20.

CZ-NACE 30 MANUFACTURE OF OTHER TRANSPORT EQUIPMENT

20.1 DIVISION CHARACTERISTIC

*CZ-NACE 30 division is broken down into the following groups:*

- 30.1 Building of ships and boats;
- 30.2 Manufacture of railway locomotives and rolling stock;
- 30.3 Manufacture of air and spacecraft, engines and related machinery;
- 30.4 Manufacture of military fighting vehicles (data not published);
- 30.9 Manufacture of transport equipment not elsewhere classified.

In terms of its product range, CZ-NACE 30 is a major pro-export division. Its production accounts for 38% of exports; supplies for domestic investments account for 33% and those for intermediate consumption account for about 22%. The largest customers are companies within CZ-NACE 30 itself, as well as CZ-NACE 28 Manufacture of machinery and equipment n.e.c. and CZ-NACE 33 Repair and installation of machinery and equipment.

In the case of large boats, this involves mainly their repairs or the construction of its structural body, and its completion abroad. Rolling stock manufacturers have customers in particular between Central European rail carriers, to which they supply new locomotives or railway cars, or for which they perform complete renovation of rolling stock. Companies in the aviation industry are not only important suppliers of aircraft parts for foreign manufacturers, but also very successful ultralight manufacturers, who manage to obtain new orders from abroad. For other means of transport, there is a dominant production of bicycles, with about 300-350 thousand units produced annually in the Czech Republic, and about 2,000 units of motorcycles and quad bikes.

The division is dominated by large enterprises, which account for 84% of its revenues and value added. They accounted for 76% of employed persons. Large enterprises are followed by medium-sized enterprises with a share of more than 10% in revenues and value added. Their share of employed persons was around 15%.

The most significant group of the division is 30.2, whose share in the division’s revenues was 47.9% and value added of 44.8%. Group 30.3 had a slightly lower share of the selected indicators; the shares of group 30.9 were around 10% (Table 20.1.1).

Table 20.1.1 – Shares of groups in CZ-NACE 30 division in 2016 (%; division = 100 %)

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.1</td>
<td>0,5</td>
<td>0,4</td>
<td>0,6</td>
<td>0,3</td>
<td>0,2</td>
<td>0,4</td>
<td>1,0</td>
<td>18,0</td>
</tr>
<tr>
<td>30.2</td>
<td>46,6</td>
<td>44,8</td>
<td>47,9</td>
<td>50,2</td>
<td>56,9</td>
<td>59,8</td>
<td>44,6</td>
<td>7,0</td>
</tr>
<tr>
<td>30.3</td>
<td>41,0</td>
<td>41,6</td>
<td>34,7</td>
<td>33,5</td>
<td>28,1</td>
<td>26,8</td>
<td>38,0</td>
<td>11,5</td>
</tr>
<tr>
<td>30.4</td>
<td>2,5</td>
<td>3,7</td>
<td>3,5</td>
<td>3,6</td>
<td>5,1</td>
<td>5,0</td>
<td>2,6</td>
<td>0,4</td>
</tr>
<tr>
<td>30.9</td>
<td>9,3</td>
<td>9,5</td>
<td>13,3</td>
<td>12,5</td>
<td>9,8</td>
<td>8,0</td>
<td>13,8</td>
<td>63,1</td>
</tr>
</tbody>
</table>

Source: CZSO, 2016 calculations MIT
20.2 DIVISION DEVELOPMENT

In terms of production characteristics, the production of railway locomotives and rolling stock is the most significant group of the whole CZ-NACE 30. The development of rail transport is one of the EU priorities in line with the EU White Paper on Transport as part of the Transport Strategy 2050.

The aviation industry has almost a hundred-year tradition in the Czech Republic, with its strongest aspect being professional continuity and internationalization. The Czech aviation industry annually cashes in more than CZK 25 billion. In terms of production characteristics, the CZ-NACE 30 is the second most important group in the Czech Republic.

The Czech Republic is one of the few countries in Europe that can develop and produce complete aircraft and their parts on its own. At the same time, the Czech aviation industry has become a part of supply chains for large global players such as Airbus and Boeing. The aviation industry employs highly educated, often narrowly specialized professionals. Only few of the aviation specialisations cannot be used in other industries.

The Czech aviation industry systematically builds its research and development activities on the updated strategic objectives of the EU aviation industry and aims to contribute to the achievement of the objectives set out in the European strategy papers ACARE and Strategic Research & Innovation Agenda (SRIA). This concerns in particular the improvement of quality and affordability of air travel, improved flight safety and reduction of air accidents, enhancing air transport safety and, last but not least, the reduction of negative impacts of air transport on the environment (reduction of fuel consumption and CO2 emissions, reduction of external noise, etc.).

