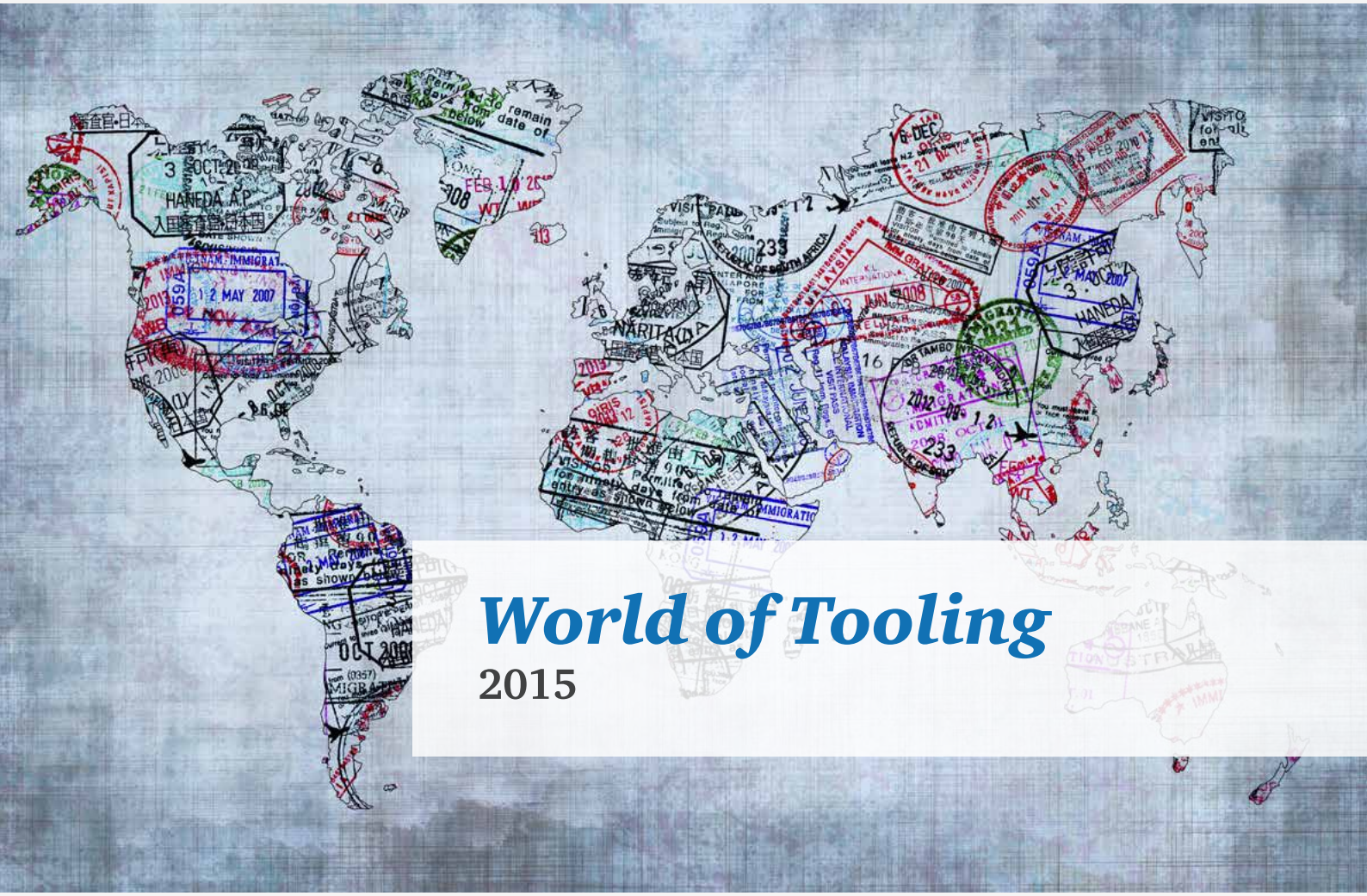

World of Tooling

2015

2015

Wolfgang Boos
Martin Pitsch
Thomas Kuhlmann
Max Schippers
Maximilian Stark

WZL | RWTH AACHEN UNIVERSITY

WBA AACHENER WERKZEUGBAU AKADEMIE

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天就行
神樓佛具 名香紙料
鴻運
九記肉食

Executive summary

The demand for tools of producing companies has been continuously rising over the last few years, except during the economic crisis of 2008 and 2009. Besides global economic growth, there are two main reasons for the increasing demand for tools: Firstly, the derivatization of products and shorter life cycles of these products are directly linked to the increased demand for tools. Secondly, globalization results in an internationalization of production sites, which calls for multiple tools and spreads the demands worldwide. This transformation forces both tooling companies and procurement divisions of producing companies to evaluate the international tooling markets intensely. International sourcing options are vital to ensure a reliable distribution of tools for international production sites, to use price potentials and to gain innovation based on the knowledge of international comparison. For the World of Tooling, one fact is certain: The competition is never idle.

The WBA Aachener Werkzeugbau Akademie deals with the evaluation of tool and die manufacturers and their markets for many years. There exists a cooperation between the Chair of Production Engineering from the Laboratory for Machine Tools and Production Engineering WZL of the RWTH Aachen University and the Fraunhofer Institute for Production Technology IPT. A unique database with more than 1,000 benchmarking data sets as well as more than 2,000 evaluated international tool and die manufacturers is the basis for sound statements concerning performance and development potential of tool and die markets. In addition, many field visits to different markets in Asia, Northern America, and Eastern Europe strengthened the impressions. The current study, World of Tooling, shows concentrated results and an objective, validated comparison between the relevant tool and die markets today and in the future.

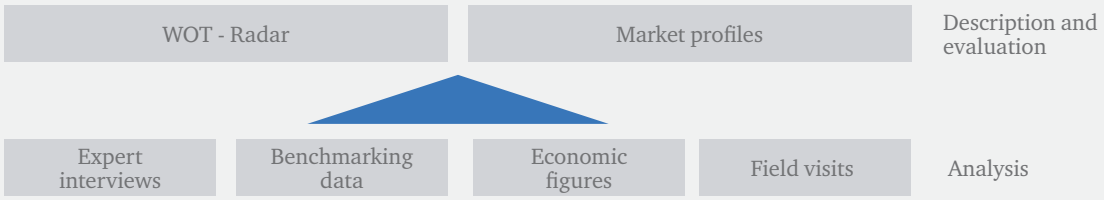
Twenty markets have been identified and analyzed in the categories market size, tooling competence and development potential.

The results of the study World of Tooling show that Germany has and will continue to occupied the leading position in the tool and die industry and will also continue to do so in the future. However, they also show that the competition is not only getting closer, but also increasing in number and partly exceeds traditional markets. For example, Italy is one of the markets that will not be able to defend its position in the top markets of the world and has a limited development potential for the immediate future. In the USA, known for deindustrialization for many years, there are increased investments in the tool and die industry, which lead to recognizable positive developments. Many markets in Eastern Europe were able to rapidly and reliably catch up with low prices. China's development remains volatile; its relevance based on its market size and increasingly due to real tooling competence is nonetheless growing. In addition, there are markets of which we presently do not know much besides from them gaining importance. India or Indonesia are part of the rapidly growing economies and are becoming increasingly attractive as production locations. This will also increase the attention from tool and die companies for these markets. Even South Africa, which is better known for numerous social, political and infrastructural problems, could become an interesting market in the future. It is the only country with industrial experience in the rapidly growing southern region of Africa.

There is hardly any industry in which it is more difficult to gain market insight to than the tool and die industry. Compared to the volume of the mechanical engineering sector, the industry is a niche sector in the world and is characterized by small and medium-sized companies. However, its products are the path to efficiency, reliability and innovation in serial production. A supply of tools and dies, which fulfills the requirements while remaining cost-efficient, will always lend a competitive advantage and therefore international market intelligence will continue to be essential!

Study design

The objective of the study, “World of Tooling”, is to review the international tooling market. Companies, which buy or produce tools and dies on the international market, have to face the challenge of acquiring market expertise from different countries in order to make sound decisions. The study will assist companies by providing an overview of relevant data of twenty of the most important tooling markets. The study creates transparency, particularly in light of a variety of disparate data, which is available for the industry, by presenting, aggregating and interpreting a systematic selection of the most crucial key figures.



The two main results of the “World of Tooling” are a market comparison with the “World of Tooling Radar” (hereafter the WOT-Radar) as well as a market overview with market profiles. In the WOT-Radar, the countries considered are evaluated and depicted in a portfolio modelled with the three dimensions market size, tooling competence and development potential. The dimension market size describes the importance of each market with regard to the volume of the tool and die industry. In the dimension tooling competence, tooling specific figures with indication on product, process and resource competence are analyzed. In addition, figures pertaining to the general economic situation are considered, which provide positive conditions for the tool and die industry. The development potential bundles information for the outlook of a market in a single indicator. The market profiles aggregate the most important key figures and results for every country and they are divided into the following three fields: The country and its people, the economy and the industry and the tool manufacturing and the tools. Lastly, available data for the production, import and export of tools and dies is analyzed.

The descriptions and results are based on expert interviews, benchmarking data, economic figures and also field visits as quantitative and qualitative input for the study. In the expert interviews, tool and die industry experts speak and give insight into a specific market. In doing so, they explain their approach, the considered development of the country and give an outlook for the development in the coming years. Besides the three interviews in this study, many dialogues concerning international markets have been conducted in the expert network of the WBA Aachener Werkzeugbau Akademie. Benchmarking data of several tool and die manufacturers from the database of the Laboratory for Machine Tools and Production Engineering (WZL) of the RWTH Aachen University, which contains data of more than 1,000 German and 2,000 international tool and die manufacturers has been evaluated. The economic figures used have been extracted and evaluated for the past years from publicly available databases such as Comtrade and Eurostat. Furthermore, the experiences of field visits of the WBA Aachener Werkzeugbau Akademie, which were collected during numerous international collaborations and projects, have been taken into consideration.

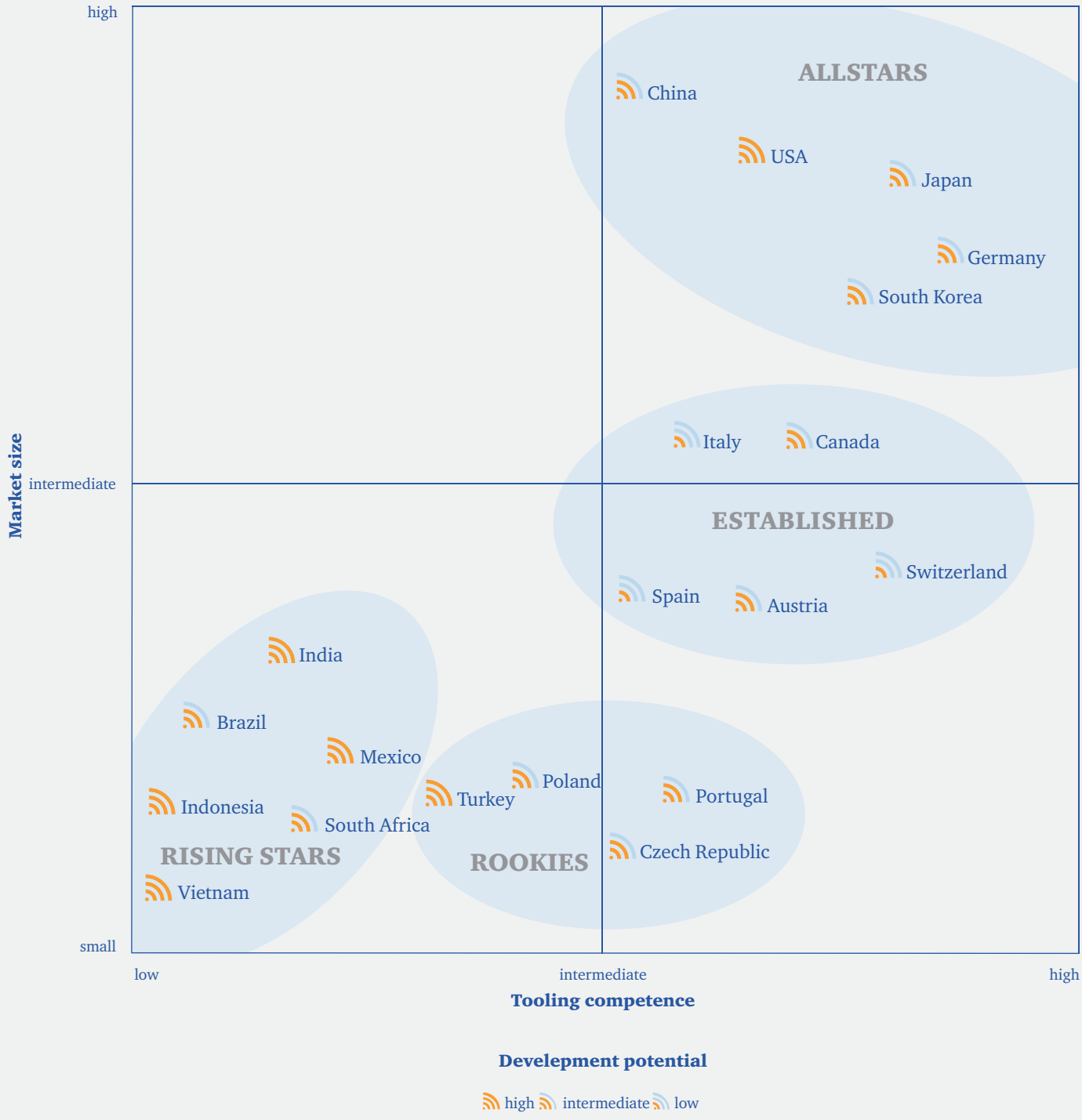
WOT-Radar

Allstar [ˈɔlˌstɑr], noun:
An outstanding performer, often selected by public vote, considered to be the best player in a position in a particular league, division, or else.

Established [ɪˈstæblɪʃt], noun:
A person introducing a state of things, while permanently securing acceptance for it and thereby placing an issue beyond dispute and giving calmness or steadiness to the mind of others.

Rookie [ˈrʊki], noun:
A new recruit or a novice in a particular field or profession, especially someone playing in his or her first major league or championship.

Rising Star [ˈraɪzɪŋˌstɑr], noun:
A person or thing considered to be destined for or currently attaining success in a particular field.


high
intermediate
small
Market size
low
intermediate
high
Tooling competence
ALLSTARS
China
USA
Japan
Germany
South Korea
Italy
Canada
ESTABLISHED
Switzerland
Spain
Austria
India
Brazil
Mexico
Poland
Turkey
Portugal
Indonesia
South Africa
Czech Republic
RISING STARS
ROOKIES
Vietnam
Develepment potential
high
intermediate
low

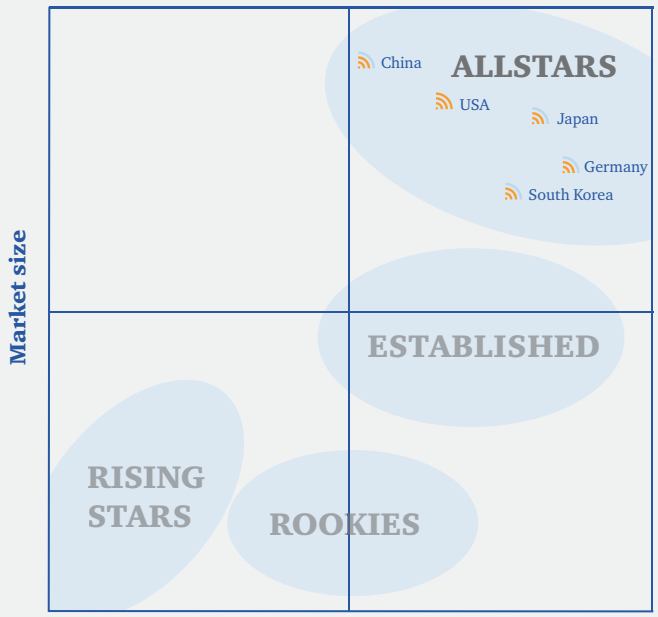
WOT-Radar

The World of Tooling Radar (WOT Radar) shows the relevance of the twenty most important tooling markets today and in the future and is measured by the size of the tooling markets on the ordinate and existing tooling competencies on the abscissa. In addition, the future development potential of the tooling markets is assessed. The calculations for market size, tooling competence and future development potential is based on figures from the past five years. For the rating of the development potential further-reaching time series have been analyzed for chosen figures. The size of the tooling markets has been calculated by the production volume of each country and its tool imports and exports. The calculation of tooling competence was based on a variety of aggregated market figures and additional data from the database of the WZL and IPT. This included figures, which were used as an indicator for technological and organizational competence. Furthermore, free available figures from the the tool and die industry have been used, for example the number of tooling relevant patent registrations or the quality of education in engineering and technology. Finally, general economic figures regarding unemployment, business fields or infrastructure have been considered. In addition to quantitative figures, a qualitative figure describing the tooling competence was included in the calculation. It is an expert opinion generated from the international tooling experience of the WBA and the WZL. The 20 markets of this study are ranked by the system of the aforementioned WOT-Radar. Four market groups could be identified based on the characteristics of each tooling market. The names of the groups are derived from the related associations with the names „Allstars“, „Established“, „Rookies“ and „Rising Stars“.

The 20 most important countries in the World of Tooling

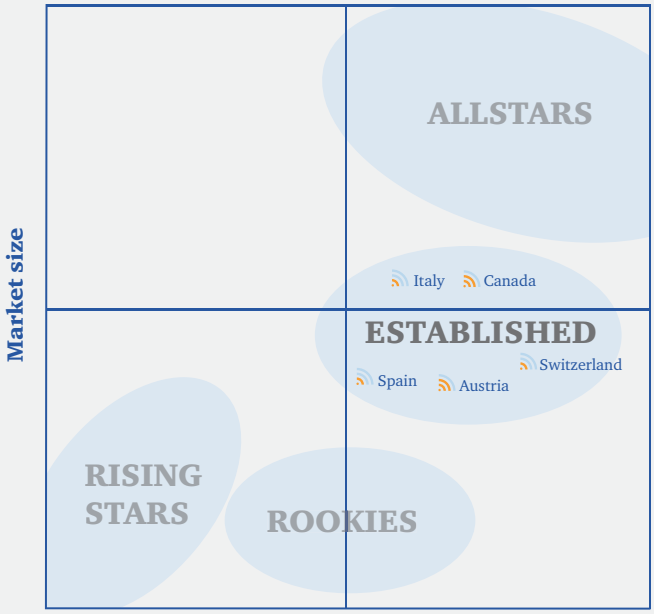
- Brazil
- China
- Germany
- India
- Indonesia
- Italy
- Japan
- Canada
- Mexico
- Austria
- Poland
- Portugal
- Switzerland
- Spain
- South Africa
- South Korea
- Czech Republic
- Turkey
- USA
- Vietnam

Allstars



Allstars describe those tooling markets that designate both a large market size as well as high tooling competence. These markets comprise of Germany, Japan, South Korea, USA and China. China is at the lower competence range of the Allstars, but has by far the largest tooling market. However, in the market average, China is not comparable to the other Allstar-markets with respect to tooling competence. The stage of development of the Chinese tooling industry is much less homogeneous than other markets. Its classification as an Allstar is justified by the fact that there are Chinese companies, which have a high tooling competence along the entire process chain of toolmaking. The United States of America has the second largest tooling industry in the world, which after many years of contraction is growing again. The tooling competence is unable to compete with the top three countries, but increasing investments express a positive development in the future. Germany, Japan and South Korea have, with the exception of Switzerland, the highest tooling competence. A wide range of organizational and technological innovations of the tooling industry have its origins in one of these markets. They have a highly developed manufacturing industry and are known for their local automotive industry. The importance of these three markets will not decrease in the foreseeable future for both the local industry and global sourcing of highly complex tools. Because of the high tooling competence and the large market size, every Allstar-market could be used for sourcing tools with a high degree of complexity in large volumes.

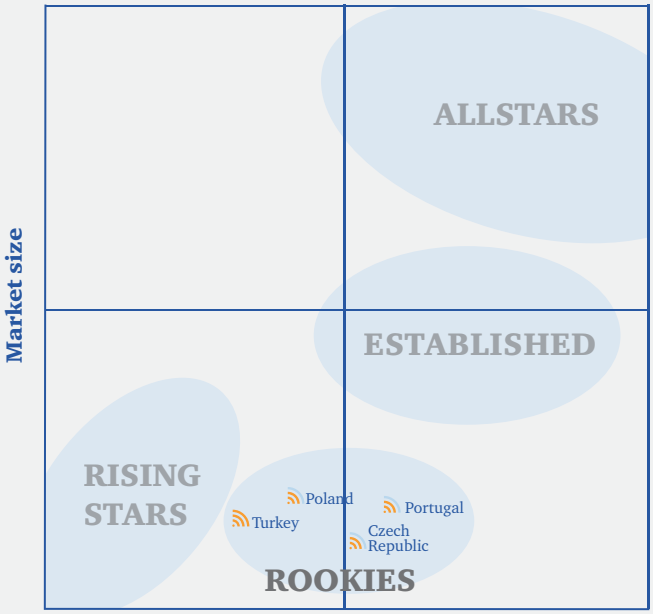
Established



Tooling competence

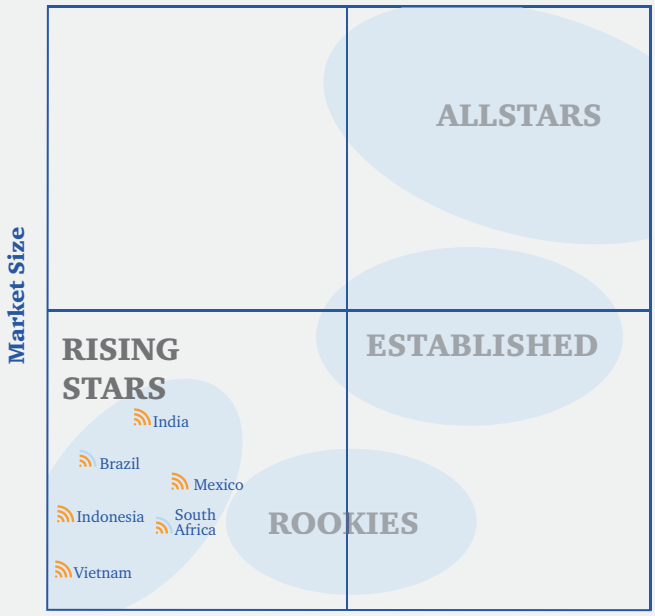
Established are markets with a high or very high tooling competence and smaller market size than Allstars. These include Italy, Canada, Spain, Austria and Switzerland. Barring Italy, whose development potential is considered to be low, they are suitable for sourcing complete tools. The consolidation of the tooling industry in Italy has led to a considerable decrease in tooling competence in recent years. For many years Italy was a valued partner of the German automotive industry, in particular for the complete procurement of sheet metal- and massive forming tools. Due to insolvent companies and lack of investments, the complete procurement of complex tools is no longer possible without restrictions. The rebuilding of these competencies is not yet in sight. Switzerland‘s development potential is also classified as low, due to the difficult overall economic situation, caused by the decoupling of the Swiss franc and the euro. The shrinking Swiss market will initially have no effect on the very high tooling competences. The number of Canadian tooling companies has shrunk considerably in recent years. The Canadian tooling industry depends on the North American automotive industry, which used to source Canadians tools as a high quality alternative to American tools. The Spanish tooling industry has suffered considerably from the economic and financial crisis like the entire southern European region. However, tooling companies exist that may be internationally competitive. Due to lacking tooling networks and a largely insignificant manufacturing industry the development potential is low. Austria has finally benefited from its location on the German border and its very good access to East European markets.

Rookies



Rookies are characterized by an average to high tooling competence, but cannot reach the market size and/or tooling competence of the Established or Allstars. The Rookie group contains Poland, Portugal, the Czech Republic and Turkey. Portugal has been an internationally respected partner for several years for injection molds with average to high complexity. Three government –funded regional networks combine most of the 400 to 600 tooling companies of the country. These provide for high reliability and fast project execution. The Czech Republic and Poland are experiencing a long term, continuous boom on a macroeconomic level as well as in the tooling industry. Especially the Czech Republic profits from of the excellent quality of the technical education, which is at par with the international level. The local automobile industry and the immediate proximity to Germany generated many interesting suppliers, particularly for an outsourcing of machining tasks. Various interesting tooling companies exist in Turkey. This is valid both for the sourcing of sheet metal forming tools driven by the local automobile industry and for injection molds driven by numerous OEMs for producing white good products. Turkish tooling companies are able to offer complete tools with low complexity or act as extended workbenches. It has been observed, that the market size of the Turkish tooling industry is growing faster than their tooling competence.

Rising Stars



Rising Stars have neither high tooling competence nor a big tooling market; but these countries have the potential to grow rapidly in market size and tooling competence. The markets of Mexico, Brazil, South Africa, India, Indonesia and Vietnam are classified as Rising Stars. Indonesia and Vietnam, having fast growing economies and located in the operating range of China, have good conditions to develop a local tooling industry. The producing industry of these countries is growing, especially with a high amount of foreign direct investments. Additionally, there are already well-known tooling companies, which can compete internationally. Currently, professional association structures are being developed around these companies, which will support the development of the industry.

Mexico is the trend market of 2015. The enormous amount of investments of the automobile OEMs leads to a high level of activity within the Mexican tooling market. Currently the local structures cannot satisfy the growing tooling demand of the local enterprises. One major reason could be the lack of skilled employees. With interesting local tooling networks, Brazil could take advantage of this situation, but due to restrictive custom regulations, they produce tools mostly for the local market.

For several years India cannot fulfill the high expectations for its tooling industry. However, this could change in the future, as new subsidies have been announced.

The development of South Africa's national economy is not satisfactory, but the tooling industry is the only positive exception in its economy. Functional association structures and governmental subsidies were able to preserve the current level of the tooling industry until now. Although the Rising Stars have tremendous potential, they are presently only partially suitable for the sourcing of complete tools with low complexity. Their development has to be observed and if necessary, existing tooling companies have to be enabled as a sourcing option.

Ranking Tooling competence

Germany	1	Italy	8	Mexico	15
Japan	2	Portugal	9	South Africa	16
Switzerland	3	China	10	India	17
South Korea	4	Spain	11	Brazil	18
Canada	5	Czech Republic	12	Indonesia	19
USA	6	Poland	13	Vietnam	20
Austria	7	Turkey	14		

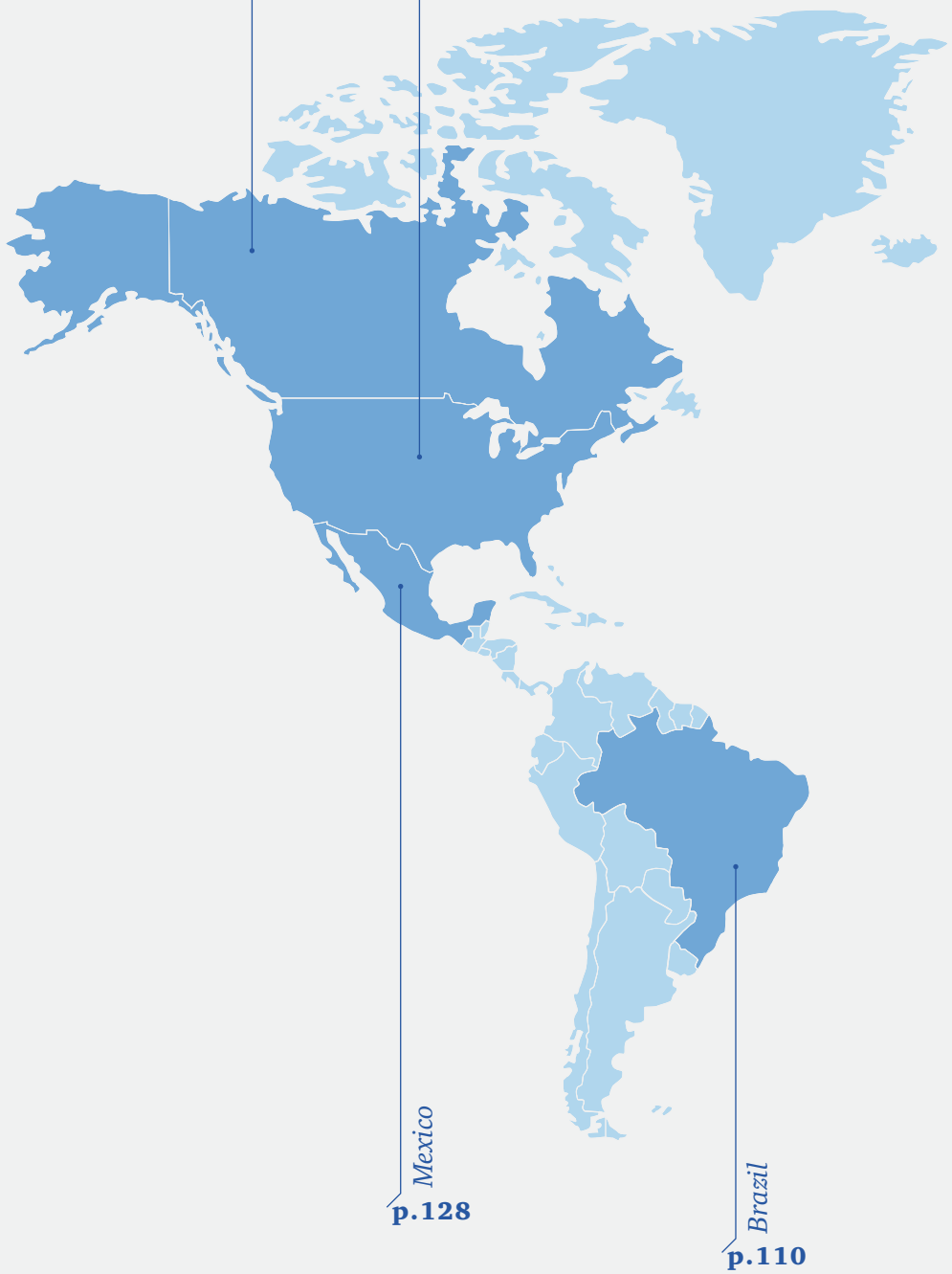
Ranking Market size

China	1	Switzerland	8	Portugal	15
USA	2	Spain	9	Turkey	16
Japan	3	Austria	10	Indonesia	17
Germany	4	India	11	South Africa	18
South Korea	5	Brazil	12	Czech Republic	19
Canada	6	Mexico	13	Vietnam	20
Italy	7	Poland	14		

Ranking Development potential

high	medium	low
India	Brazil	Italy
Indonesia	China	Switzerland
Mexico	Germany	Spain
Turkey	Japan	
USA	Canada	
Vietnam	Austria	
	Poland	
	Portugal	
	South Africa	
	South Korea	
	Czech Republic	

Market profiles




p.28
Germany
p.82
Poland
p.100
Turkey
p.18
China
p.34
Japan
p.40
South Korea
p.76
Spain
p.94
Czech Republic
Austria
p.64
Portugal
p.88
Switzerland
p.70
Italy
p.52
South Africa
p.138
India
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Indonesia
p.122
Vietnam
p.144

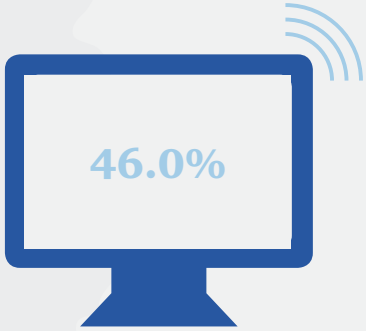
Country:	***China***
Area:	***9,596,960 km²***
Population:	***1,355.69m***
GDP per capita:	***€6,764***
Category:	***Allstars***

China

[The Middle Kingdom comprises almost 19% of the global population and its provinces oscillate between a developing or highly developed country.]

The country and its people

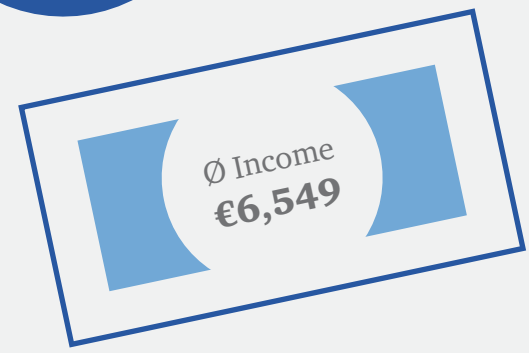
Located in East Asia, China is the most populated country of the world with its 1.35bn citizens, where almost 19% of the global population resides. The demographic growth is at a low level of approximately 0.5%, largely due to political family planning measures and estimations of the UN imply that the population will decrease to 1.3bn by 2050. Nevertheless, the average age of 36 years is well below the average of western industrial nations. China possesses strong inter-regional disparities. The large share of the economic power concentrates on the East Chinese coast where the development level is significantly higher than in the more rural areas in Central and East China. Especially the metropolitan cities - Shanghai and Hong Kong - occupy top positions by international standards-, for instance educational institutions, although China invests only 0.5% of its gross domestic product in education. Differences are also visible in the health care system, the labor market and the income. Beside economic centers, China is still in many domains a developing country, while metropolies are often comparable to the highly developed industrial nations. At the same time, the recent year's high rate of urbanization was responsible for supply and environment problems particularly in the metropolises.



Population with internet access
2014

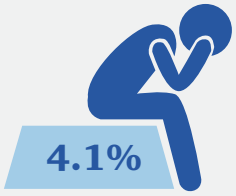
Population
1,355.69m citizens

Birthrate 12/1000 (births/citizen)
2014



The economy and the industry

[China's economy has grown from a developing country into a global economic power in record time. However, the rapid growth is showing signs of slowing down.]



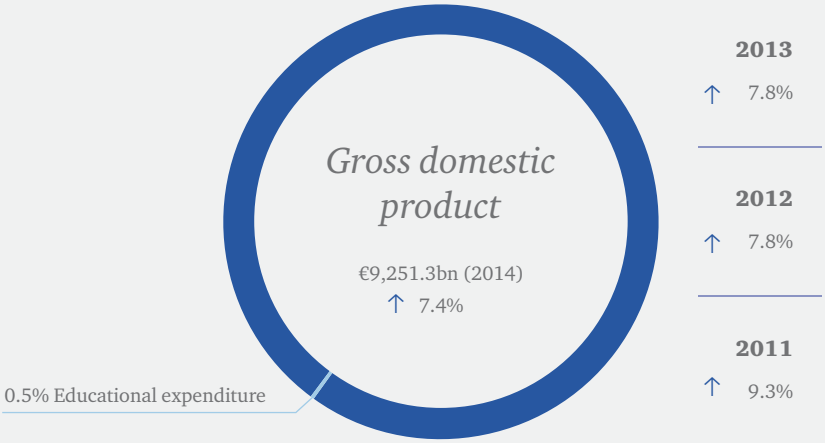
Rate of unemployment
2015

Index for English language skills
2014

Business climate by comparison of 189 countries
Ease of Doing Business 2014

In terms of the Gross Domestic Product, (GDP) China is the second largest economy in the world, second to the United Stated of America. The GDP per capita is approximately €6,764 and thus within the lowermost third of the countries which were compared in the present study. The economy has grown by an average of 8.1% in the last four years. Since 2000, China's economy grew by more than €1bn. In 2009, China for the first time took over from Germany as the largest exporting nation in the world. China's economy was and is an essential factor for the global economic growth. While still being positive, the outlook for the years 2015 and 2016, shows signs that growth will slow down significantly, implying that monetary policy as well as structural economic problems must be amended. China is currently the world's largest exporting and second largest importing nation. Nearly 10% of all global exports and imports exist because of China.

The country exported goods worth €1.86bn in 2014, mainly from electronic, textile and machinery sectors. The country has various natural resources, such as tungsten, coal, iron ore, graphite, tin and platinum and petroleum. Nevertheless, primary materials are the second largest import goods. More than 50% of the total GDP is generated at the east coast of China. In 2013, the wage level was on average €6,549 and thus significantly lower than all industrial nations, while the income per capita in urban areas is twice as high as in rural areas. On average, every employee works 2,288 hours per year, which is more than every country considered in this study. Labor productivity has risen proportionally to the labor costs in recent years. However, this average is particularly supported by the increase of productivity in agriculture. Particularly in the industrial sector, labor costs have increased for several years faster than productivity.



[China's tool and die industry: 40,000 enterprises, 1m employees. Germany's tool and die industry: 3,800 enterprises, 54,000 employees.]

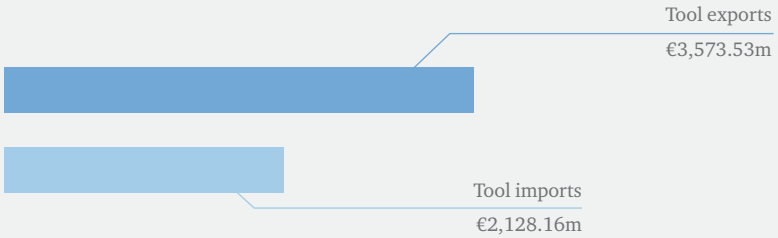
According to official statistics, China's tool and die industry comprises of more than 40,000 enterprises with more than 1m employees. Compared to Germany, China has a significantly larger number of tool and die manufacturers with more than 100 employees. In 2012, China produced tools and dies worth €15,720.87m. Since 2010, this value increased from €11,999.30m. In 2013, 301,644 tons of tools and dies with a value of €3,573.53m were exported. The number consists of solid and sheet metal forming tools worth €532.73m, injections molds worth €2,733.68m and die-casting molds worth €307.11m. In 2013, China imported tools worth €2,128.16m which comprised of €725.63m of solid and sheet metal forming tools, €1,214.35m of injection molds and €188.19m of die casting molds. The rise of the tool and die industry and the rise of the Chinese economy occurred simultaneously.The sales development of the tool and die industry was in line with the development of the economy as a whole. Barring the years of crisis, 2008 and 2009, the industry

The tool manufacturing and the tools

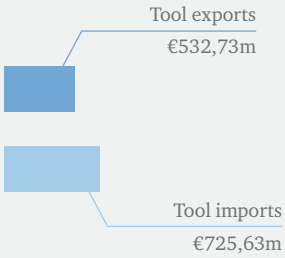
616

Number of patent registrations in the tool and die industry
2000-2011

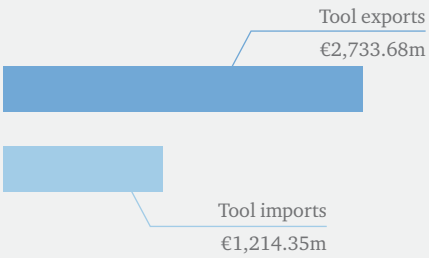
Tool production/tool exports/tool imports



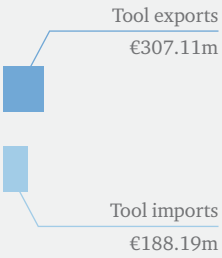
Solid and sheet metal forming tools



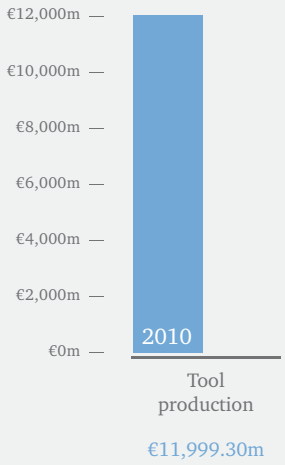
Injection molds

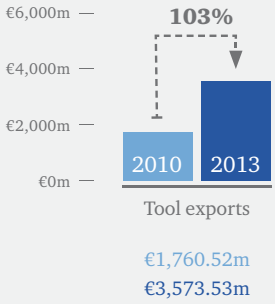


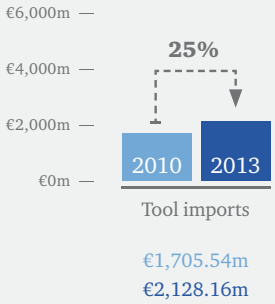
Die casting molds



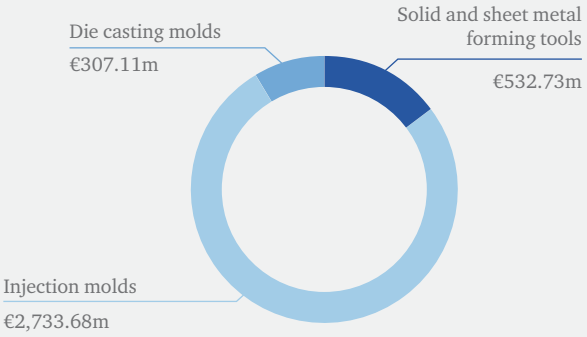
The tool manufacturing and the tools



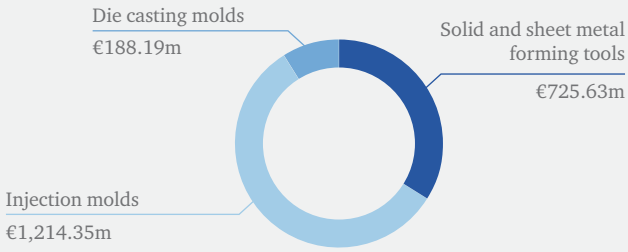




Tool exports

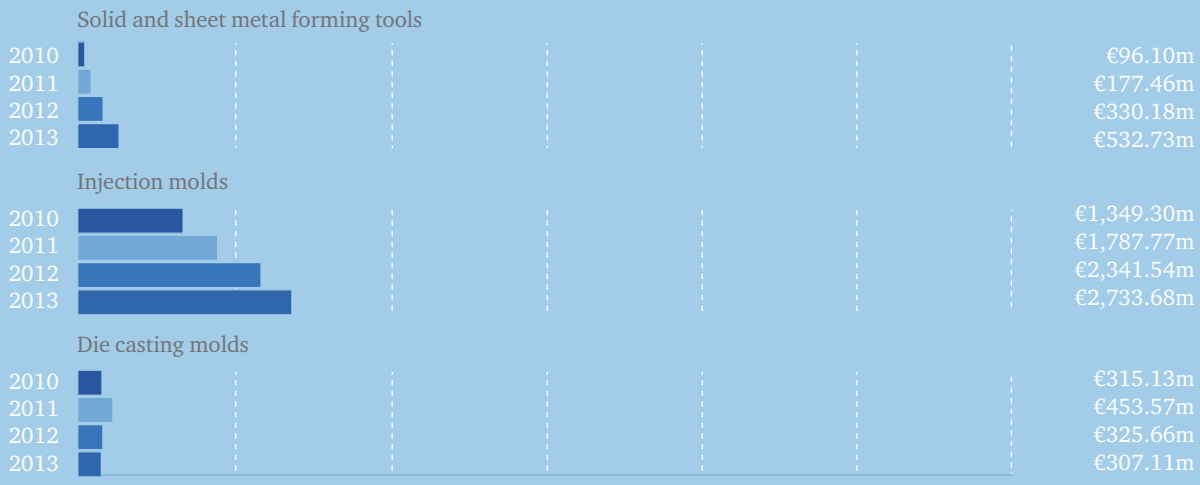


Tool imports

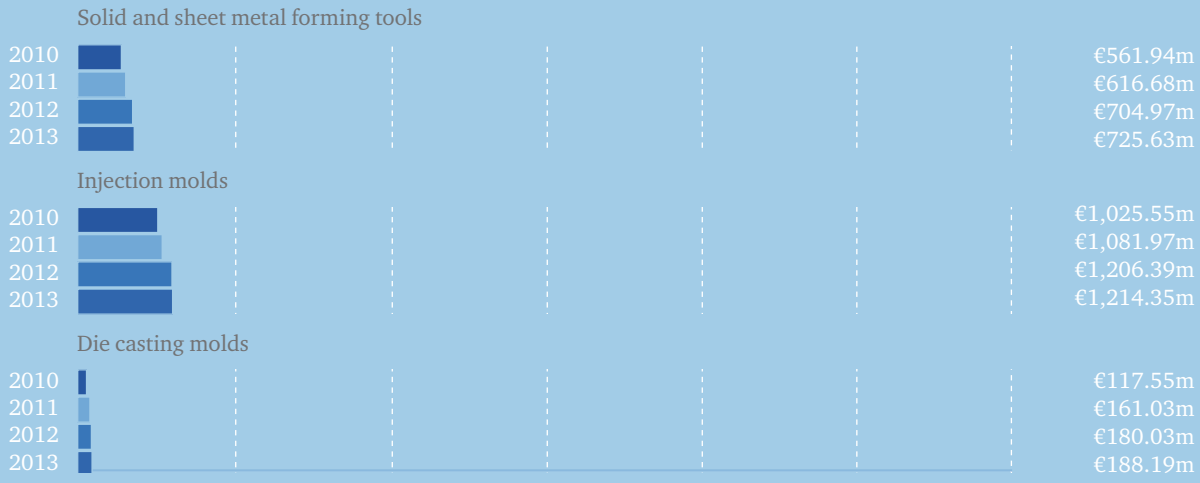


grew in double-digits thanks to massive governmental aids within a 5-year plan. The tool and die industry is present all over the Chinese mainland. In the East Chinese coast, the tool and die industry has developed into a core industry. The coast provinces of Guangdong, Zhejiang, Jiangsu and the city Shanghai collectively cover 80% of the total tool and die production. Chinese tool and die manufacturers distinguish themselves by a very high availability of manpower and resources, which enables them to accomplish low lead times – comparable with Germany. Though, in most cases the engineering expertise for sophisticated tools and dies is absent in both the assembling as well as the qualification of tools and dies. In the meantime, there are several enterprises related to all tool and die types, which operate on highest international level along the complete process chain in tool and die manufacturing. Solely because of the size of the industry, China will have a key role in the world of tooling in future. The fact, that internationally competitive companies with a high level of quality could evolve confirms the positive development of the tool and die manufacturing expertise. China is an Allstar in the World of Tooling which will witness a slight ease of development potential.