20.3 MAIN ECONOMIC INDICATORS

Economic value added was positive in 2015 and 2016 and its creation increased year on year. The division is very effective. Improvement in the generation of economic value added was driven by the two largest and strongest groups in the division – 30.2 and 30.3.

Revenues in the reference period 2008–2016 mostly increased, with minor falls in 2010 and 2016. Similar development was in added value, with minor falls in 2010 and 2013. The number of employed persons also had a similar development, with a decline reported in 2010. Average wages and the number of units were increasing throughout the entire period. The development of value added and the number of employees reflected in the development of labour productivity, which had a growing trend up to 2011, with declines and growth alternating in the following years (Chart 20.3.1).

CZ-CPA 30 practically replicates the price development of rolling stock manufacturers, the most significant commodity within CZ-CPA 30 (see Chart 20.3.2).

The development of the financial position of the division, characterized by the Spread indicator, shows that this indicator had a significantly negative value in the pre-crisis period in 2008. However, with the onset of crisis in 2009 it turned into black numbers. Spread values were positive until 2016, although with a downward trend, despite fluctuations.
**Chart 20.3.1 – Major economic indicators of CZ-NACE 30 division**

![Graph 20.3.1](image1)

- **Number of units**
- **Average number of employees**
- **Sales (CZK m)**
- **Value added (CZK m)**
- **Average monthly wage (CZK)**
- **Labour productivity from the VA (CZK/month)**

*This is a monthly aliquot share calculated from annual data.*

**Source:** CZSO, MIT calculations

**Chart 20.3.2 – Price development of CZ-CPA 30 (2005 = 100%)**

![Graph 20.3.2](image2)

**Chart 20.3.3 – Spread (ROE – re) CZ-NACE 30 (in %)**

![Graph 20.3.3](image3)

**Source:** CZSO, MIT calculations

Note: Groups 30.1, 30.3, 30.4 and 30.9 are not monitored.
20.4 FOREIGN TRADE

20.4.1 DEVELOPMENT OF FOREIGN TRADE

Czech exports are starting to slow down. The trade balance in CZ-CPA 30 products decreased by approximately CZK 6.1 billion in 2016 compared to 2015. A significant decline in the negative balance was recorded in CZ-CPA 30.2 Railway locomotives and rolling stock (by almost CZK 4 billion year-on-year), a slight decrease was recorded in CZ-CPA 30.3 Manufacture of air and spacecraft and related machinery (by almost CZK 1.8 billion year-on-year) and also in CZ-CPA 30.9 Transport equipment n.e.c. (by almost CZK 0.4 billion year on year).

Chart 20.4.1 – Product export, import and balance of foreign trade in CZ-CPA 30 (CZK m)

Source: CSO, data as at 3/5/2017

20.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

From territorial perspective, the export of the products is mainly directed to EU member states, especially to Germany (17%), France (14%), USA (12%), Slovakia (8%) and Russia (5%). Surprisingly, the pace of exports to China is falling. The fact that the category of unnamed other countries is 31% shows that the CZ-CPA 30 products are exported to a relatively wide range of countries.

This is also the case for imports where the leading suppliers to the Czech Republic are the USA (23%), Germany (14%), France (10%), China (8%), Slovakia (5%) and the other countries account for 26%. It can be assumed that, even in the future, main production will continue to be traded mainly with EU countries, although imports from the US have taken a relatively important role in recent years.
20.5 RESEARCH AND DEVELOPMENT

Research and development in the railway and aviation industries is dominant in this division. Research institutions include VÚKV a.s. (former Výzkumný ústav kolejových vozidel), Výzkumný Ústav Železniční, a.s., Výzkumný a zkušební ústav Plzeň s.r.o. and Výzkumný a zkušební letecký ústav, a.s. On 11 January 2017, Výzkumný a zkušební letecký ústav, a.s. was granted a new Czech patent No. 306517 entitled: “Transparent form for repeated precision casting made of composite material”, whose author is Ing. František Martaus.

In the middle of January, AŽD Praha and the Desná Valley Association of Municipalities signed a contract for the purchase of three 810 series motor cars and two 010 trailer cars, for which it paid CZK 6.8 million. AŽD Prague thus fulfills its plan to convert the lines Čížkovice – Obrnice and Dolní Bousov – Kopidlno into test polygons for testing their modern security technologies under development.

R&D expenditure in 2015 in Division 30 amounted to CZK 1,453 million, with total R&D expenditure in this division being down 27% from 2011. The bulk of the funds were expenditures from business resources. In addition, it can be observed that from 2010 to 2014 the expenditures from public foreign sources increased, mainly due to the public funds from the OPEI, and these expenditures can be assumed to again increase after 2016 due to the OP EIC funds.

The companies that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include EVEKTOR-AEROTECHNIK a.s., Aircraft Industries, a.s., TL-ULTRALIGHT s.r.o., JIHLAVAN airplanes, s.r.o., JAWA Moto spol. s r.o. Furthermore, PBS Velká Bíteš, a.s. is involved in the DISRUPT project (Horizon 2020).

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation with CZ-NACE 30 as the main segment were allocated in 2015–2016 a subsidy amounting to CZK 412.8 million, which was proportionally divided among large and small enterprises from five of the Czech Republic’s regions. The largest beneficiary among the large enterprises was AERO Vodochody AEROSPACE a.s. (project Advanced on-board systems of new generation aircraft L-39NG) from the Central Bohemian Region; among small companies it was AICTA Design Work, s.r.o. (project Research and development of a series of diesel aviation engines) from the Hradec Králové Region.
20.6 DIVISION SUMMARY AND PROSPECTS

The results of CZ-NACE 30 division achieved in 2016 form a good basis for the following period. The manufacture of other means of transport includes, in particular, railway and tramway locomotives and rolling stock, aviation equipment and its repairs. The manufacture of boats, motorcycles and bicycles is not so significant in the Czech Republic.

Significant enterprises within CZ-NACE 30.1 are: BARKMET a.s., which specializes in the construction and production of steel vessels. It offers welding of metal structures and piping, plasma cutting. It manufactures container ships, chemical tankers, towing tugs, pontoons, yachts, floating houses etc. The company ČESKÉ LODĚNICE, a.s., which has been on the market since the 19th century, is a traditional manufacturer of cargo ships of all kinds, technical vessels and floating equipment. At present the company has shipyards in Děčín-Křešice.

CZ-NACE 30.2 is represented by ŠKODA TRANSPORTATION a.s. with its products being on the market for more than 150 years. Today, ŠKODA TRANSPORTATION focuses on the production of vehicles for public transport and railway. CZ LOKO, a.s., ŠKODA VAGONKA a.s., ČKD KUTNÁ HORA, a.s., and BONATRANS GROUP a.s. are other important players in the field of railway technology manufacture. IFE-CR, a.s. is one of the world leaders in the development and manufacture of automatic door systems for rail vehicles etc.

In CZ-NACE 30.3, the largest companies are AERO VODOCHODY AEROSPACE a.s., HONEYWELL AEROSPACE OLOMOUC s.r.o., LETOV LETECKÁ VÝROBA s.r.o. – the oldest aviation producer in the Czech Republic, EVEKTOR, spol. s r.o., AIRCRAFT INDUSTRIES, a.s., ATEC, v.o.s., AEROSPOOL CZ, spol. s.r.o., KUBÍČEK AIRCRAFT s.r.o., BRM AERO s.r.o., and CZECH SPORT AIRCRAFT a.s.

CZ-NACE 30.9 is represented by companies: BOHEMIA BIKE, which is a manufacturer of the Czech bicycle brand Leader Fox, DAMA SPORT (CONDOR bicycles) – manufacture of children’s bicycles and bicycles for adults. Other well-known companies are: JAWA MOTO spol. s r.o. – manufacturer of road and off-road motorcycles, D-ANA s.r.o. – JRM DIVIŠOV – production and sale of speedway motorcycles and spare parts.

Manufacturers in the railway industry will help in the future to modernize railway infrastructure in line with the European strategy for the construction of high-speed rail corridors, which will, among other things, encourage the interest of carriers in modern fast trains and associated equipment. Fast, comfortable, environmentally friendly, energy-efficient, intelligent, reliable and competitive rail transport and an increasing...
share of producers in the Czech Republic with their growing know-how, productivity and prosperity are the predominant perspectives for CZ-NACE 30.

From an international perspective, the Czech Republic is perceived as competitive in the production of small transport aircraft (up to 19 passengers) and sport aircraft. The Czech Republic is the second largest manufacturer and exporter in Europe in the field of small sport airplanes. In the manufacture of ultralight planes, the Czech Republic covers more than a quarter of the world market. The strategic objective of the Czech aerospace industry is to maintain its position as a major European manufacturer and exporter of light sport aircraft.