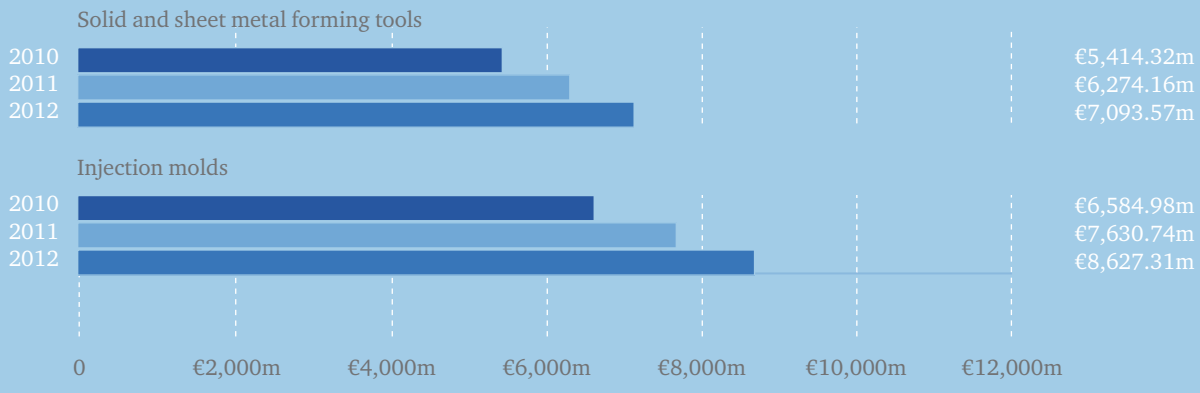
Tool exports



Tool imports



Tool production



Expert interview

Andreas Hill

Huf Tools

Huf Hülsbeck & Fürst develops and produces mechanical and electronical locking systems, driving authorization systems, passive-entry systems, driver access systems, door handle systems, tailgate and rear door systems all over the world. With a market share of above 20% in locking systems, Huf belongs to the most important vendors within this segment. Huf Tools was founded in 1999 from the former manufacturing unit of the parent company Huf Hülsbeck & Fürst as a complete subsidiary and has about 110 employees and 11 trainees at its location in Velbert. Ever since, the company has been a partner for innovative development and production for customized and high-quality injection molds and automated assembly facilities not only for the Huf group but also for external customers.

[Our experiences have shown us, that it is necessary to have a German employee on-site.]

What motivated you to open up a tool shop in china?

The Huf group has an international production network, which is supplied with highly complex tools and dies from its tool shop in Velbert. After the procurement of injection molds from different external Chinese suppliers-since 2005, Huf Tools decided to establish its own tool shop in China in 2009. With the tool shop in China, we wanted to not only supply our local Chinese production faster and qualitatively better than local suppliers but also profit from more favorable labor costs in terms of a mixed calculation.

How did you select the organization form and the location of the company and what obstacles did you have to overcome?

For the selection of the organization form of the company, we considered all available opportunities from the acquisition of an existent company to diverse possibilities of internal and external Joint Ventures and even the foundation of a 100% subsidy. Regarding the location, we were open to all Chinese industry centers, in which the tool and die industry played a role. Finally we decided upon a Huf internal Joint Venture with our production site in Yantai, located in the North East, which is centrally located with all other Huf locations in China. It had a tool and die repair center since a few years, from which we recruited our first staff. With our Chinese Joint Venture partner, we handled bureaucratic obstacles relatively easily. More troublesome was the recruitment of other employees, as Yantai is not traditionally a tool and die industry center. We quickly noticed that although the recruitment of staff was more difficult, the fluctuation was low compared to more popular areas. For the first two years we had two employees from Germany installed as a director and a technical manager on-site. Now a Chinese colleague leads the company and the vice director is a German. Our experience shows us, that it is necessary to have a German employee on site.

How did you identify the best tool and die suppliers during your visits?

An obstacle at the selection of tool and die suppliers was the performance assessment, which is why we asked for recommendations and then specifically audited these companies. →

[During audits we concentrated on the equipment and condition of the machine parks. An additional criterion was the CAD-system in place.]

Within auditing, we concentrated on the equipment and condition of the machine parks. An additional criterion was the CAD-system in place. Old version of CAD-systems can lead to insufficient data consistency and deviations between the data and the tool and die geometry can occur.

Which role does the tool shop in china play in your production network?

Half of the production of the tool shop in China is for our four Chinese locations. The other half of the tool and dies is mainly sent to Europe and the USA, and a part is used to supply the Huf locations in India, Brazil and Mexico. More simple tool and dies are deliberately made in China to decrease the total costs in terms of a mixed calculation.

How would you estimate the future development of the tool and die industry in China?

The major trend of shifting tool and die production to China will continue, but the exchange rate of the Chinese currency and the development of the labor costs will retard this development. Depending on the transporting costs and time, Eastern Europe will become more attractive to supply European production sites. Even Chinese companies have recognized this and are investing in East European tool shops. In the issue of complexity, tools and dies, which are very complex or need many modifications, continue to be produced more efficiently in Germany with the available know-how.

[Adjustments of tools and dies are not updated appropriately in the drawings. With arising differences between tools and dies and their drawings additional efforts in maintenance and repair are required.]

In which crucial points do you see deficits of the Chinese tool and die industry?

A huge disadvantage in China is the low process knowledge to optimize complex plastic parts. As manual rework is not seen as a problem because of low labor costs, there is a lack of motivation to optimize tools and dies. Adjustments of tools and dies are not entered back into the drawings properly. With the arising differences between tools and dies and their drawings, additional efforts in maintenance and repair are required. These inaccuracies can also be noticed in the measurement accuracy of geometric tolerances because measurement results have a low reliability and are therefore of low importance. Likewise, only few employees are able to speak English, which complicates a direct interaction for example with a designer. Despite these disadvantages, the importance of the Chinese tool and die industry will continue to increase, as there is also the will to invest at a large scale.

What makes the location China better than other countries, for example India?

China has experienced a rapid growth in the last 10 years. At the time, there were about 30,000 mold makers, of which only some were up to the mark. Today, there is a variety of companies, which produce tools and dies ranging from average to high quality. This is explained by high investments in modern machine tools. In countries like India, the →

development of the tool and die industry is stagnant, as there were only small investments into machine parks.

What is the market situation of standard parts and materials in China?

An essential driver of the development of the Chinese tool and die industry is the distinctive supplier network in China. One exception is the quality of Chinese steel, which fluctuates too much for the use in challenging conditions. For this reason, we use German tool-steel, which can be procured on-site as other materials and standard parts. However, reliable suppliers and checks are necessary in order to avoid counterfeits of standard parts. In other countries, such as Indonesia or Vietnam, this supplier network is completely absent.

What are cultural differences that you have noticed in the daily life in China?

The cultural differences should not be neglected. To prepare for a long-term stay, a preparatory course is useful. It must be remembered that during collective decisions, Chinese employees do not address problems directly and openly. ←

Country:	***Germany***
Area:	***357,340 km²***
Population:	***81.00m***
GDP per capita:	***€42,414***
Category:	***Allstars***

Germany

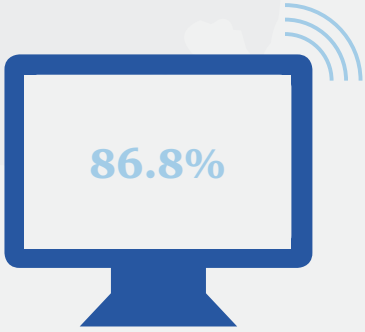
[Germany is the land of poets and thinkers. The 1,600,000 graduated engineers ensure the engineering and automotive export success.]

Situated in central Europe, Germany, with its 81m citizens, is the most populated country as well as a founding member of the European Union. Estimations of the German Federal Bureau of Statistics assume the population to decrease to 74m citizens by 2050. Germany is one of the most highly developed countries of the world, and this is shown in relevant statistics concerning income, life expectation or education level. 86% of adult citizens hold a higher school degree, while the school system's quality, when compared to other industrial nations and according to the PISA Study, is only slightly above the average. Germany is the second most popular country of immigration, following the United States of America.

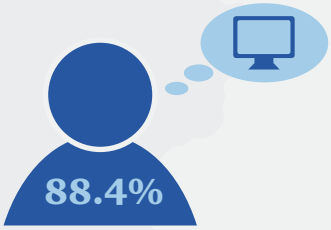
The country and its people

Population
81.00m citizens

Birthrate 8/1000
(births/citizen)
2014

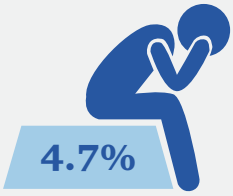


Population with internet access
2014

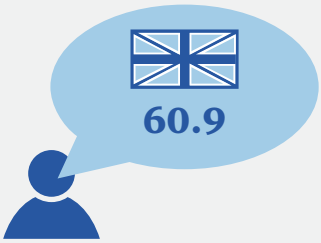


Population with basic computer knowledge
2013

The economy and the industry



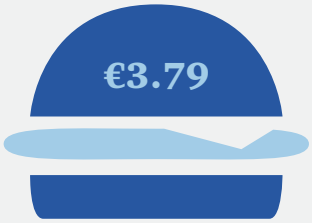
Rate of unemployment
2015



Index for English language skills
2014

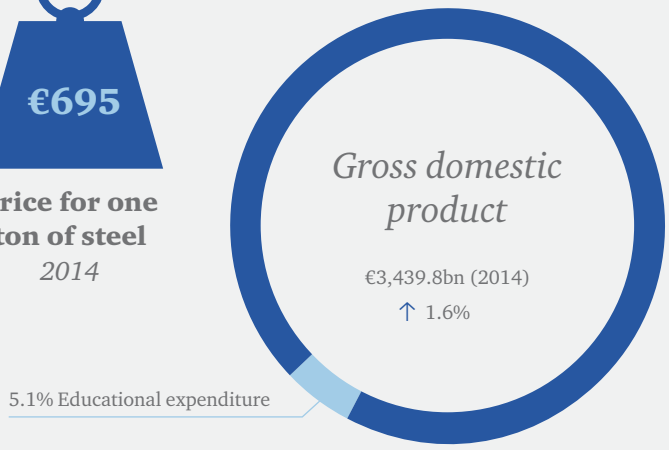
[The German "Mittelstand" is the backbone of the German economy comprising of 99.7% of all businesses subjected to VAT, 66% of all employees subjected to social insurance contributions and 83% of all apprentices while at the same time, more than 90% is family-owned.]

Measured on the basis of the gross domestic product (GDP), Germany is Europe's biggest and the World's fourth biggest national economy. Referred to the GDP per capita Germany occupies the fifth place compared to the other countries of the present study. During the last four years, the economy has grown moderately with 1.5%. The forecast for the years 2015 and 2016 is positive. At the moment, Germany is the third biggest export and import nation worldwide. In 2014, the country exported goods worth €1,130bn. The most important exports were automobiles, machines and chemical products. Besides the service sector, the industry is of particular importance. The country is low on natural resources. In 2013, the wage level averaged €36,402 and hence was significantly above all industrial nations. However, the income distribution is very heterogeneous and 20% of the wealthiest Germans earn four times as much as the poorest 20%. The average citizen works for 1,398 hours per year, which is 20% less than the average of all industrial nations. Worldwide, Germany is perceived to be the most important location for trade fairs and host of numerous leading trade fairs, especially for the manufacturing industry. Several indices acknowledge Germany to have not only an outstanding location quality but also international competitiveness.



Measure for purchasing power parity, price for one Big Mac
Big Mac Index 2015

Price for one ton of steel
2014



2013
↑ 0.2%

2012
↑ 0.6%

2011
↑ 3.7%

[Germany is the fourth largest tool and die manufacturer worldwide.]

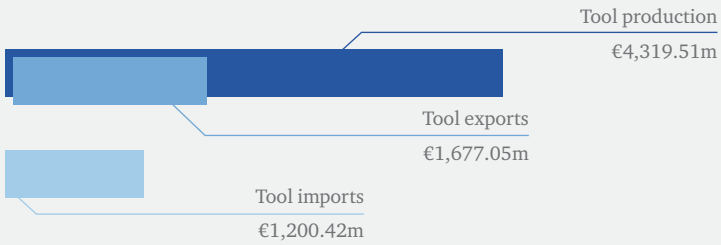
The tool and die industry is characterized by small and medium-sized companies, distinct heterogeneity and strong fragmentation. More than 80% of the 3,800 tool and die manufacturers in Gaermany have less than 20 employees. On the other hand, less than 1% of the companies have more than 100 employees. Only few internal tool and die manufacturers of the automotive industry and other producing companies have partly more than 1,000 employees. At the moment, there are approximately 54,000 employees in the German tool manufacturing industry. A massive decline in sales in the amount of about 26% occurred, after a strong sales growth between 2005 and 2008, with the beginning of the global economic and financial crisis in 2009. The pre-crisis level could be exceeded again only in 2012. In 2013, the tool and die production added up to €4.32bn to the tool and die industry. Therefore, Germany is by international comparison the fourth largest tool and die manufacturer. The share of injection molds is with 49.6% only slightly larger than the share of solid and sheet metal forming tools and die casting molds. With respect to market size and market maturity, the German tool and die manufacturing market is among the leading tool and die manufacturing markets in the world. The industry's tight connection to the automotive industry and the creation of value, distributed over a broad field of

The tool manufacturing and the tools

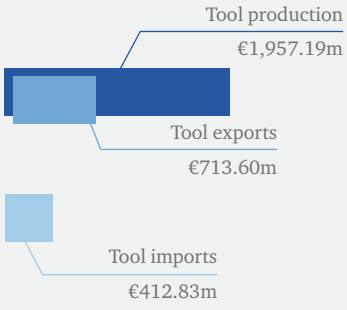
5,555

Number of patent registrations in the tool and die industry
2000-2011

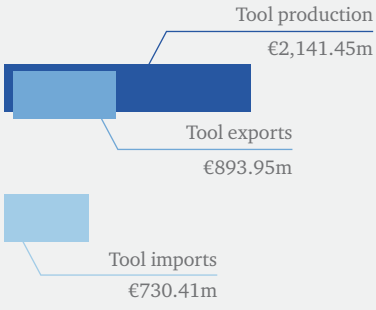
Tool production/tool exports/tool imports



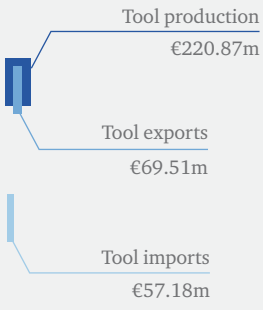
Solid and sheet metal forming tools



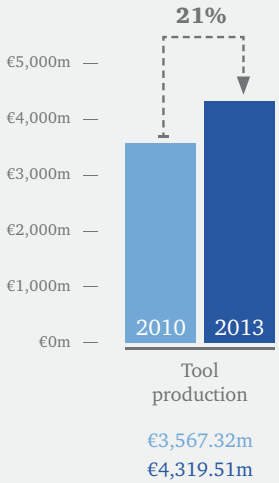
Injection molds



Die casting molds

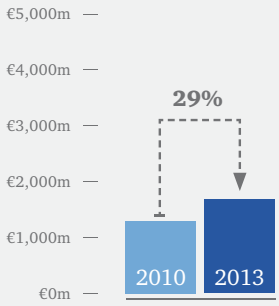


The tool manufacturing and the tools



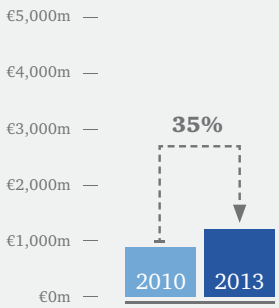
Tool production

€3,567.32m
€4,319.51m



Tool exports

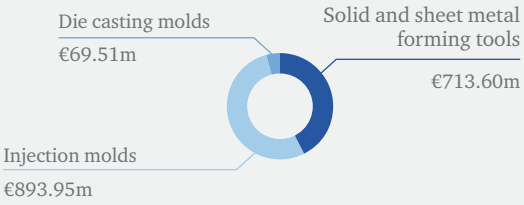
€1,295.01m
€1,677.05m



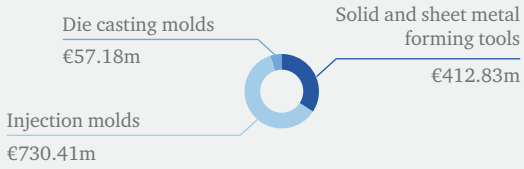
Tool imports

€890.41m
€1,200.42m

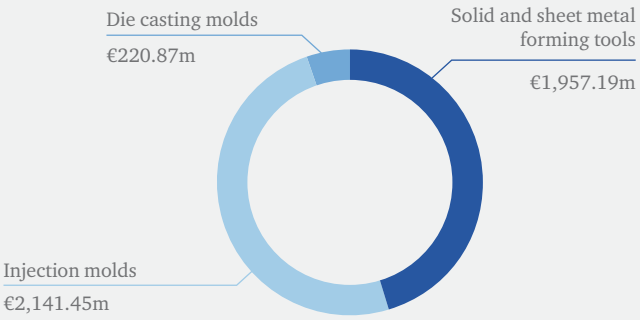
Tool exports



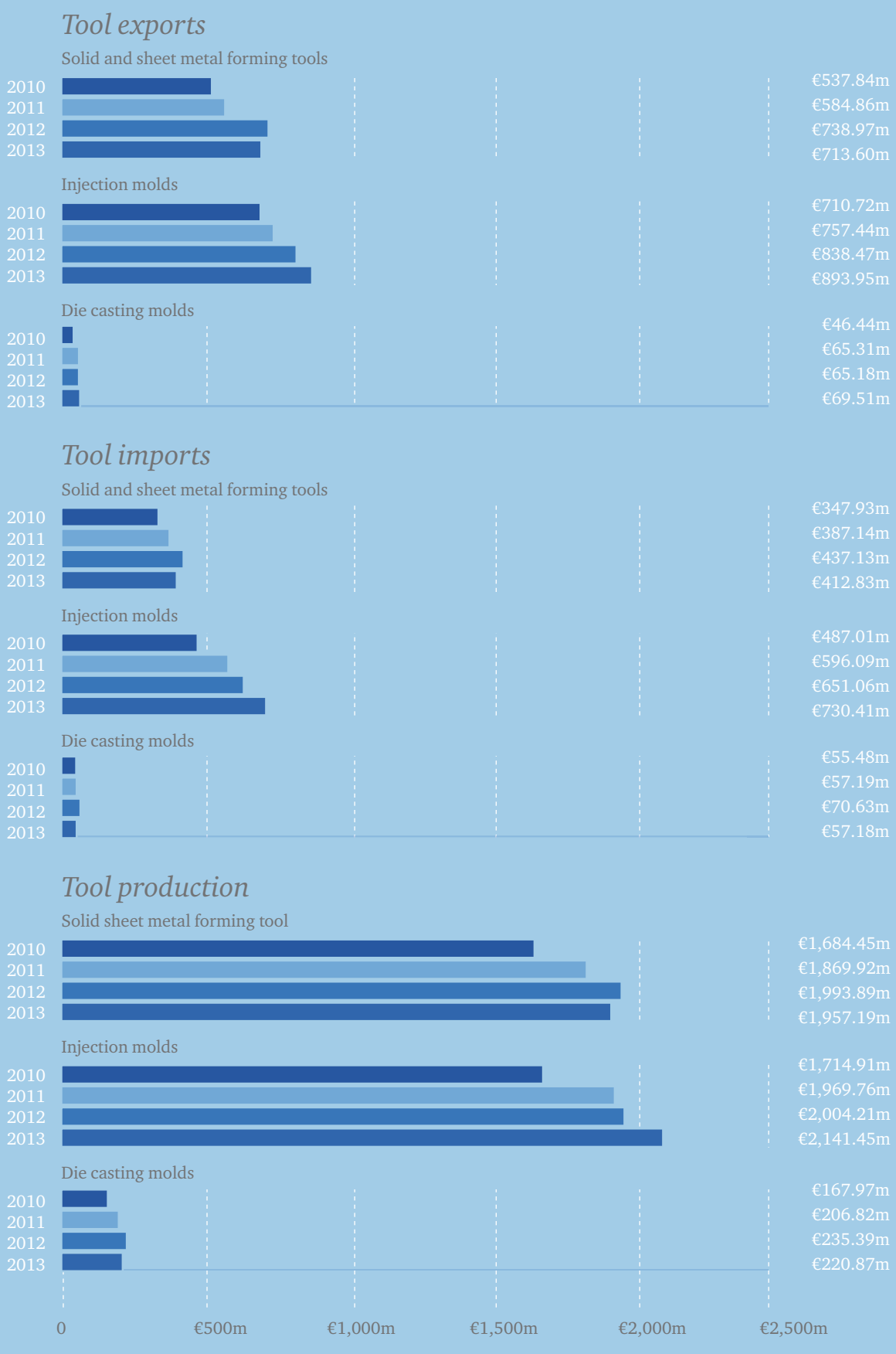
Tool imports



Tool production



middle and small-sized companies, is a factor of its success. The German tool and die industry meets the highest requirements, concerning tool quality and complexity. High-priced, complex solid and sheet metal forming tools for the automotive industry are still produced in Germany. Reliable and efficient processes enable the high quality of the tools. On an average, the process quality, concerning the tool and die manufacturing and complete order processing is very good. In addition, the German tool and die industry distinguishes itself with good human resources and machines. With an established education system, tool and die manufacturer have hands-on, qualified employees who enhance and pass on their know-how. The machine tools needed for German tool and die manufacturers, mainly come from own production. Thus, German tool and die manufacturers have an unlimited and direct access to high-quality machine tools. With the high performance ability of the tool and die industry, well trained employees, latest machine equipment and the big-sized tooling market, Germany is considered to be an Allstar. A decreasing population and the current high performance of the tool and die industry implies a medium development potential, although Germany will continue to define the tool and die industry in the future.


Tool exports
Solid and sheet metal forming tools
2010 €537.84m
2011 €584.86m
2012 €738.97m
2013 €713.60m
Injection molds
2010 €710.72m
2011 €757.44m
2012 €838.47m
2013 €893.95m
Die casting molds
2010 €46.44m
2011 €65.31m
2012 €65.18m
2013 €69.51m
Tool imports
Solid and sheet metal forming tools
2010 €347.93m
2011 €387.14m
2012 €437.13m
2013 €412.83m
Injection molds
2010 €487.01m
2011 €596.09m
2012 €651.06m
2013 €730.41m
Die casting molds
2010 €55.48m
2011 €57.19m
2012 €70.63m
2013 €57.18m
Tool production
Solid sheet metal forming tool
2010 €1,684.45m
2011 €1,869.92m
2012 €1,993.89m
2013 €1,957.19m
Injection molds
2010 €1,714.91m
2011 €1,969.76m
2012 €2,004.21m
2013 €2,141.45m
Die casting molds
2010 €167.97m
2011 €206.82m
2012 €235.39m
2013 €220.87m
0
€500m
€1,000m
€1,500m
€2,000m
€2,500m

Country:	***Japan***
Area:	***377,915 km²***
Population:	***127.10m***
GDP per capita:	***€32,380***
Category:	***Allstars***

Japan

[Japan is considered as the land of smiles and the rising sun – the country's politics oriented itself early to western nations, who aided development and led to Japan becoming one of the most advanced Asian nations.]

The country and its people

With 127m citizens, Japan is the tenth most populated country in the world. The island nation is located in East Asia in the Pacific Ocean. Estimations of the UN expect the population to shrink to 108m by 2050. Thus Japan, together with Germany, has the most negative population growth rate of all industrial nations. The Japanese society is very homogenous; only about 1% belong to ethnic minorities. Japan is considered to be one of the most highly developed countries in the world. This is reflected in all relevant statistics regarding income, life expectancy and level of education. The PISA Study, which is an international measure for the quality of school education, shows Japan usually with top ratings. The life expectancy is nearly 83 years and thereby 3 years higher than the average of all other industrial nations. At the moment, there are more than 50,000 centenarians in Japan - a phenomenon in no other country of the world. Further, the country has one of the lowest crime rates of all industrial nations. On an average there are only two capital offences caused by arms per year (compared to 8850 in the USA). Japan is notably prone to earthquakes, with the earth moving 1500 times a year. Japan's young population is considered childish by European standards. Big cities like Tokyo may appear unfamiliar with its colorful diversity. Nevertheless, the profound and significant culture is of high importance in Japan. Samurai and Shoguns are just one small aspect.

Business climate by comparison of 189 countries
Ease of Doing Business 2014

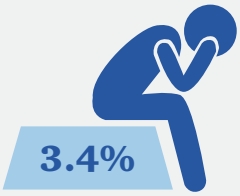
Population
127.10m citizens

Birthrate 8/1000 (births/citizen)
2014

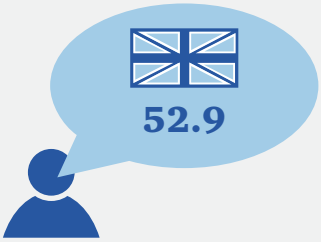
The economy and the industry

[Japan's industry is renowned for its advanced technology and its production philosophy.]

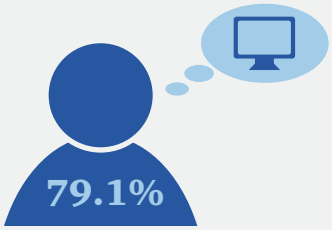
In terms of the gross domestic product (GDP) Japan is the third largest national economy in the world. After World War II, the Japanese economy could grow again, despite international isolation, because of its very close internal links between producers, suppliers and distributors. This recognizable characteristic of Japan's economy, known as "Keiretsu", nowadays stands for successful value creation in networks. The GDP per capita is approximately €32,380 and thus Japan occupies the 7th place in present study's comparison. During the last four years, the economy has grown moderately by 0.7% per year. The outlook for 2015 and 2016 is positive. Currently, Japan is the world's fourth largest nation for export and import. The country is poor in natural resources and exported goods worth €580.33bn in 2013. The three most important exports were automobiles, machinery and electronics. In 2013 the average wage level was with €29,504 well above the average of all industrial nations. The average person works for 1,735 hours every year, which is 15% more than other industrialized nations. After decades of full employment in Japan, unemployment led to social problems in the 90s. In the 2000s, the economy recovered due to liberal monetary policies, during which Japan was burdened by debts of nearly 250% of its GDP. Unemployment currently stands at 3.4%, although a significant number of unreported cases are suspected. While other Asian countries are infamous for their cheap products, Japanese products are connected to a high quality. As Germany or Switzerland, the country is known for its high precision and efficiency. This is evident by the excellent train system where the average delay is with 18s a global peak.



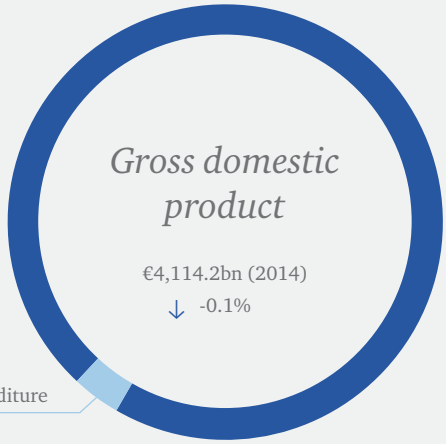
Rate of unemployment
2015



Index for English language skills
2014



Population with basic computer knowledge
2013



2013
↑ 1.6%

2012
↑ 1.8%

2011
↓ -0.5%

[Swiss quality from the Far East – the Japanese tool and die industry is at par with Swiss quality and actively trades with China.]

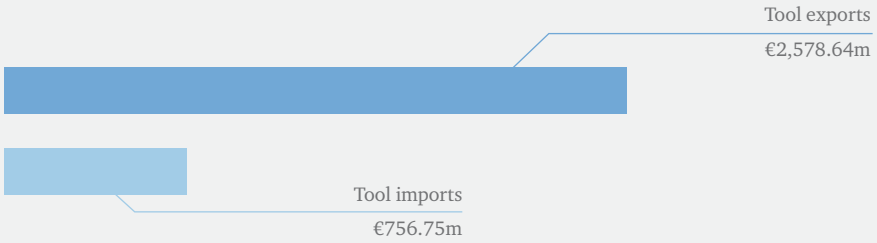
The Japanese tool and die industry is driven by the local automotive industry. 62% of the tools produced are intended for the automotive industry; the electronics industry is second with a wide margin of 7%. In terms of value, the Japanese tool and die industry is the largest exporter of solid and sheet metal forming tools in the world with €1,270.68m in 2013. In the same year, tools and dies with a total value of €2,578.64m were exported. Behind China and Germany, Japan is the third largest exporter of injection molds with a net value of €1,006.24m. The largest buyer of Japanese tools and dies are the United States of America (19%), followed by China (18%) and Thailand (15%). Germany does not appear among the top ten purchasers of Japanese tools and dies. Since 2009, the amount of tool and die imports increased faster than that of exports. China's importance for Japanese tool and die industry has continuously risen in this period. In 2011, the entire tool and die production was worth €9,052m, which corresponds to an increase of 11%

The tool manufacturing and the tools

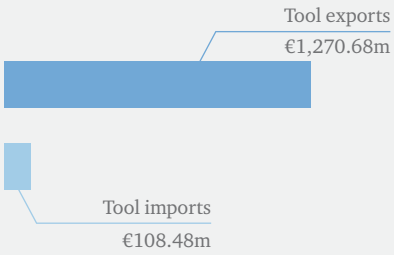
5,173

Number of patent registrations in the tool and die industry
2000-2011

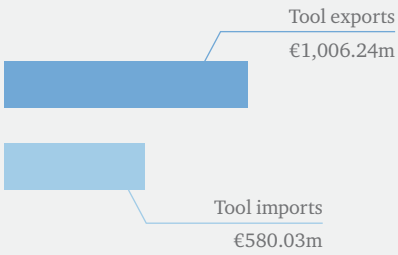
Tool production /tool exports/tool imports



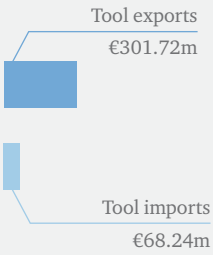
Solid and sheet metal forming tools



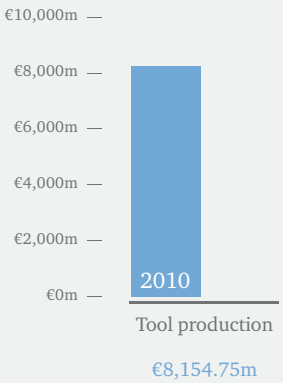
Injection molds

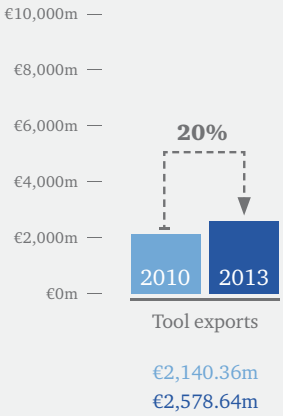


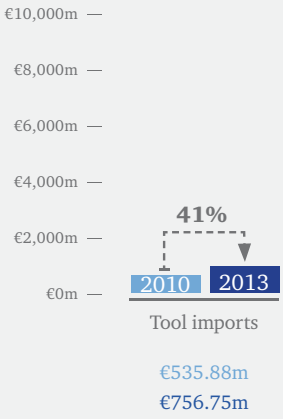
Die casting molds



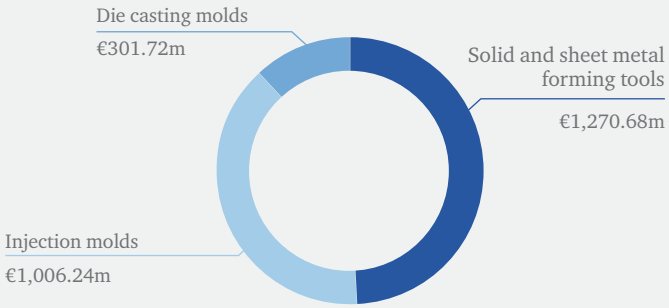
The tool manufacturing and the tools



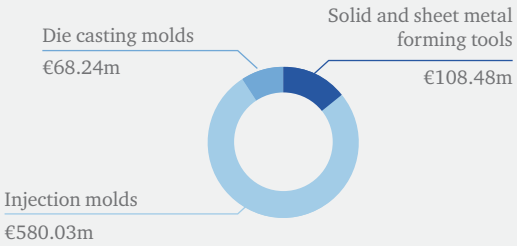




Tool exports

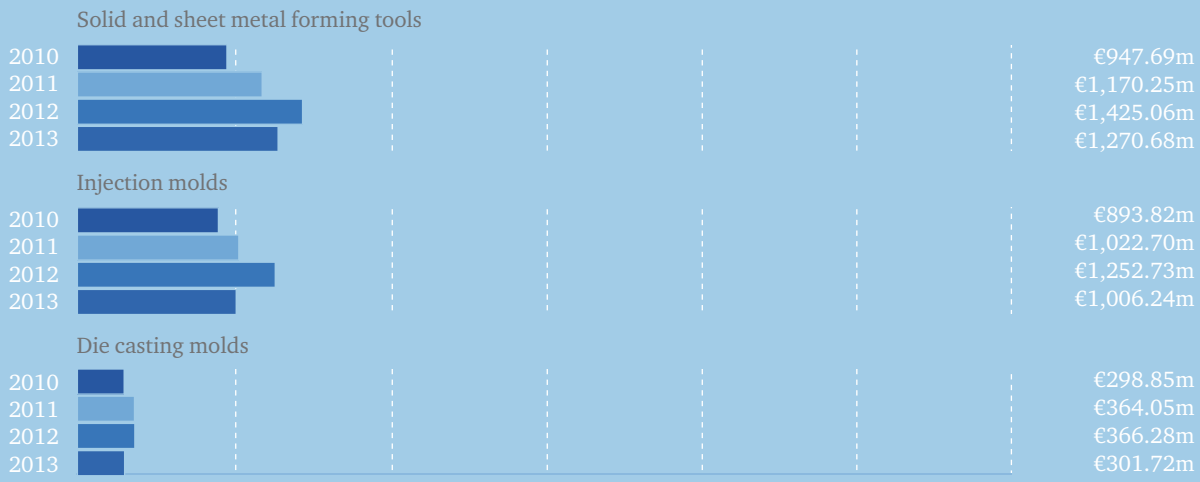


Tool imports

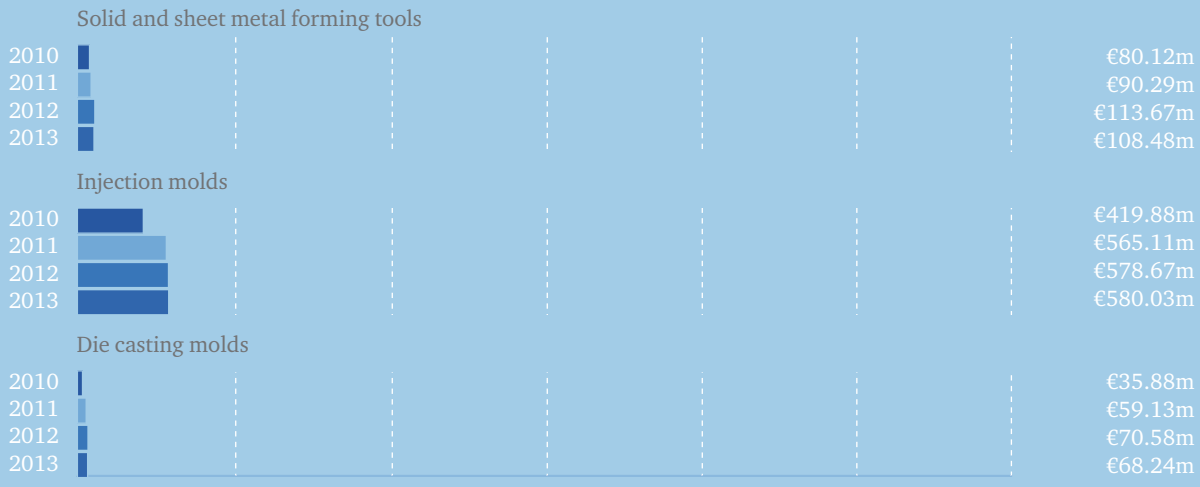


from 2010 to 2011. Currently, there are about 8,500 tool and die manufacturers with approximately 10,000 employees in Japan. More than 70% of the enterprises have less than 10 employees. These micro-enterprises represent approximately 15% of the industry output. There are about 80 companies with more than 100 employees, who provide roughly 30% of the Japanese tool and die production. Before the economic crisis in 2009, the tool and die industry comprised of 13,000 companies with a total of 12,000 employees. The technological and process expertise of Japanese tool and die manufacturers is at the highest international level and comparable with Germany or Switzerland. Tools and dies made in Japan have a very high degree of innovation and complexity. Among others, this is due to highly qualified employees. Japan is an "Allstar" of the World of Tooling study with a medium development potential.

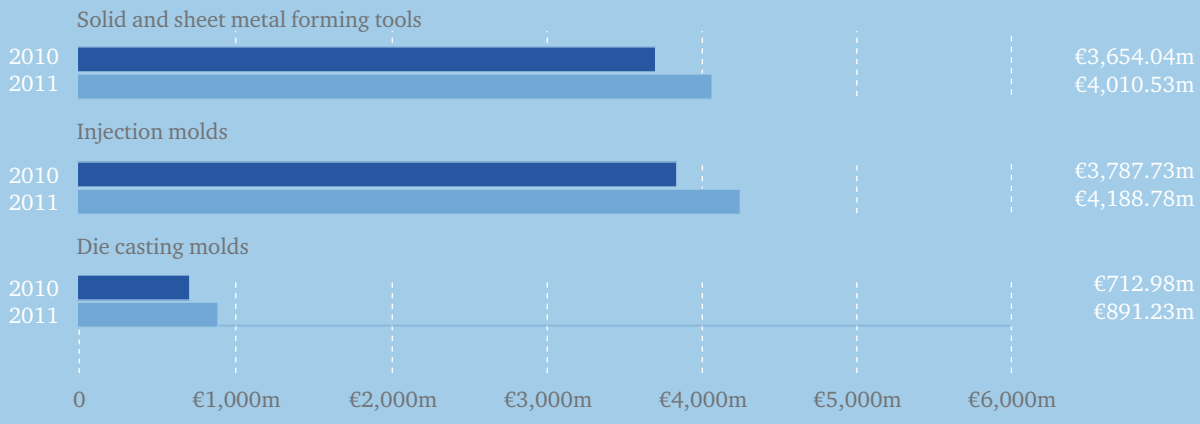
Tool exports



Tool imports



Tool production



Country:	***South Korea***
Area:	***99,720 km²***
Population:	***49.04m***
GDP per capita:	***€25,044***
Category:	***Allstars***

South Korea

[South Korea is considered the land of the morning calm and is said to be the country with the highest national IQ.]

South Korea has 49m citizens and is located on the southern part of the Korean peninsula in East Asia. Due to its low birthrate and immigration, the population is projected to shrink to 47m citizens by 2050. After the occupation by Japan, as South Korea regained its sovereignty, the northern part of the peninsula separated itself and a dictatorship was born in North Korea and ever since the Korean War, there has been tension between the two countries. In South Korea, the PISA Study shows peak values in reading skills, literacy, mathematics and science. 82% of adults have a higher education degree. The ratio of enrolled six-year-olds is 100%. In terms of income and life expectancy, South Korea is well above the OECD average. Although South Korea is one of the most modern countries in the world, life satisfaction is low. The suicide and divorce rates are at a record level. For people under 40, suicide is the leading cause of death. Age and occupation are very important for South Koreans, resulting in a high degree of courtesy. Unique to South Korea is the calculation of age in the country - the years are counted beginning with conception and not with birth as in most countries.

The country and its people

Population
49.04m citizens

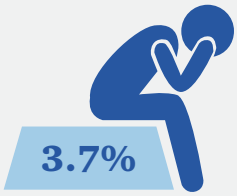
Birthrate 8/1000
(births/citizen)
2014

Measure for purchasing power parity, price for one Big Mac
Big Mac Index 2015

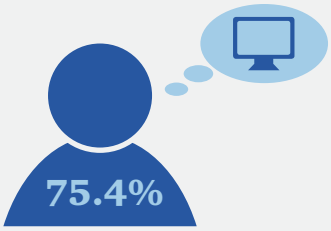
Index for English language skills
2014

The economy and the industry

[With Germany as its role model – after the severe destruction of the country by the war, South Korea has worked its way up to become one of the most modern countries in the world.]



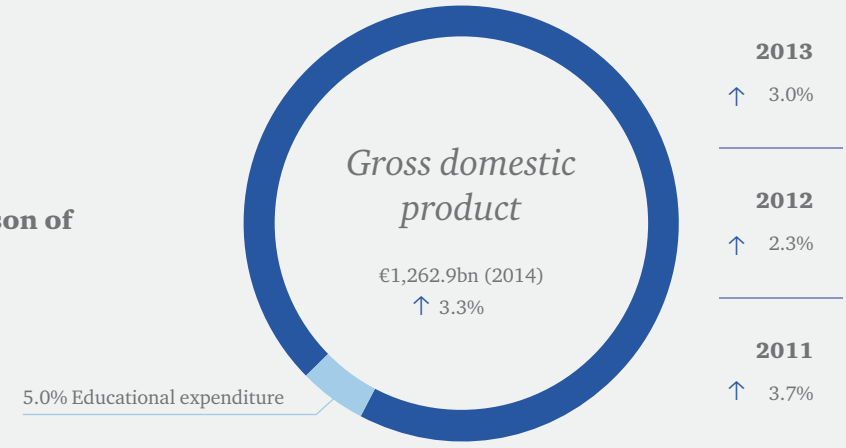
Rate of unemployment
2015



Population with basic computer knowledge
2013

Business climate by comparison of 189 countries
Ease of Doing Business 2014

In terms of gross domestic product (GDP) South Korea is the twelfth largest national economy in the world. The GDP per capita is €25,044. During the last four years, the economy has grown by 3.1% annually. The outlook for 2015 and 2016 continues to be positive. Currently, South Korea is the world's seventh largest export nation and the ninth largest import nation. In 1960 the GDP remained at par with poor African countries and it was incorporated into the G20 due to massive reform efforts. Substantial restrictions on imports of goods and capital and close cooperation between companies and the state enabled the economic ascent. In 2013 the country exported goods worth €464.17bn. The three main exports were semiconductors, automobiles and ships. The country is poor of natural resources. The average income is €30,295 and meets the average of the OECD-countries. However, the average Korean works 2,146 hours every year, which is 23% more than the average of all industrial nations. With excellent education policy and peak values in the PISA Study, South Korea has created a solid structure to produce highly qualified employees. Together with the relatively low wage level, the country is a competitive location for industry. The main challenges remain to be the aging population and the dominance of large corporate conglomerates, which inhibit the rise of small and innovative businesses.