In addition, the Czech Republic also wants to be a respected supplier of assemblies, aggregates, components and services for airplanes and helicopters, both in civilian and military aircraft programmes.

Thanks to their quality and prices, Czech producers are sought-after suppliers of their products on the domestic market as well as on the markets of other EU countries and third countries.
21. CZ-NACE 31 MANUFACTURE OF FURNITURE

21.1 DIVISION CHARACTERISTIC

Sorting of CZ-NACE 31 division (the sorting is by classes, this division is not sorted by groups):
- 31.01 Manufacture of office and shop furniture;
- 31.02 Manufacture of kitchen furniture;
- 31.03 Manufacture of mattresses;
- 31.04 Manufacture of other furniture.

This division includes the manufacture of furniture and related articles made of any material except stone, concrete and ceramics. Primary raw materials for the furniture industry are agglomerated boards, plywood and veneers from pre-processed (treated) wood, mostly from a renewable raw material supplied by the woodworking industry. CZ-NACE 31 is characterized by considerable material intensity (about 80% of production costs). The use of new, modern technologies, including nanotechnology, allows compliance with EU legislation and ensures that products do not contain hazardous substances or pollutants that endanger their users or the environment (e.g. formaldehyde).

In terms of size, CZ-NACE 31 is dominated by medium-sized enterprises. They account for 49% of revenues, 47% of value added and 40% of employed persons. The second most important group is small enterprises with a market share of about a quarter. Large enterprises have a higher share of revenues (18%) and value added (16%) than micro-enterprises (9% and 12%), but micro-enterprises have a higher share of employees (22% vs. 12%).

21.2 DIVISION DEVELOPMENT

Within the manufacturing industry, this division is the one of the less important ones and its share in the total revenues of the MI in 2016 was about 1%.

Unlike in previous years, the results of the Czech furniture industry are positively affected by the recovery of domestic furniture consumption. The growth in furniture consumption was very modest between 2012 and 2014, but this trend is beginning to change.

Most entrepreneurs in the division (93%) consider the lack of skilled workers the biggest problem. The scarcest professions are joiners (47.5%) and upholsterers (27.5%). The poor situation in the labour market is illustrated by the fact that, according to the survey, two thirds of potential job seekers out of the labour market lack the necessary quality and 30% are only average. In 67% of the cases, employers solve the problem by retraining, recruitment of Ukrainian labourers, or they select future workers from among students at vocational schools. However, these schools are faced with a decrease in the number of pupils; the share of graduates in the furniture fields fell almost 50% in 11 years. For this reason, nearly 13% of entrepreneurs are considering setting up their own apprenticeship center. One of the reasons for the shortage of workers and apprentices is also the lower average wage in the industry. This is due to the low added value of the industry and the continuing need for investment in production. The low final margin and ongoing investments reduce overall profit of companies and create wage pressures. Furniture makers are also affected by cost increases and
pressure of multinational customers. Yet, half of domestic manufacturers are expecting revenue growth and another half are expecting stagnation.

Despite recent successes in the division (production has recovered remarkably, mainly due to growing exports), the furniture industry is not so significant within the manufacturing industry.

### 21.3 MAIN ECONOMIC INDICATORS

Revenues saw a decline in 2009, and then remained stagnant until 2013; they started to rise again in 2014. The minimum values were reached in 2013. It is positive that in 2016 revenues were higher than in 2008. Added value had a similar pattern, with the minimum being reached in 2011 and the 2008 levels exceeded in 2015. Labour productivity, which has been growing since 2012, and the average wage, which has been growing throughout the reference period, saw favourable development. The number of employed persons was affected by two waves of lay-offs in 2009–2010 and 2013–2014. The number of units increased sharply from 2008 to 2011 and then saw a sharp decline (Chart 21.3.1).

Price developments in 2008–2015 saw moderate growth. In 2016, it slightly decreased, or, in other terms, it was practically stagnant (Chart 21.3.2).

The generation of economic profit in 2015 was inadequate, i.e. it was negative. Critical values were reached in 2009–2011, then they gradually improved (Chart 21.3.3). In 2016, Spread moved to positive due to the succession of improving indicators: increased labour productivity – increased margins – increased production capacity – increased return on equity.

**Chart 21.3.1 – Major economic indicators of CZ-NACE 31 division**

![Graph showing major economic indicators](image)

*This is the proportional monthly share calculated from yearly data

Source: CSO, MIT calculations

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192
21.4 FOREIGN TRADE

21.4.1 DEVELOPMENT OF FOREIGN TRADE

The results of foreign trade can be assessed positively. The foreign trade balance has been positive over the entire reference period, i.e. from 2009 to 2016. This can be explained by the fact that domestic consumption is growing slowly but manufacturers are successful in placing products on foreign markets. Import dynamics is also high. The significant year-on-year decline in external trade values in 2016, as shown in Chart 21.4.1, was due to the change in the classification of seats used in motor vehicles from CZ-CPA 31 Furniture to CZ-CPA 29 Motor vehicles (except motorcycles), trailers and semi-trailers.

The largest furniture importers in the Czech Republic are mainly large specialized furniture companies. On the other hand, Czech furniture manufacturers supply furniture to all major domestic specialized chains.

Chart 21.4.1 – Product export, import and balance of foreign trade in CZ-CPA 31 (CZK m)

Source: CZSO, data as of 3 May 2017
21.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

In the long run, foreign trade in furniture has not seen any significant changes. The largest furniture importers in the Czech Republic are large specialized furniture companies. Significant furniture importers into the Czech Republic are Poland with 27% share, followed by Germany with 19%, and China with 15%. In terms of exports, Germany (34%) is the dominant buyer, followed by Slovakia (11%), France (7%) and the United Kingdom (5%). The pie charts in 21.4.2 illustrate the import and export territories.

Chart 21.4.2 – Foreign trade with CZ-CPA 31 products

Source: CZSO, data as of 3 May 2017

21.5 RESEARCH AND DEVELOPMENT

In 2012–2015, division 31 R&D expenditure was mainly channelled into experimental research, funded mainly by the business sector (Chart 21.5.1).

The companies with CZ-NACE 31 as their main economic activity that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include BORCAD cz s.r.o., MERCI, s.r.o. and KOVO, výrobní družstvo.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation segment were allocated in 2015–2016 a subsidy amounting to CZK 19.6 million, which was divided among several, rather smaller enterprises from five of the Czech Republic’s regions. The largest beneficiary among medium-sized enterprises is Dřevojas, a production cooperative from the Pardubice Region (the project Building image on foreign markets); among small enterprises it is the South Bohemian Cluster of Czech Furniture Manufacturers, a cooperative (the project Development of the Cluster of Czech Furniture Manufacturers).
21.6 DIVISION SUMMARY AND PROSPECTS

The performance of the Czech furniture industry is still affected by weaker domestic demand, so it is understandable that this division will continue to be heavily dependent on exports in the near future.

Furniture manufacturers in the Czech Republic produced goods worth CZK 44.64 billion last year, up 2.5% year-on-year. Furniture sales increased by 2.3 percent to CZK 35.48 billion. Production has been growing for six years in a row. Sales revenues, however, have not yet reached pre-crisis levels, being 4% below the 2007 level.

Furniture imports were almost CZK 22.5 billion in 2016. The price per kilogram of imported furniture dropped slightly last year. This shows that we are increasingly importing cheaper and lower-quality furniture. Statistical data shows that the price per kilogram of exported furniture has been increasing for five years. This indicates that Czech furniture makers produce better quality products with higher added value. In foreign markets, they can negotiate a higher price and sell goods with high added value there.

Further development will require strengthened trade relations in the EU internal market as well as with third countries. The division will, however, have to cope with the growing competition of foreign retail chains, which are pushing their expansion in the fight for market share (e.g. Sconto, XXXL Lutz, IKEA, etc.).

The industry also has to deal with the fact that customers are rarely aware of the origin of furniture. The origin of furniture is mostly known to the seller only. The goods are usually offered under the retailer’s trademark. Thus, the Swedish IKEA group benefits from a large part of furniture exports from Polish suppliers, which have been cooperating with IKEA for a long time.
22. CZ-NACE 32 OTHER MANUFACTURING

22.1 DIVISION CHARACTERISTIC

CZ-NACE 32 division is broken down into the following groups:
- 32.1 Manufacture of jewellery, bijouterie and related articles;
- 32.2 Manufacture of musical instruments;
- 32.3 Manufacture of sports goods;
- 32.4 Manufacture of games and toys;
- 32.5 Manufacture of medical and dental instruments and supplies;
- 32.9 Manufacturing not elsewhere classified.

CZ-NACE 32 includes a total of six different manufacturing groups, which differ both in terms of input raw materials, production technologies as well as the final products. Some groups are resource-intensive, depending on the high manual skills and creativity of designers and workers. Many of these product groups have a long tradition and a considerable international reputation (e.g. the production of bijouterie, musical instruments, wooden toys, office supplies, etc.).