[The volume of tool and die imports is less than 5% of the exports of the same. In an almost autarkic way, South Korea either supplies itself with tools and dies or exports them to the Asian market.]

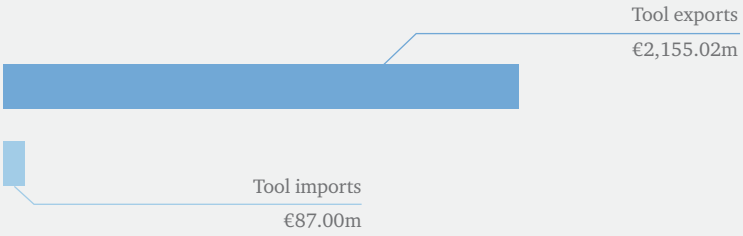
The tool and die industry is one of the most important industries in South Korea. The main centers of tool and die manufacturers are Gyeonggi, Gyeongnam, Inchon, Busan and Seoul. There were 1,338 companies with less than 10 employees in 2009. In 2011 the production amounted to €4,545.12m. Since 2010, it has risen by 25% and due to good development of the manufacturing industry, the tool and die industry has evolved positively. Two-thirds of the customers of the South Korean tool and die industry are made up by the automotive and electronic industry. The tool and die industry focuses on injection molds. In 2013, tools and dies worth €2,155.02m were exported. Among

The tool manufacturing and the tools

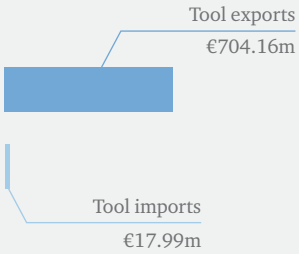
782

Number of patent registrations in the tool and die industry
2000-2011

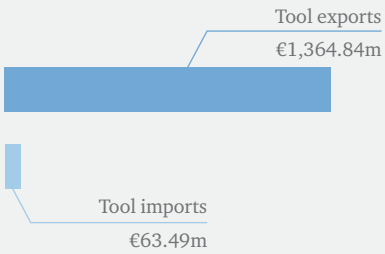
Tool production/tool exports/tool imports



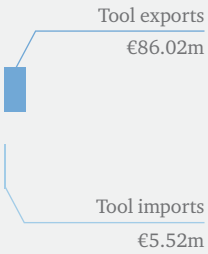
Solid and sheet metal forming tools



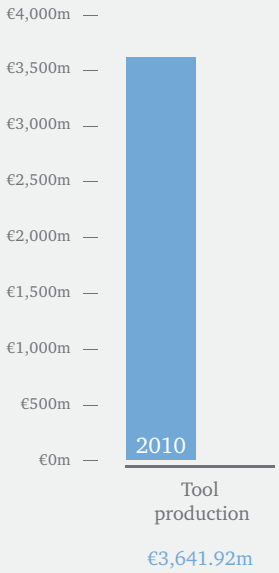
Injection molds

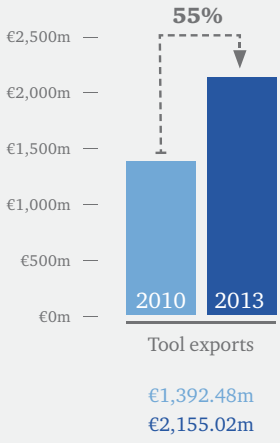


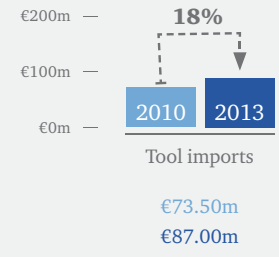
Die casting molds



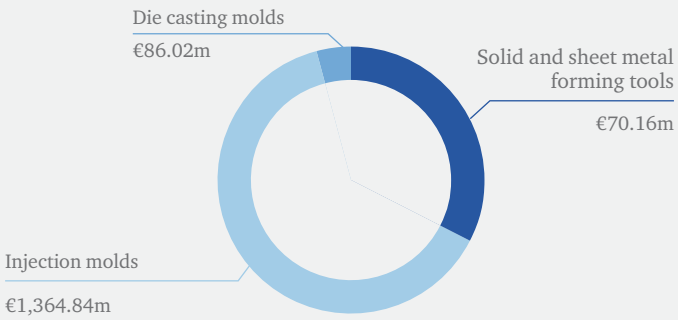
The tool manufacturing and the tools



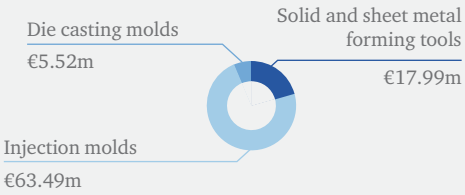




Tool exports

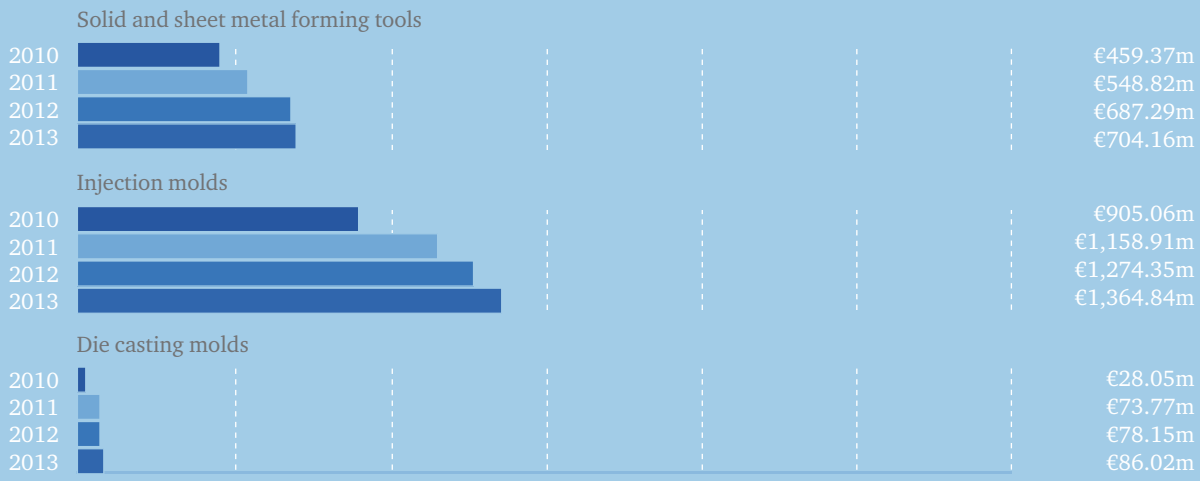


Tool imports

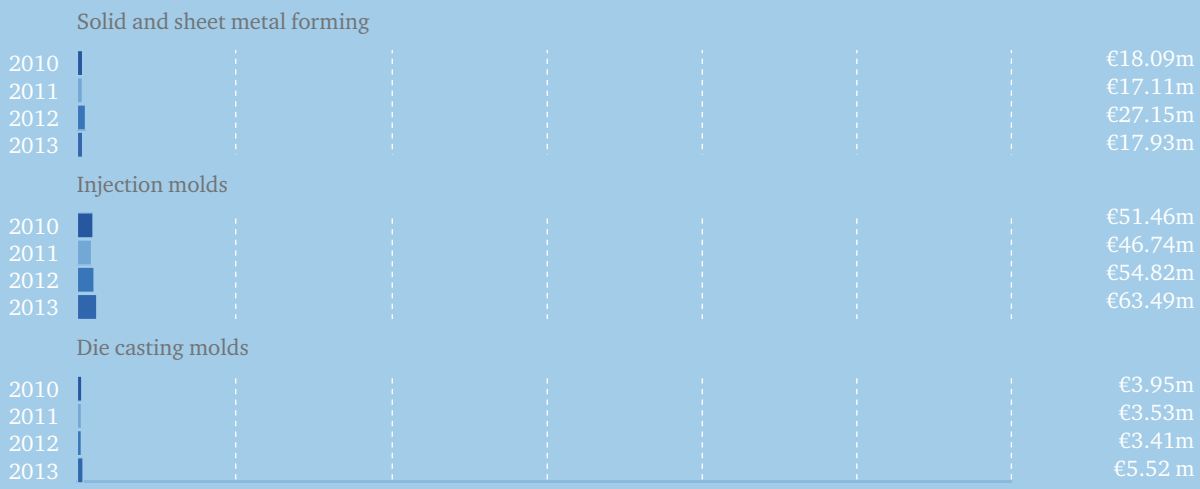


these were die casting molds with a value of €704.16m and injection molds with a value twice as large as the former. In 2013 South Korea's import of tools and dies booked a very low amount of €87m, including €17.99m of die casting molds and €63.49m of injection molds. This is an indicator of the ability to produce complex tools and dies and remain import independent. The most important tool and die manufacturers are organized in the association "Korea Die & Mold Industry Cooperative" (KODMIC). The South Korean tool and die industry profits from its effective and cheap supplier network consisting of small companies, which is why it is able to produce highly complex and high-quality tools and dies. South Korean tool and die industries are known for their high reaction rate and the good, flexible service. Due to many employees of South Korean tool rooms with no or a poor command of English, growth and international success of the tool and die industry are inhibited by the ensuing language difficulties. With its strong expertise in the tool and die manufacturing, South Korea belongs to the group of the Allstars. The development potential is estimated to be at par with Japan and Germany.

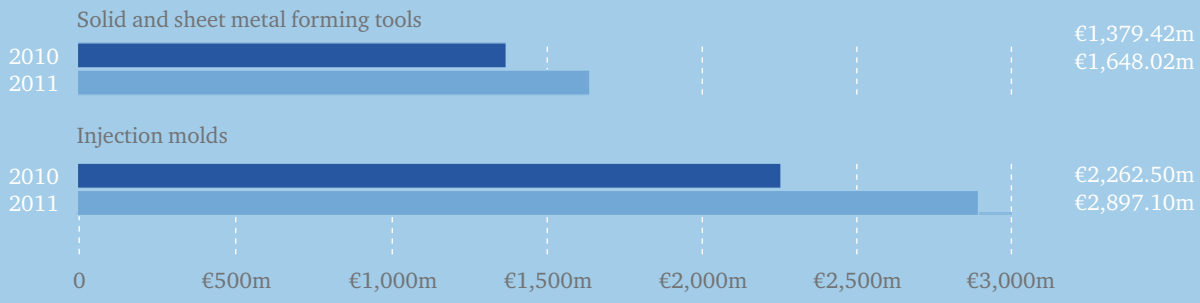
Tool exports



Tool imports



Tool production



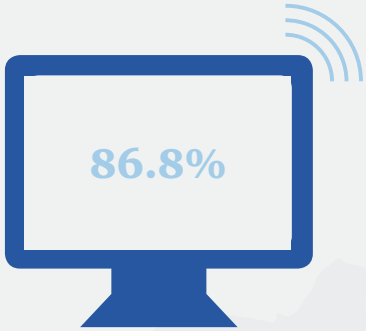
Country:	***USA***
Area:	***9,826,675 km²***
Population:	***318.89m***
GDP per capita:	***€48,658***
Category:	***Allstars***

USA

[From rags to riches. The United States of America is considered to be the land of infinite opportunities and freedom – the USA is the most popular immigration country.]

The United States of America (USA), a country comprising of 50 federal states in North America, has approximately 320m citizens and is the third most populated country in the world. Estimations of the UN assume that the population will significantly increase to 403m citizens. The largest conurbations are located around New York, Los Angeles, Chicago, Miami and Dallas. In addition, extensive tracts of land are sparsely populated and are used for agriculture or serve as a natural habitat for animals. In the relevant statistics, the USA ranks among the highly developed countries of the world regarding income, life expectancy and level of education and has the lowest personal tax rates in the world (average 31.3%). Simultaneously, the USA is home to the largest number of millionaires and billionaires in the world. 89% of all adults have a higher educational degree, whereas the quality of the school system, according to the international PISA Study, is slightly below average. The USA is renowned for its large number of top universities that are managed autonomously through donations and Nobel Prize winners. The USA is the most attractive place for immigrants. It is estimated that the share of the currently dominant „white“ population will decline sharply and other ethnic groups will grow in number. The American's great pride and love for their country is famed.

The country and its people



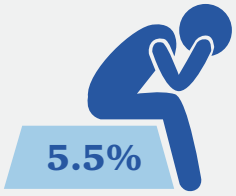
Population with internet access
2014

Population
318.89m citizens

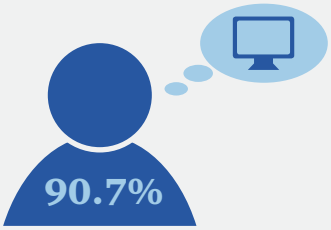
Birthrate 13/1000 (births/citizen)
2014

The economy and the industry

[The stock exchange of the United States of America, the Wall Street, is probably the most renowned in the world - market fluctuations often affect other nations.]



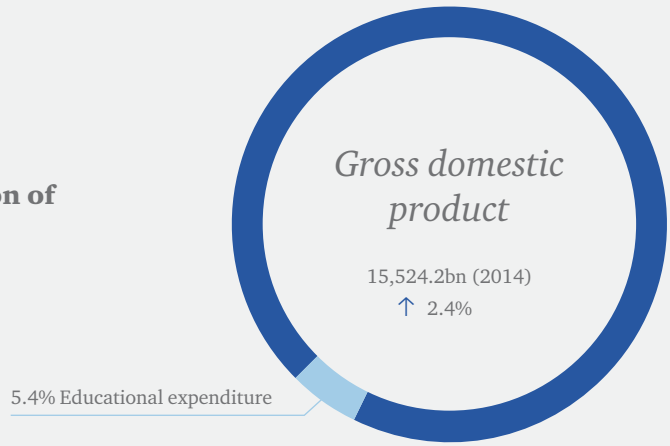
Rate of unemployment
2015



Population with basic computer knowledge
2013

In terms of the gross domestic product (GDP) the United States had the largest economy of the world in 2013. In terms of GDP per capita the country settles for the second position with €48,658 among the countries examined. The economy has grown steadily in recent years by about 2.1% per year and the outlook for 2015 and 2016 is positive. The USA is currently the world's second largest exporter and the world's largest importer. In 2014 the country exported products and goods worth €1,37bn. The three main export goods were automobiles, petroleum products and aircrafts. The service sector is the dominant sector of the economy with 77% of GDP. The country possesses large deposits of raw materials, particularly petroleum and natural gas. In 2013 the average wage level was €46,950 and thus significantly higher than the average of all industrialized nations. The prosperity is unequally distributed and due to the low level of taxation only a small share is covered by social protection systems from the state.
The top 20% of the population earns about eight times as much as the lower 20%. After the economic crisis, unemployment has declined to a level of 5.5%.On an average, employees work 1,785 hours per year, only marginally more than the average of industrialized nations. Those who work hard can accomplish a lot in the United States. However, former important industrial sites, such as Detroit, could lose their importance. The United States of America has a positive attitude towards improvements and innovations and the rise of Silicon Valley is another success story, which influenced the development of the world significantly.

Business climate by comparison of 189 countries
Ease of Doing Business 2014



2013
↑ 2.2%

2012
↑ 2.3%

2011
↑ 1.6%

[The American tool and die industry profited from the efforts to bring back outsourced scales of added value to the United States.]

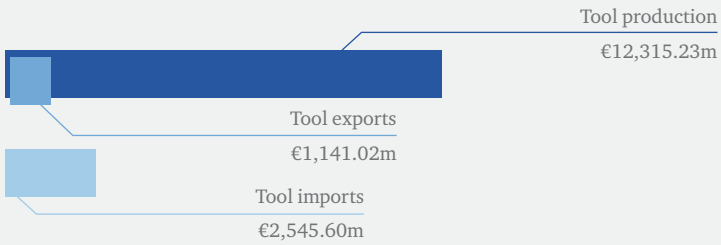
According to the USA statistics office, the number of tool and die manufacturers has shrunk by 20% and provides 75,950 workers with employment since 2005. The high volume of produced tools stands in conflict with this negative development. In terms of generated employment, the main centers for tool and die manufacturers are located in the states Michigan, Ohio, Illinois, Pennsylvania and Wisconsin. The shorter duration of model life cycles and model maintenance intervals in the automotive sector necessitates an increasing demand of tools, which cannot be presently met by US, Mexican and Canadian production. With regard to the tool and die industry in 2013, the production value was €12,315.23m. This number increased by 21% from €10,213.21m in 2010. In 2013, goods worth €1,141.02m and 23.762 tons were exported, of which €428,880m were solid and sheet metal forming tools, €650,23m were injection molds and €61.91m

The tool manufacturing and the tools

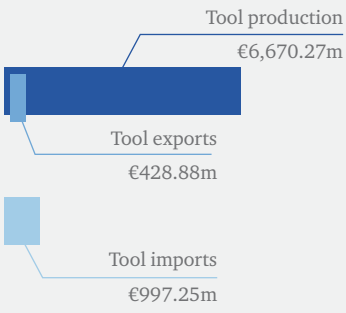
6,599

Number of patent registrations in the tool and die industry
2000-2011

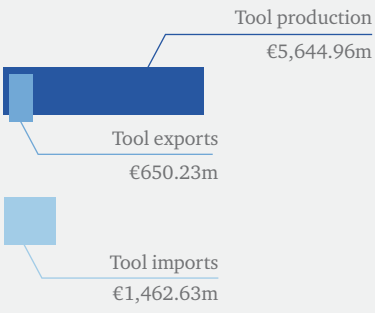
Tool production/tool exports/tool imports



Solid and sheet metal forming tools

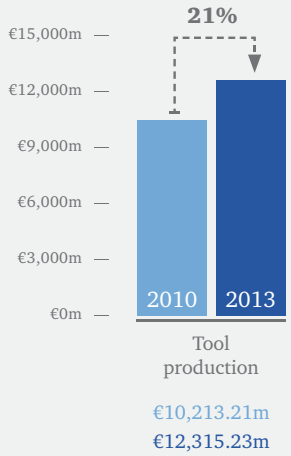


Injection molds



Die casting molds

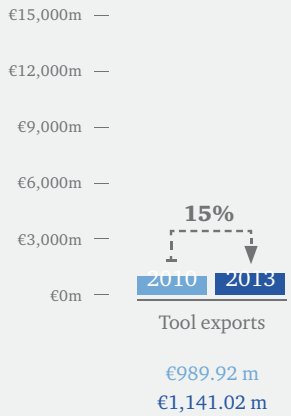
The tool manufacturing and the tools



Tool production

€10,213.21m

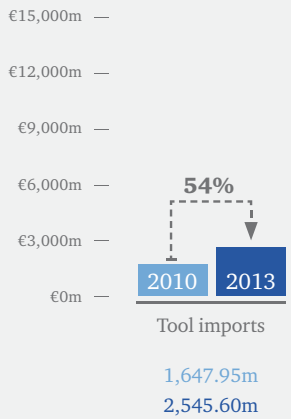
€12,315.23m



Tool exports

€989.92 m

€1,141.02 m

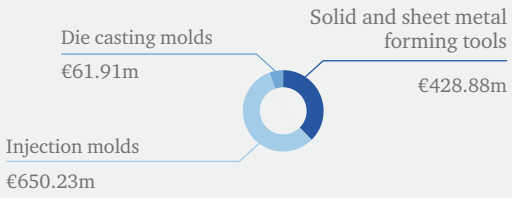


Tool imports

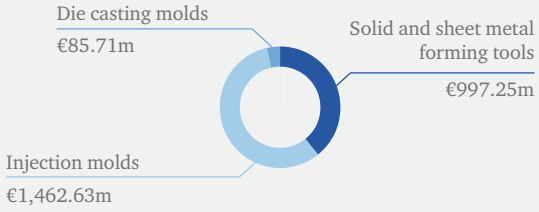
1,647.95m

2,545.60m

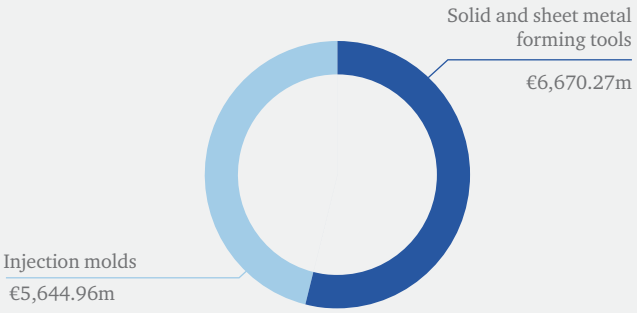
Tool exports



Tool imports

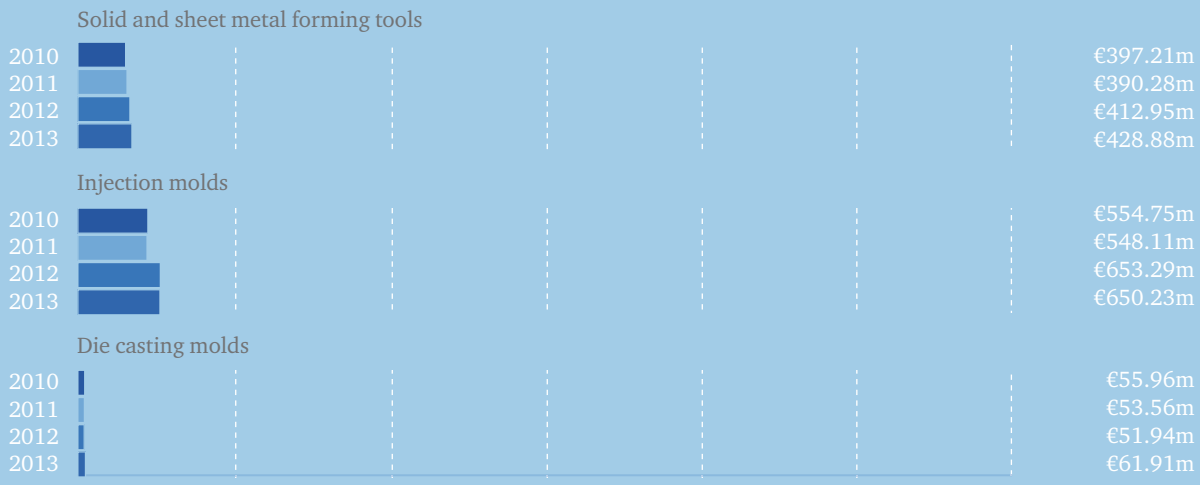


Tool production

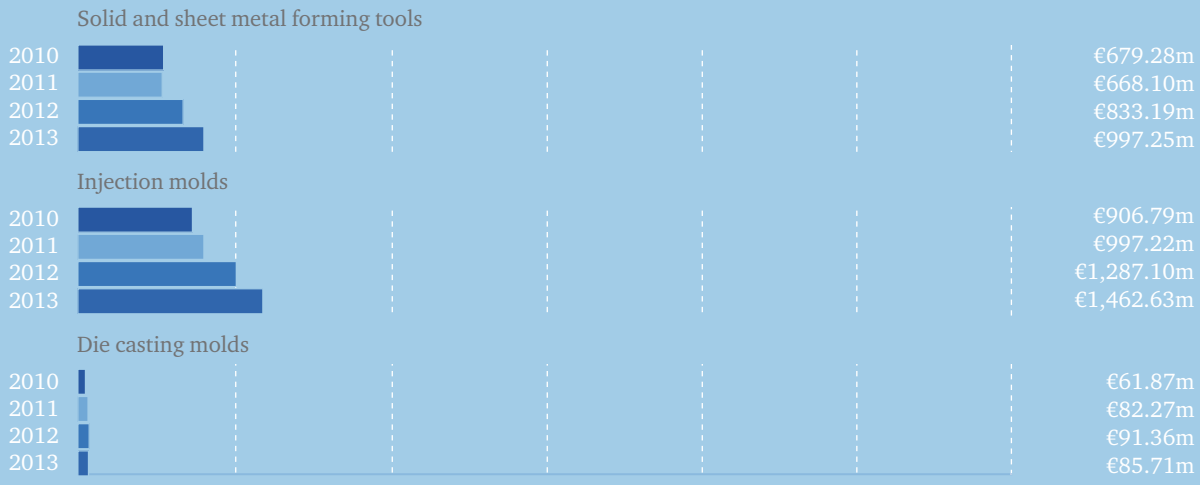


were die casting tools. In 2013, the USA imported tools worth €2,545.60m, of which €997,25m were solid and sheet metal forming tools, €1,462.63m were injection molds and €85,71m were die casting tools. The wage cost difference between the United States of America (the average hourly wage in the sector is €20.06) and other markets, which are used as an external workbench, is a source of motivation for companies to relocate parts of their value added processes to the United States. By strengthening the manufacturing industry, the tool and die industry will have a more important role to play. The training of qualified specialists is significant. In 2010, the professionals' average age in American tooling companies was 52 years (compared to Germany: 41 years). Therefore, over the next few years qualification measures and further automation of the production are required. With an intermediate to high competency in the tool and die industry and a large market size, the USA assumes a position in the Allstars group and has, largely due to a positive economic prognosis, a high development potential.

Tool exports



Tool imports



Tool production

Country:	***Italy***
Area:	***301,340 km²***
Population:	***61.68m***
GDP per capita:	***€31,927***
Category:	***Established***

Italy

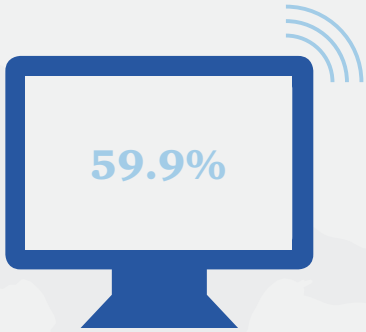
[The land of fashion and desire – La Dolce Vita!.]

Italy, the boot shaped country in the south of Europe, belongs with 62m citizens to the most populated countries of the European Union, which is - like Germany - one of its founding members. Estimations of the UN assume that the population will decline mildly to 59m citizens in 2050. Italy belongs to the developed countries of the world. This is underlined by income statistics, life expectation statistics and health system statistics. The education system is regularly poorly rated. Since 2000 Italy occupies the lower ranks of the PISA Study. Furthermore, only 57% of the population has a higher educational degree and less than 60% have access to the internet (in comparison with South Korea, where this figure is larger than 90%). Italy is the sixth most popular immigration country in the world. However, the country is currently witnessing a high refugee influx from Africa and the Near East, clearly more than every other country of Europe. Tourists associate the "sweet life", La Dolce Vita with Italy, which is however differently perceived by the Italians: in general, they are less satisfied with their lifestyles than citizens of other developed countries.

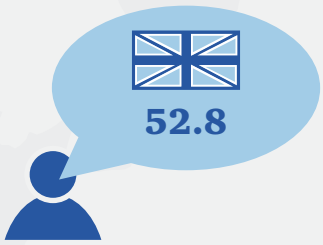
The country and its people

Population
61.68m citizens

Birthrate 9/1000 (births/citizen)
2014



Population with internet access
2014

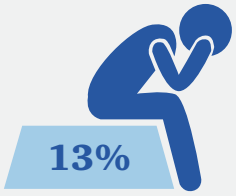


Index for English language skills
2014

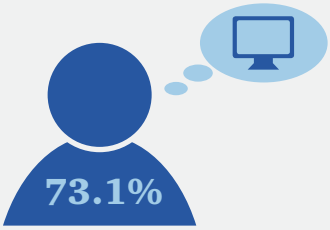
The economy and the industry

[One of the biggest economies in the world finds itself in a permanent crisis.]

Measured against the gross domestic product (GDP), Italy is one of the biggest economies of the world and occupies internationally, the ninth rank. Behind Germany and France, Italy is the third largest economy in the Euro zone. The majority of the economy power is located in the North, while economical and infrastructural development declines towards the south of Rome. The energy supply in the country is particularly unreliable and in some parts on par with developing nations. Still the energy prices are higher than in Germany. The GDP per capita is currently at €32,000. Therefore, Italy takes the seventh place in this study ahead of Spain and behind Japan. The economy was stuck by a recession for the last 4 years and shrank by an average of -1.1% per year. The outlook for the years 2015 and 2016 is slightly positive with +0.6% and +1.5%. The recession has not yet abated and is noticeable in persisting high numbers of unemployment. These are steady at about 13%, of which 61% are long-term unemployed citizens. Particularly among the youth, unemployment is with 42.7% alarmingly high. Italy is currently the world's eighth largest export and import nation. In 2013 the country exported goods worth €461.66bn. The most important exports are machines, chemicals and groceries. However, the country has poor raw materials. The wage level is with an average of €28,801 in 2013 among the upper third of the selected countries. The income distribution is unevenly distributed than Germany. 20% of the wealthiest Italians earn six times as much as the poorest 20%. An employed citizen works on average for 1,762 hours per year, which is at par with the average of all industry nations. Only 4% of all dependent employed Italians work the longest hours, which is remarkably under the OECD average with 13%.

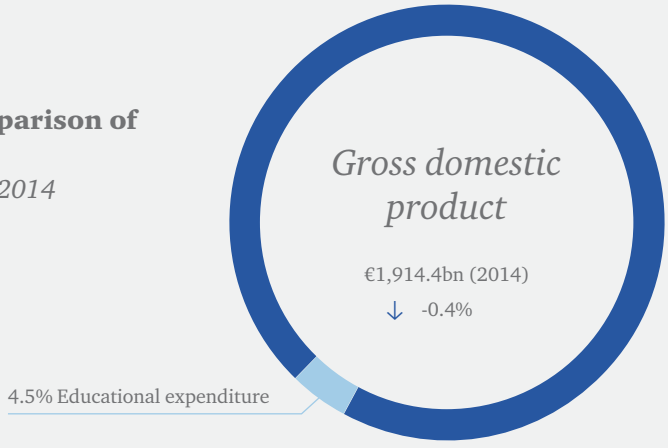


Rate of unemployment
2015



Population with basic computer knowledge
2013

Business climate by comparison of 189 countries
Ease of Doing Business 2014



2013
↓ -1.7%

2012
↓ -2.8%

2011
↑ 0.6%

[The Italian tool and die industry has a long tradition but is unable to compete with the best markets.]

Italy has one of the largest tool and die industries worldwide and the second largest in Europe. In 2013 tools worth €1,853.66m were produced. This value rose by approximately 26 % from €1,702.6m in 2010. In 2013 tools worth €1,158.24m weighing 18,942 tons in total were exported, of which €268.67m were solid and sheet metal forming tools, €691.02m injection molds and €198.55m die casting molds. At the same time Italy imported tools worth €365.93m, of which €56.94m were solid and sheet metal forming tools, €256.36M injection molds, €52.63m die casting molds and €52.64m other tools. Italy's tool and die industry is located in northern Italy and suffered during the economic crisis and is unable to regain the levels of its growth. Before the crisis Italy was a popular supplier for the German automotive industry. Particularly within the sector of large sheet metal forming tools, Italy was well positioned in international market comparison. As of 2014 and the first half of 2015, reputable manufacturers had to report insolvency. Therefore, the future outlook

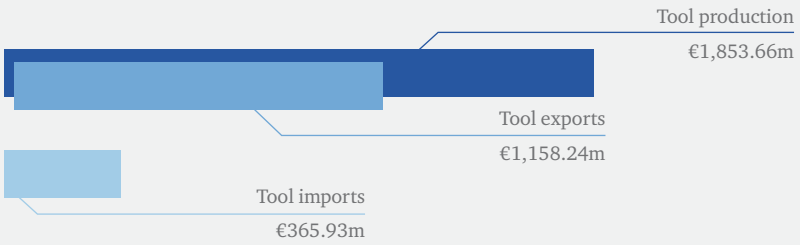
The tool manufacturing and the tools

1,262

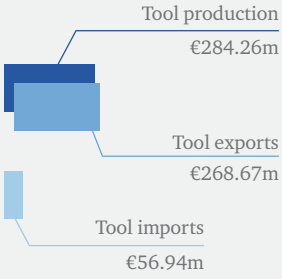
Number of patent registrations in the tool and die industry

2000-2011

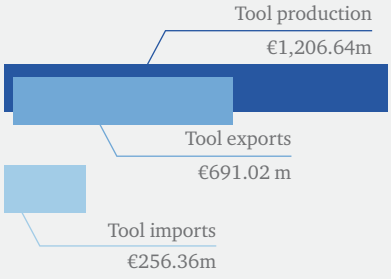
Tool production/tool exports/tool imports



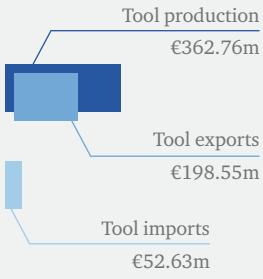
Solid and sheet metal forming tools



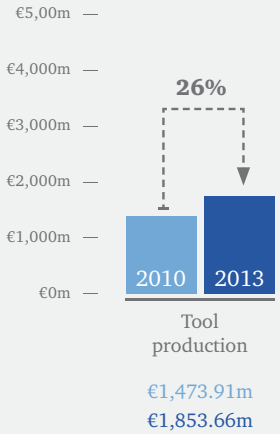
Injection molds



Die casting molds



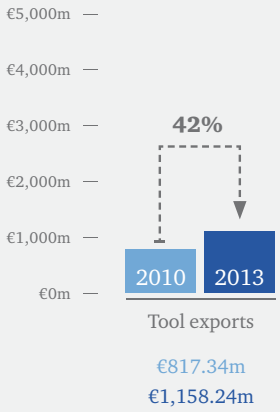
The tool manufacturing and the tools



Tool production

€1,473.91m

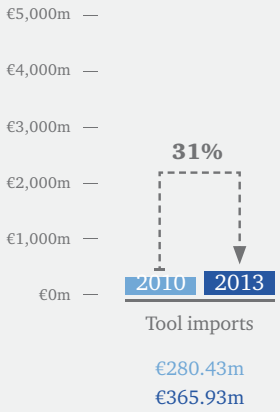
€1,853.66m



Tool exports

€817.34m

€1,158.24m

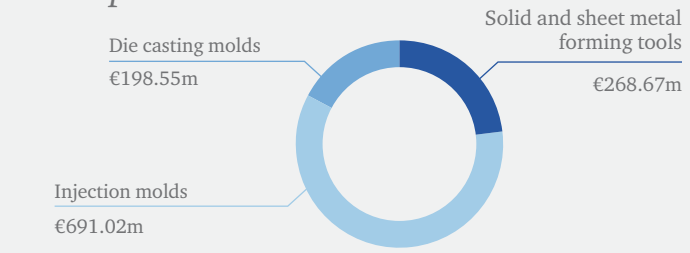


Tool imports

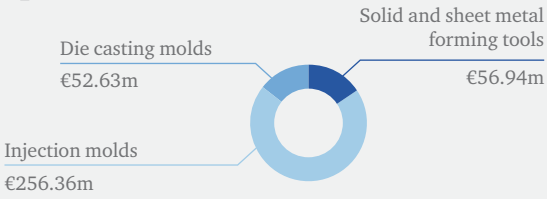
€280.43m

€365.93m

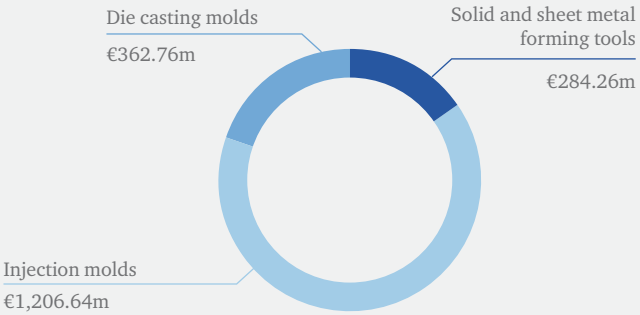
Tool exports



Tool imports

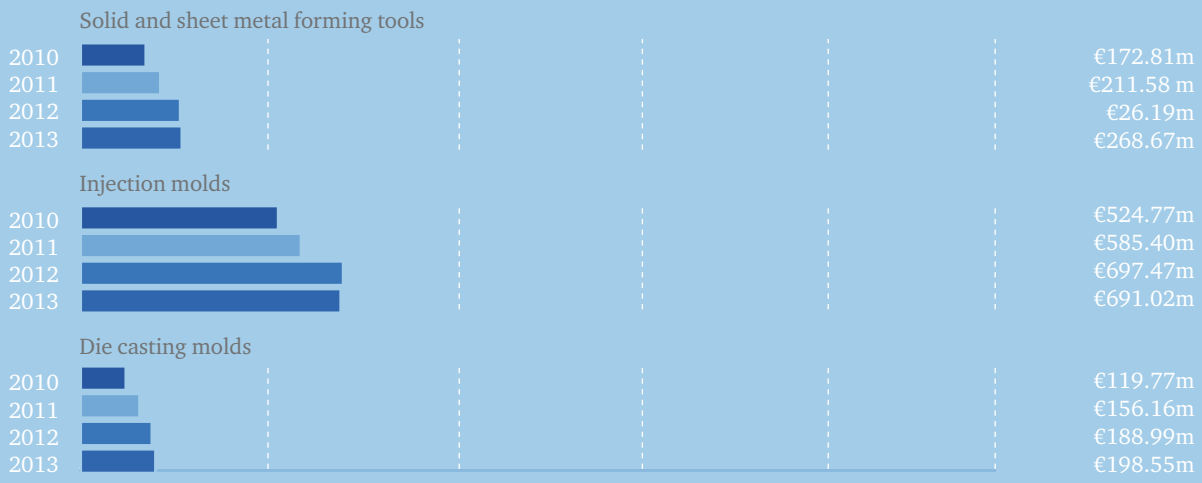


Tool production

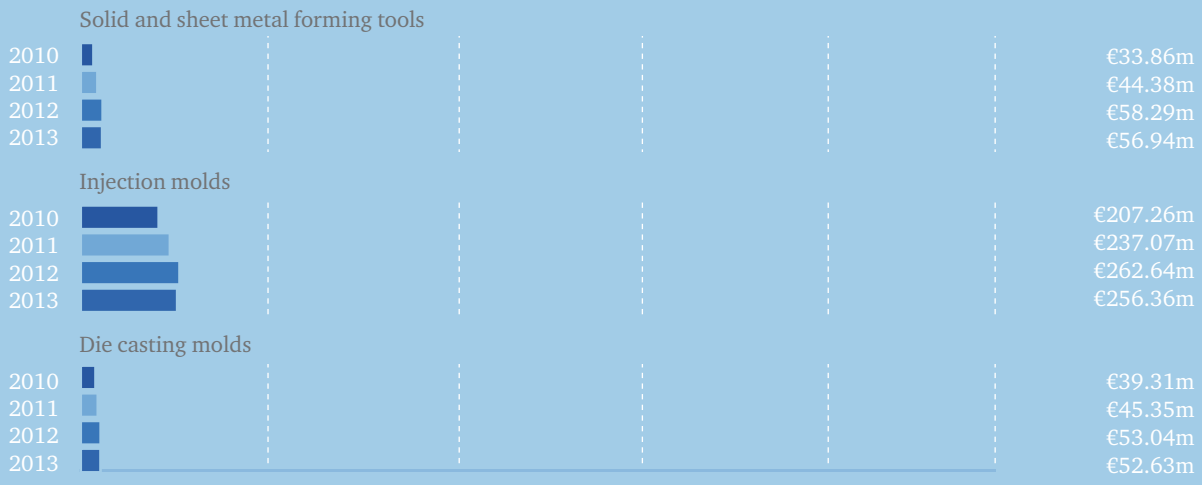


remains bleak. The experience in tool and die manufacturing, the accompanying performance capabilities and die quality and complexity with an above average market size places Italy in the group “Established”.

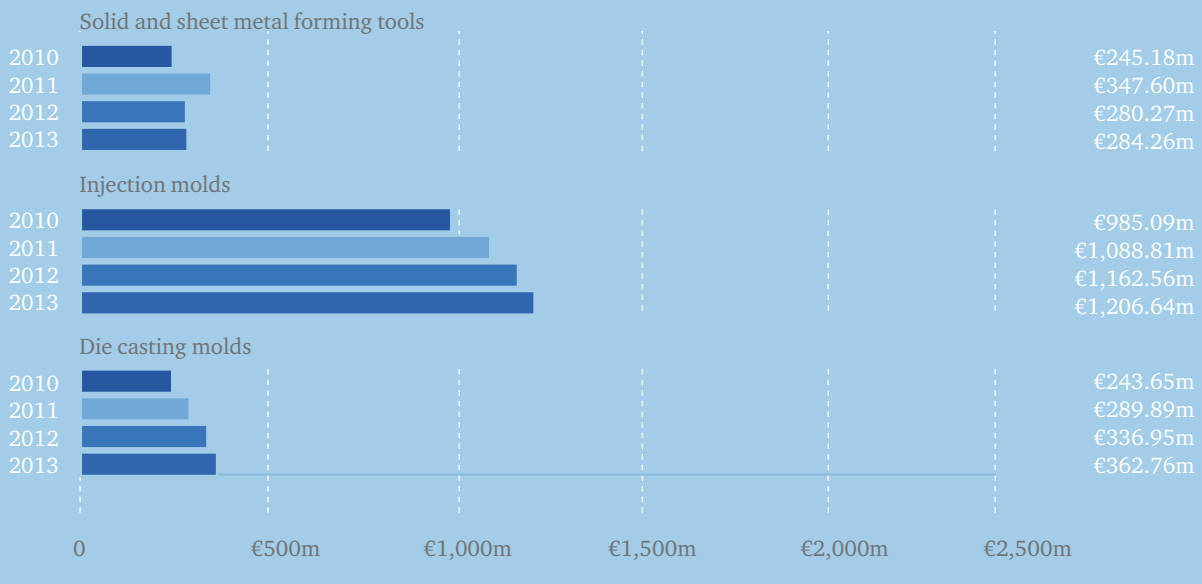
Tool exports



Tool imports



Tool production



Country:	***Canada***
Area:	***9,984,670 km²***
Population:	***34.83m***
GDP per capita:	***€44,916***
Category:	***Established***

Canada

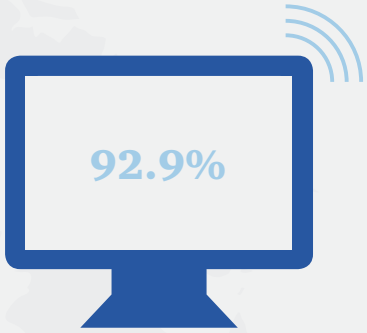
[Canada is the country of lakes, forests and glaciers. The attractive living conditions and its multicultural society attract many immigrants in search of a new start.]

The country and its people

Canada is located to the north of the United States of America and shares its single border with it. Canada has 35m citizens, mostly distributed in the urban centers in the south, along the borderline. Vast parts of the country are covered in dense forests and lakes which are highly inaccessible, especially in the icy winters. The UN assumes that the population will grow to 44m citizens by 2050, which is relatively intense for a developed country. The high level of development is depicted by all relevant statistics regarding income, live expectation and education level, where 89% of all adults have a higher educational qualification. The quality of the school system is also underlined by the low difference between the PISA results of the children with a high and poor social-economic background. According to OECD, Canada was the fifth most popular immigration nation worldwide in 2012. It uses a scoring system to issue working visa to high qualified immigrants with good language skills. Besides English, French is an official language, which is mostly spread in the areas around Quebec, Ontario and Alberta. The personal security in Canada is very good and the possibility of being attacked is 1.3%, which is the lowest value in the OECD-area.

Population
34.83m citizens

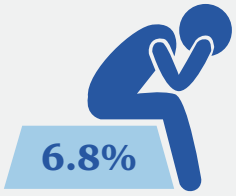
Birthrate 10/1000
(births/citizen)
2014



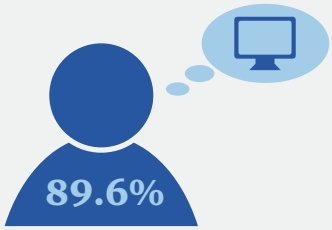
Population with internet access
2014

The economy and the industry

[With the introduction of NAFTA in 1994, Canada evolved to a natural resources exporter - as a result the investment in the competitiveness of producing companies decreased.]



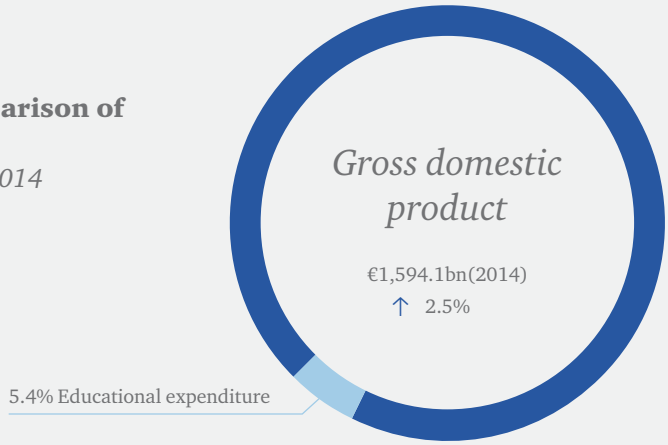
Rate of unemployment
2015



Population with basic computer knowledge
2013

In terms of the gross domestic product (GDP), Canada has the eleventh biggest economy worldwide. With a GDP per capita of €44,916 the country occupies the fourth place within the surveyed countries of this study. Since the last 4 years, the economy grew at 2.3 % per year. The outlook for 2015 and 2016 is positive. Canada is currently the worldwide 13th largest export and 11th largest import nation. The country exported goods worth €516.67bn. The three main exports were automobiles, machines and raw oil. After Venezuela and Saudi Arabia, the raw oil reserves of Canada are the third largest worldwide and are mainly found in oil sand. The country has a big amount of mineral resources and is the largest producer of zinc, uranium, potassium carbonate, Sulphur and nickel in the world. The wage level was, with an average of €39,093 in 2013 significantly above the average of all industrial nations. On an average, the employees work for 1,704 hours per year what is consistent with the average of the industrial nations. Due to the very good educational system, Canada strives to increase the share of its high-technology sector and increase value creation. Canada's goal is to decrease its image of being a reasonable exporter of simple products to the USA. In this way, the dependency on volatile natural resources prices shall be decreased to reduce the potential losses caused, for example by the low oil prices in 2015.

Business climate by comparison of 189 countries
Ease of Doing Business 2014



2013
↑ 2.0%

2012
↑ 1.9%

2011
↑ 3.0%

[Canadas tool and die industry is closely linked to development of the automobile production in Detroit. Almost 75% of the produced tools are exported to the USA.]

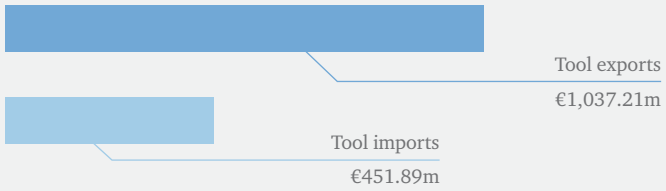
The Canadian tool and die industry is closely linked to the production in the USA. Canada's largest tool and die center is located in Windsor, Ontario and is separated from the automotive stronghold, Detroit, by a lake. The number of Canadian tool and die companies decreased significantly during the economic crisis. While there existed 579 tool and die companies in 2005, in 2012 there were only 464, which provided 5600 employees with work. Large Canadian tool and die companies exist both with a focus on large injection molds as well as high quality tools for large sheet metal forming. The production volume in 2010 was €944.70m. 2013 tools worth € 1,037.21m in total were exported. The total export comprises of €248.21m of solid and sheet metal forming tools, €775.64m of injection molds and

The tool manufacturing and the tools

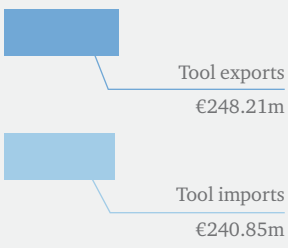
644

Number of patent registrations in the tool and die industry
2000-2011

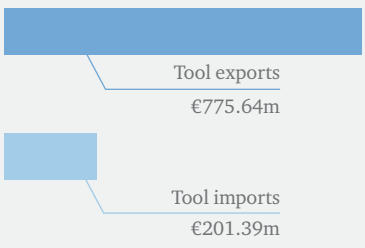
Tool production/tool exports/tool imports



Solid and sheet metal forming tools

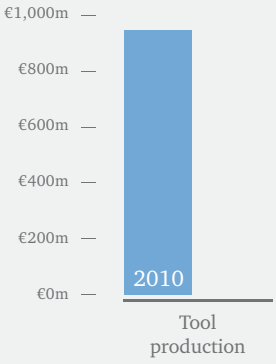


Injection molds



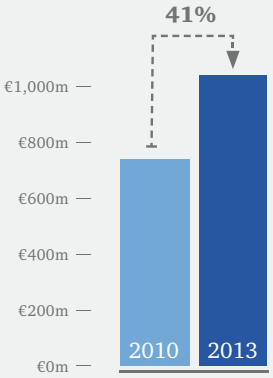
Die casting molds

The tool manufacturing and the tools



Tool production

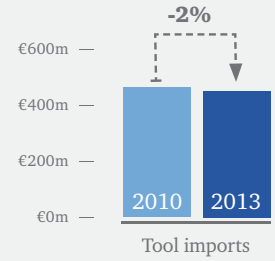
€944.70m



Tool exports

€737.59m

€1,037.21m

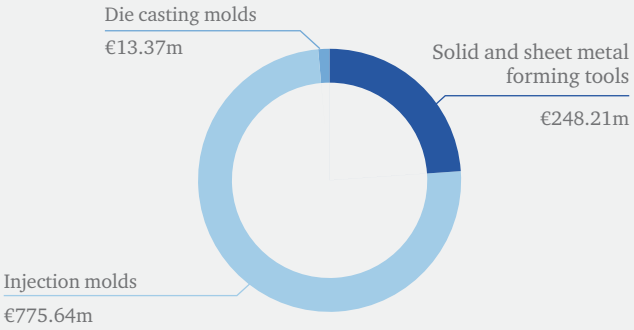


Tool imports

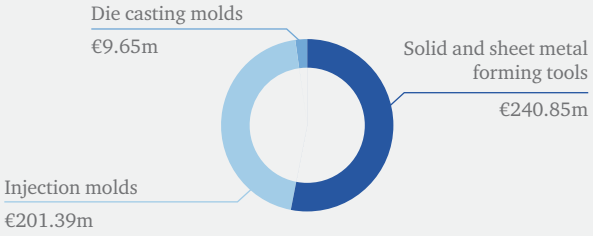
€462.45m

€451.89m

Tool exports

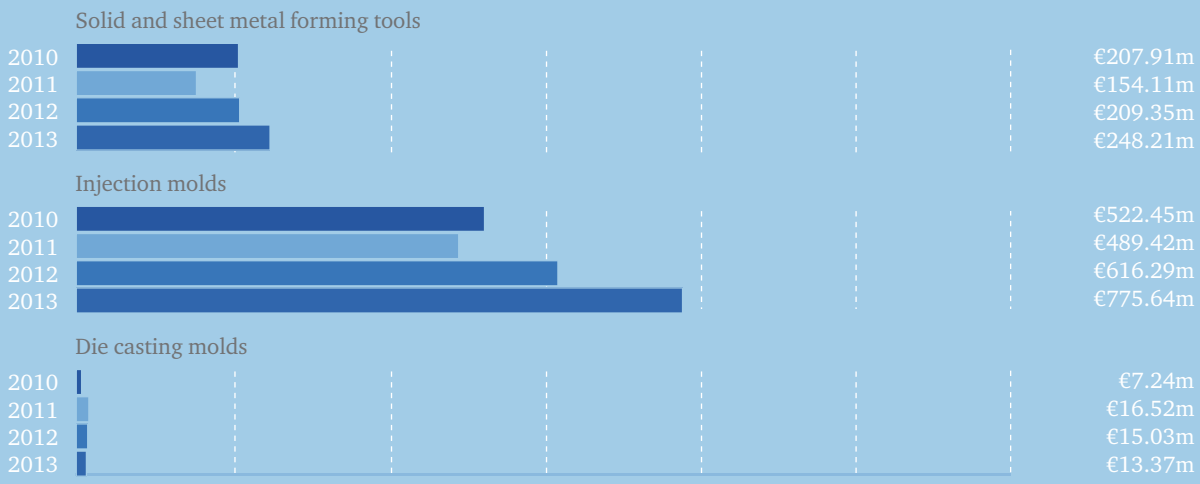


Tool imports

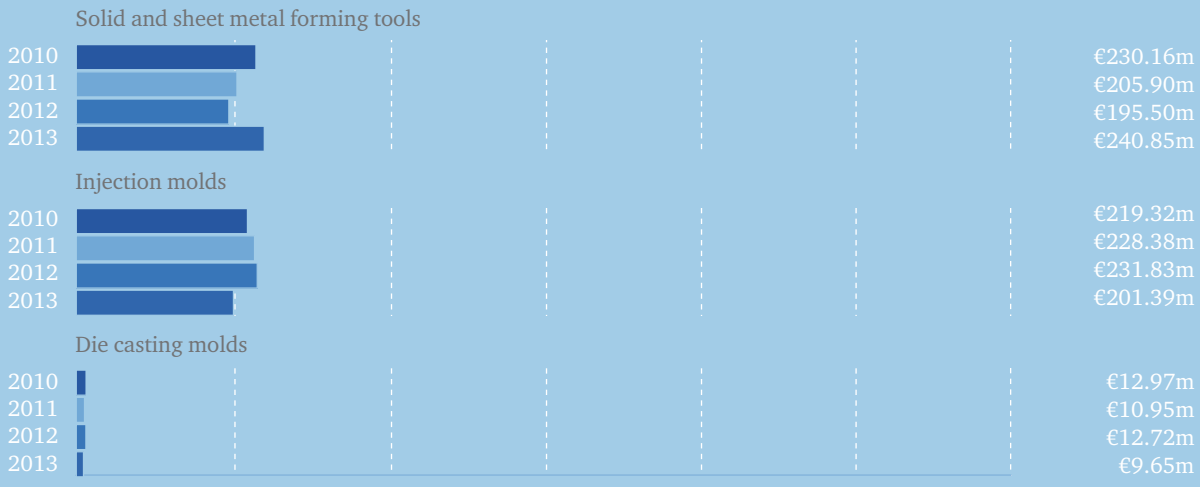


€13.37m of die casting molds, with 75 % the majority of the exported tools intended for the United States of America. Within the imports, Canada registered a total value of €451.89m, split in €240.85m for solid and sheet metal forming tools, €201.39m for injection molds and €9.65m for die casting molds. The last year's the tool and die sector experienced a large consolidation of the tool and die manufacturers leading to a strongly competitive core, which produce better tools than competitors in the United States of America. Depending on the exchange rate between the American and the Canadian dollar, the tool and die companies have an additional competitive advantage. On mid-term, the developing perspectives of Mexico look better, as the larger part of the North American investments in the automotive sector were made there. Due to the middle to a high tool and die manufacturing competence and a comparable market size to Italy, Canada belongs to the "Established" markets. The positive progress of the producing industry in the USA leads to an average development potential of the Canadian tool and die industry.

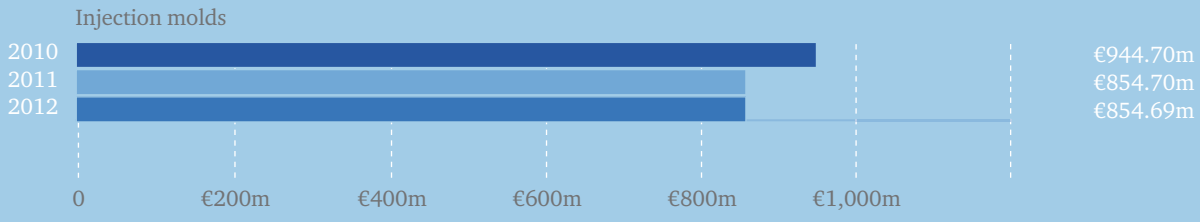
Tool exports



Tool imports



Tool production



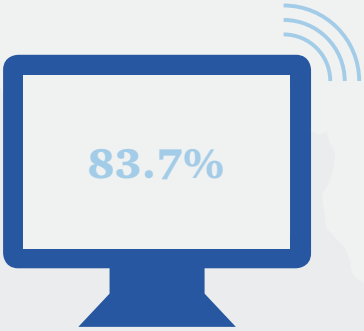
Country:	***Austria***
Area:	***83,871 km²***
Population:	***8.22m***
GDP per capita:	***€45,726***
Category:	***Established***

Austria

[In the country of gentian and edelweiss, which can be seen as national symbols, the mountainous landscape makes for an important part in tourism. Furthermore, the alpine republic brought forth peerless composers of the likes of Mozart and Haydn.]

The country and its people

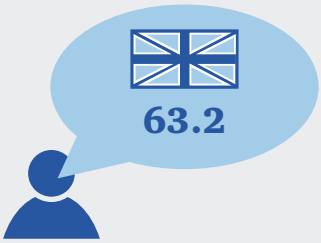
Austria is a landlocked country in the middle of Europe with 8.22m Citizens and joined the EU in 1995. With its various tunnels and bridges in the Alps and its central position in middle Europe, Austria is known as a transit nation in both the north-south but as well in east-west routes. Austria belongs to the world's leading developed nations. This is underlined by relevant statistics regarding income, life expectancy and education level. 83% of all adults have a higher educational degree, whereas the quality of the school system is according to PISA Studies only slightly above average when compared to other industrial nations. Within comparisons made by the study, Austria is ahead of Spain, France and the United States of America. According to the OECD, Austria was the 12th most popular immigration destination in 2012. In terms of cultural expenditure, Austria finds itself among the leading countries in the world. Various festivals and a rich cultural heritage are a testimony to this, in Vienna, Salzburg and several other cities. The alpine landscape which is a popular destination for skiing or hiking attracts many tourists not only in summer but also in winter.



Population with internet access
2014

Population
8.22m citizens

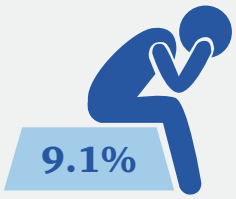
Birthrate 9/1000 (births/citizen)
2014



Index for English language skills
2014

The economy and the industry

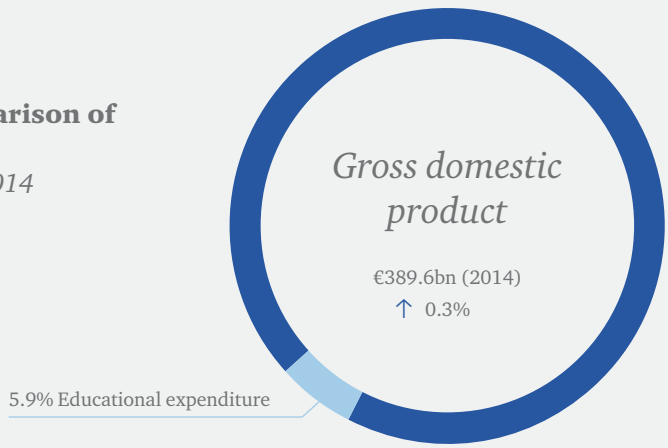
[The transit state Austria has close economic relationships with many East European markets and was able to gain an advantage in this region compared to other Europe.]



Rate of unemployment
2015

Austria is, in terms of its gross domestic product, one of the mid to large sized economies in Europe. With a GDP per capita of €45,726, the country occupies the third place within the surveyed countries of this study. Austria could only briefly recover from the economic crisis in 2008 and 2009. The rate of unemployment rose between mid-2011 and the end of 2014 mainly because of lower domestic demand. Nevertheless, the economy has grown by 1.1% per year for the last 4 years. However, the outlook for 2015 and 2016 is on a low but positive level and beneath the EU average. Economic experts feel that the public and private investments are too low. Worldwide, Austria is the 29th and 26th largest export and import nation respectively. The country exported goods worth €126bn in 2013. The three largest exports were automobiles, machines and chemistry products. The country has a large amount of different natural resources. The wage level with an average of €37,666 in 2013 was significantly above the average of all industrial nations. On an average, the Austrians work for 1,673 hours every year which is 4% lower than in other industrial nations. The importance of tourism amounts to 5.5% of the GDP and is underlined by 131.9m overnight stays every year. Not only tourists, but also Austrians are satisfied with their country and the public services offered according to international.

Business climate by comparison of 189 countries
Ease of Doing Business 2014



2013
↑ 0.2%

2012
↑ 0.9%

2011
↑ 3.1%

[The Austrian tool and die industry is dominated by high exports in the neighboring markets of Germany, Switzerland and Italy.]

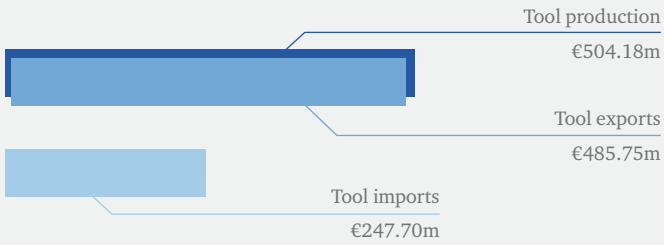
The trade figures show that the tool and die industry focuses on the production of injection molds, which are mostly exported. A higher volume of simple value chain products are imported from cost-effective markets and processed to high quality tools and dies. This can be explained by the geographic position of Austria, which has direct access to not only high quality and complex tools and dies from Germany and Switzerland but also to cheaper tools and dies from the Czech Republic and Poland. The technological understanding and tool and die quality is at a high level. This is underlined by 437 patent registrations in the tool and die industry between 2000 and 2011. On the basis of the tool and die industry the production in the year 2013 was worth €504.18m. This value increased by approximately 35% since 2010 from €372.91m. In 2013 tools and dies worth €485.75m and 2,106 tons were exported, of which €61.16m were for solid and sheet metal forming tools, €411.39m for injection molds and €13.2m for die casting molds.

The tool manufacturing and the tools

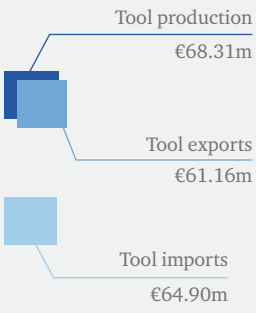
437

Number of patent registrations in the tool and die industry
2000-2011

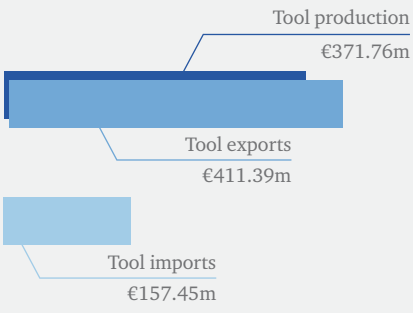
Tool production/tool exports/tool imports



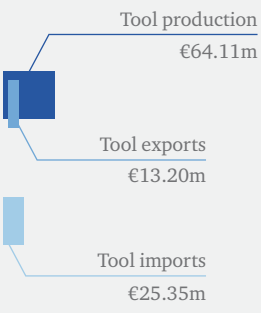
Solid and sheet metal forming tools



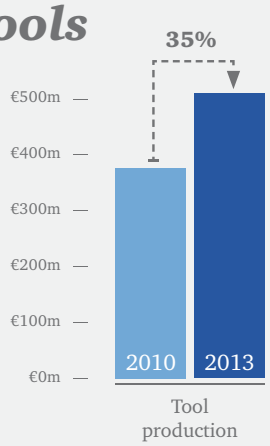
Injection molds



Die casting molds



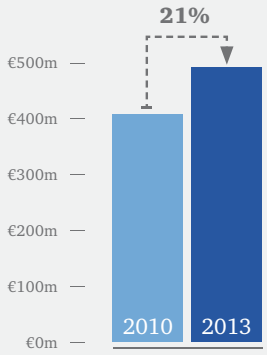
The tool manufacturing and the tools



Tool production

€372.91m

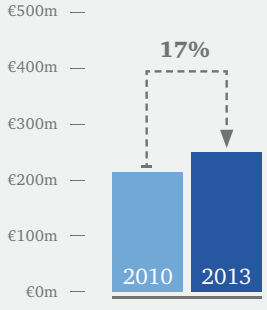
€504.18m



Tool exports

€402.98m

€485.75m

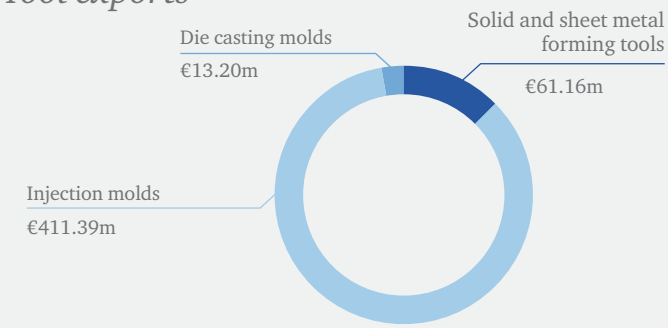


Tool imports

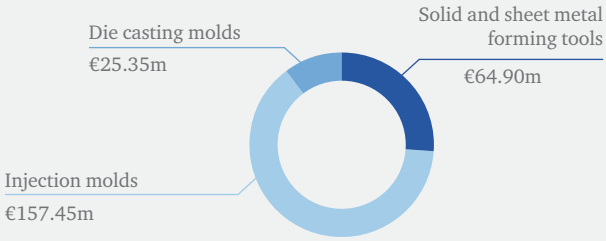
€211.36m

€247.70m

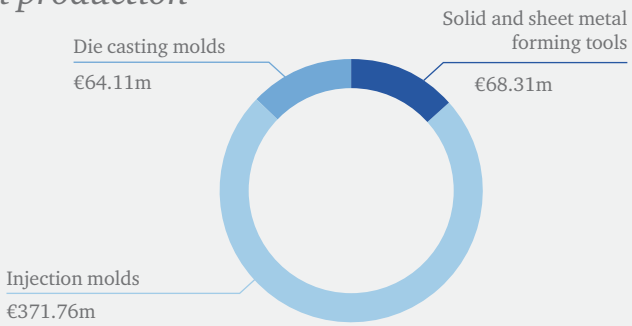
Tool exports



Tool imports

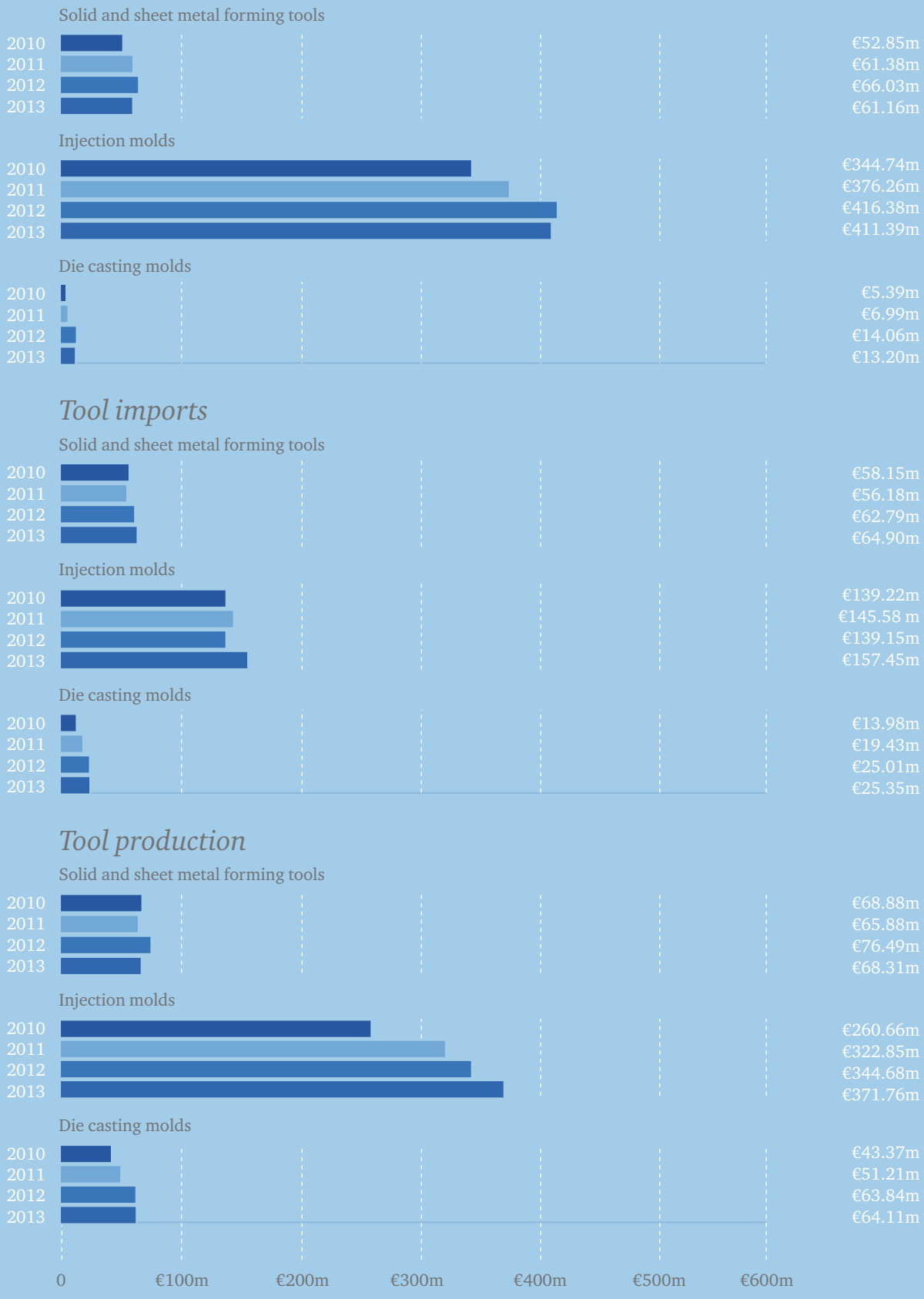


Tool production



Austria registered a total value of €247.70m in imports, split into €64.9m for solid and sheet metal forming tools, €157.45m for injection molds and €25.35m for die casting molds. As the development perspective of the industry appears positive but restrained and the tool and die industry is well established, the development potential is rated between medium and high. With a high tool and die competence, on a level with Canada and the USA, and a high export rate in combination with a market size below-average, Austria is positioned in the category “Established”.

Tool exports



Tool imports

Tool production

Country:	***Switzerland***
Area:	***41,277 km²***
Population:	***8.06m***
GDP per capita:	***€77,960***
Category:	***Established***

Switzerland

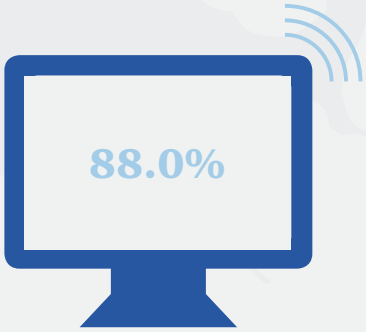
[A land of glacier-covered mountains and crystal-clear lakes. Switzerland is the global leader in the manufacture of high quality watches and has centuries of tradition of producing cheese and chocolate.]

The country and its people

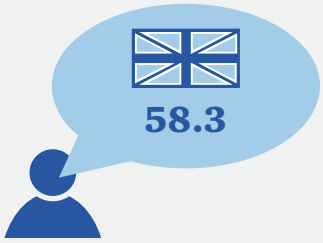
Switzerland, located in central Europe, belongs with 8.06m citizens to the smaller European nations but is densely populated in the midlands. With 2m people, the percentage of foreigners is very high. Unlike most of its neighbors, Switzerland isn't part of the EU. Because of high immigration numbers the UN assumes that the population will remain constant until 2050, despite a low birth rate. Switzerland belongs to the highly developed countries of the world. This fact is underlined by all relevant statistics relating to income, life expectation and education level. 86% of all adults have a higher educational degree. The quality of the school system is perceivably above the PISA Study average. Within the international PISA comparison, Switzerland belongs to the top ten countries. There are four official languages in Switzerland, German, French, Italian and Rhaeto-Romanic. The country is structured in 26 partly-sovereign cantons, in which the citizens can directly participate in democratic decisions with frequent national referendums.

Population
8.06m citizens

Birthrate 10/1000
(births/citizen)
2014



Population with internet access
2014

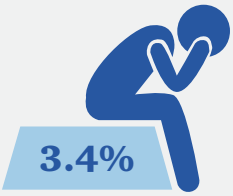


Index for English language skills
2014

The economy and the industry

[The strong Swiss franc threatens the producing industry after decoupling from the Euro.]

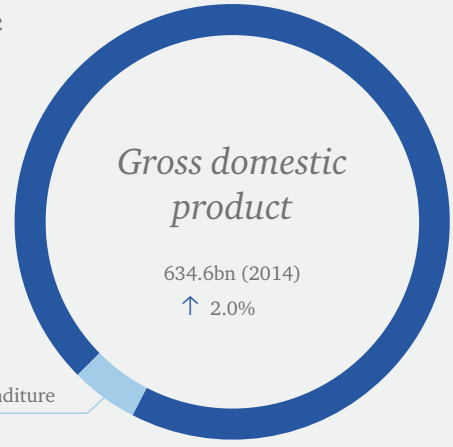
Even though Switzerland isn't a member of the EU, many regulations were constructed in conformity to those of the EU. Trade restrictions are effective only in the agricultural industry, which makes for a small amount of the economic strength. The concentration of the economic performance in the four centers, Zurich, Geneva, Basel and Bern, is in comparison to other countries with 59% very high. Measured in terms of the gross domestic product (GDP), Switzerland is one of the largest economies in Europe and the 20th largest economy in the world. With a GDP per capita of €78,000, the country leads the list of surveyed countries of this study. The economy reached a growth of 1.7% per year for the last 4 years. With the end of the minimum exchange rate of the Swiss franc to the Euro in January 2015 and the resulting appreciation of the franc, experts expect a decrease of growth in 2015 to 0.9%. Worldwide, Switzerland is currently the 23rd largest export and import nation. The country exported goods worth €308bn in 2012. The three biggest exports were high-tech products, weapons and pharmaceutical products. The service industry employs 75% of all employees. The financial industry takes a key position in the service industry with 10.5% of the GDP. Switzerland is not endowed with natural resources, but covered 56% of its energy needs with hydroelectric power. The wage level of €45,197 in 2013 occupies the second position of all industrial nations. On average, employees work for 1,607 hours every year which is 8% less than the average of the industrial nations. The labor laws are conducive for employers and allows for up to 50 hours per week and short notices of termination.



Rate of unemployment
2015

Measure for purchasing power parity, price for one Big Mac
Big Mac Index 2015

Business climate by comparison of 189 countries
Ease of Doing Business 2014



2013
↑ 1.9%

2012
↑ 1.1%

2011
↑ 1.9%

[The tool and die industry driven by exports, has to weather hard times after the franc appreciation.]

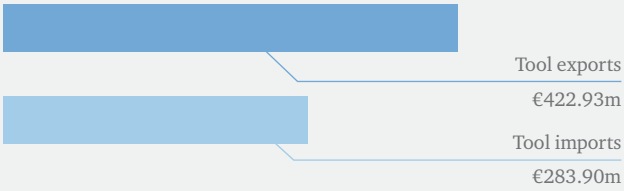
The image of the Swiss precision in watch manufacturing holds true for the producing tool and die industry as well. Swiss tool and die manufacturers contain a strong understanding of complex machine technology and the highly precise workmanship. Due to high labor costs, which partially can be compensated by long working times and smaller employer contributions, the Swiss tool and die manufacturers have to focus on upmarket tools. In 2013 tools and dies worth €422.93m were exported, of which €87.06m were for solid and sheet metal forming tools, €318.26m for injection molds and €17.62m for die casting molds. Switzerland registered a total value of €283.90m, apportioned among €69.45m for solid and sheet metal forming tools, €198.61m for injection molds and €15.83m for die casting molds. Many tool and die companies use their diverse process knowledge to increase the productivity of their tools and dies for their customers. The technological comprehension together with the precise production of tools and dies convinces of high tool and die competence in Switzerland. Measured in absolute

The tool manufacturing and the tools

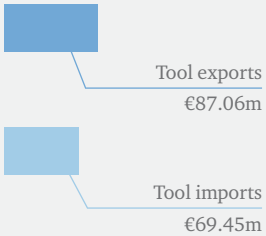
713

Number of patent registrations in the tool and die industry
2000-2011

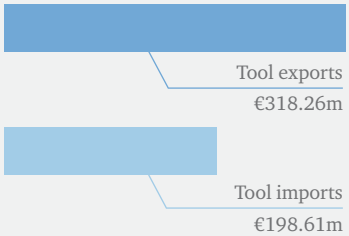
Tool production/tool exports/tool imports



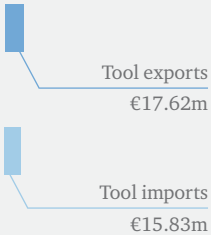
Solid and sheet metal forming tools



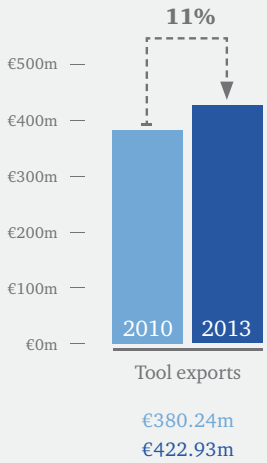
Injection molds



Die casting molds

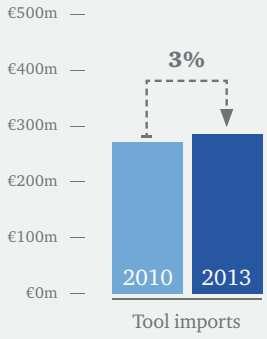


The tool manufacturing and the tools



Tool exports

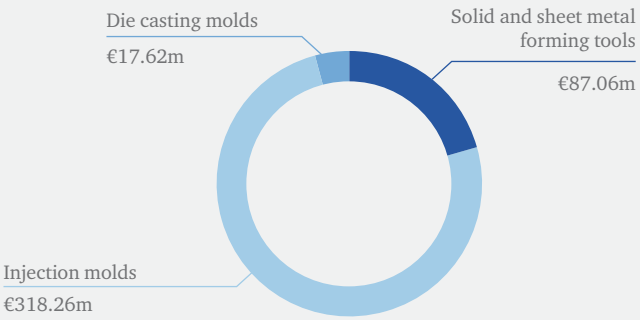
€380.24m
€422.93m



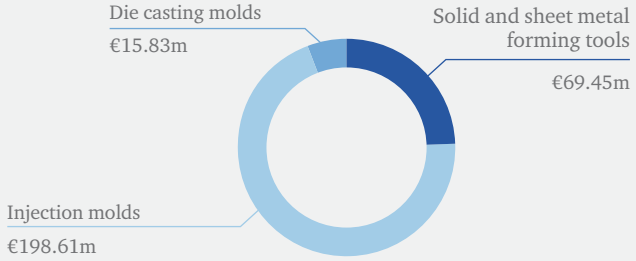
Tool imports

€276.66m
€283.90m

Tool exports

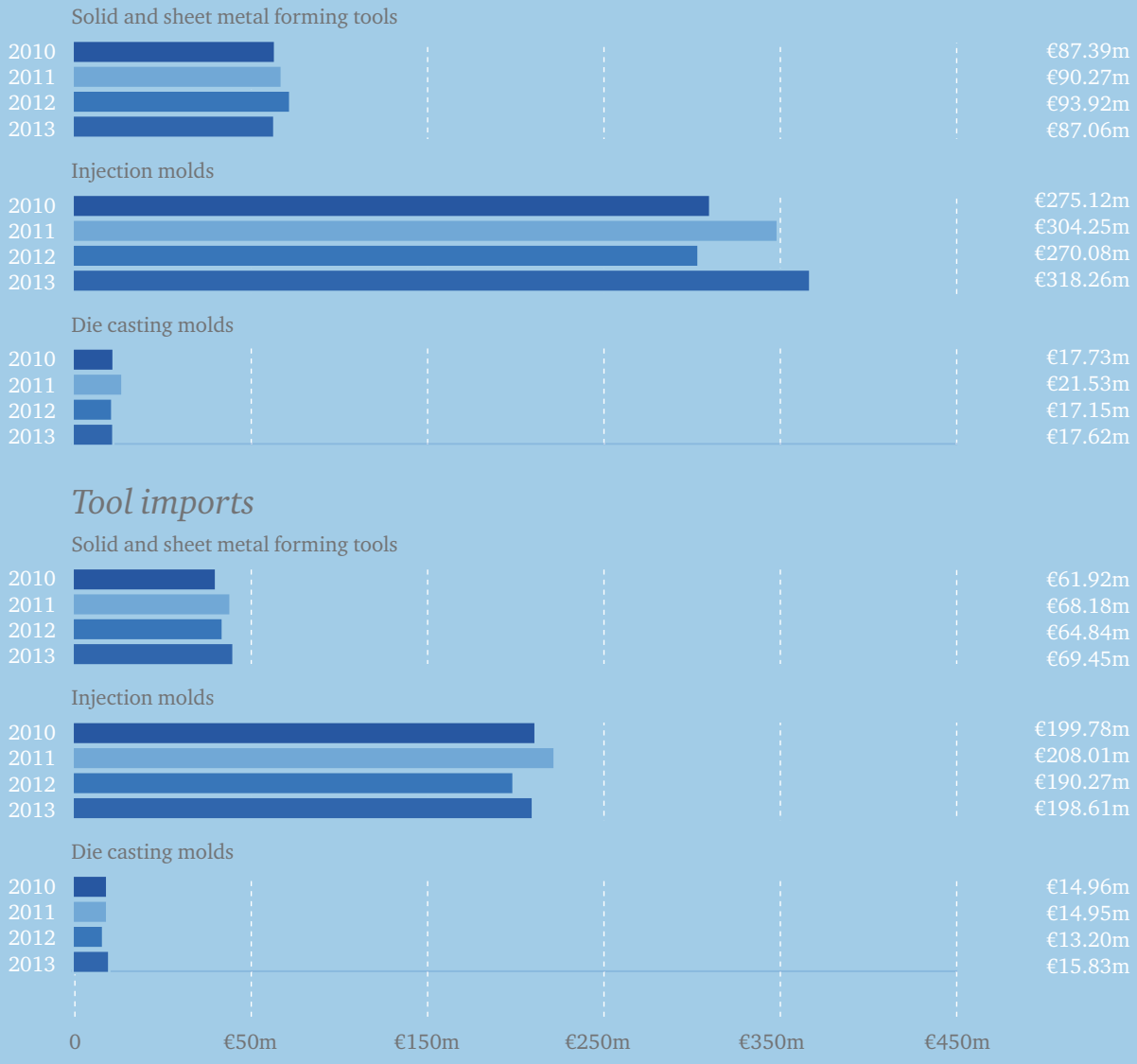


Tool imports



production numbers, Switzerland takes a mid-position, compared to other tool and die markets. The relatively low number of companies is well suited for production and export of tools largely due to their know-how. The appreciation of the Swiss franc and the thereof arising difficulties of an industry dependent on exports results in a development rating of “low” for Switzerland. Switzerland is located in the “Established” group, with a high tool and die competence next to a mid-market size.

Tool exports



Tool imports

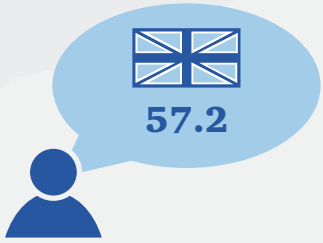
Country:	***Spain***
Area:	***505,370 km²***
Population:	***47.74m***
GDP per capita:	***€26,985***
Category:	***Established***

Spain

[As a former global power with colonies in Central and South America, Spain now serves as a tourism magnet, largely due to its Mediterranean climate and famous architecture and museums.]

The country and its people

Spain is located in South-west Europe and has 47.74m citizens. After the death of its dictator Franco, the country evolved into a democracy, which was the beginning of its extensive modernization and belongs to the founding members of the European Union. It is divided into 17 autonomous communities and is confronted with independence movements in the Basque region and in Catalonia. Shortly before the economic crisis, Spain experienced an enormous construction boom. Chiefly because the country adopted the Euro, investors profited from low rates of interest, fueling high investments in infrastructure, commercial and housing areas, which peaked in 2007 with a value of €59.5bn per year. The current situation is plagued by high rates of unemployment, presently at 23.8%. 55% of all adults have a higher educational qualification, which is 20pp. below the OECD average. In the international PISA Study, Spain occupies a below average position compared to other industrial nations. According to OECD, Spain was the fourth most popular country of immigration in 2012; a contrast from 2007, where Spain was ranked second. Spain is famous for its daily routine which consists of a siesta and a late dinner, as the weather is more pleasing due to lower temperatures.



Index for English language skills
2014

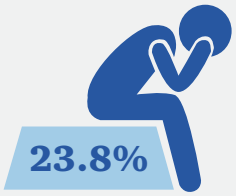
Measure for purchasing power parity, price for one Big Mac
Big Mac Index 2015

Population
47.74m citizens

Birthrate 10/1000 (births/citizen)
2014

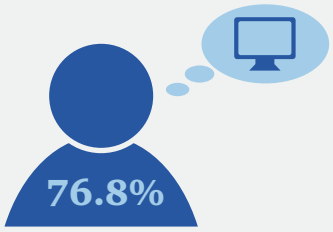
The economy and the industry

[After a deep recession caused by the economic crisis in 2008 and a high rate of unemployment, Spain's economy currently grows as at rates prior to 2007.]



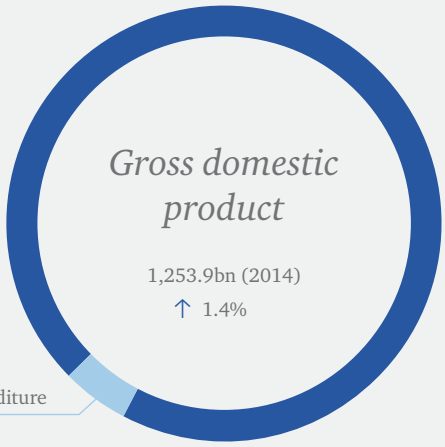
Rate of unemployment
2015

In terms of its gross domestic product (GDP), Spain takes the 8th position among the surveyed countries. The GDP per capita is €27,000. During the last 4 years, Spain was struck by recession and shrunk by 0.6% every year. However, in 2014 Spain achieved growth levels of 1.4%, which is expected to increase to 2.8% in 2015 and 2016 and the outlook for these years is positive. Worldwide, Spain is currently the 18th largest exporter and 15th largest importer. The country exported goods worth €217bn in 2012. The main exports are automobiles, fruits, vegetables, wine, machines and metal goods. Spain belongs to the resource endowed nations in Europe and has natural resources such as coal, iron, mercury and copper. Spain continued to export goods during the recession, and in 2013 the foreign trade balance was positive for the first time since 1986. With an average of €29,090 in 2013, the wage level was marginally above all industrial nations. On average, the Spaniards work for 1,670 hours every year, slightly below the average. The average person has 16.1 hours every day for leisure and relaxation - a leader among industrial nations. Spain is one of the most popular vacation destinations, frequented by Europeans. In 2010, Spain was the fourth most popular travel destination worldwide, which is contributes significantly to its economy.



Population with basic computer knowledge
2013

Business climate by comparison of 189 countries
Ease of Doing Business 2014



2013
↓ -1.2%

2012
↓ -2.1%

2011
↓ -0.6%

The tool manufacturing and the tools

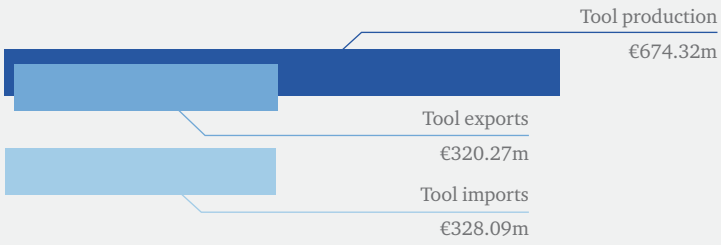
[Spain is the fifth largest tool and die manufacturer in Europe. The focus lies in the fulfillment of the needs of the local automotive industry and in the export of solid and sheet metal forming tools.]