CZ-NACE 32.9 is a group with a wide range of products, which covers bijouterie from general metals, glass, wood, leather, etc., school and office supplies, brushmaking products, matches, umbrellas, parasols, etc.

There are many micro-enterprises (80% of units) in the division, which only contribute 7% to revenues, 8% to the value added and 20% to employed persons. The most important are large enterprises which contribute 47% to revenues, 42% to the value added and 35% to employed persons. Medium-sized enterprises make smaller contributions (27% to 32%).

The most significant groups of the division are 32.5 and 32.4. Together they make up more than 60% of the division. The third group is 32.9 (Table 22.1.1). CZ-NACE 32.1 has the largest share of the number of production units, but also has the second lowest share of the average number of employees. This is due to the nature of production because it includes an assortment of hand-made products produced by individuals or micro-enterprises.

<table>
<thead>
<tr>
<th>Group CZ-NACE</th>
<th>Personnel costs</th>
<th>Value added</th>
<th>Sales</th>
<th>Net turnover</th>
<th>Equity</th>
<th>Total assets</th>
<th>Average number of employees</th>
<th>Number of units</th>
</tr>
</thead>
<tbody>
<tr>
<td>32.1</td>
<td>4,4</td>
<td>6,1</td>
<td>5,6</td>
<td>6,3</td>
<td>7,1</td>
<td>6,1</td>
<td>6,3</td>
<td>32,0</td>
</tr>
<tr>
<td>32.2</td>
<td>2,6</td>
<td>2,7</td>
<td>2,0</td>
<td>2,0</td>
<td>2,2</td>
<td>1,7</td>
<td>2,8</td>
<td>3,4</td>
</tr>
<tr>
<td>32.3</td>
<td>7,8</td>
<td>8,8</td>
<td>7,3</td>
<td>6,3</td>
<td>6,7</td>
<td>5,6</td>
<td>8,6</td>
<td>5,6</td>
</tr>
<tr>
<td>32.4</td>
<td>25,1</td>
<td>13,8</td>
<td>32,1</td>
<td>33,8</td>
<td>31,3</td>
<td>37,3</td>
<td>20,5</td>
<td>6,2</td>
</tr>
<tr>
<td>32.5</td>
<td>42,0</td>
<td>46,0</td>
<td>34,0</td>
<td>32,6</td>
<td>30,2</td>
<td>31,8</td>
<td>40,0</td>
<td>27,2</td>
</tr>
<tr>
<td>32.9</td>
<td>18,1</td>
<td>22,5</td>
<td>19,1</td>
<td>19,1</td>
<td>22,6</td>
<td>17,5</td>
<td>21,8</td>
<td>25,7</td>
</tr>
</tbody>
</table>

Source: CSZSO, 2016 calculations MIT
22.2 DIVISION DEVELOPMENT

Division 32, Other manufacturing, is the supplier and purchaser of products and services in relation to a number of other manufacturing industry divisions, e.g. the chemical and plastics industry, manufacture of basic metals, health care and other related industries and services.

In 2015 and 2016, the division created value, i.e. it had positive economic value added. Its year-on-year growth was slightly positive. The reason was a decrease in risk and an improvement in indebtedness. The most significant groups 32.5 and 32.4 reached positive economic value added in both years; however, group 32.4 increased it and group 32.5 decreased it. The development in labour productivity was negative, which negatively affected the generation of economic value added. The reason was a significant decline in group 32.4. One of the main reasons was the fact that the group posted a significant year-on-year decline in total value added of about 42.6% and a decline in value added per employee of about 47.4%, which resulted in the worst result in the reference period 2008–2016. To a large extent, the year-on-year increase of imports by 13.6% also contributed to the results of CZ-NACE 32.4.

22.3 MAIN ECONOMIC INDICATORS

The main economic indicators significantly affect the economic results of CZ-NACE 32.4 Manufacture of games and toys and CZ-NACE 32.5 Manufacture of medical and dental instruments and supplies.

It should also be noted that the total economic results are also substantially affected by production units with 20+ employees; however, there were only 219 such units in 2016, i.e. 2.4% of the total number of production units. Nonetheless, they contribute 84.7% to revenues from the sales of own products and about 83.6% to the number of employees.

The division saw positive developments between 2008 and 2016. Revenues, number of units, and average wages were increasing throughout the period. Value added grew until 2015 and fell slightly in 2016. Labour productivity was intermittently growing and declining. The number of employed persons stagnated after a decline in 2009 and started to grow slightly in 2014 (Chart 22.3.1).