Tools and dies are the third most important commodity group in the Spanish production industry, followed by automobiles and airplane components. Most of the Spanish tool and die industry is located near the bases of the automotive industry in Saragossa, Barcelona and Valencia, located in Eastern Spain. Within the production of tools and dies, a narrow focus lies on injection molds. Interestingly, most of the sheet and solid metal forming tools are exported to other markets. A growth of 84% was registered in 2013 with recorded production at 504.18bn, while in 2010, this figure was 365.87bn. In 2013, tools and dies worth €320.27m and weighing

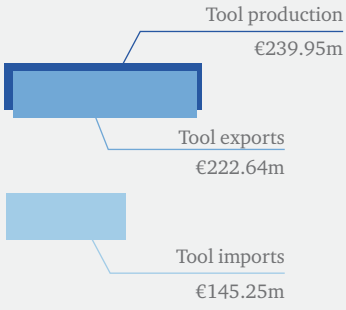
295

Number of patent registrations in the tool and die industry
2000-2011

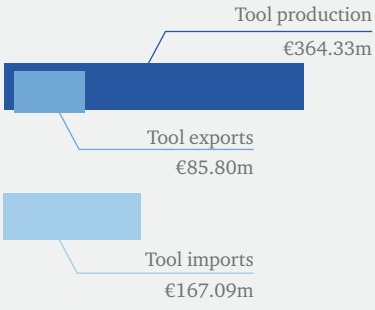
Tool production/tool exports/tool imports



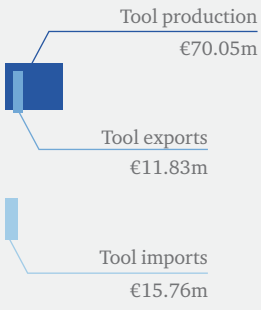
Solid and sheet metal forming tools



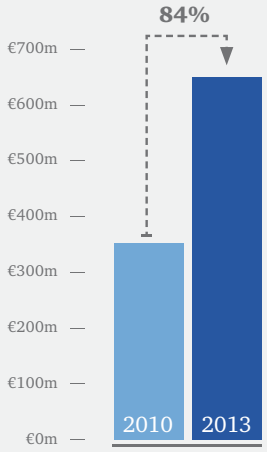
Injection molds



Die casting molds



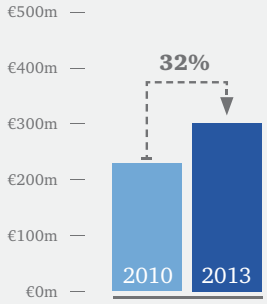
The tool manufacturing and the tools



Tool production

€365.87m

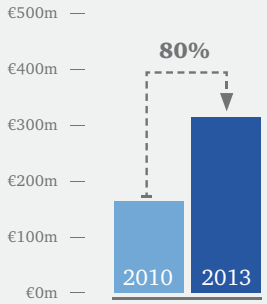
€674.32m



Tool exports

€243.20m

€320.27m

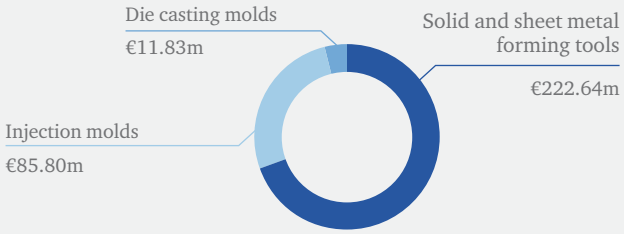


Tool imports

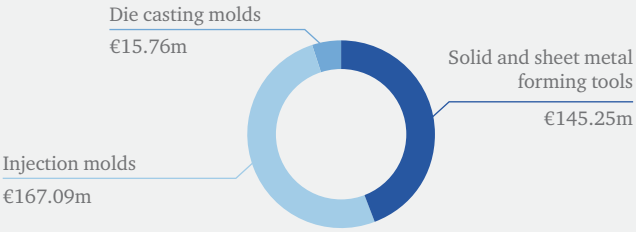
€172.33m

€328.09m

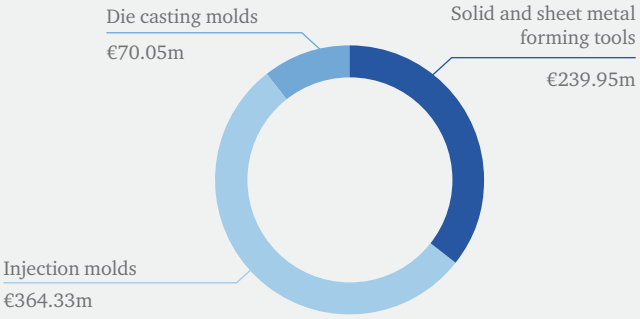
Tool exports



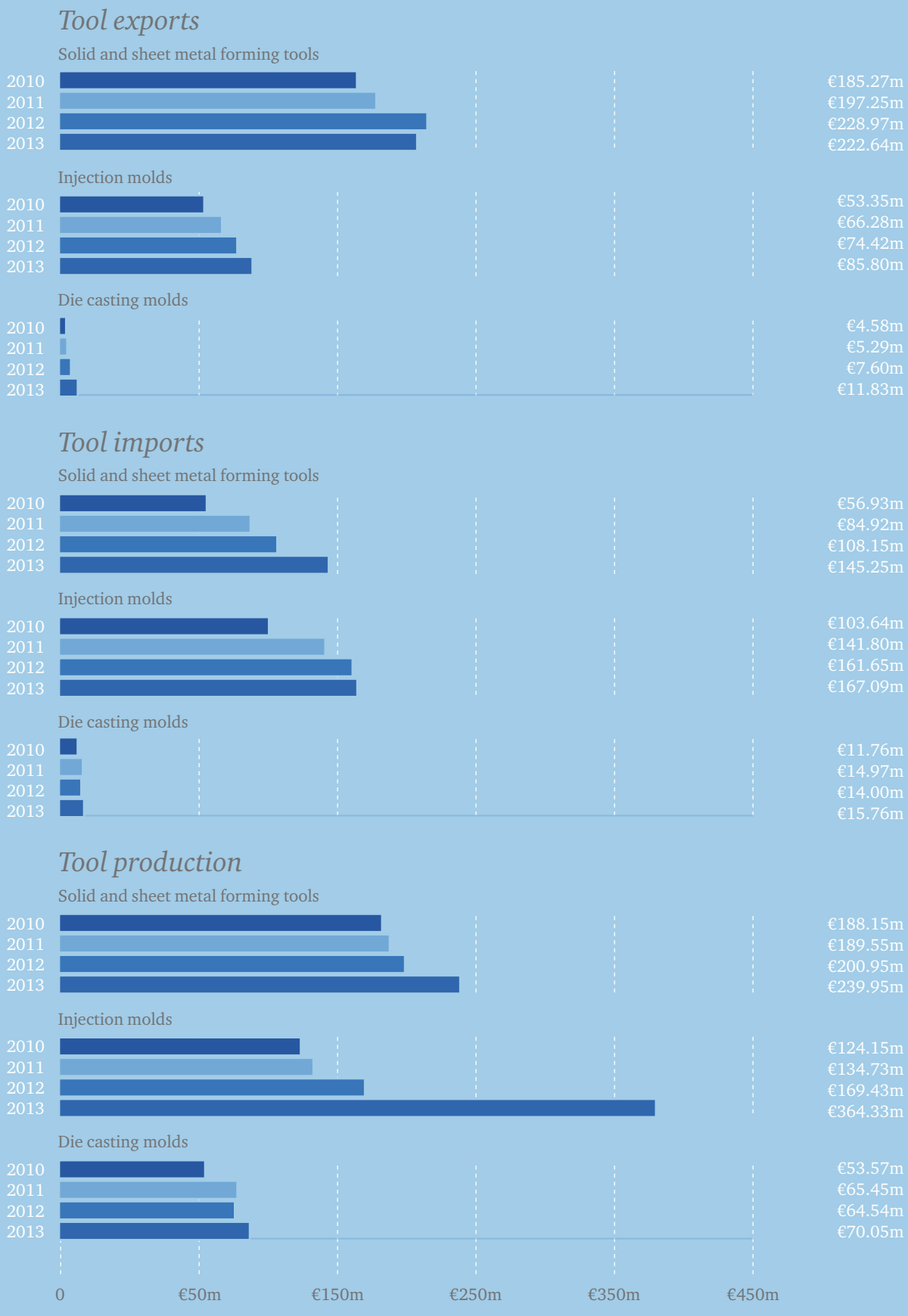
Tool imports



Tool production



26.611 tons were exported. These were €239.95m for solid and sheet metal forming tools, €364.33m for injection molds and €70.05m for die casting molds. Within the imports, Spain could register a total value of €328.09m, split up among €145.25m for solid and sheet metal forming tools, €167.09m for injection molds and €15.76m for die casting molds. The development of the Spanish tool and die industry is closely linked to the developed local automotive industry. In contrast to Portugal, which focuses on injection molds and the production of tools in corporate networks, most Spanish tool and die manufacturer lack distinguishing features in order to be competitive on an international level. With a middle market segment and middle tool and die competences, Spain is categorized in the “Established” group. Since larger improvement possibilities are present and production expansion is not expected, the development potential is rated low.


Tool exports
Solid and sheet metal forming tools
2010 €185.27m
2011 €197.25m
2012 €228.97m
2013 €222.64m
Injection molds
2010 €53.35m
2011 €66.28m
2012 €74.42m
2013 €85.80m
Die casting molds
2010 €4.58m
2011 €5.29m
2012 €7.60m
2013 €11.83m
Tool imports
Solid and sheet metal forming tools
2010 €56.93m
2011 €84.92m
2012 €108.15m
2013 €145.25m
Injection molds
2010 €103.64m
2011 €141.80m
2012 €161.65m
2013 €167.09m
Die casting molds
2010 €11.76m
2011 €14.97m
2012 €14.00m
2013 €15.76m
Tool production
Solid and sheet metal forming tools
2010 €188.15m
2011 €189.55m
2012 €200.95m
2013 €239.95m
Injection molds
2010 €124.15m
2011 €134.73m
2012 €169.43m
2013 €364.33m
Die casting molds
2010 €53.57m
2011 €65.45m
2012 €64.54m
2013 €70.05m
0
€50m
€150m
€250m
€350m
€450m

Country:	***Poland***
Area:	***312,685 km²***
Population:	***38.35m***
GDP per capita:	***€12,815***
Category:	***Rookies***

Poland

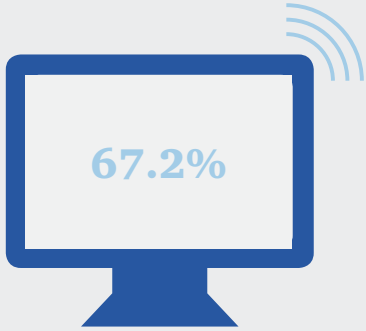
[Poland is the land of storks and a thousand lakes – with ten thousand closed lakes, it is one of the countries with the most lakes in the world.]

Poland is located on the border to Germany and to the east of Central Europe with 38.25m citizens. It is the sixth most densely populated country in the EU and is the largest country in the EU. Poland became a member of the EU in 2004, five years after it joined the NATO. Poland is considered to be a highly developed country and occupies a top position concerning the standard of living. This is related to security and social structure for example but especially to the educational system. Within the OECD Poland reaches the second place and was only beaten by Finland. 90% of all adults have a higher educational degree and the school system is of excellent quality, which can be seen in consistent, outstanding PISA Study values. In contrast, the personal income and subsequently the labor market and health care system are not very good, although there are signs that indicate a positive trend.

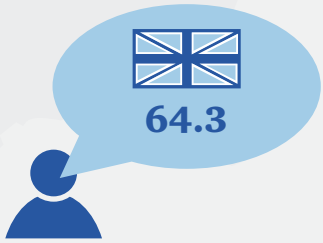
The country and its people

Population
38.35m citizens

Birthrate 10/1000 (births/citizen)
2014



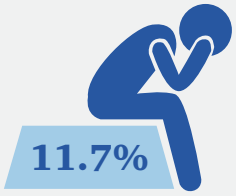
Population with internet access
2014



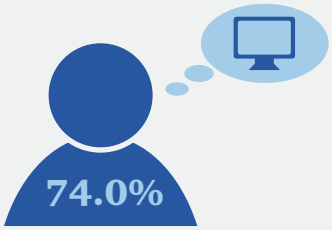
Index for English language skills
2014

The economy and the industry

[The Polish economy continues to grow – a high rate of unemployment is evidence of the existing structural problems.]



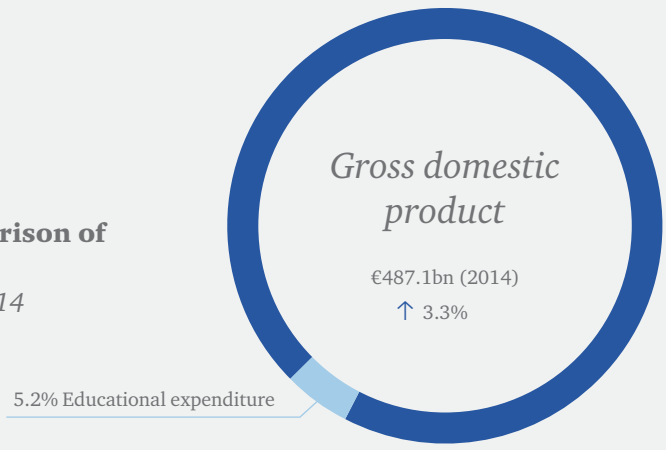
Rate of unemployment
2015



Population with basic computer knowledge
2013

Since 1990 Poland has systematically supported the liberalization of its economy. During the global financial and economic crisis in 2008 and 2009, Poland was the only country in the EU that steered clear of a recession. In terms of gross domestic product (GDP) Poland is among the larger European economies. However, referring to GDP per capita, the country settles for the 12th position in this study. In recent years, the economy has showed positive growth rates and grew moderately in the last four years by 2.9% per year. Especially in the years after its EU accession until 2009, the country enjoyed growth rates as high as 7%. The outlook for the years 2015 and 2016 is positive. Poland is currently the 27th largest export nation and 24th largest import nation worldwide. The country exported products and goods worth €153bn in the year 2013. The three most important export goods were parts for the automotive, machines and chemical industry. The country has large deposits of coal and brown coal as well as copper and silver. The industrial production shrunk considerably in the first years after 1990 due to the decommissioning of many state-owned companies. Consolidation and privatization of the remaining companies resulted in modernization and the companies are able to compete internationally. The level of wages was close to an average of €18,879 in 2013 and therefore significantly below the average of all industrial nations. The distribution of income within the population is homogenous. 20% of the wealthiest Poles earn approximately twice as much as the poorest 20%; a better figure than Italy's, where the difference is six times higher. On an average, a Pole works 1,931 hours every year, which is 10% above the average of all other industrial nations. The rate of unemployment and youth unemployment is, with current 11.7% and 23.9% respectively, above the EU average. However, it shows significant regional differences: in the cities Posen and Warsaw the rate of unemployment is below 3% whereas in rural regions it is partially above 20%.

Business climate by comparison of 189 countries
Ease of Doing Business 2014



2013
↑ 1.7%

2012
↑ 1.8%

2011
↑ 4.8%

[97% of the tool and die volume produced in Poland is exported.]

The tool and die industry in Poland produced tools and dies worth €141.76m in 2013. This is an increase of 39% since 2010, at which time it was €101.83m. Although Poland and the Czech Republic are frequently mentioned in one breath, Poland's tool and die production volume is significantly lower than that of the Czech Republic, although it is said that Poland scores better than the Czech Republic in macroeconomic terms. In 2013 2,087 tons of tools and dies worth €140.12m were exported, which is almost the entire production. The total export is apportioned as follows: €25.67m for solid and sheet metal forming tools, €107.19m for injection molds and €7.27m for die casting molds.

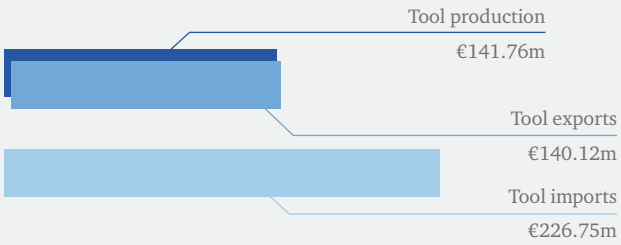
At the same time, Poland imported tools and dies worth €226.76m. This included €56.86m of solid and sheet metal forming tools, €149.06m of injection molds and €20.83m of die casting molds. Owing to its good education system, Poland is very popular for carrying out engineering services. Meanwhile, there are independent offices or outsourced departments in Poland, which engineer or design tools and dies completely or as an extended workbench. This gives Poland an edge over other countries with comparatively low labor costs but a low level of competency. Well educated, competent employees in the tool and die industry and the good quality of Polish products positions the Polish

The tool manufacturing and the tools

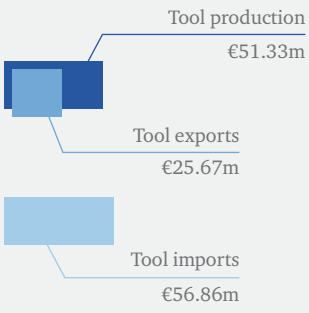
33

Number of patent registrations in the tool and die industry
2000-2011

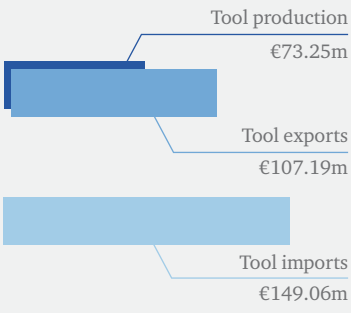
Tool production/tool exports/tool imports



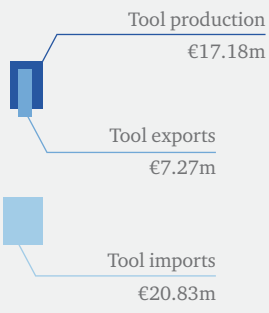
Solid and sheet metal forming tools



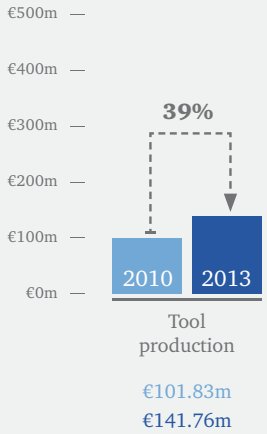
Injection molds

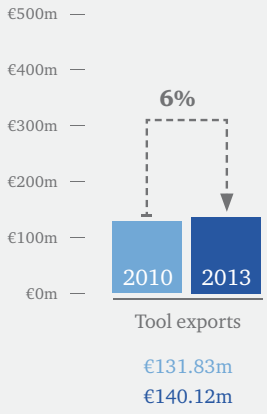


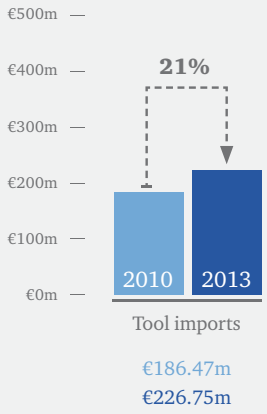
Die casting molds



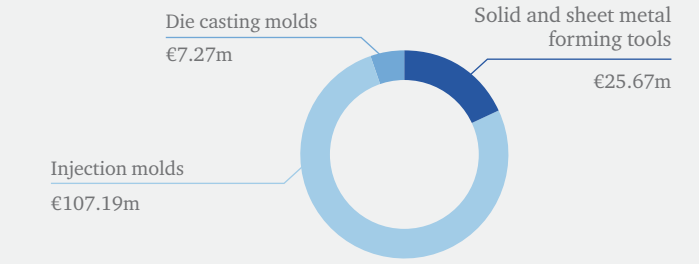
The tool manufacturing and the tools



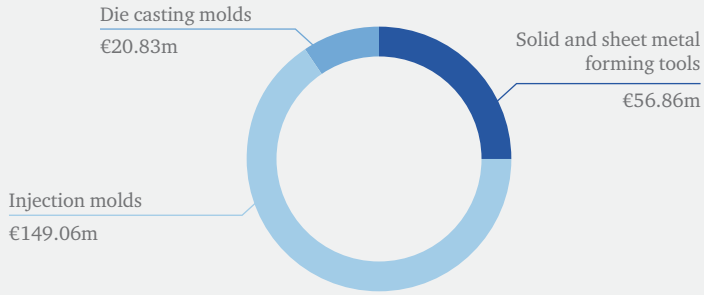




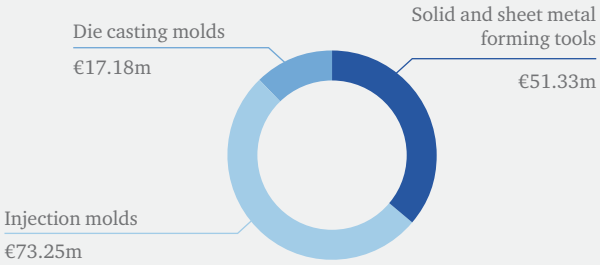
Tool exports



Tool imports

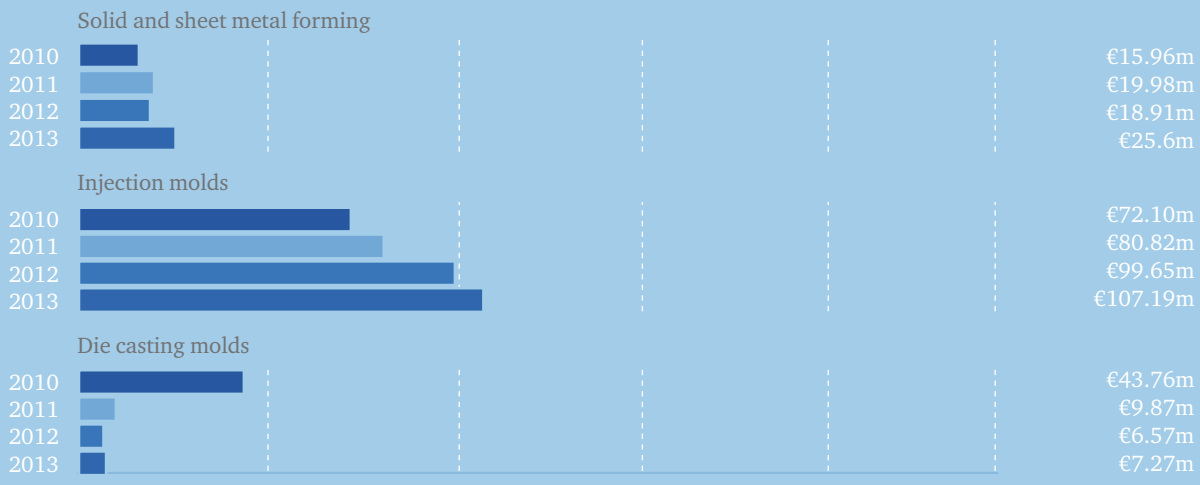


Tool production

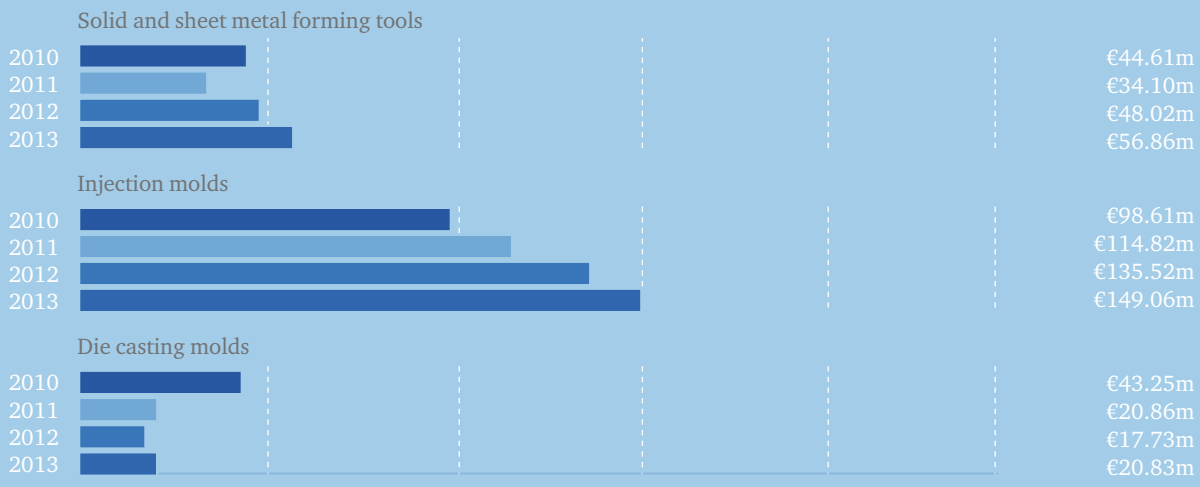


tool and die industry in the category of the Rookies. In the future, the production figures will increase and the industry will gain more importance. However, Poland is not a traditional country for such products implying an average development potential.

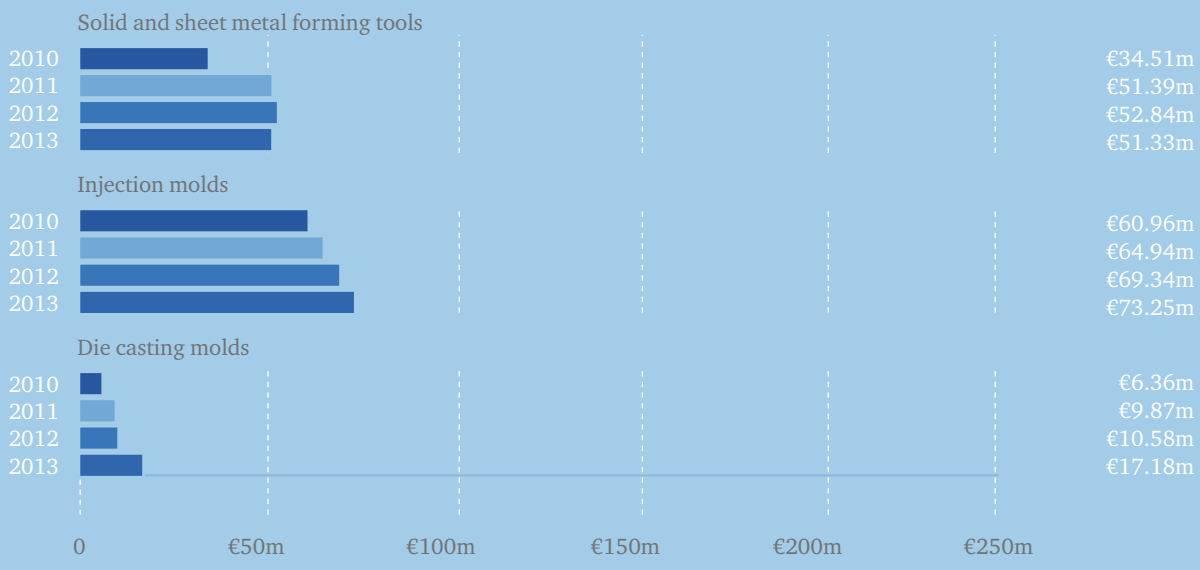
Tool exports



Tool imports



Tool production



Country:	***Portugal***
Area:	***92,090 km²***
Population:	***10.81m***
GDP per capita:	***€19,723***
Category:	***Rookies***

Portugal

[Portugal is the land of great explorers and "Fado". Portugal has important income sources in tourism and wine making.]

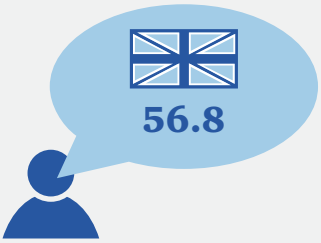
Portugal has 11m citizens and is the most western country of continental Europe. With Spain, the country forms the Iberian Peninsula and despite its small size has a varied landscape with mountains, plains and coastlines. The country is a founding member of the NATO (1949) and is still the poorest founding member of the EU, even though it had an economic upswing at the end of the 20th century. Portugal was a country of emigration for a long time. Millions of Portuguese live in several countries in North and South America as well as in Africa. By 2050, the population will slightly shrink to a size of 9m citizens. Statistics indicate that Portugal has a standard of living, which is below the average compared to other developed countries. Only 38% of all adults have a higher educational degree (as opposed to the OECD average of 75%). The PISA Study, an indicator for the quality of school systems, even shows values below the average. The Portuguese themselves are less satisfied with their standard of living compared to the citizens of other developed countries. On a scale from 0 to 10 the Portuguese rate their satisfaction standard of living with a 5.1, which is 1.5 points below the OECD average. However, Portugal is still very attractive for tourists: more than 25m visit the country every year, which makes Portugal one of the most popular tourism destinations worldwide.

The country and its people

Population
10.81m citizens

Birthrate 9/1000 (births/citizen)
2014

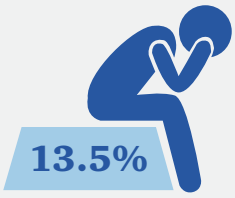
Measure for purchasing power parity, price for one Big Mac
Big Mac Index 2015



Index for English language skills
2014

The economy and the industry

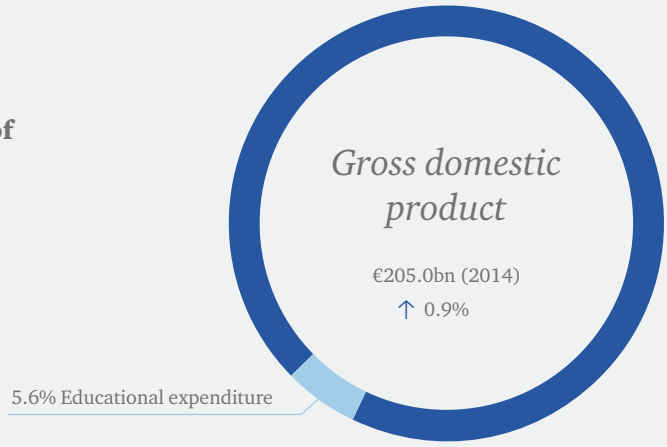
[Once branded as the Euro-problem-child, Portugal is now on the right track out of the crisis, even being cited as a role model by Brussels and the media.]



Rate of unemployment
2015

With reference to the share of its gross domestic product (GDP) Portugal is a medium-sized European economy and the 48th largest worldwide. In terms of GDP, the country occupies the 10th position when compared with the other countries of this study. In the 1990s, Portugal's economy grew due to debt financing, while simultaneously the export performance was already decreasing. The financial and economic crisis caused a recession which endured for several years with a high rate of unemployment and a considerable increase of public debt. Even in the last four years, the economy shrunk by 1.6% per year. However, profound structural reforms helped to stabilize the economy and the competitiveness, thereby restoring the exportability of the country. After many years, a moderate growth of 0.9% could be realized in 2014. In 2015 and 2016 the growth rate is predicted to rise to 1.8%. The weakened economy is characterized by an extremely high rate of unemployment (13.5%) and youth unemployment (34.8%). Portugal is the 39th largest import nation worldwide. In 2014, the country exported products and goods worth €70bn. The three most important export goods were supply parts for the automotive industry, machines and metals. The country is poor in natural resources. The level of wages was with €19,740 in 2013 on par with the average of all industrial nations. Portuguese work 1,714 hours every year, which is 2% below the average of all industrial nations. The positive tendency of the Portuguese economy is still confronted with many structural problems: weak competition in service sectors, energy supply, missing market mechanisms on the labor market and high corporate taxes. Additionally, a low level of innovation due to ineffective links between governmental and commercial supported research and development make market entry difficult and burdens Portugal's competitive ability.

Business climate by comparison of 189 countries
Ease of Doing Business 2014



2013
↓ -1.6%

2012
↓ -4.0%

2011
↓ -1.8%

[The development and production of high quality injection molds is constantly promoted in Portugal's company networks.]

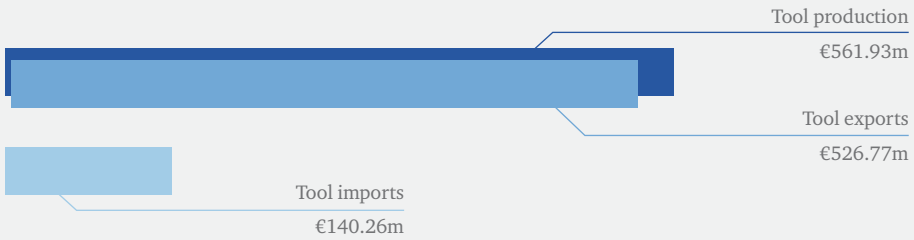
The Portuguese tool and die industry focusses on injection molds, which can be seen in the countries' trade figures. The total production in 2013 was worth €561.93m. Since 2010, this value increased by 62%, from its original value of €347.5m. In total, 671 tons of tools and dies worth €526.77m have been exported in 2013. The export divides into €11.69m solid and sheet metal forming tools, €489.94m injection molds and €25.14m die casting molds. At the same time Portugal imported tools and dies worth €140.26m, including €17.35m of solid and sheet metal forming tools, €119.2m of injection molds and €3.7m of die casting molds. Portugal pursues the ambitious target of becoming one of the leading markets for injection molds. For this purpose the trademark "engineering and tooling from Portugal" has been established by the tool and die industry network Pool-Net, where the industrial association Cemafol and the technical center for mold making (Centimfe) play a vital role. Pool-Net hosts

The tool manufacturing and the tools

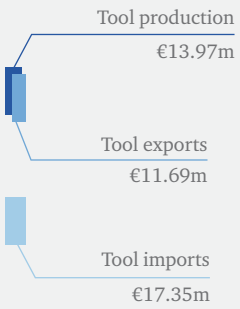
22

Number of patent registrations in the tool and die industry
2000-2011

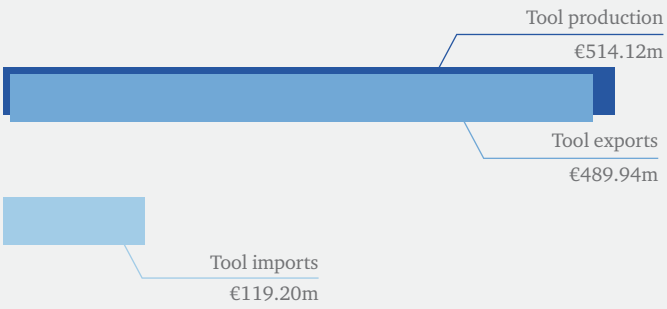
Tool production/tool exports/tool imports



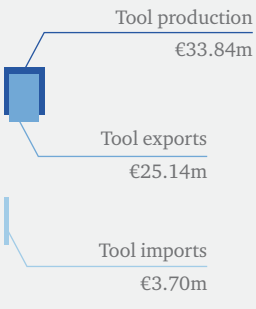
Solid and sheet metal forming tools



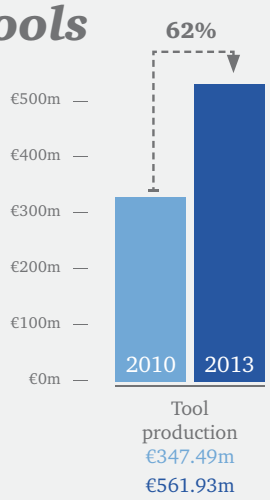
Injection molds



Die casting molds



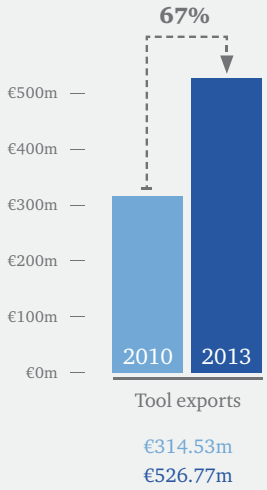
The tool manufacturing and the tools



Tool production

€347.49m

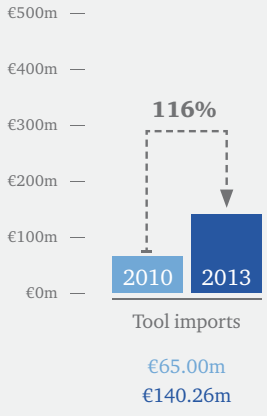
€561.93m



Tool exports

€314.53m

€526.77m

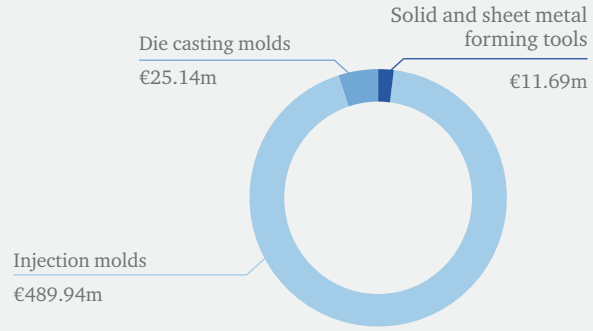


Tool imports

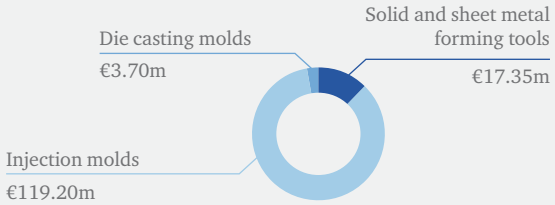
€65.00m

€140.26m

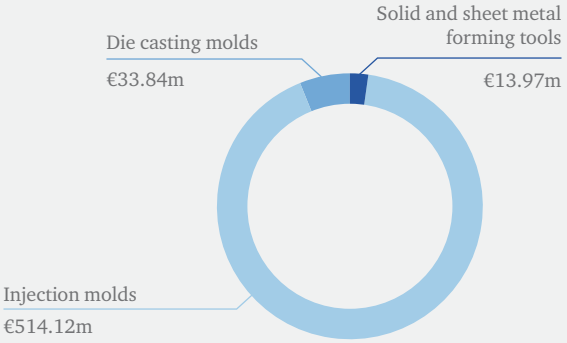
Tool exports



Tool imports

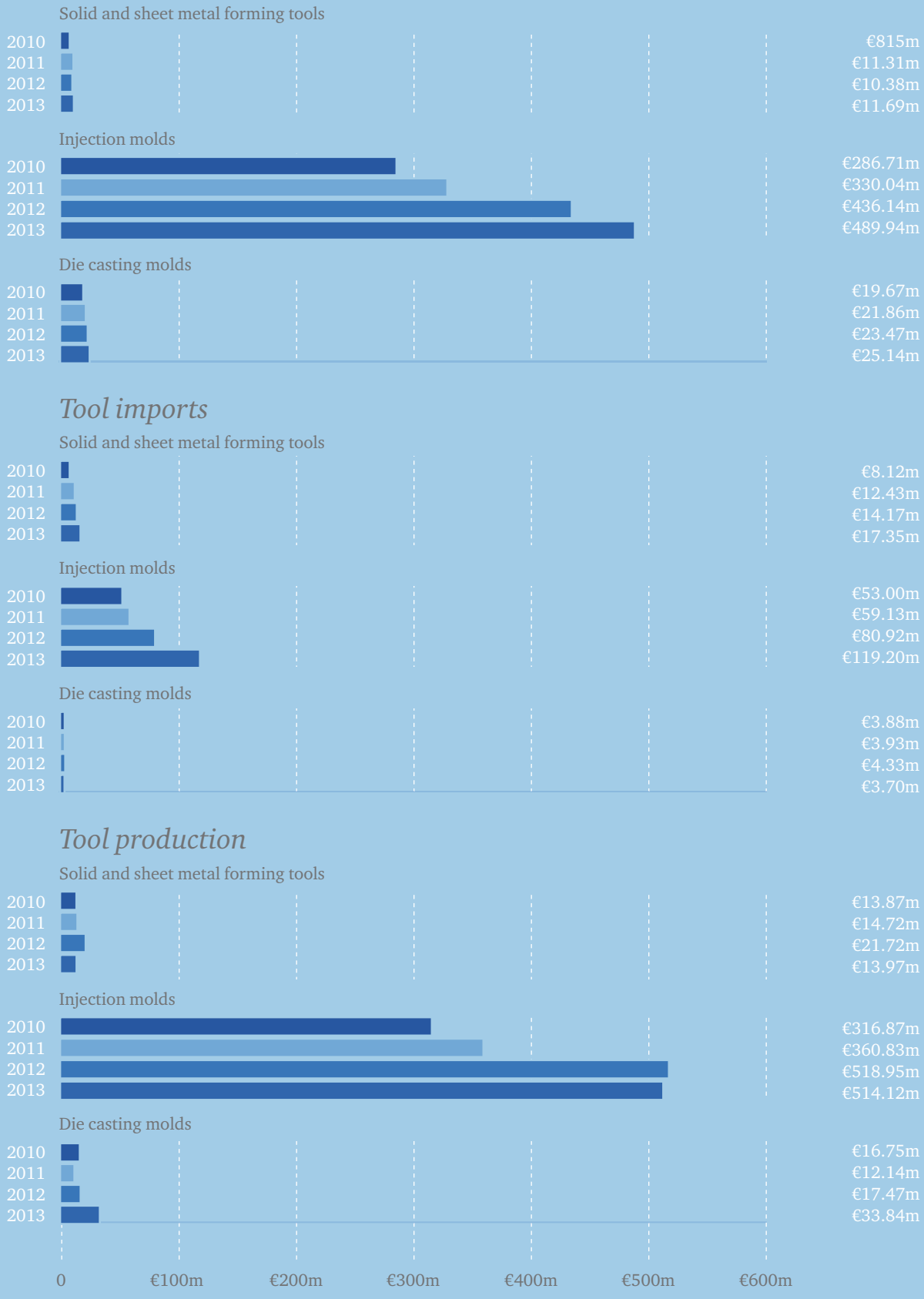


Tool production



international exhibitions and workshops and coordinates the development of the tool and die industry in Portugal. Thereby, the buildup of a close network of tool and die manufacturers and local research institutions is intended. Due to the combination of low wages and close proximity to the European automotive centers, Portugal has established itself as an important supplier. According to evaluations, between 75% and 85% of the tool and die manufacturers in the country are located in the three biggest centers in Marinha Grande, Oliveira de Azeméis and Leiria which make up 400 to 600 of the tool and die manufacturers in the country. The industry consists of small and very small manufacturers. More than 90% have less than 50 employees. In addition, the network structures enable a faster processing of larger tool and die volumes. Therefore Portugal is a Rookie market with medium development potential. A positive development, particularly in the export sector, is pivotal for the tool and die making industry in order to pave the way for a better development.

Tool exports



Tool imports

Tool production

Country:	***Czech Republic***
Area:	***78,867 km²***
Population:	***10.63m***
GDP per capita:	***€17,435***
Category:	***Rookies***

Czech Repulic

[The Czech fundament of success is their great educational system – the country is famous for beer, the Vltava (Moldau) River and the "Golden City" Prague.]

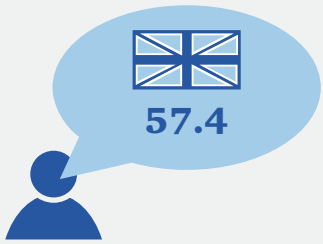
The country and its people

The Czech Republic, a neighboring state of Germany, is a landlocked country in the east of Europe with 10.6M citizens, which joined the EU in 2004 along with 12 other countries. In the EU the Czech Republic is the 12th most populated country. Especially in the field of education, the Czech Republic reaches a top position and is located in the OECD comparison only slightly behind Germany. 92% of the adult citizens hold a higher educational degree, significantly more than the average of developed countries at 75%. Nearly 57.4% of the population speaks English, which is slightly above the European average with 56.9%, and even more people speak German. The school system's quality in total is above average, but compared to other eastern European countries the Czech Republic performs worse than Poland or Slovenia. Almost 80% of all citizens have access to the Internet, which is about 5% less than the level in Germany. The Czech Republic scores well in many measures of quality of life. Apart from the education, internal security and environment belong to the positive factors. With regard to income, the labor market and health system of the Czech Republic cannot keep up with the highest developed countries in the world. In this effect, the Czech Republic shows similar characteristics to Poland, although the development of the polish society is rated higher.

Population
10.63m citizens

Birthrate 10/1000
(births/citizen)
2014

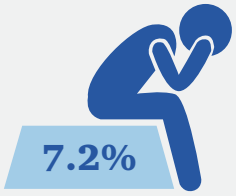
Business climate by comparison of 189 countries
Ease of Doing Business 2014



Index for English language skills
2014

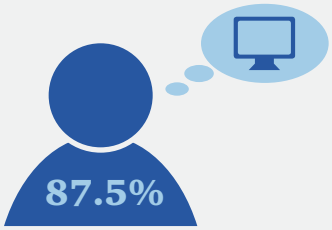
The economy and the industry

[After a long stagnation, the Czech Republic is witnessing a growing economy, driven by an increasing number of exports - the unemployment is one of the lowest in Europe.]

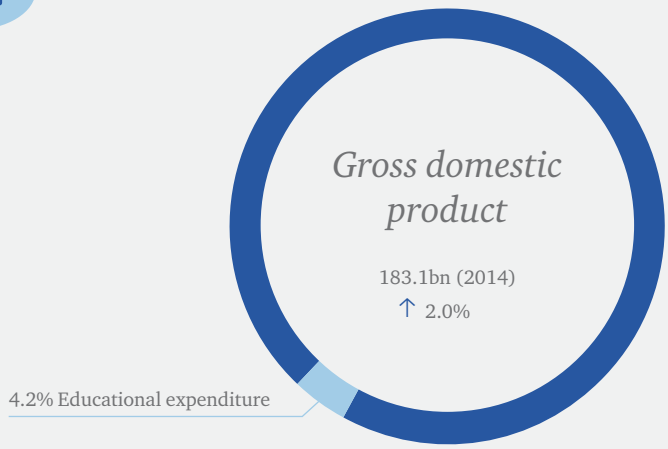


Rate of uneployment
2015

In terms of the gross domestic product (GDP), the Czech Republic is one of the smaller economies in Europe and the 53rd largest economy in the world. With regard to the GDP per capita of €17,500 the Czech Republic obtains the 11th place in this study. Scaled on the purchasing power, the Czech GDP approaches the average of the EU, but the positive progress has tapered off in the last years. The Czech economy could initially not recover after the crisis of 2008-2009 and has only grown moderately with about 0.6% per year since the last four years. However, the prospects for 2015 and 2016 are quite positive. Economic growth up to 2.6% is predicted. The Czech Republic exported goods worth €143.5bn in 2014. The three most important exports are automobiles, machines and chemicals. Germany is by far the most important trade partner for the Czech Republic and constitutes 30% of foreign trade. Poland, the second most important trade partner, achieves only 8%. The other way round, the Czech Republic is the 11th most important trade partner to Germany and plays a bigger role than Russia. The Czech Republic is also a popular country for German direct investment: Since 1993 German companies invested about €19.1bn. Škoda Auto, a brand of the Volkswagen Company, is among the largest companies of the country and makes up for a major part of all exports. The Czech Republic and the Ukraine are the last suppliers of uranium in Europe. The level of wages was close to €16,948 in 2013 and therefore below the average of all industrial nations. The real wage increase has stagnated in the last few years. An employee works on average for 1,799 hours every year, which is 3% above the average of all other industrial nations. The rate of unemployment is 7.2%, which is significantly below the average of the European Union (9.6% in 2015).



Population with basic computer knowledge
2013



2013
↓ -0.7%

2012
↓ -0.8%

2011
↑ 2.0%

[Driven by an international recognized automotive and tool industry, the Czech Republic possesses a competitive tool and die industry – main importer of Czech tools is Germany.]

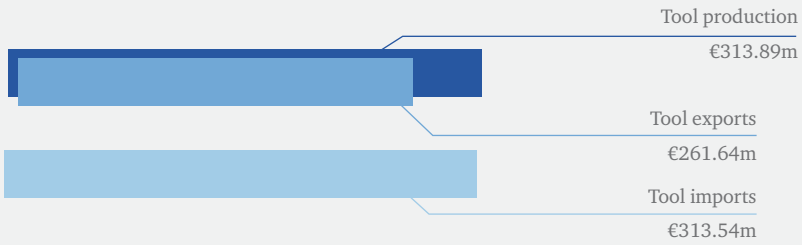
In 2013, the Czech Republic produced tools and dies with an overall value of €313.89m. Since 2010 this value has risen from €212.22m by 48%. 5301 tons of tools and dies worth €261.64m were exported in 2013. The export apportions among €85.24m for solid and sheet metal forming tools, €172.41m for injection molds and €3.99m for die casting molds. Simultaneously, the Czech Republic imported tools and dies worth €313.54m, including €113.58m of solid and sheet metal forming tools, €187.35m of injection molds and €12.61m of die casting molds. Every year more than 5000 mechanical engineers graduate from Czech universities. Engineers are trained for three to four years in special engineering-schools and no other European country has a comparable high availability of engineers

The tool manufacturing and the tools

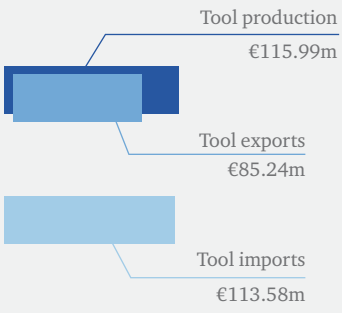
18

Number of patent registrations in the tool and die industry
2000-2011

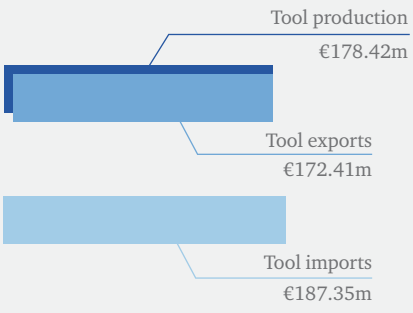
Tool production/tool exports/tool imports



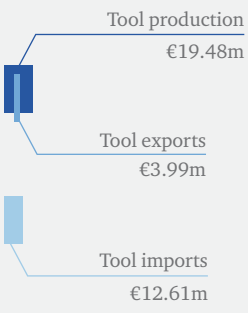
Solid and sheet metal forming tools



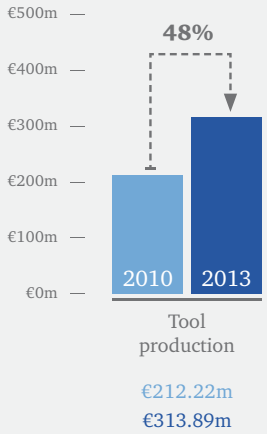
Injection molds



Die casting molds



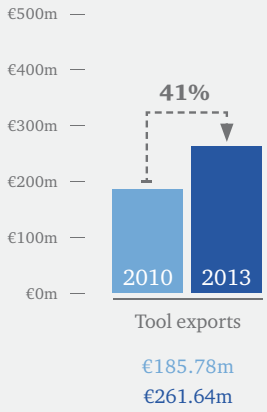
The tool manufacturing and the tools



Tool production

€212.22m

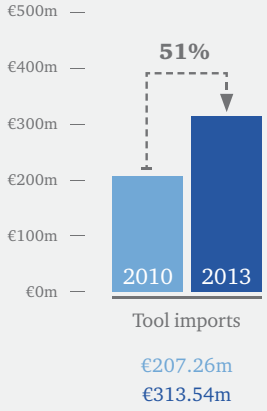
€313.89m



Tool exports

€185.78m

€261.64m

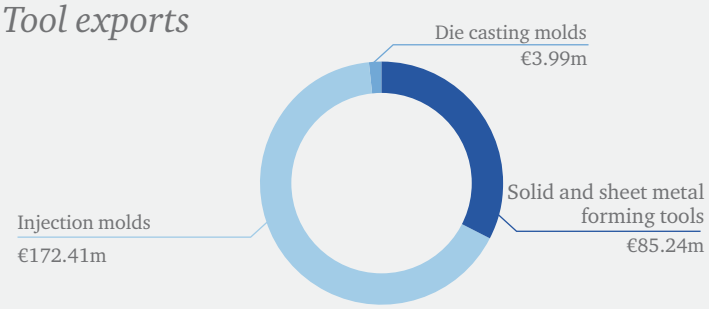


Tool imports

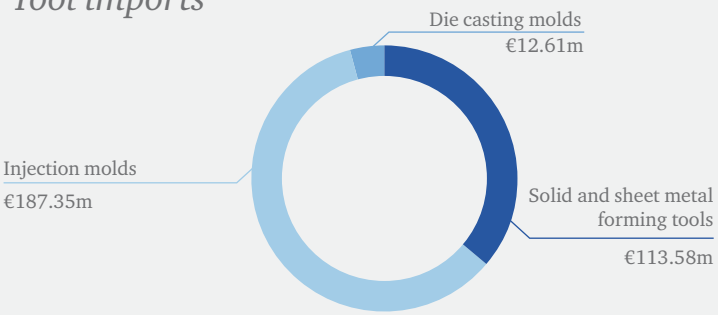
€207.26m

€313.54m

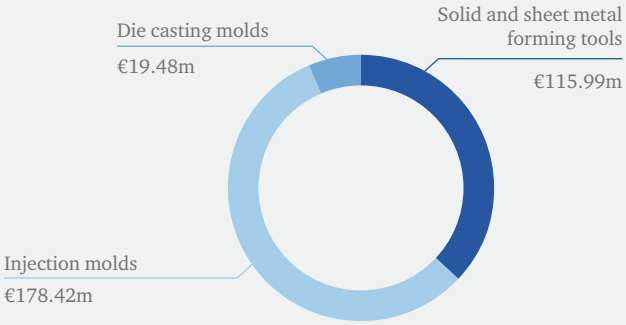
Tool exports



Tool imports

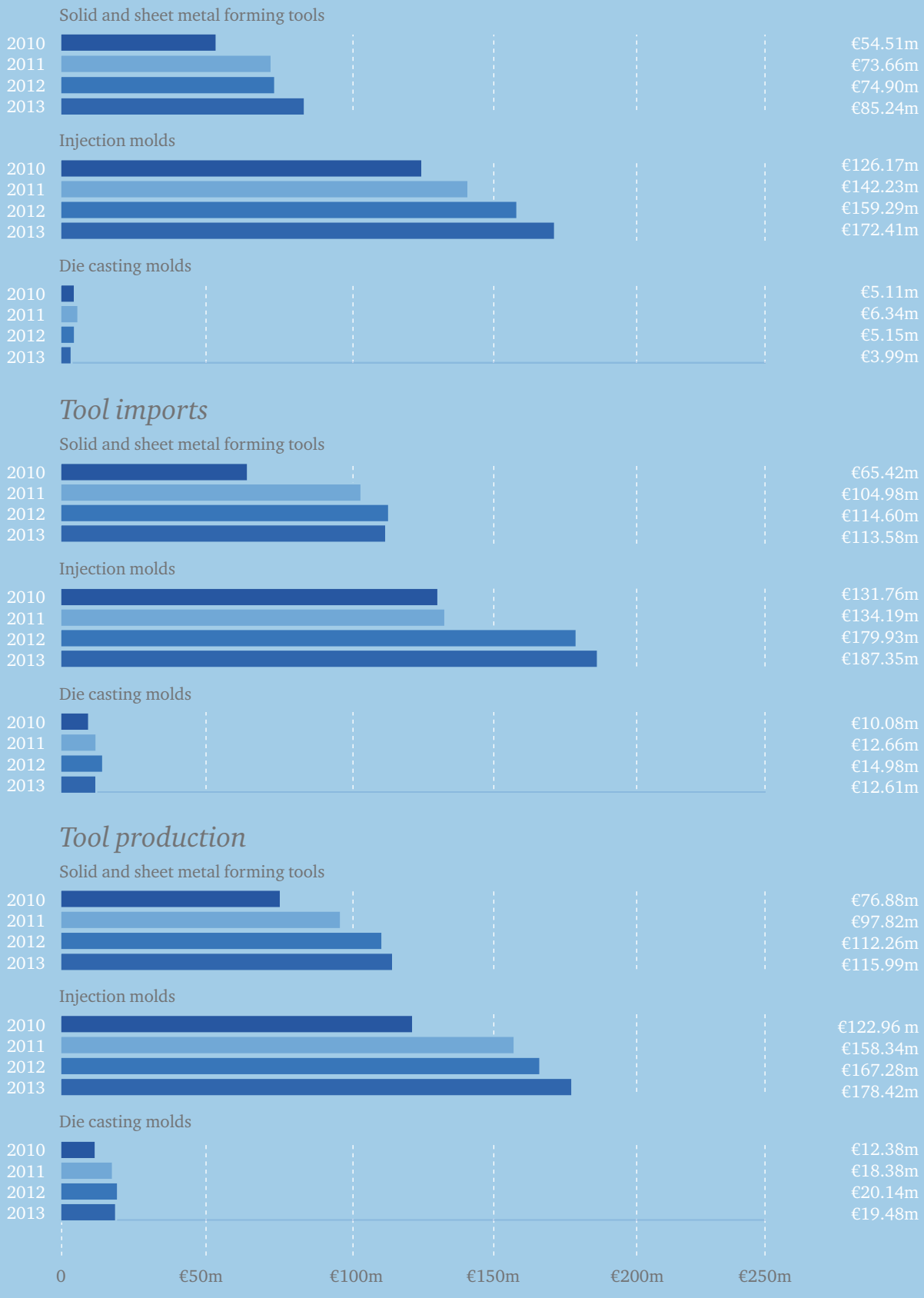


Tool production



as the Czech Republic. This useful foundation, combined with the foreign language skills (particularly German and English), results in the increase in the number of several export-oriented tool and die manufacturers. It serves as an extended workbench and offers an alternative to companies in south Germany. The Czech Republic is a Rookie in the “World of Tooling” study with positive prospects by further economic recovery.

Tool exports



Country:	***Turkey***
Area:	***783,562 km²***
Population:	***81.62m***
GDP per capita:	***€9,342***
Category:	***Rookies***

Turkey

[A fifth of all Turks live in Istanbul – the city combines many of Turkey's characteristics: growth and contradictions, Europe and Asia, modernity and antiquity.]

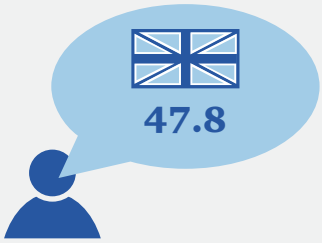
Turkey, located on the border between Asia and Europe, has about 82m citizens and evaluations of the EU assume that the population will sharply increase up to 92m citizens by 2050. In the last twenty years Turkey made strong progress in the improvement of living conditions of its inhabitants. Nevertheless, Turkey's performance in many indicators regarding the standard of living is below average and often lags behind when compared to other developed countries. Especially healthcare and educational system, the labor market and the personal income as well as the political and social security have a low performance. Only 34% of all adults have a higher educational degree and in the PISA Study, an indicator for the quality of the school system, Turkey is frequently one of the worst rated countries. Still, Turkey has an English Proficiency Index of 47.8 and also German is widespread. Since 2005, Turkey and the European Union are in a dialogue concerning the admission into the EU, but no progress has been made in the past few years.

The country and its people

Population
81.62m citizens

Birthrate 17/1000
(births/citizen)
2014

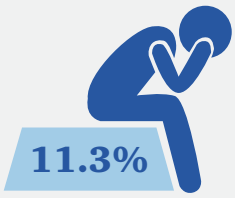
Measure for purchasing power parity, price for one Big Mac
Big Mac Index 2015



Index for English language skills
2014

The economy and the industry

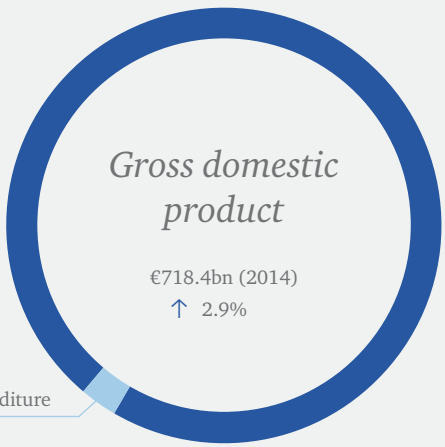
[The Turkish economy was based on the textile industry and agriculture for many years. The long enduring upswing has led to a high-quality industrial production.]



Rate of unemployment
2015

In terms of gross domestic product (GDP), Turkey is one of the larger economies worldwide on rank 17. With regard to the GDP per capita, Turkey is with €9,342 in the lower third of the countries in this study. In the last four years the economy grew steadily by 4.5% per year. The outlook for 2015 and 2016 is positive, but at the same time Turkey has one of the highest trade deficits based on the GDP. The Turkish economy is increasingly driven by the industrial and service sectors, however agriculture still builds up 25% of the economic performance. An aggressive privatization of the banking sector as well as the industrial, transport and communication sectors has strengthened the free market economy and led to new small and medium-sized companies apart from the traditional textile and clothing industry. Turkey is now the 32nd largest export nation and the 22nd largest import nation. The country exported products and goods worth €157.75bn in 2014. The three most important export goods were textiles, machines and automobiles. Furthermore, Turkey has vast natural resources such as chrome, copper, iron ore, oil and borax. The level of wages is at an average of €14,099 and thereby below the average of all industrial nations. The average person works for 1,857 hours every year, which is 6% more than the average of all other industrial nations. The rate of unemployment is about 11.3%, with youth unemployment even higher at 18%. The labor market has not been able to recover from the crisis in 2008 and 2009 and shows structural deficits. The income differences in Turkey are very high despite minimum wages. The unemployment benefit is ineffective and provides only a low amount of social protection. The legal minimum wage is one of the highest of all industrial nations, as measured by particular average wages. Nevertheless, studies show that more than 50% of all Turkish employees earn less than this minimum wage.

Business confidence by comparison of 189 countries
Ease of Doing Business 2014



2013
↑ 4.1%

2012
↑ 2.1%

2011
↑ 8.8%

[The Turkish tool and die industry centers in the Marmara region, in the greater area of Istanbul, Bursa and Izmir and works primarily for the domestic producing industry. It is an interesting alternative for procurement in Asia concerning less complex tools and an extended workbench.]

In 2013 Turkey exported 1,547 tons of tools and dies worth €108.93m, comprising of €34.81m for solid and sheet metal forming tools, €64.91m for injection molds and €9.22m for die casting molds.

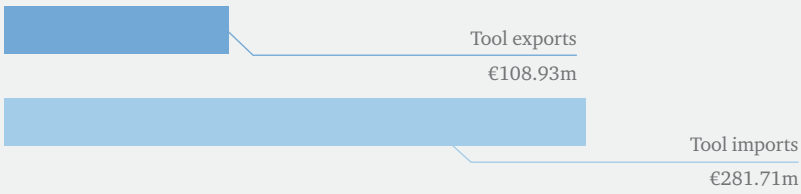
At the same time Turkey imported tools and dies worth €281.71m. This included €41.83m of solid and sheet metal forming tools, €219.60m of injection molds and €20.27m of die casting molds. In the past

The tool manufacturing and the tools

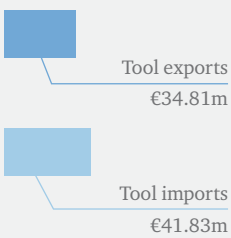
39

Number of patent registrations in the tool and die industry
2000-2011

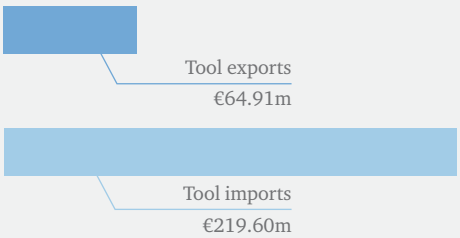
Tool exports/ tool imports



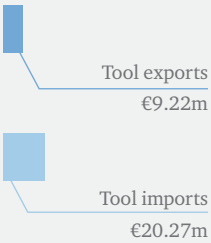
Solid and sheet metal forming tools



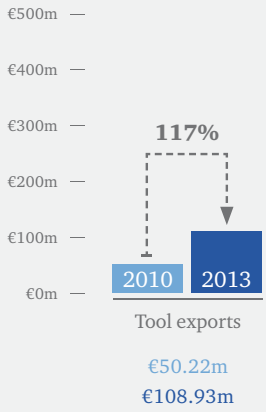
Injection molds

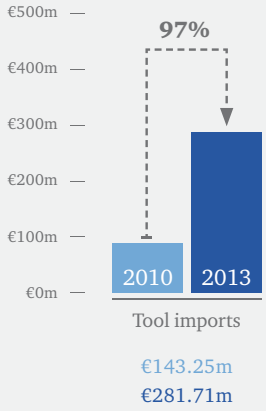


Die casting molds

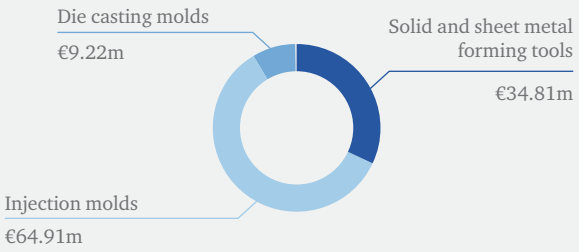


The tool manufacturing and the tools

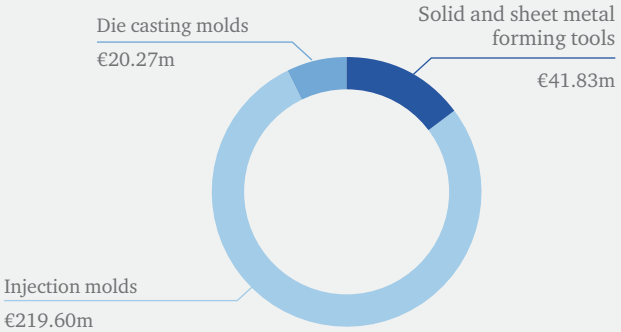




Tool exports



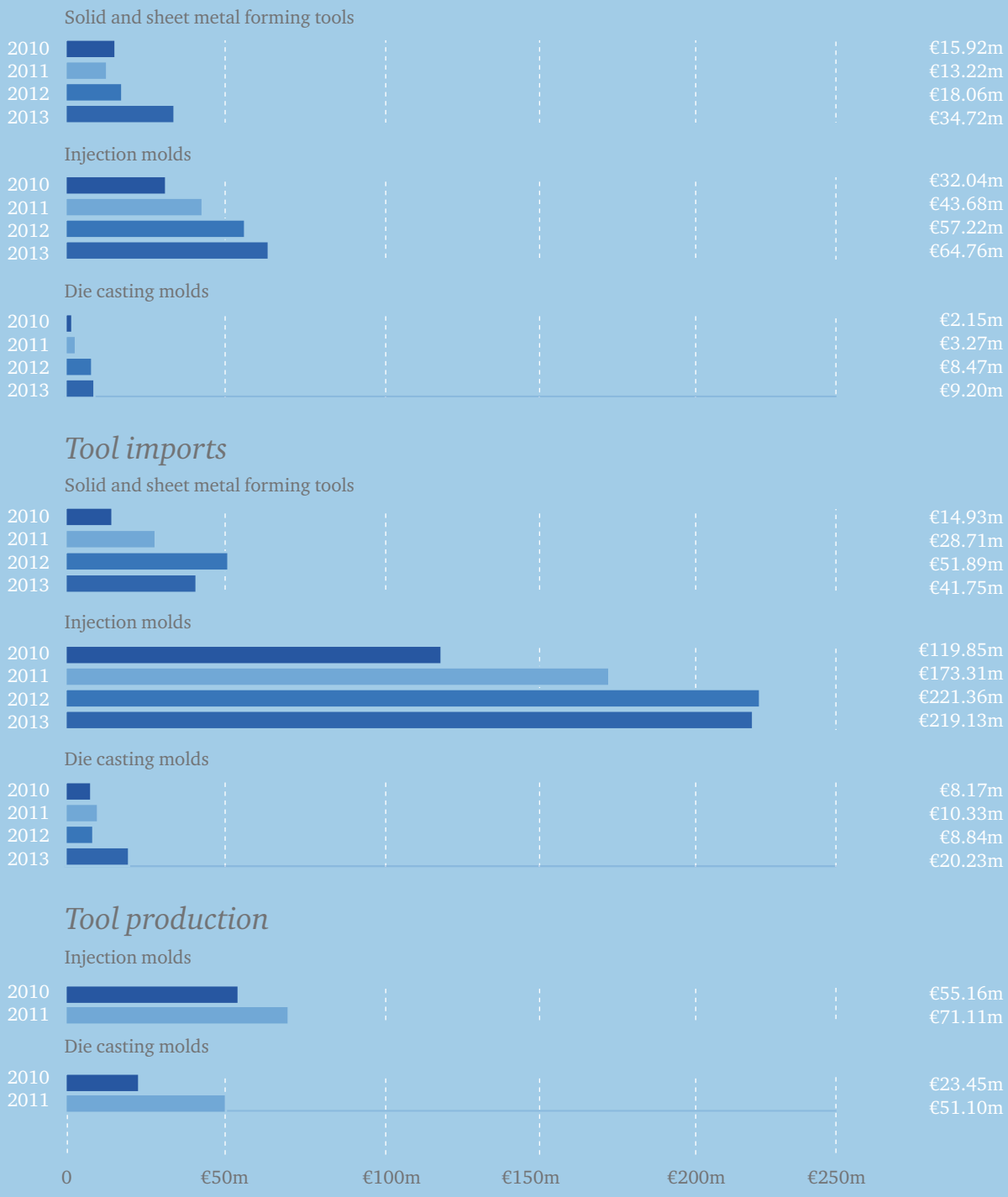
Tool imports



years Turkey could establish itself as a reliable sourcing alternative for several German companies. The majority of the Turkish tool and die industry is, similar to the entire economy, focused in the Marmara region, located near Istanbul, Bursa and Izmir. The geographical position, a good infrastructure and relative simple customs regulations to the EU allow for rapid transport. Furthermore, many Turkish employees can speak German, a fact which simplifies communication. The tool and die industry in Turkey is focused on both injection molds and sheet metal forming tools for the automotive, appliance and packaging industry. Thereby, a majority of the produced tools and dies is determined for local series producers.

As an exporter to Germany, Turkish tool and die manufacturers have established themselves as an extended workbench for the manufacturing of simple tools. The price advantage compared to Germany ranges between 10% to 50% and is quality dependent. The Turkish tool and die industry is a Rookie market with several companies that can provide tools and dies of medium complexity within international competition. Due to the proximity to Western Europe and low costs at the same time, Turkey is an interesting alternative to Asian procurement markets. The development potential for the future is rated as average, due to the absent expected development in the past years.

Tool exports



Tool imports

Tool production

Expert interview

Günter Hofmann

HOFMANN
tool manufacturing

The Hofmann Innovation Group is a company, which was founded in 1958 and operates worldwide with about 600 employees and generates an annual turnover of about €100m. The innovative service provider offers Full-Service Engineering in the areas of product development, tool and die manufacturing and production and assembling to the plastic processing industry. The tool and die manufacturer is broadly positioned with services ranging from Rapid Tooling up to high precision serial production. The production can handle batch sizes starting from individual parts and Rapid Prototyping up to low volume production. In his interview, Günter Hofmann gives an insight into the international activities of the family-led company, which has its headquarter in the Franconian Lichtenfels.

[Meanwhile, we are present with our products worldwide and on all continents.]

Which tool and die manufacturer markets do you currently use for procurement, distribution or production of tools and dies and components?

Though we are an international operating company, the focus of our business still lies in Germany. To offer our customers the best services possible, we have subsidiaries in China, Turkey and Spain. However, our presence at the locations is still limited exclusively to services and distribution as we do not operate our own production.

How large is the share of business in Germany and where are your customers?

About 90% of our sales are generated in Germany. A large part of our customers come from the automotive supplier industry and is located in Germany and Europe. Furthermore, many non-European customers order through their European partners. That is the reason why our products are used in more countries as the sales numbers would let someone assume. Meanwhile, we are present with our products worldwide and on all continents.

You already have mentioned the subsidiaries in China and Turkey. Which criterions characterize China and which tasks do you perform there?

Our Chinese subsidiary is located in Ningbo. The region is characterized by a high amount of reliable suppliers and tool and die manufacturers. We produce testing tools there and additionally use the location to prepare imported tools or other products from Germany for the delivery in China. In exceptional cases, we also manufacture serial tools, usually for simpler parts, which we then produce on-site.

How do you rate the performance of the Chinese subsidiary?

Meanwhile, we have a small team of highly motivated staff, which is continuously expanded and trained. It is still difficult to recruit experienced employees. Instead, our task is to further educate the young Chinese, who often come directly from school and to introduce them to a German level of quality and working standards. With this concept we are, for instance, capable to perform design tasks on our own on-site.

Does the positive evaluation also count for the quality and efficiency in the production?

The production is characterized by a high process quality and thus high reliability, short lead times and excellent cost efficiency. The product quality is in the case of high precision tasks still not sufficient, but in the meanwhile it meets medium quality requirements well.

You have an additional subsidiary in Turkey. What was you motivation?

The idea arose as a Turkish employee planned to start a business on his own. We thought about how we could profit from each other and saw opportunities in our engagement in →

Turkey. We began to selectively source there and to build relationships – meanwhile we have five partners, with whom we work together on a long-term basis with deep trust. It is helpful that they are situated near Istanbul, have a good connection to the infrastructure and can be reached in short time.

Which products are manufactured in Turkey?

We mainly produce tool and die structures and plates there –they are components with rather simple geometric requirements.

[From our experience, five-axis machining is not reliable in Turkey.]

Is the purchasing of complete tools and dies in Turkey possible in the future?

We do not believe that we will manufacture complete tools and dies or high precision components there in future. From our experience, five-axis machining is not reliable in Turkey.

Which experiences did you make with regard to process quality and adherence of delivery dates?

Adherence of delivery dates is very good, which was our highest priority for our partners in Turkey. Their delivery times are very reliable and are even partially better than here in Germany. Waiting time at the EU borders, is generally included and therefore does not cause problems. The Turkish partners organize the delivery through local logistic providers on their own - that works very well. However, we always have one or two employees on-site, who ensure that a high reliability is maintained.

The process quality is generally speaking good. However, we have to check the delivered parts thoroughly, especially when orders are subcontracted, as this is noticeable in the quality of the product. In most cases, rework in Germany is necessary to reach our standards. The cost advantage (approx. 10%), which we usually have in Turkey, could be lost in such cases. However, at the end we profit from the reliability and the low prices

How did your engagement develop over the years?

Unfortunately, it was not as good as we had hoped for. Occasionally it happens that experienced and valuable employees leave and make themselves independent. This could lead to a vacuum, which must be filled. Even in Turkey, it is mostly difficult to find well trained and experienced employees.
Furthermore, we are rarely able to sell our products in Turkey, as local plastic processing manufacturers purchase their tools and dies for the most part from cheaper Chinese or Korean manufacturers. Their lower product quality is sufficient for Turkish plastic processing manufacturers. →

How do you estimate the development of Turkey in the next years?

Unfortunately we expect stagnation in Turkey. During the last few years, there was no development noticed and for us there are no signs of change. Additionally the political situation remains unclear from a Western European perspective. Although it has never directly affected businesses, a residual risk prevails.

We will continue to use the market for the procurement of structures and plates as we have been doing till now, but nothing else. The internal market for tools and dies will not open up for us. We assume, that the Turkish plastic processing manufacturers will continue to get by with Chinese and Korean tools and dies.

What are the most attractive markets in the coming years for you?

We could imagine setting up an office for distribution and service in the USA in the long-term. Economically, this could be very interesting, but we are aware that some established companies of the tool and die industry have failed in this market. The necessary size and the right appearance, as well as moving forward into the right areas must be achieved, which is certainly not easy. In order to confront the complexity of the foreign market, we have to begin by intensely acquiring market knowledge. ←

I

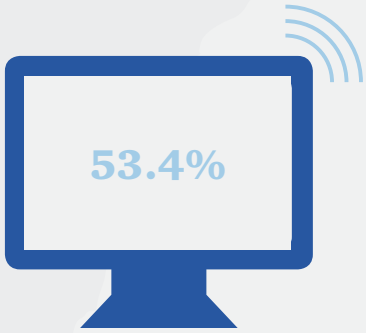
Country:	***Brazil***
Area:	***8,514,877 km²***
Population:	***202.66m***
GDP per capita:	***€10,342***
Category:	***Rising Stars***

Brazil

[Brazil, the country of soccer, samba and thousand colors – "Brasilin" stands for red lights and describes the color of Brazilian wood, which in Europe was used for dyeing of cloth in colonial times.]

The country and its people

Brazil is the largest and most populated country in South America. It has about 203m citizens, whereas estimates of the UN assume an increase to 223m citizens by 2050. Brazil is an emerging nation and belongs to the so-called "BRICS-nations", an association of upcoming economies, which, in addition to Brazil, include Russia, India, China and South Africa. The country has made a great progress with regard to the quality of life of its citizens in the last years, while reducing the enormous social imbalance and the widespread poverty. More than 26m citizens escaped from the acute poverty between 2003 and 2013. Nevertheless, Brazil still faces important social and political challenges, especially in direct comparison with highly developed industrial nations. This applies to income, the labor market, healthcare system, inner and social security and education. Only 45% of all adults have a higher educational degree and also the quality of the school system is by international comparisons of industrial nations significantly lower. The average income of Brazil households is the lowest worldwide. Despite the progress, only Mexico is worse than Brazil. Brazil has to deal with high crime rates and organized crime. The country belongs, like many other Central and South American countries, to the top 20 concerning frequency of capital crimes per 100,000 citizens. Despite numerous problems a positive bias seems to exist: The inhabitants of Brazil are significantly more satisfied with their lives than citizens in many other industrialized nations, even though they are higher developed.



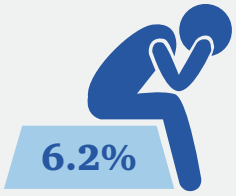
Population with internet access
2014

Population
202.66m citizens

Birthrate 15/1000
(births/citizen)
2014

The economy and the industry

[Brazil's economic strength surpasses all other Central and South American countries and strengthens its presence in international markets – problems with corruption, crime and restrictive trade regulations inhibit growth.]

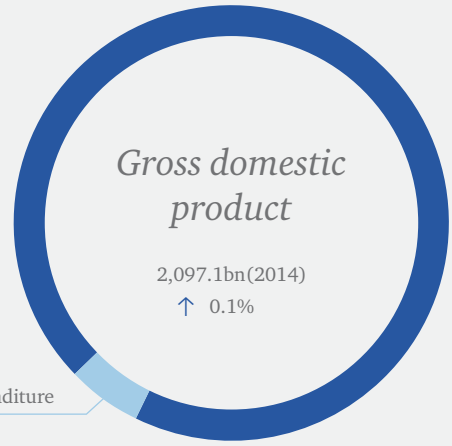


Rate of unemployment
2015

Index for English language skills
2014

In terms of gross domestic product (GDP), Brazil is the 10th largest national economy worldwide. With regard to GDP, the country occupies the 62nd position in the world. The economy has reached a growth of 2% per year for the last 4 years. The growth rates fell by an average of over 2pp. compared with the period 2006-2010. Inflation remains at 6.4% and the economic outlook for 2015 and 2016 is only moderately positive, with an expected growth of 1.2% and 2.0% respectively. Brazil is currently the world's 22nd largest export and import nation. In 2012, the country exported goods worth €228bn. The most important exports were resources (iron ore and crude oil) and products from the food and automotive industry. The country has large deposits of raw materials, including tin, iron ore, gold, aluminum and uranium. The level of wages was close to €14,314 in 2013 and thereby significantly below the average of all industrial nations. The unemployment rate is at its historical lows at 6%. Brazil continues to be a volatile country with great potential, but major risks for investors exist in terms of currency security, corruption and the administrative system. In particular, trade regulations affecting import and export customs, complicate the activities of foreign market participants. Not only the complexity and customs regulations but also abrupt and temporary tax increases on certain goods in the name of protection of local economies, lead to an unstable foreign trade.

Business climate by comparison of 189 countries
Ease of Doing Business 2014



2013
↑ 2.7%

2012
↑ 1.8%

2011
↑ 3.9%

[Brazil's tool and die industry is currently not noticed on the international market - almost 98% of the produced tools remain in their own country.]

In total, 5,426 tons of tools and dies worth €63.91m were exported in 2013. The export apportions among €21.15m for solid and sheet metal forming tools, €41.94m for injection molds and €0.8m for casting molds. Almost 98% of the produced tools remain in their own country and the total production is estimated at over €3bn. The industry has been growing with double digits for several years. Additional tools and dies were imported in 2013 with a total value of €420.02m to Brazil, comprising of €188.84m of solid and sheet metal forming tools, €215.47m of injection molds and €15.7m of casting molds. The heart of the industry is located in Joinville, south of Sao Paulo, where about 20% of the estimated 2,000 companies are located. There are almost no major companies with more than 100 employees and the industry's focus is on simple tools or processing. The local automotive industry is the main

The tool manufacturing and the tools

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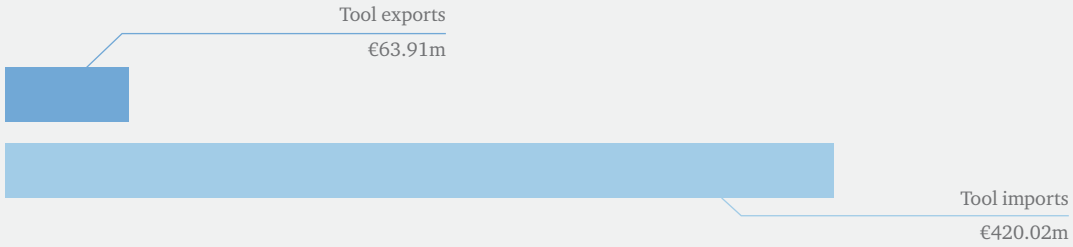
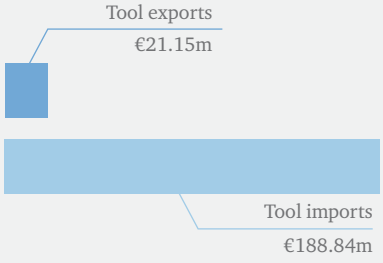
Number of patent registrations in the tool and die industry
2000-2011

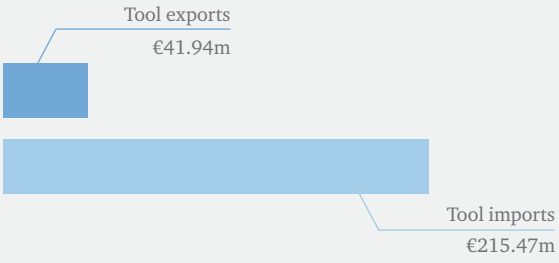
Tool production/tool exports/tool imports



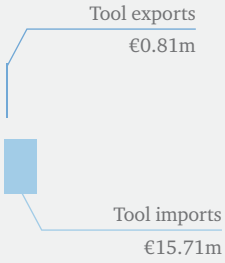
Solid and sheet metal forming tools



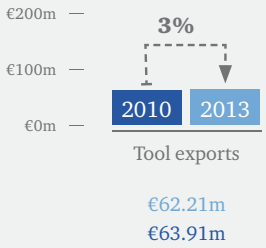
Injection molds



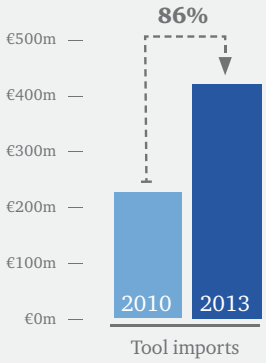
Die casting molds



The tool manufacturing and the tools

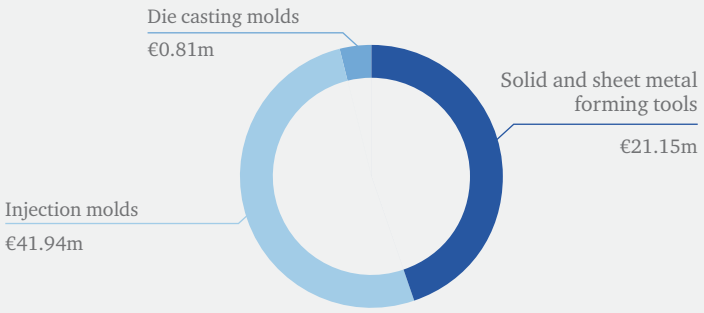


€62.21m
€63.91m

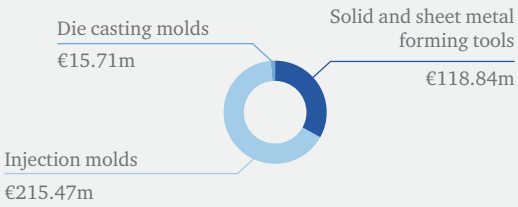


€225.85m
€420.02m

Tool exports

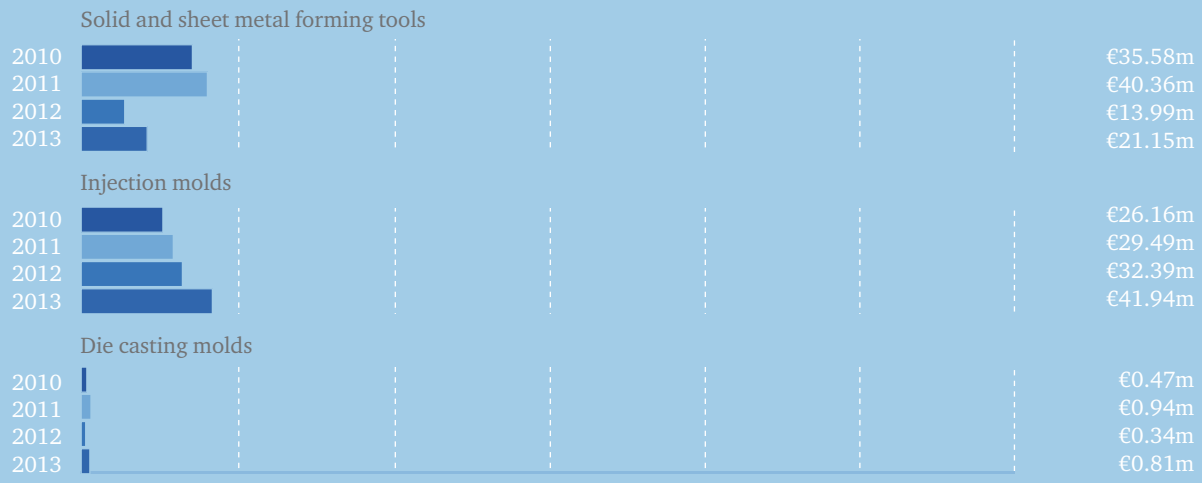


Tool imports

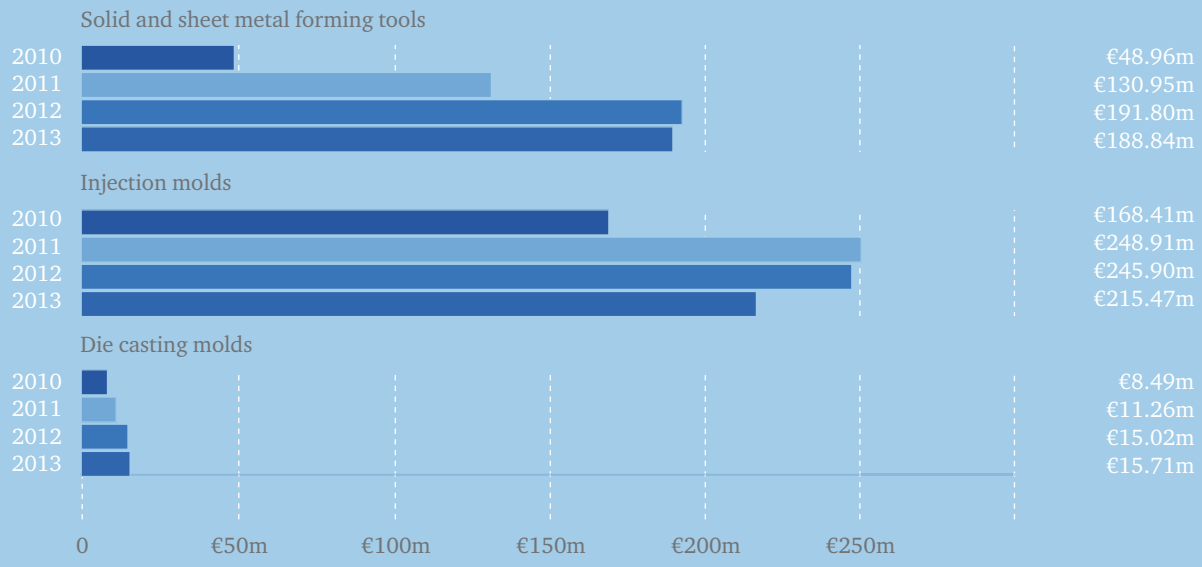


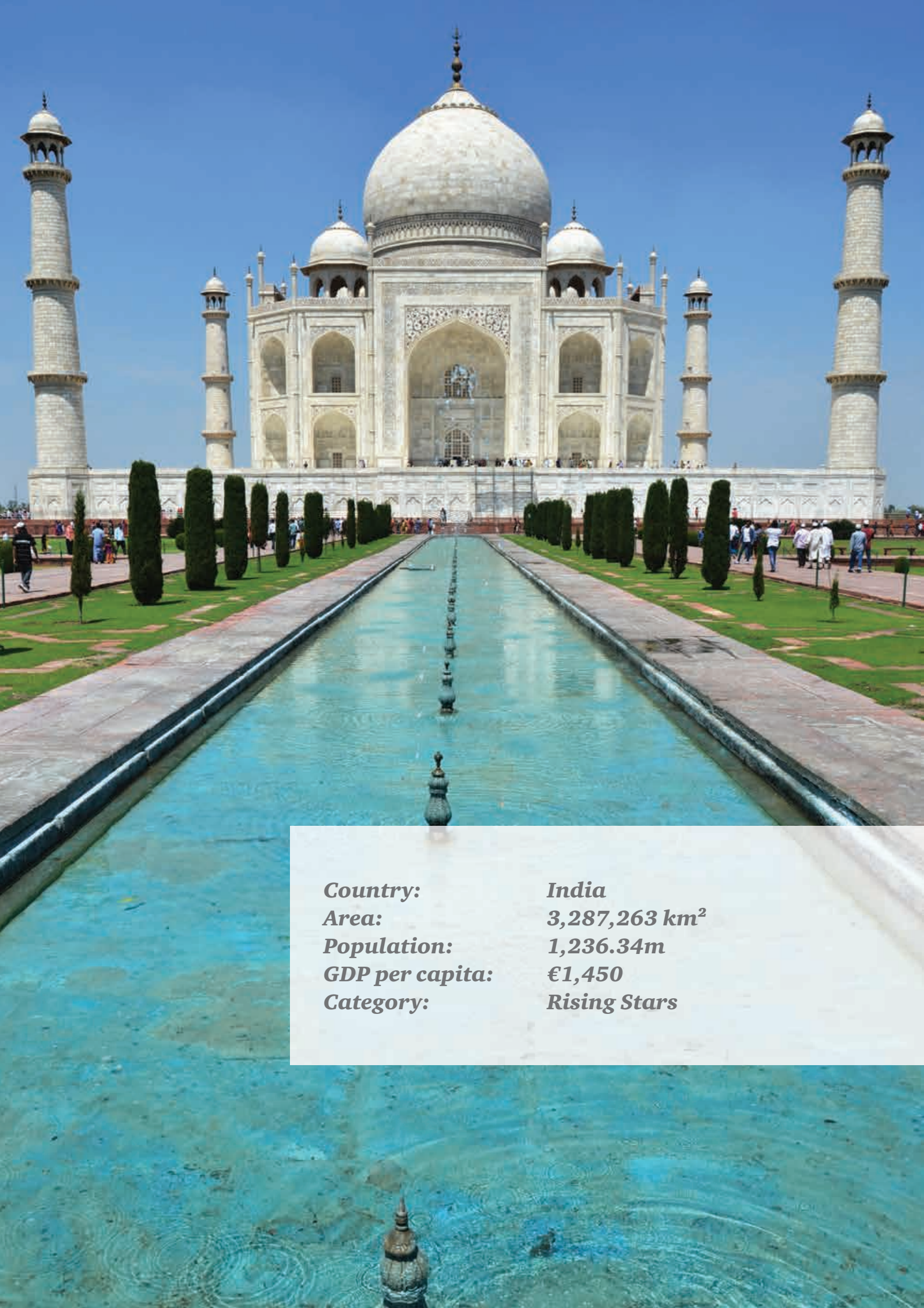
customer for the industry, followed by the packaging and electronics industries. Brazil has a large domestic market on which the local industry is focused. Unlike Mexico, international customers and exports are an exception. This will not change in the foreseeable future. Brazil is attributed to the Rising Stars. It is the only country on the South American continent with industrial and tool and die specific experience. The development potential is still rated average, because the general economic situation, as well as the complex trade regulations, will continue to hinder the exportability of products from the tool and die industry in the foreseeable future.