The price level oscillated in the reference period with a moderate growth trend. The highest price indices were seen in group 32.9, which significantly affects the price level of the division. CZ-NACE 32.4 Manufacture of games and toys was stagnant or rather in decline, which is due in particular to strong competition and high supply of these products on the market (Chart 22.3.2).

The Spread indicator, which reflects the overall efficiency of the division, has been positive throughout the reference period, but has been in significant decline. Nevertheless, we can say that the division has managed to cope with a number of problems and its performance within the manufacturing industry is slightly above-average.
Note: Groups 32.1, 32.2 and 32.3 are not monitored

Source: CSO, MIT calculations

* This is the proportional monthly share calculated from yearly data

Source: CSO, MIT calculations

Note: Groups 32.1, 32.2 and 32.3 are not monitored

Source: CSO, MIT calculations

Source: CSO, MIT calculations
22.4 FOREIGN TRADE

22.4.1 DEVELOPMENT OF FOREIGN TRADE

On a pan-European scale, the Czech Republic is a relatively small market for CZ-CPA 32 products, even though the range of these products is very wide and diverse. If manufacturers want to fully use their capacity and if they want to compete with other European producers, they must try to succeed abroad and get into manufacturing new and high-quality products. And they are quite successful. This is significantly facilitated by foreign capital. The development of foreign trade in the reference period 2009–2016 is illustrated by Chart 22.4.1 below.

The foreign trade balance in CZ-CPA 32 has been consistently positive, i.e. exports dominate over imports. China has consistently had a negative effect on the overall foreign trade balance; in 2016, it accounted for about 20.0% of total imports. Throughout the reference period 2009–2016, the value of total exports increased faster than the value of total imports.

In 2016, the total turnover of foreign trade was about CZK 208.9 billion, which is about 8.7% more than in 2015. The largest trading partner in 2016 was Germany (by turnover), which accounted for almost 25.0% of total turnover.

Total exported goods amounted to about CZK 126.9 billion, about 7.3% more than in 2015, and imported goods amounted to CZK about 82.0 billion, i.e. about 10.1% more than in 2015. The positive foreign trade balance in 2016 was about CZK 44.9 billion, i.e. about 1.6% more than in 2015. In terms of individual codes, in 2015 CZ-CPA 32.4 was the largest contributors to total turnover (about 48.0%, roughly the same as in 2014), and to exports (about 55.3%) and imports (about 36.7%).

In CZ-CPA 32.1 Manufacture of jewellery, bijouterie and related articles, imports have consistently dominated over exports, and in 2016 the foreign trade balance was CZK -3.0 billion (i.e. about 57.8% higher than in 2015).

Chart 22.4.1 – Product export, import and balance of foreign trade in CZ-CPA 32 (CZK m)

Source: CZSO, data as of 3 May 2017

22.4.2 TERRITORIAL STRUCTURE OF FOREIGN TRADE

The largest foreign customer of CZ-CPA products was traditionally Germany, with exported goods in excess of CZK 38.2 billion in 2016, its share of exports being about 1.3% higher than in 2015 (Chart 22.4.2). Other major customers include Austria, with exported goods of about CZK 9.5 billion (although the value of exports to Austria increased by about 7.7%, its share of exports remained roughly the same as in 2015), and Slovakia,
with exported goods of about CZK 8.1 billion (about 12.2% more than in 2015). Other important territories include France, the United Kingdom, Poland, and Italy. Another important territory is Russia with exported goods in 2016 of about CZK 5.4 billion (about 19.8% more than in 2015), despite the restrictions.

In 2016, CZ-CPA 32.4 Manufacture of games and toys accounted for more than 48.0% of total exports. However, this was about 7.3% less than in 2015. CZ-CPA 32.5 Manufacture of medical and dental instruments and supplies accounted for about 26.6% of total exports (about 3.3% more than in 2015) and CZ-CPA 32.9 Manufacturing not elsewhere classified accounted for about 12.0% (about 2.3% more than in 2015).

Most goods were imported from China (for about CZK 16.3 billion, i.e. about 7.9% more than in 2015), then from Germany, Hungary, Austria, the USA and Denmark.

**Chart 22.4.2 – Foreign trade with CZ-CPA 32 products**

- **Import territories in 2016**
  - China: 20%
  - Germany: 17%
  - Austria: 6%
  - Hungary: 7%
  - USA: 6%
  - Denmark: 5%
  - Poland: 4%
  - Italy: 4%
  - Other: 31%

- **Export territories in 2016**
  - Germany: 30%
  - France: 6%
  - Austria: 8%
  - Slovakia: 6%
  - United Kingdom: 6%
  - Russia: 4%
  - Poland: 5%
  - Italy: 5%
  - Other: 30%

Source: CZSO, data as of 3 May 2017

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### 22.5 RESEARCH AND DEVELOPMENT

As shown in Chart 22.5.1, R&D expenditure has been rising since 2013, which is a consequence of the growing demand for these products both domestically and abroad. The highest expenditure was channelled into experimental and applied research and was mainly paid for by the business sector, which contributed 86.5% to total expenditure in 2015. Public expenditure from abroad amounted to 8.0% and public funds from the Czech Republic only 5.5%.