Tool exports



Tool imports





Country:	***India***
Area:	***3,287,263 km²***
Population:	***1,236.34m***
GDP per capita:	***€1,450***
Category:	***Rising Stars***

India

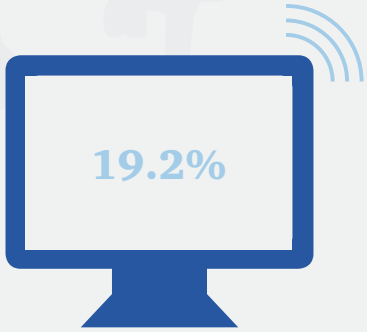
[India is said to be a land of contrasts and many faces – a rich and diverse culture encounters impoverishment and social problems of modern India.]

The multiethnic state in South Asia has 1,24bn citizens; only China is more populated. India is located in South Asia and is bounded by the Indian Ocean in the south and the Himalayas in the north. It is one of the most densely populated countries in the world and has the highest absolute population increase of the world. The UN assumes that the population will grow to 1,69bn citizens in 2050. The average life expectancy of 66 years is clearly below the average of western industrial nations (80 years). Moreover the Indian income is low, which makes India one of the less developed countries in this study. The people's lives, especially in rural areas is still strongly influenced by the predominant caste system, which existed in this form for centuries. Approximately 80% of the population belongs to the Hindu religion, whose central element is the cycle of life and death and reincarnation. In addition to the official language Hindi, there are further 20 regional languages and English is an official language. The government strongly invested in better education for the population. Only 78% of the citizens can read and write and the quality of educational institutions differ vastly. Among universities, the Indian Institutes of Technology are internationally well known. It is planned to increase the number of students from 26.5m, to 40m in 2020.

The country and its people

Population
1,236.34m citizens

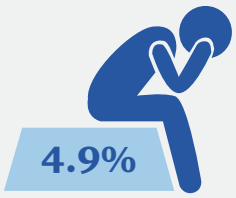
Birthrate 20/1000
(births/citizen)
2014



Population with internet access
2014

The economy and the industry

[Bollywood and IT services are India's best-known industries. Despite the enormous economic growth, still half of all workers are employed in the shrinking agriculture sector.]

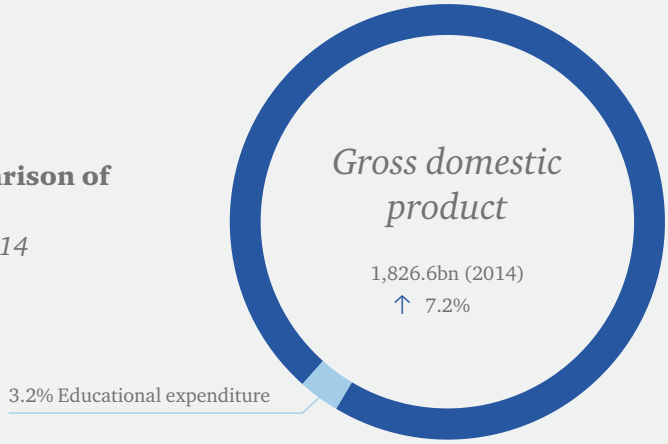


Rate of unemployment
2015

Index for English language skills
2014

Measured against the gross domestic product (GDP), India has the 10th largest economy worldwide. With a GDP per capita of €1,450, the country occupies the last place of the surveyed countries in this study. The economy grew at 6.5% per year for the last four years. The outlook for 2015 and 2016 is positive. Worldwide, India is currently the 19th largest export and 13th largest import nation. As a member of the BRICS-states, India has a positive attitude towards the trade with other markets. The country exported goods worth €386.67bn. The three largest exports were textile goods, raw materials (crude oil) and software products. The country is rich in natural resources like iron ore, coal, diamond, zinc and lead. On average the employees work for 2,106 hours every year which is approximate. 20% above the average of the industrial nations. The Indian economy benefits from the increasing globalization and the international division of labor. Therefore, India is a popular destination for outsourcing – particularly software projects use the huge labor market of well-trained and skilled professionals. However, different business practices, cultural differences and a heterogeneous IT market are serious obstacles in the implementation. The economic growth leads to an increasing income gap between the rural population and the middle class in the cities. Only 10% of the employees have a contractual regulated employment relationship and are insured in case of illness or work-related accidents. The extreme poverty is also reflected in the fact that 70% of the population live on less than €1.5 per day.

Business climate by comparison of 189 countries
Ease of Doing Business 2014



2013
↑ 6.9%

2012
↑ 5.1%

2011
↑ 6.6%

[The expectations of the development of the Indian tool and die industry were and still are very high. The sector development speed of the sector has disappointed until now and was lower than the growth of the Indian overall economy.]

The Indian tool and die industry has been a focal point for government incentive programs for many years and offers plenty of growth potential. This can be attributed to the positive development of the Indian manufacturing industry – the demand for energy increases by 35% to 40% annually. Programs such as the "Make in India"-initiative (strengthening of the automotive and aviation industry in India) contribute additionally to the positive development. The development speed of the tool and

The tool manufacturing and the tools

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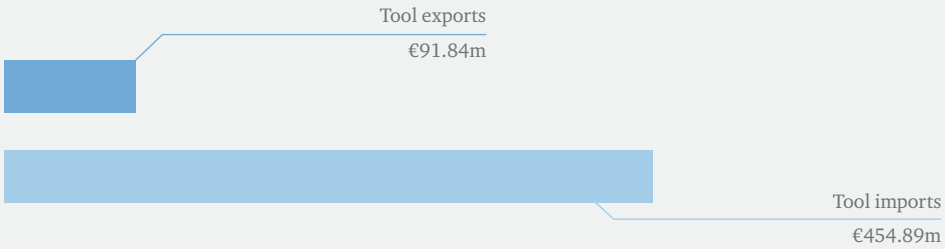
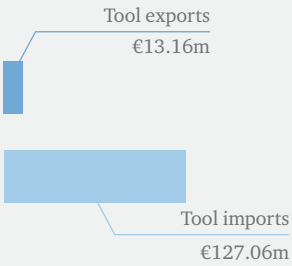
Number of patent registrations in the tool and die industry
2000-2011

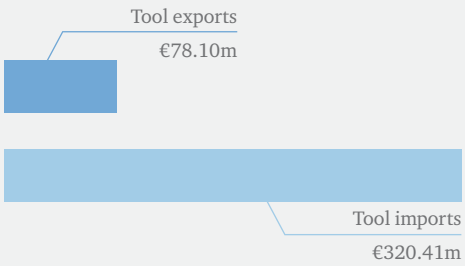
Tool production/tool exports/tool imports



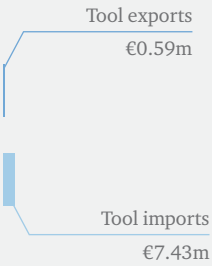
Solid and sheet metal forming tools



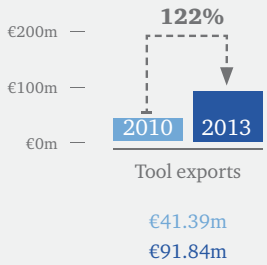
Injection molds

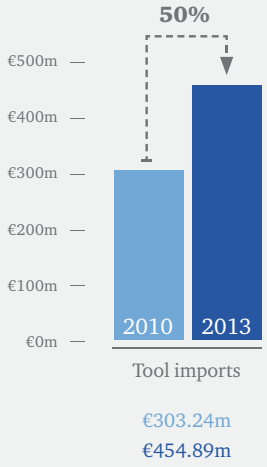


Die casting molds

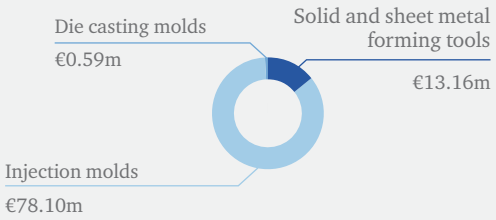


The tool manufacturing and the tools

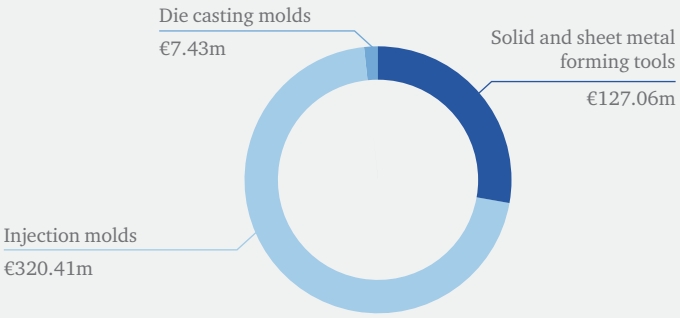




Tool exports

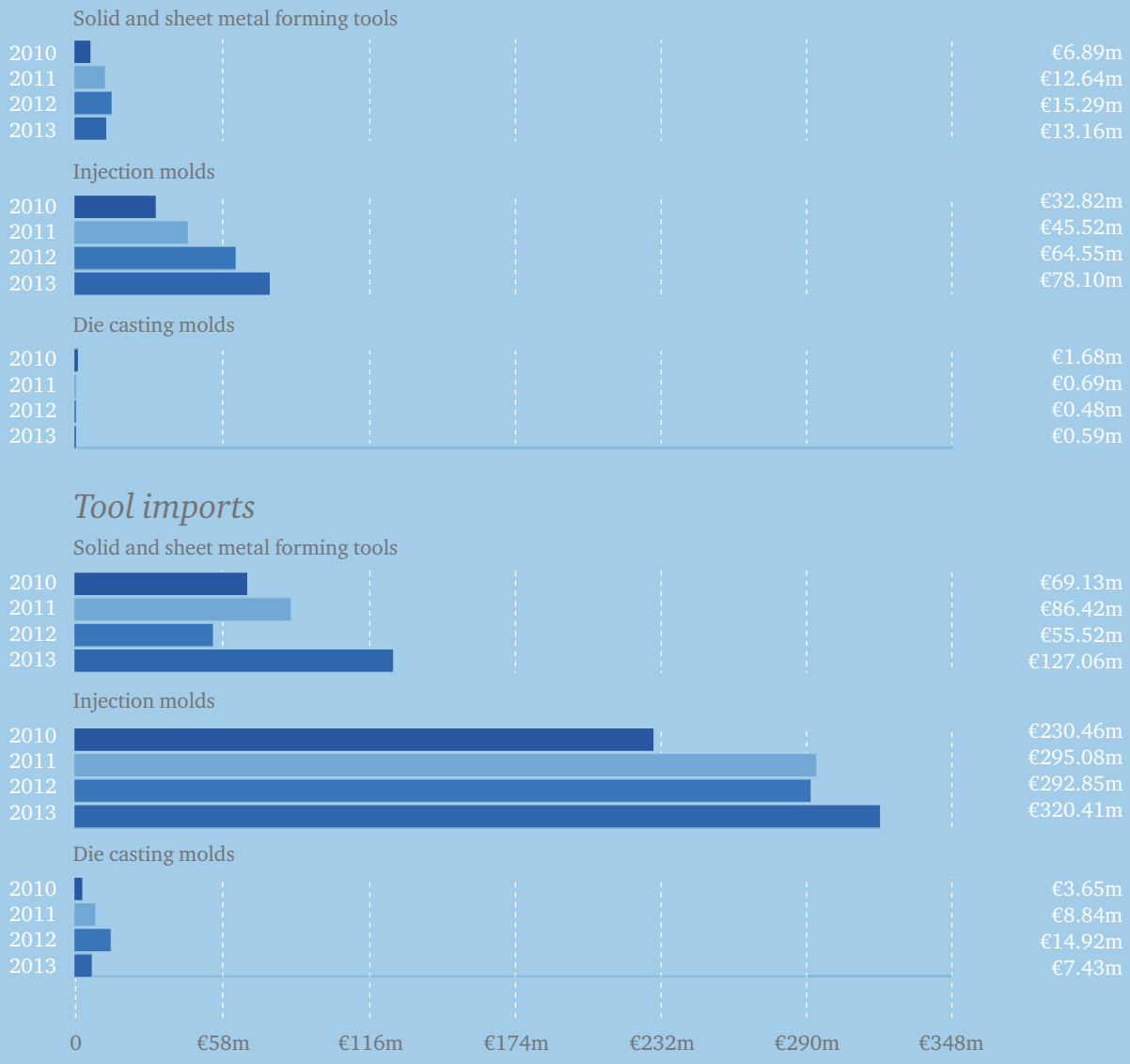


Tool imports



die industry, however, does not meet the expectations. Causes include the small number of production sites of European and Asian automotive manufacturers and the complicated and time-consuming bureaucracy. Regular power outages result in production failures and inhibit development. The southern part of India with cities like Chennai and Bangalore has developed faster in the last decade, compared to the northern part. This is partly due to better infrastructure and the nearby ports. The Indian employees of the tool and die industry are cheap, well qualified and the management level speaks English. This may assist with an intense orientation on the export of tools and dies. In addition, this industry is affected by steadily rising labor costs and high material costs. An increase of the tool and quality can be observed, however, the average quality is significantly beneath the Chinese. In 2013 tools worth €91.84m were exported, of which €13.16m were solid and sheet metal forming tools, €78.10m were injection molds and €0.59m were die casting molds. At the same time India has imported tools with a value of €455m, which is more than four times higher than the value of the exported tools. India is the second largest market for solid and sheet metal forming tools behind China. Injection molds build the larger part in both exports and imports. The Indian tool and die industry with its medium to low toolmaking expertise at a present small market size is a Rising Star. The strong efforts of the government to strengthen the tool and die industry, coupled with a growing economy lead to a high development potential.

Tool exports



Tool imports

Country:	***Indonesia***
Area:	***1,904,569 km²***
Population:	***253.61m***
GDP per capita:	***€3,150***
Category:	***Rising Stars***

Indonesia

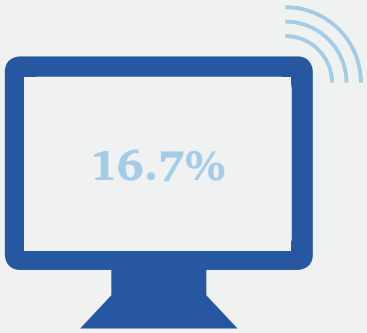
[250m inhabitants live on more than 17,000 islands; although Indonesia is a relatively unknown land.]

Indonesia, located in Southeast Asia, consists of 17,508 single islands and with 254m inhabitants is the biggest island nation worldwide. Estimations of the UN assume that the population will increase to 294m inhabitants by 2050. More than 25% of the Indonesians live in poverty, with large differences between the wealthy main island Java and the poorer provinces especially in the east of the country. Particularly in metropoles such as Jakarta, there are many large slums. 1.7m street children are believed to live on Java. In the last 30 years, the government managed to reduce this number by half. The political and social stability has also improved considerably since the past two decades. Nevertheless, Amnesty International still takes note of human rights violations every year. Indonesia remains a developing country by most indicators. This applies particularly to the educational and healthcare system. Furthermore, the infrastructure is still underdeveloped in comparison to other countries in Southeast Asia.

The country and its people

Population
253.61m citizens

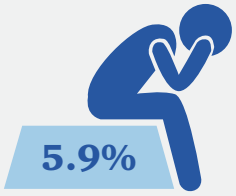
Birthrate 17/1000
(births/citizen)
2014



Population with internet access
2014

The economy and the industry

[Indonesia's economy grows consistently unlike most economies worldwide – by 6.5% per year in the last decade.]

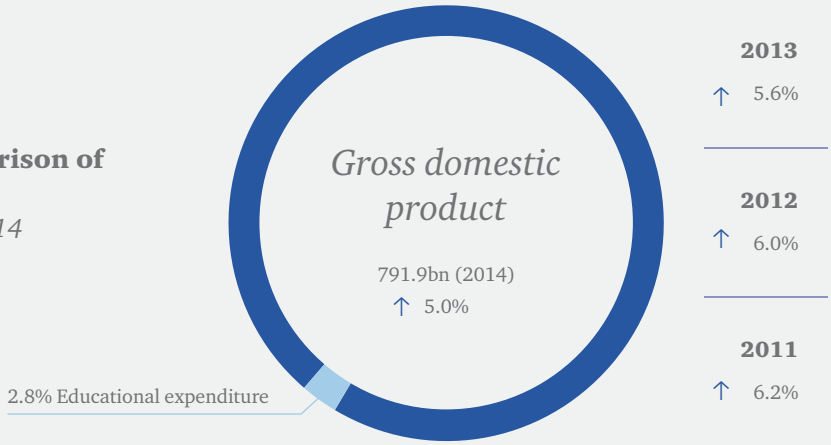


Rate of unemployment
2015

Index for English language skills
2014

Business climate by comparison of 189 countries
Ease of Doing Business 2014

In terms of the gross domestic product (GDP), Indonesia is the 16th largest economy and ranks therefore one position behind South Korea. The country belongs to the G-20 economies. With regard to the GDP per capita (€3,150) the country occupies the third-last position of the countries in this study. Only India and Vietnam have a lower GDP per capita than Indonesia. Since 2004 the economy grew by more than 5% per year, except in 2009. For many years Indonesia was one of the three fastest growing G20-countries (mostly with China and India). Despite of shrinking growth rates since 2012, the outlook for 2015 and 2016 remains positive. Indonesia's economy depends to a large extent on the growth of the internal market as well as government investments and state-owned companies. The government controls 141 companies in the country and sets the price range for many fundamental goods such as gasoline, rice and electricity. Currently Indonesia is the 26th largest export and 28th largest import nation. The country exported products and goods worth €177.35bn in 2012. The three most important export goods were oil and gas, textiles and plywood. The country has its own natural resources such as oil, natural gas, tin, nickel, copper and gold. The level of wages was €11,986 in 2013 and thereby significantly below the average of all industrial nations. The minimum wage is about €3,000 per year.



[A small industry with a huge potential.]

Measured by its volume, the tool and die industry in Indonesia plays an unimportant role for the Indonesian economic performance as well as for the consideration in this study. In 2013, tools and dies worth €10.04m were exported. These included €1.58m of solid and sheet metal forming tools, €6.54m of injection molds and €1.92m of die casting molds. At the same time tools and dies worth €269.02m were imported consisting of €77.81m of solid and sheet metal forming tools, €170.46m of injection molds and €20.75m of die casting molds. The Indonesian economy has been growing rapidly for many years. Without taking the mining industry into consideration, engineering occupies about 25% of the economic performance. Foreign direct investments increase yearly by 20% to 30%. Alone 350 German companies have locations in Indonesia. In the tool and die industry new associations have been forming and its structure is being streamlined. A fast growing economy as well as increasing foreign direct investments in the producing industry will lead to a higher demand of more complex tools. Furthermore, the location in the periphery of China has a benefitting effect on the emergence of an internationally oriented tool and die industry. One may assume future growth of the industry, but in the

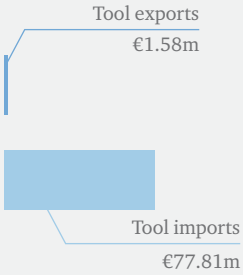
The tool manufacturing and the tools

3

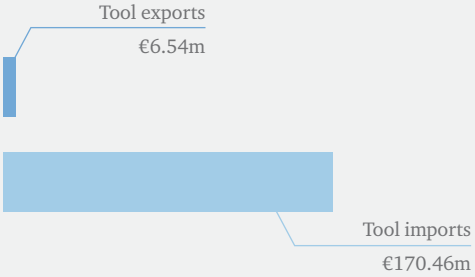
Number of patent registrations in the tool and die industry
2000-2011

Tool production/tool exports/tool imports

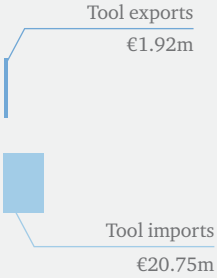
Solid and sheet metal forming tools



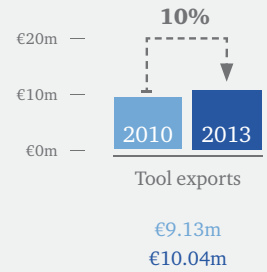
Injection molds



Die casting molds

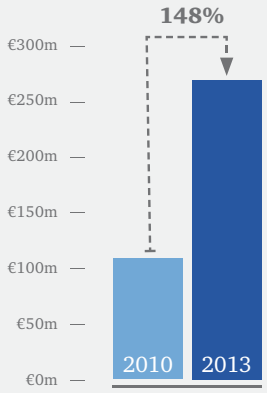


The tool manufacturing and the tools



Tool exports

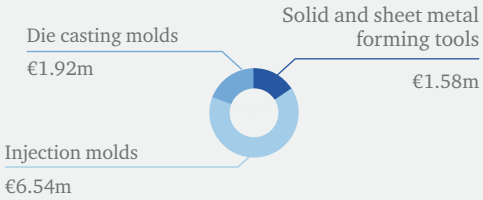
€9.13m
€10.04m



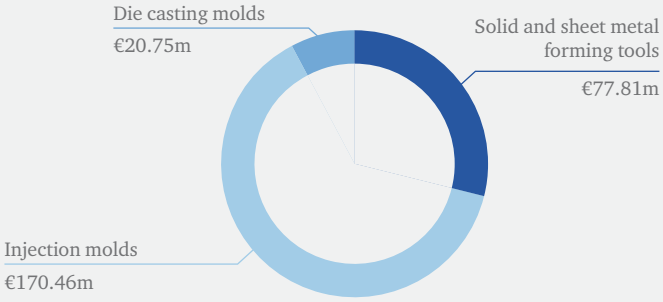
Tool imports

€108.43m
€269.02m

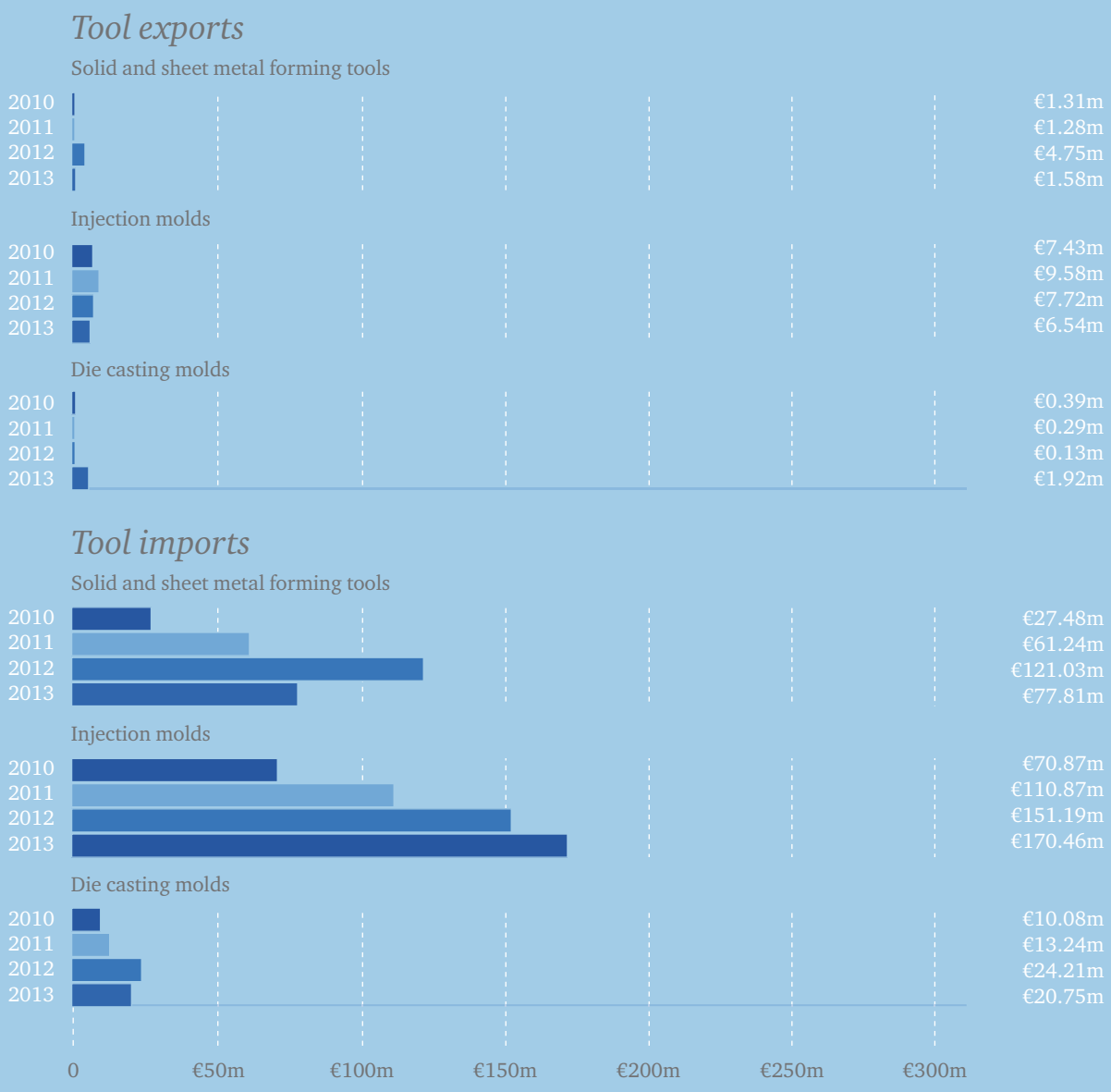
Tool exports

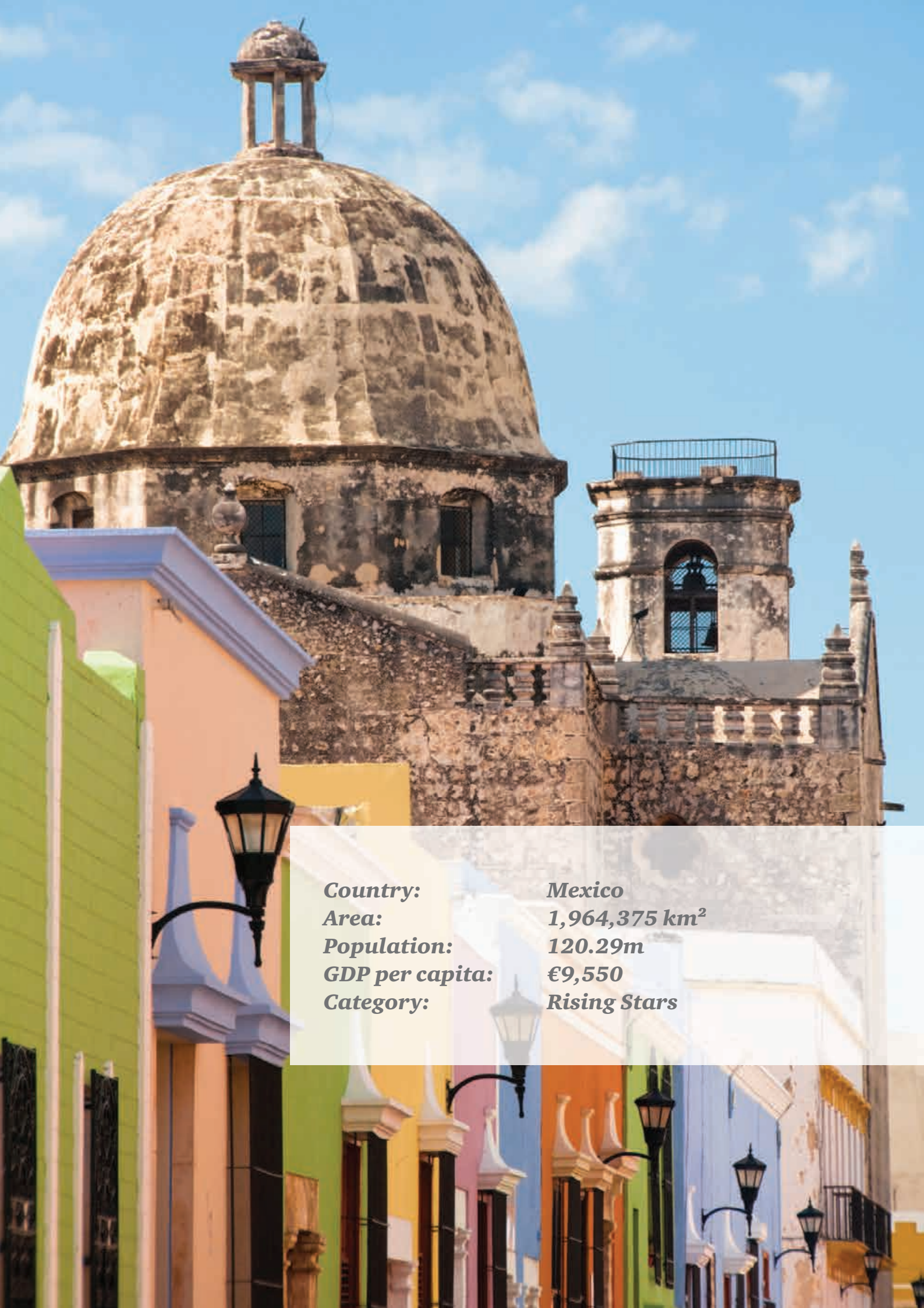


Tool imports



first instance to satisfy domestic demand. In the foreseeable future, Indonesia will show low relevance as an export nation in the tool and die industry. However, it is classified as a Rising Star with high development potential.


Tool exports
Solid and sheet metal forming tools
2010 €1.31m
2011 €1.28m
2012 €4.75m
2013 €1.58m
Injection molds
2010 €7.43m
2011 €9.58m
2012 €7.72m
2013 €6.54m
Die casting molds
2010 €0.39m
2011 €0.29m
2012 €0.13m
2013 €1.92m
Tool imports
Solid and sheet metal forming tools
2010 €27.48m
2011 €61.24m
2012 €121.03m
2013 €77.81m
Injection molds
2010 €70.87m
2011 €110.87m
2012 €151.19m
2013 €170.46m
Die casting molds
2010 €10.08m
2011 €13.24m
2012 €24.21m
2013 €20.75m
0
€50m
€100m
€150m
€200m
€250m
€300m



Country:	***Mexico***
Area:	***1,964,375 km²***
Population:	***120.29m***
GDP per capita:	***€9,550***
Category:	***Rising Stars***

Mexico

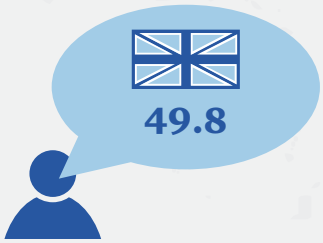
[Mexico is testimony to the advanced civilizations of the Mayas and Aztecs and despite ongoing problems with organized crime it attracts numerous tourists every year - the murder rate and the number of capital crimes is one of the highest in the world.]

The country and its people

The United Mexican States, a federal republic located in Central America, has approximately 120m citizens. Estimates of the UN assume that the population will increase to 144m citizens by 2050. Although Mexico is not among the developing countries, the UN lists 70 countries which are more developed than Mexico. Among these are many countries from Latin America such as Argentina, Panama and even Venezuela. The country regularly occupies the lower places in all statistics concerning the educational system within the OECD. Although the country invests the same amount of its' gross domestic product in its education system as Germany (5.1%), only 37% of adult citizens have a higher educational degree, significantly less than the OECD average (75%). This is reflected in the PISA Study, in which the country was well below average. Nevertheless, Mexico has made remarkable progress over the past years particularly in the improvement of living conditions, in the educational system, but most significantly in the healthcare system and the economy.

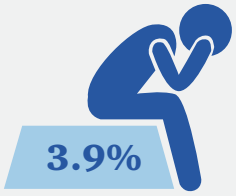
Population
120.29m citizens

Birthrate 19/1000 (births/citizen)
2014



Index for English language skills
2014

The economy and the industry

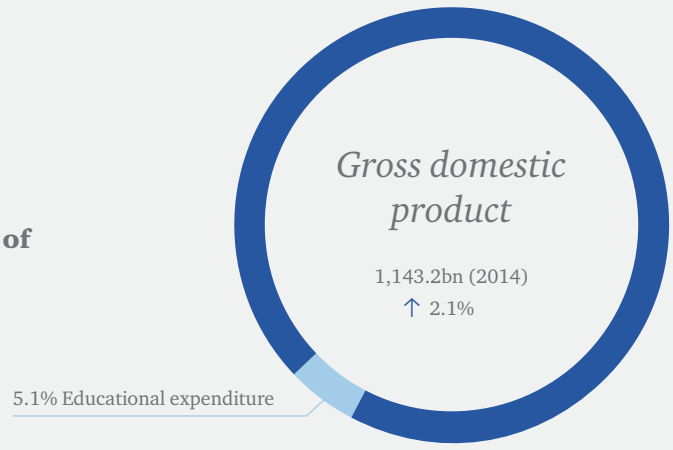


Rate of unemployment
2015

[20% of all automobiles produced in North and Central America are produced in Mexico; the same figure was 10% in 2004 and in 2020 it is projected to be at 25%. 70% of all automobiles produced in Mexico are exported to the USA.]

In terms of gross domestic product (GDP) Mexico is the world's 14th largest economy. The GDP per capita is approximately €9,550. Thus, Mexico takes the 14th place among the twenty countries represented in this study. Over the last three years, the economy grew on average moderately by 2.9% per year. The outlook for 2015 and 2016 remains positive. In 2012 the country exported products and goods worth €331bn. The three main export goods were oil, food and automobiles. The country is rich in natural resources and has oil, gas and many other mineral resources. In particular, the automotive sector has experienced rapid growth and is an essential driver of employment. Investments worth €22bn were announced for Mexico by automotive OEMs within the last four years. The strategic geographical location at the border to the US, ports towards the east and west have a positive effect. Moreover, there is not only a free trade agreement (NAFTA) between Mexico, the US and Canada, but also an agreement between Mexico and the EU. An automobile with a value of €55,000 exported from the US to Europe would entail €5,500 in custom duties, which is not charged for the same automobile from Mexico. Thereby Mexico still has a driving cost advantage. In 2011, the wage level was on average at €13,494 and despite moderate growth in mechanical engineering, the country still shows a wage-cost advantage over the US of €500 to €600 per employee per month. Mexicans work on an average for 2.239 hours every year - almost 30% more than the average of all industrialized nations.

Business climate by comparison of 189 countries
Ease of Doing Business 2014



2013
↑ 1.4%

2012
↑ 4.0%

2011
↑ 4.0%

[Despite a booming automotive industry, the tool and die industry is still underdeveloped. The pressure of the OEMs should empower the local industry in the near future.]

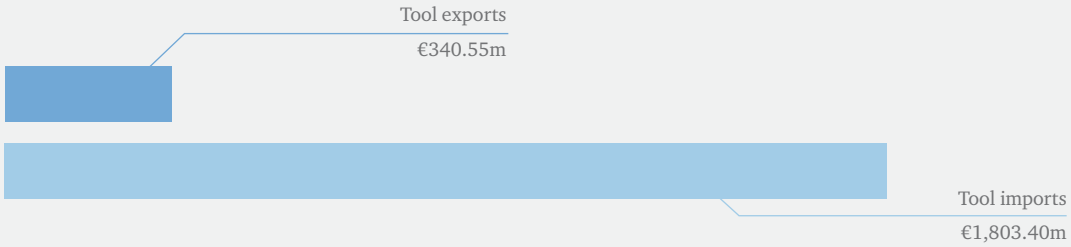
In 2013 a total of tools and dies with a value of €340,55m were exported. Of these tools and dies, €38,36m were solid and sheet metal forming tools, €288,33m were injection molds and €13,85m were casting tools. In 2013, Mexico imported tools and dies worth a record value of €1,803.40m, of which €531,12m were for solid and sheet metal forming tools, €1,114.88m for injection molds and €157.40m for die casting molds. Tool and die imports in the field of solid and sheet metal forming tools have increased notably over the last four years. In contrast, injection molds and die casting molds showed a lower growth rate, while tool exports of solid and sheet metal forming tools has remained constant for the past four years. The local industry falls short of fulfilling high quality requirements and is unable

The tool manufacturing and the tools

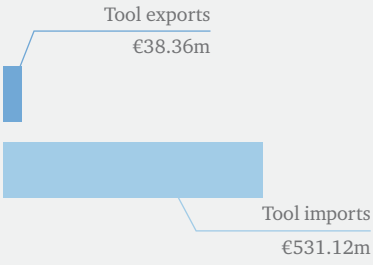
33

Number of patent registrations in the tool and die industry
2000-2011

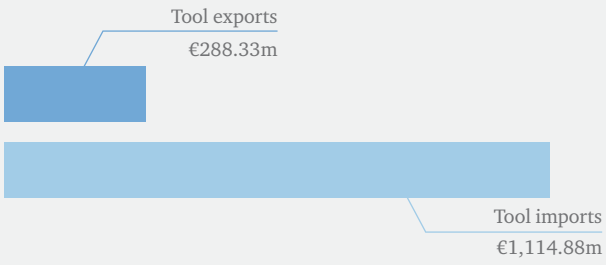
Tool production/tool exports/tool imports



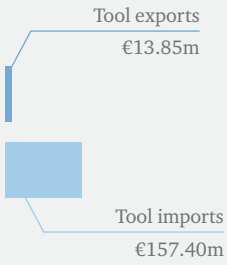
Solid and sheet metal forming tools



Injection molds

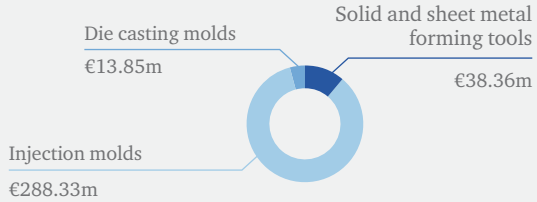


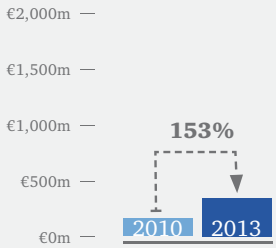
Die casting molds



The tool manufacturing and the tools

Tool exports

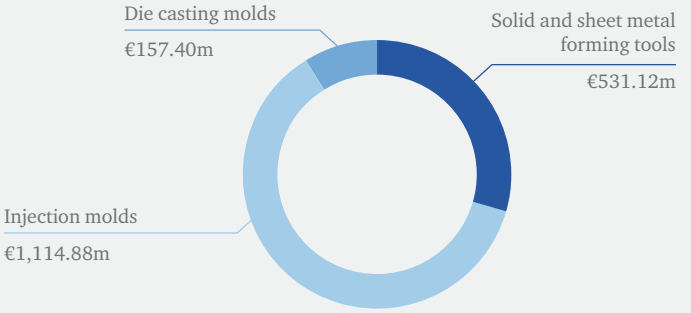


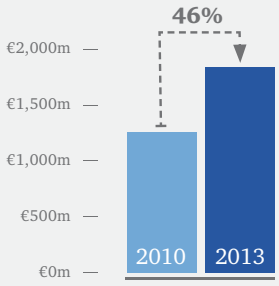


Tool exports

€134.50m
€340.55m

Tool imports



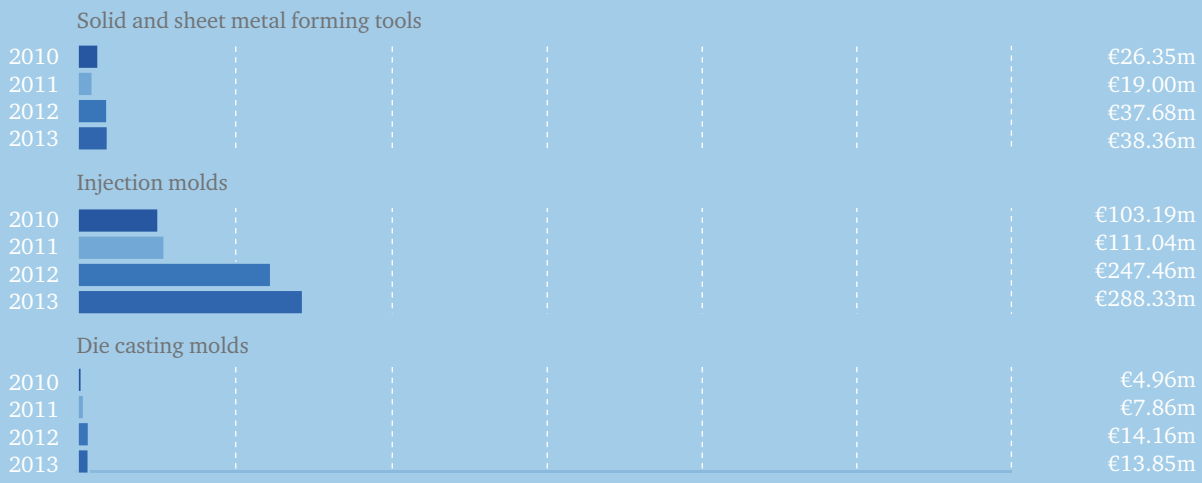


Tool imports

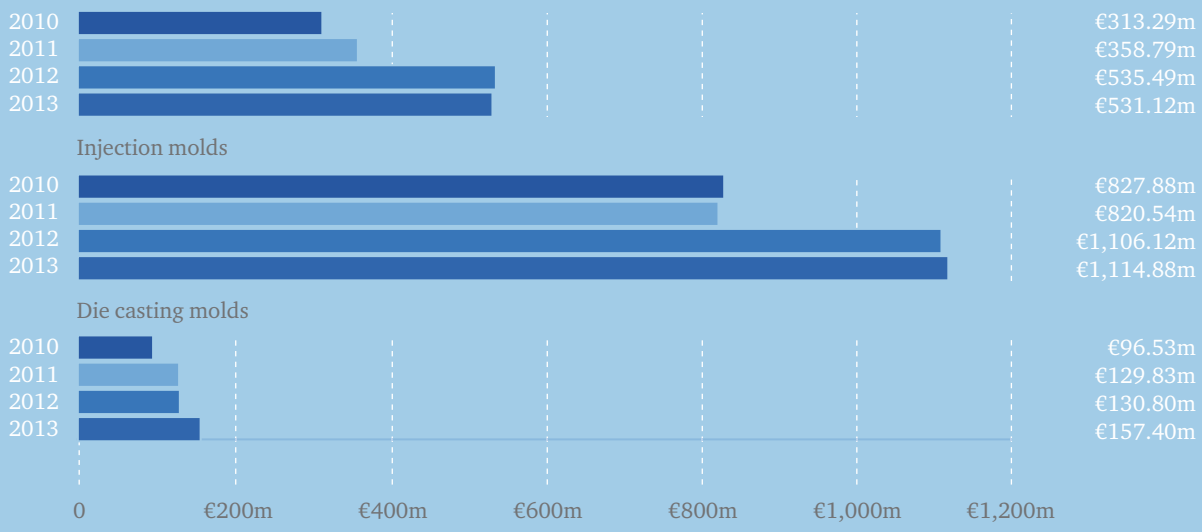
€1,237.71m
€1,803.40m

to meet the increasing demands induced by the growth of the automotive industry. Almost all tools and dies required for the automotive serial production are imported from North America. There are currently no independent companies that could boost the international production or take on activities for maintenance and repairs. The enormous tool and die requirements as well as the large number of production sites of OEMs and international suppliers will, however, in the near future, give rise to the local industry. Although the development level is low currently, the potential is rated high on a long-term and with that, Mexico belongs to the Rising Stars of this study.