In terms of individual groups, the largest contributor to total R&D investments is 32.5 Manufacture of medical and dental instruments and supplies.

The companies in Division 32 that received in 2004–2016 a significant amount of special-purpose State support within the national programmes of the Ministry of Industry and Trade (IMPULS, TIP, TRIO) and Technical Assistance of the Czech Republic (Alfa, Competence Centres and Epsilon) include Medical Technologies CZ a.s., MEDIN, a.s. a BTL zdravotnická technika, a.s. Others include Woodcomp Propellers s.r.o., a participant in the ARGOS (Horizon 2020) project.

Under the announced calls for the OP EIC for the 2014–2020 programming period, projects focusing on research, development and innovation with CZ-NACE 32 as the main segment were allocated in 2015–2016 a subsidy amounting to CZK 160.5 million, which was divided among almost 30 enterprises from all of the Czech Republic’s regions. The highest support in terms of the total volume of the subsidy was granted to ARROW International CR, a.s., a large enterprise from the Hradec Králové region (the project “Introduction of an innovated series of catheters into production”); the second highest support was granted to a small
Moravian-Silesian enterprise SPRINT TRADING s.r.o. (project for the establishment of a development and innovation centre). The third largest beneficiary is the medium-sized company MZ Liberec, a.s. (project “New generation of a system of multifunctional medical devices with automated user setting”). Overall, projects of small enterprises and micro-enterprises dominate in this section.

Chart 22.5.1 – Expenditure on research and development in CZ-NACE 32 (CZK m)

Source: CZSO data, MIT calculations (for methodological reasons the figures may differ from the data published by the CZSO)

22.6 DIVISION SUMMARY AND PROSPECTS

The CZ-NACE 32 division is characteristic for a very wide range of products, often diametrically different in terms of production technology and final use. This division has a particular problem in a small number of investment activities that would be aimed at technology development and research and development, which is reflected in the currently low demand for high-skill professions.

In terms of individual economic indicators, it can be stated that development is positive in virtually all groups of this division and that revenues and turnover as well as the number of employees are increasing. The only exception is CZ-NACE 32.1 Manufacture of jewellery, bijouterie and related articles, where the economic indicators monitored tend to fluctuate depending on fashion trends. Nevertheless, here too, we can see an improving situation.

CZ-NACE 32.5 also saw positive development in 2016. Czech companies manufacturing healthcare technology are successful in the Far East, and with the EGAP insurance tools, they also have the prospect of further expansion. Among the most successful ones are LINET spol. s r.o., whose health beds and other products are already known in more than 100 countries around the world and it is also successful in the US markets.

Although CZ-NACE 32.4 Manufacture of games and toys is among groups with the best economic results, in 2016 there was a significant drop in revenues and added value, which was particularly due to a significant decrease in the revenues of LEGO Production s.r.o. However, the results of other toy and game manufacturers indicate good prospects for the near future.

Also in 2016, CZ-NACE 32.2 producers of musical instruments were successful, as their turnover grew by about 4.8% year-on-year. The number of their orders (especially from abroad) is increasing, which is also true of Petrof spol. s r.o., the traditional producers of pianinos and pianos from Hradec Králové. The company exports musical instruments to more than a dozen countries, and in response to late payment culture on
Western markets, it has shifted its attention mainly to China, accounting for about 30.0% of turnover, Russia with about 13% of turnover, and also to Japan, Singapore and Iran.

In order for CZ-NACE 32 to maintain or strengthen its competitiveness, it is necessary that producers continuously invest in modern technology, innovate their production, seek new opportunities for foreign capital entry or investment incentives. They should focus on the renewal or expansion of existing contacts, mainly towards the East and third countries. They should of course participate in international exhibitions and fairs. In this respect, they should also use MIT support.

A continuing challenge for CZ-NACE 32 is the import of cheap, low-quality and often unhealthy products of competitors, which is particularly true of toys where the Czech Trade Inspectorate regularly identifies most shortcomings.
Prepared at MIT by: Section of Industry, Section of Construction and Primary Raw Materials.


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