Tool exports



Tool imports



Expert interview

Christian Walter

SIEBENWURST
MODELLBAU & FORMENBAU

The company Christian Karl Siebenwurst GmbH & Co KG Modellbau & Formenbau was founded in Nuremberg in 1897 by Leonhard Siebenwurst originally as a model carpenter's workshop. Today the company with a long tradition has about 390 employees, working in the area of model and mold design and has its headquarters in Dietfurt. Siebenwurst is one of the most important employers of the region and produces about 350 tools, suppling about 100 customers in 15 different countries each year. Siebenwurst helps its customers with highly innovative solutions and serves as a solution provider with its long experience. Mr. Christian Walter, CEO of the foreign subsidiaries of the company Siebenwurst, provides an exciting insight to the activities of its international locations in China and Mexico.

[The markets in China and Mexico have developed very well during the last 5 years in strong contrast to the Indian market, where expectations are high but could not be fulfilled.]

Which tool and die manufacturing markets do you currently use for procurement, distribution or production of tools and components?

Siebenwurst sells its tools and dies actively to Europe, China, Eastern Europe, NAFTA and South America. Additionally we produce our tools in Germany, China and Mexico. The decision to manufacture in China was made 5 years ago. At the time, we decided to open up a Siebenwurst location in China, in order to increase the market proximity and have more influence. Meanwhile we have 35 employees and supply about 100 tools per year to Europe, NAFTA and the Chinese market. We hardly offer maintenance services in China, as compared to Mexico, because maintenance is hardly done in China. The decision to open up a location in China has proved to be correct. Even the foundation of the company SCM Siebenwurst CAD CAM solutions in Mexico has given yields. We decided to build up a tool shop for production, service and maintenance, as Mexico has an underdeveloped supplier market.

The markets in China and Mexico have developed very well over the last 5 years in strong contrast to the Indian market, where expectations are high but could not be fulfilled. The market is not lucrative as long as German OEM's are not present in India.

[The first intention was: We have to be close to our customers.]

Which motives are important for you to use international tool and die manufacturing markets and why did you specifically chose China and Mexico for the production of tools?

Our first intention was: We have to be close to our customers. So we asked ourselves where our markets and customers will be in the future. China and Mexico were the countries where we saw our prospective customers. The basic conditions were against China; Thailand, India and even Malaysia were in terms of political and economic conditions more interesting for us at first. However, the customers are in China.

Without direct access to the customers, a location in a low wage country makes no sense. As an extended workbench, countries as China and Mexico will increasingly gain importance. The depth of value adding of German tool and die manufacturers will decrease in the future – also in our company.

Which challenges arose during the buildup of the tool shops? Which cultural diversities did you underestimate? Which cultural characteristics did you get to know and now even appreciate?

A big challenge was to get good staff. During internationalization, one may not underestimate the importance of the development of foreign employees. →

However, a fundamental mistake is to classify good and bad cultural diversities. They exist and we have to learn to understand and accept them. In comparison, I noticed that, especially in the business area, China is more bureaucratic than Germany. It must to be remembered, that taxes are an important factor in China. Punctual and correct tax payments are an absolute must. Therefore, there is an extra tax computer at our Chinese location, which is directly linked to the tax office. Astonishing is, that Chinese customers normally pay their bills faster than our European customers do. However, when money is involved, friendship ceases in China.

Other remarkable characteristics are very low ability to give and receive criticism and the attitude, that know-how is a general purpose good, which everybody would like to have, but should not cost anything.

[Mexico has a lack of suppliers in all areas.]

How do you describe the tool and die quality (Tolerances, complexity, design and method development, qualification etc.) in China and Mexico?

In China tools and dies, which are rated simple to middle in the technology pyramid, can certainly be procured with a good quality with the necessary project management on-site. Especially in the area of sheet metal forming tools, our OEM customers in China are already purchasing complex components for from the local Chinese market as well from Korea and Japan.

Mexico has a lack of suppliers in all areas. Tools, dies and molds come from the USA, Canada, China and Europe. The purchase of components is only possible with very high restrictions and within the technology pyramid we are in the “low end” area.

How do you describe the availability of resources (Trained employees, material, etc.) and the basic conditions (Legal security, logistics, communication, etc.) in China and Mexico?

The availability of resources is very low. In Mexico and China everyone wants to study and become a manager. Additionally, there is no culture in these countries to initially learn a trade at one employer over some time. This is the most critical element abroad. We have not had any problems with legal security so far. However, both logistics and communications are definitely problems, which we had to handle. But in my eyes, these points are not critical, as long as you have your own organization on-site.

Where do you see the development of the economy, especially in the tool and die industry in the next 10 years?

We have to get moving! The tool and die industry has to invest more into unique selling points, for example research and development or the offering of extensive services. The products of our customers are becoming localized. In 10 years tools and dies will not be ordered in Germany. At the same time, we have a stagnating market in Europe. →

[The trade unions are yet to realize that we live in the 21st century and in an information society.]

Which political and economic basic conditions have to change in Germany, to enable a good perspective for the tool and die industry?

First of all, we need affordable energy prices and more flexibility in the areas of temporary work. Furthermore, we have to reduce bureaucracy, such as overstraining requirements at building investments, for example fire protection and statics. An additional problem in Germany is the over fulfillment of EU-requirements and standards with strong regulations. In other countries the same requirements and standards are not or only partially fulfilled, which leads to a clear distortion of the competition.

Finally, the power of trade unions is too strong. The trade unions are yet to realize that we live in the 21st century and in an information society. Despite that, they try to regulate the scarce resource of the work force with methods of the industrial revolution. ←

Country:	*South Africa*
Area:	*1,219,090 km²*
Population:	*48.38m*
GDP per capita:	*€5,778*
Category:	*Rising Stars*

South Africa

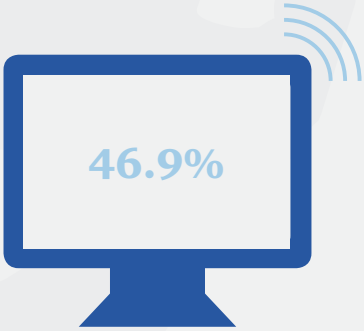
[The country with the Cape of Good Hope – South Africa is known as the cradle of human kind and for its various national parks with the big 5: elephants, rhinoceros, buffalo, lion and leopard.]

The country and its people

South Africa is located at the Southern peak of Africa and has 48m citizens. The UN estimates that the population will grow to 57m citizens by 2050. The population of South Africa is young with an average age of 25 years. Besides a higher birthrate, the low life expectancy of 52 years is an explanation for this. The income per capita is below the average of the countries considered in this study, but is still higher than certain countries like Poland and the Czech Republic. The countryside ranges from snowy mountains to savannas, which contain elephants, lions, buffalos and various other animals. With its numerous demographic groups, the country is culturally well worth seeing. However, there are large inequalities and poverty, as more than 25% of the population lives on less than €1 per day. This is responsible for a high crime rate, which often includes murder. Most of the crimes are committed within the poorest class of the population in the townships.

Population
48,38m citizens

Birthrate 19/1000 (births/citizen)
2014

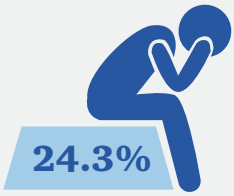


Population with internet access
2014

Measure for purchasing power parity, price for one Big Mac
Big Mac Index 2015

The economy and the industry

[From a British colony to the biggest economy in Africa – because of strikes and energy shortages, the industrialization of the resource rich country faces difficulties.]

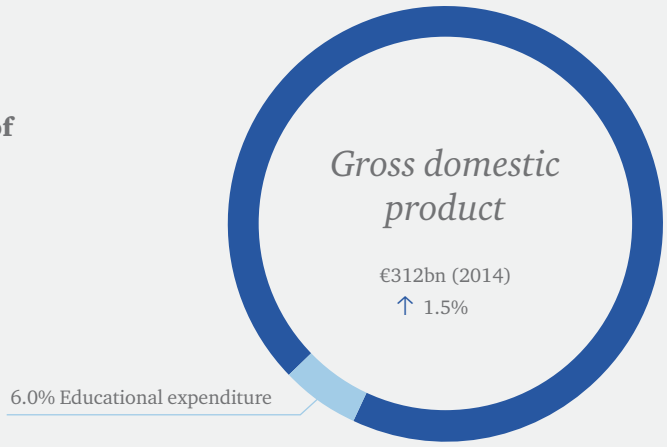


Rate of unemployment
2015

In terms of the gross domestic product (GDP), South Africa has the 33rd largest economy worldwide and the largest in Africa. With a GDP per capita of €5,778, South Africa occupies rank 17th within the countries of this study. The economy reached a growth of 2.3% per year in the 4 last years. The outlook for 2015 and 2016 is positive and the country exported goods worth €80.83bn in 2011. The three most exported goods were gold, diamonds and platinum. Even though the conditions for the usage of solar energy are good, the majority of the energy demand is covered by fossil resources. Because of a lack of investments in energy generation and electricity grids, outages occur frequently. Manufacturers increasingly have to shut down their machines temporarily and due to inadequate labor flexibility they are unable to regain lost productivity. With €13,247 in 2013, the wage level was significantly below the average of the industry nations.

In average the employees work for 2,210 hours per year, which is about 30% above the average of all industry nations. According to official statistics, the rate of unemployment of South Africa is about 25%, while unofficial statistics assume that this value is even larger than 30%. A strong driver of the growth is the machining industry, which makes for 15% of the GDP and is, besides mining and agriculture, the leading economic sector. Within the machining industry, the automotive industry is the largest heavyweight. The majority of the international automotive-OEMs own production sites in South Africa, for instance BMW, Daimler, Volkswagen, General Motors, Nissan, PSA and Toyota. However, the structural problems in energy supply, as well as frequent strikes, led to announcements that the OEMs plan to freeze or shift their investments, partially in the neighboring country Botswana.

Business climate by comparison of 189 countries
Ease of Doing Business 2014



2013
↑ 2.2%

2012
↑ 2.2%

2011
↑ 3.2%

[South Africa's tool and die industry has a long tradition, but is unable to avoid the tough economic situation – the high requirements of a still intact, local automotive industry maintain the level of some tool and die manufacturers.]

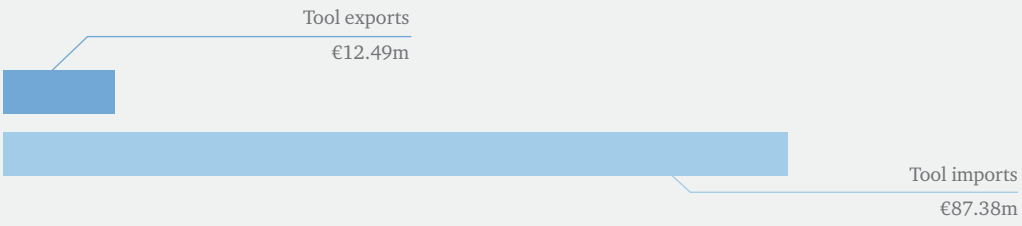
The South African tool and die industry is mainly located near Johannesburg, in the South of the country and alongside the coast, next to Port Elizabeth and Durban. The industry is characterized by microenterprises and small companies. The majority of the tool and die manufacturers employ less than 15 employees. Tool and die manufacturers with more than 15 employees mostly work with the local automotive industry and have, by South African standards, an above average

The tool manufacturing and the tools

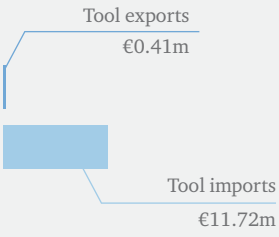
74

Number of patent registrations in the tool and die industry
2000-2011

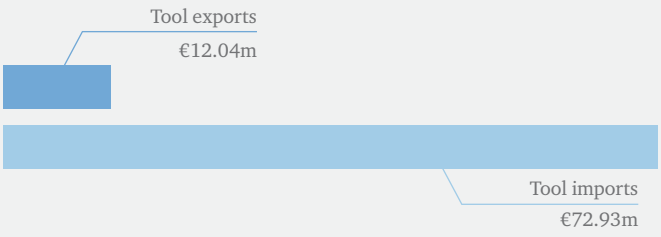
Tool production/tool exports/tool imports



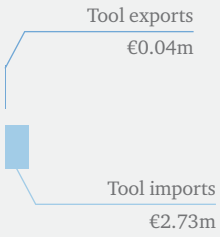
Solid and sheet metal forming tools



Injection molds

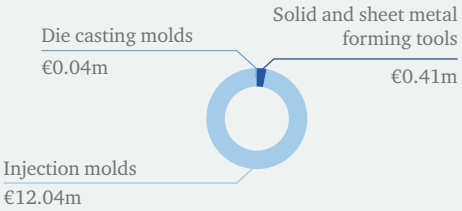


Die casting molds

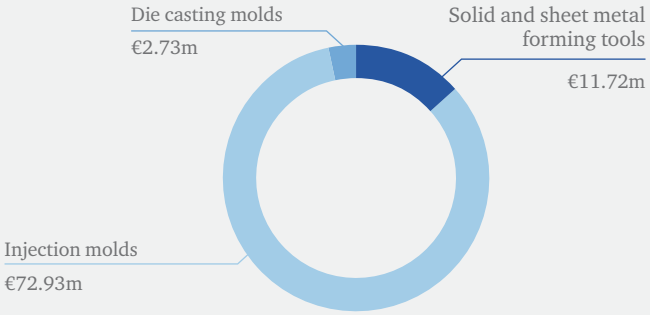


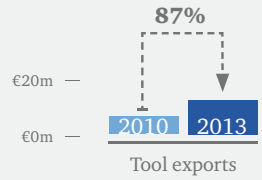
The tool manufacturing and the tools

Tool exports

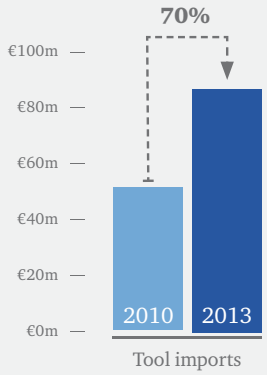


Tool imports



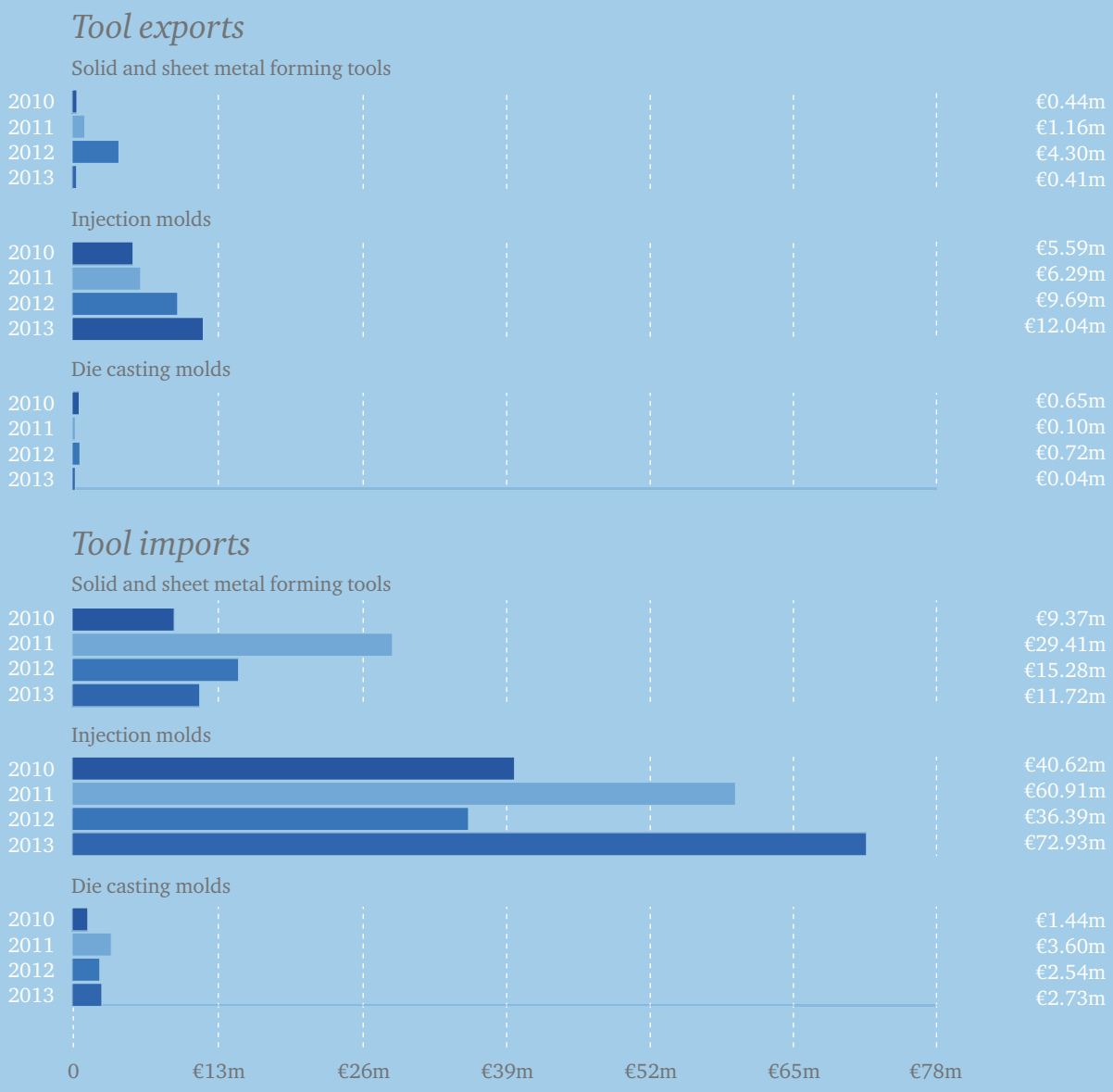


€6.68m
€12.49m



€51.43m
€87.38m

tool and die competence. The average complexity of the produced tools and dies in South Africa is low. Small and medium sized injection molds and sheet metal forming tools are used for the production of simple goods in the local market. There are no significant exports to other developed industry nations. In 2013, tools worth €12.49m were exported. The total export divides into €0.41m solid and sheet metal forming tools and €12.04m injection molds. Within the imports, South Africa could register a total value of €87.38m, split in €11.72m for solid and sheet metal forming tools and €72.93m for injection molds. The South African industry is currently unable to meet the demands of complex tools and dies in the automotive industry on its own, due to technological and capacity restraints, but profits from local-content-requirements. The industry is currently weakened by planned power outages, due to a low energy supply and long-term strikes. From the perspective of the South African government, the tool and die industry will play a key role for the economic recovery in the sector of the producing industry. Extensive governmental programs support the industry, for example with free education, advanced training and continuous development. However, individual credits for investments are rarely granted by local banks. The growth of tool and die manufactures are normally self-funded. Even though the economic environment is difficult, the South African tool and die industry is believed to be a Rising Star. It is the only market in Africa with notable industrial experience. Until now, the sector could partially evade the negative environment, yet the development potential is graded as average.


Tool exports
Solid and sheet metal forming tools
2010 €0.44m
2011 €1.16m
2012 €4.30m
2013 €0.41m
Injection molds
2010 €5.59m
2011 €6.29m
2012 €9.69m
2013 €12.04m
Die casting molds
2010 €0.65m
2011 €0.10m
2012 €0.72m
2013 €0.04m
Tool imports
Solid and sheet metal forming tools
2010 €9.37m
2011 €29.41m
2012 €15.28m
2013 €11.72m
Injection molds
2010 €40.62m
2011 €60.91m
2012 €36.39m
2013 €72.93m
Die casting molds
2010 €1.44m
2011 €3.60m
2012 €2.54m
2013 €2.73m
0
€13m
€26m
€39m
€52m
€65m
€78m

Country:	***Vietnam***
Area:	***331,210 km²***
Population:	***93.42m***
GDP per capita:	***€1,830***
Category:	***Rising Stars***

Vietnam

[Ravaged by war for decades, the country of the dragons is now developing fast.]

Vietnam is a coastal nation located in Southeast Asia and has 93m citizens. The country, which suffered from the Vietnam War for decades, now is growing rapidly and will have 104m citizens by 2050. The economic and social development of the last years is remarkable. The continuous growth led to an increase of the income per capita and a decrease of poverty. Vietnam soon realized that education is a key for sustainable development. Considering its development level, Vietnam has a very good education system and performs above average in the international PISA Study, with a value slightly behind that of Germany. Especially in technological sciences, the taught topics are not up to date and are not adjusted to the demands of the employment market. Also healthcare is at a higher development level as one would expect. The life expectation of the Vietnamese people is 76 years and therefore only 4 years below the average of all developed industry nations.

The country and its people

Population
93.42m citizens

Birthrate 16/1000 (births/citizen)
2014

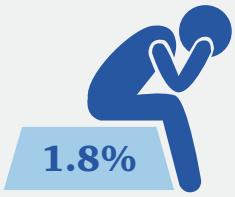
Measure for purchasing power parity, price for one Big Mac
Big Mac Index 2015

Index for English language skills
2014

The economy and the industry

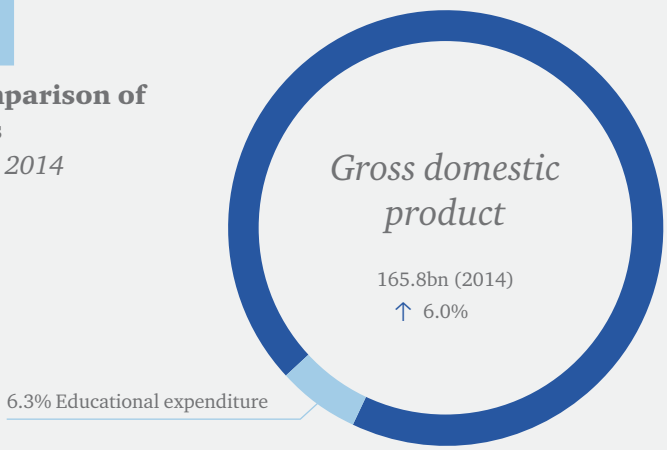
[Vietnam's economy is growing and developing continuously from a central regulated plan to a free economy.]

In terms of the gross domestic product (GDP) with €165.8bn, Vietnam has the 85thlargest economy in the world. With a GDP per capita of €1,830, as an indicator of wealth in a country, only India has a smaller value within this study. The economy has reached a growth of 5% per year during the last few years. The outlook for 2015 and 2016 is positive, with a tendency to a slightly smaller growth value. The share of agriculture of the whole economic performance decreased from 25% to 18% between 2000 and 2014. In the same period the amount of the industry increased from 36% to 38%. Public companies still make up 40% of the economic capacities, but their influence is shrinking. Among other reasons this decrease is a consequence of the admission Vietnams to the World Trade Organization (WTO) in 2007. Vietnam is currently the world's 41st largest export and 33rd largest import nation. The country exported goods worth €102.32bn in 2013. The three main exports were raw oil, textiles and coffee. During the last years, Vietnam could increase and diversify its export volume. Also the producing industry opened up for exports, but is still mainly demanded for low value-adding activities. The country owns a lot of natural resources, among others mineral oil, natural gas, coal, tin and zinc. With an average of €1,508 in 2013 the wage level is one of the lowest within this study.



Rate of unemployment
2015

Business climate by comparison of 189 countries
Ease of Doing Business 2014

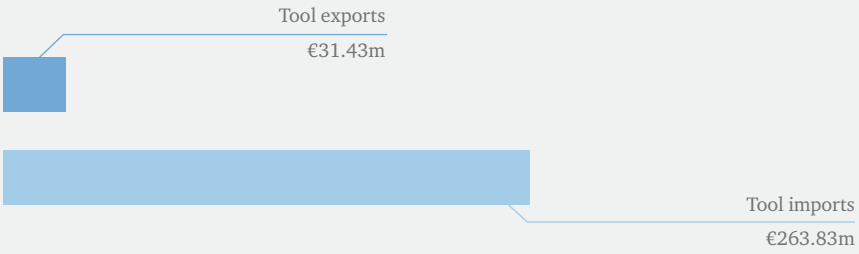


The tool manufacturing and the tools

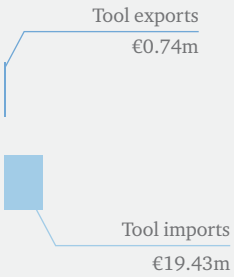
[A small, growing industry with interesting individual companies garners attention on an international level.]

In 2013 tools worth €31.43m in total were exported. The total export was comprised of €0.74m of solid and sheet metal forming tools and €30.68m of injection molds. Within the imports, Vietnam registered a total value of €263.83m, split up into €19.43m for solid and sheet metal forming tools, €241.55m for injection molds and €2.87m for die casting molds. Especially for injections molds there are very few manufacturers who appear as tool and die exporters on the European market. These possess an enormous advantage due to low labor costs and are able to fulfill western production requirements, which led to Vietnam being included in this study, notably due to a good technological education and an overall strong, growing economy and industry. The tool and die industry will profit from the growing producing industry and low foreign direct investments in the future. The geographic

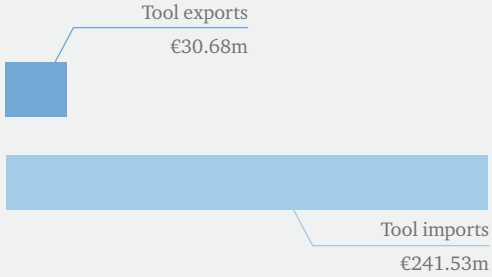
Tool production/tool exports/tool imports



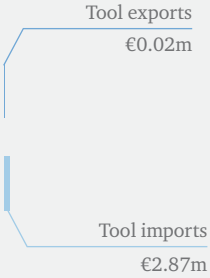
Solid and sheet metal forming tools



Injection molds

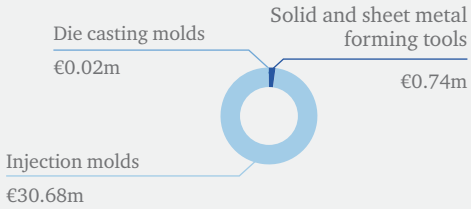


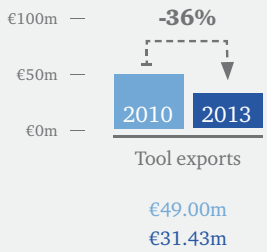
Die casting molds



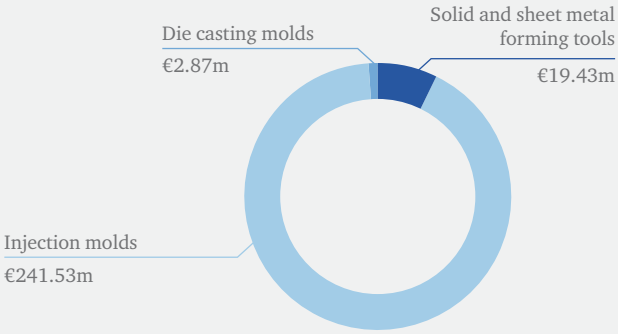
The tool manufacturing and the tools

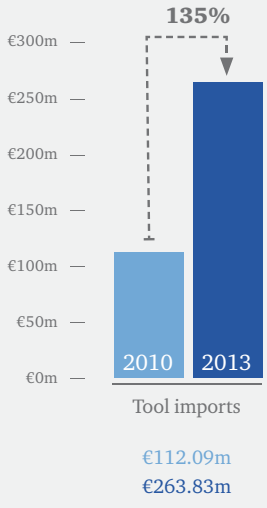
Tool exports





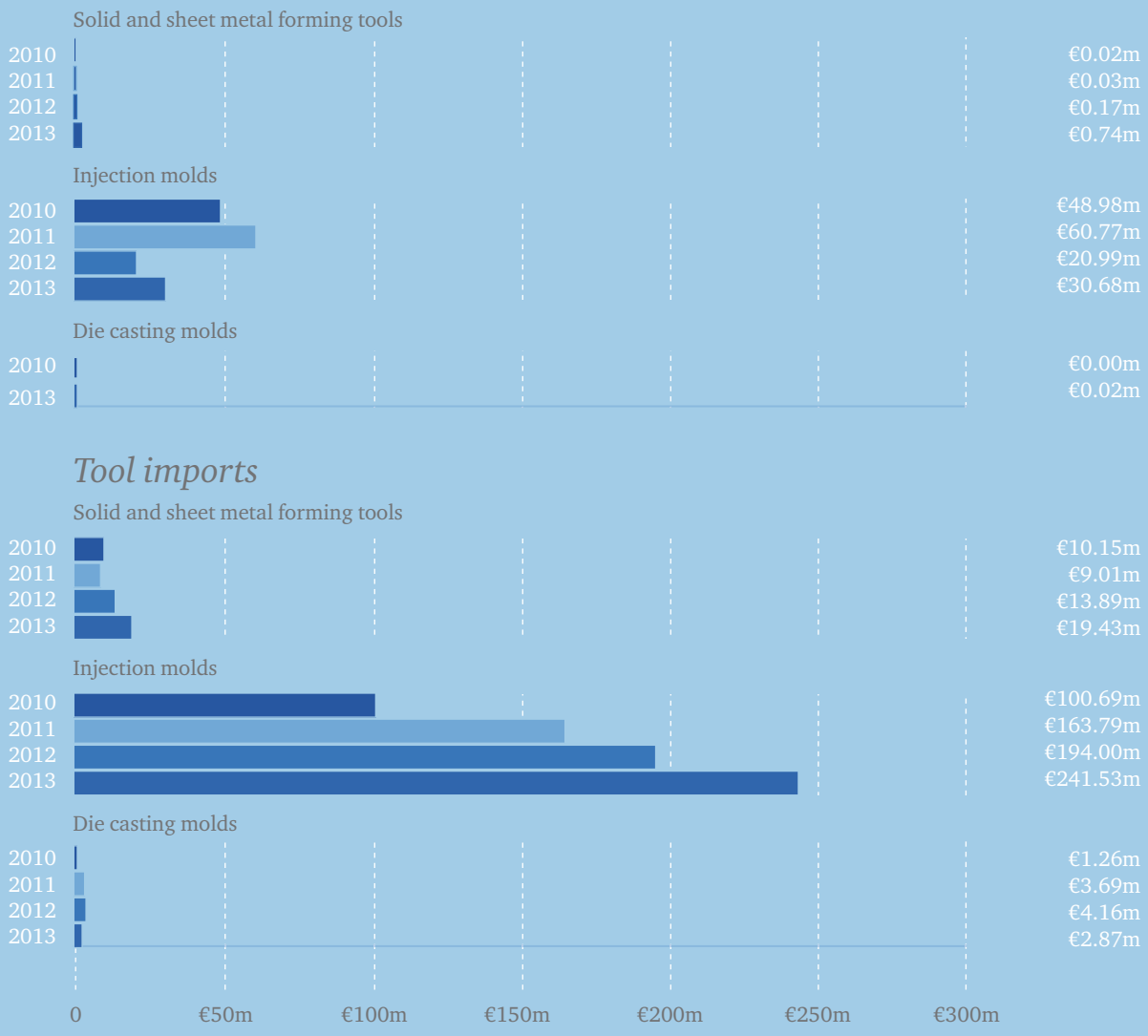
Tool imports





location in the periphery of China, combined with low labor costs and very good sea links to all continents, will strengthen the growth. Vietnam is a Rising Star with a high development potential.

Tool exports



Tool imports

Summary and outlook

This study shows the rapid developments in the “World of Tooling”, whose markets are becoming increasingly international. The number of markets is growing and the ideal business partner is not necessarily in Europe. This challenge has to be overcome in order to achieve sustainable growth and generate revenue. The study shows that the potential of international procurement outweighs the risks and its complexity. Market knowledge is becoming a core competency and a business advantage in a small, heterogeneous sector like the tool and die industry.

This study provides a profound and detailed overview of all relevant markets. It analyses and grades markets objectively - both based on figures and longtime international tooling experience of the WBA Aachener Werkzeugbau Akademie in cooperation with the Chair of Production Engineering from the Laboratory for Machine Tools and Production Engineering WZL of the RWTH Aachen University and the Fraunhofer Institute for Production Technology IPT. Numerous field visits, discussions within the expert network of the WBA and three interviews, which contain best practices of international tool procurement, support and validate the analysis.

The WOT-Radar is an exhaustive comparison of the countries considered. By evaluating the categories - market size, tooling competence and development potential, four categories with the names “Allstars”, “Established”, “Rookies” and “Rising Stars” pursuant to their characteristics with similar characteristics were defined. The Allstars, which consist of Germany, Japan, South Korea, the United States of America and China, stand out due to their market size and tooling competence. China, however, is a special case: the majority of the local industry only has an average competency. Nevertheless, there is a variety of tool and die manufacturers, which produce tools and dies on a high level. Established markets show a high to very high tooling competency, but are, due to their market size, not comparable with the Allstars. Switzerland, with its outstanding competence in the field of (high-precision) injection molds, is an example of an established market. Rookie markets are characterized by an average to high tooling competence with a small market size. Portugal is a classic example, with an interesting and state promoted industry network for injection molds. Lastly, Rising Stars are markets, which are neither comparable to established tooling markets by their market size nor by their tooling competence. However, very good development may be expected. For example, Vietnam and Indonesia are Rising Stars due to their general positive economic outlook, particularly for the manufacturing industry. In these markets, international investments in the producing industry are visible and the basic requirements for a growing local tool and die industry are fulfilled.

The demand of tools and dies will continuously increase in the near future and will become progressively more international, whereas Germany will continue to hold the pioneering role in the industry. International procurement of tools and dies for the supply of local production sites or for profiting from cost efficiency and innovation must not be contradictory. The systematic accumulation of international market intelligence will enable producing companies as well as tool and die manufacturers to optimize their tool and die procurement and therefore achieve a sustainable competitive advantage.

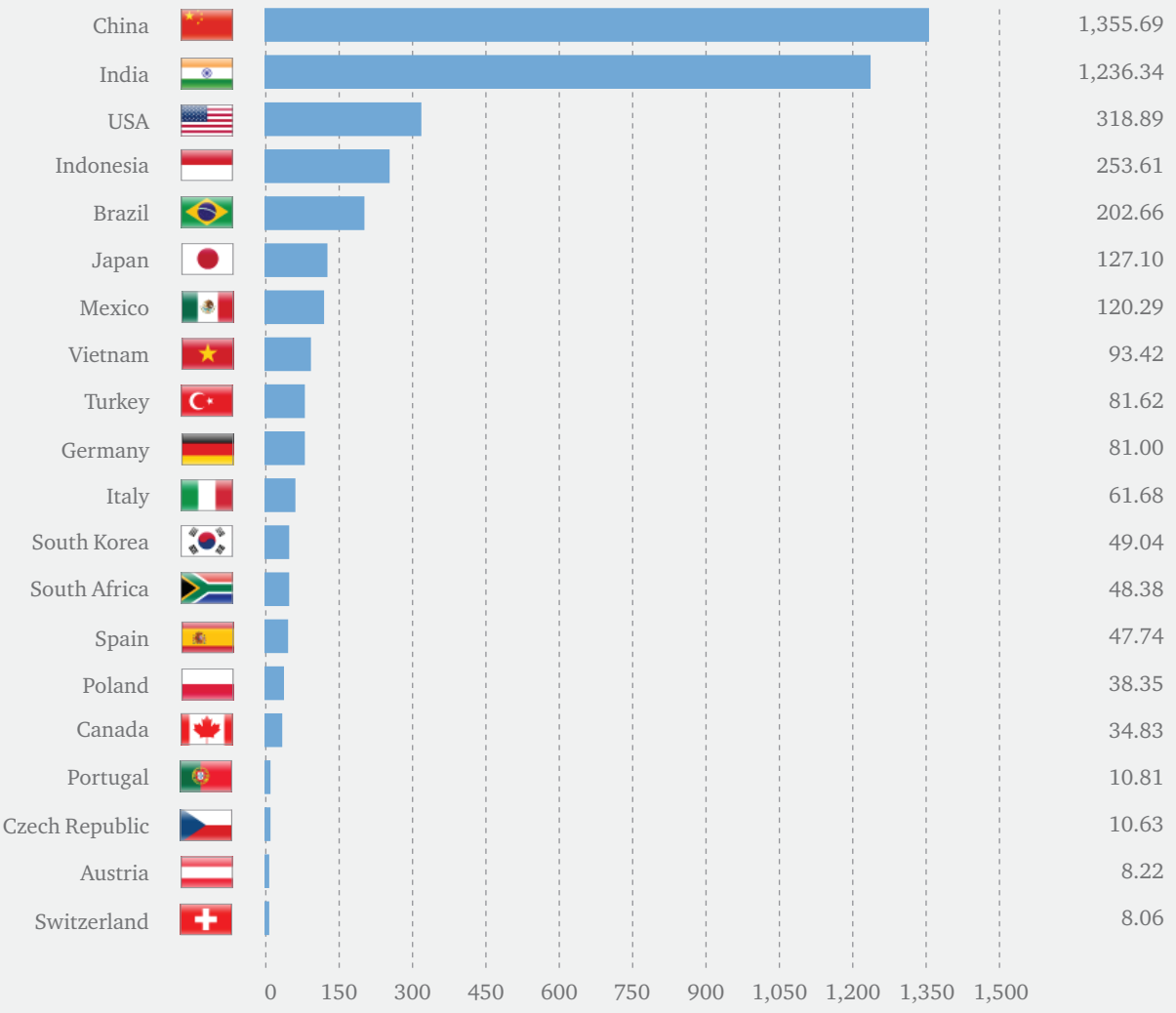
Market overview

Here the key performance indicators, which have been used for this study, are presented for the 20 most important markets of the tool and die industry.

The country and its people

Population [2014]

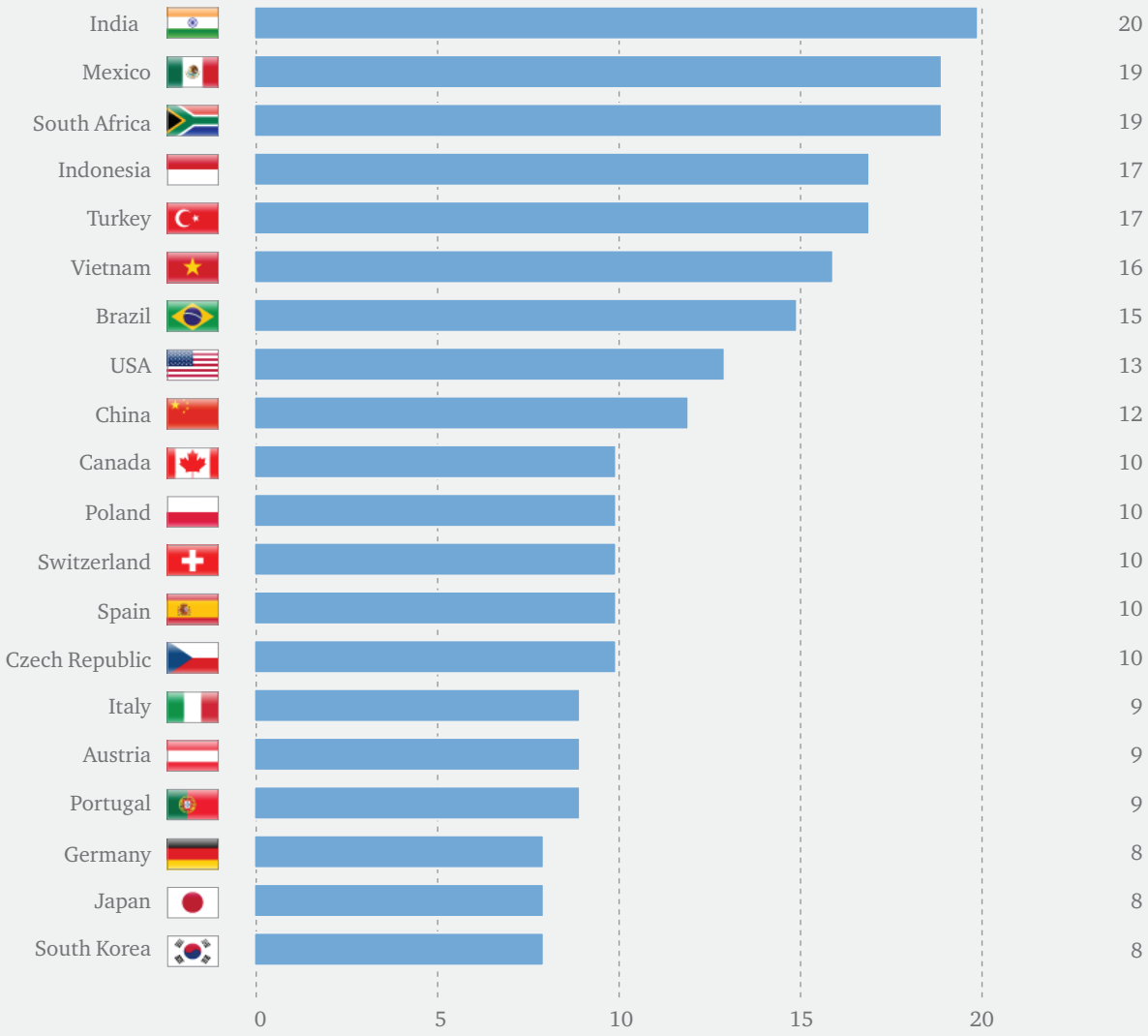
Number of inhabitants.



The country and its people

Birthrate [2014]

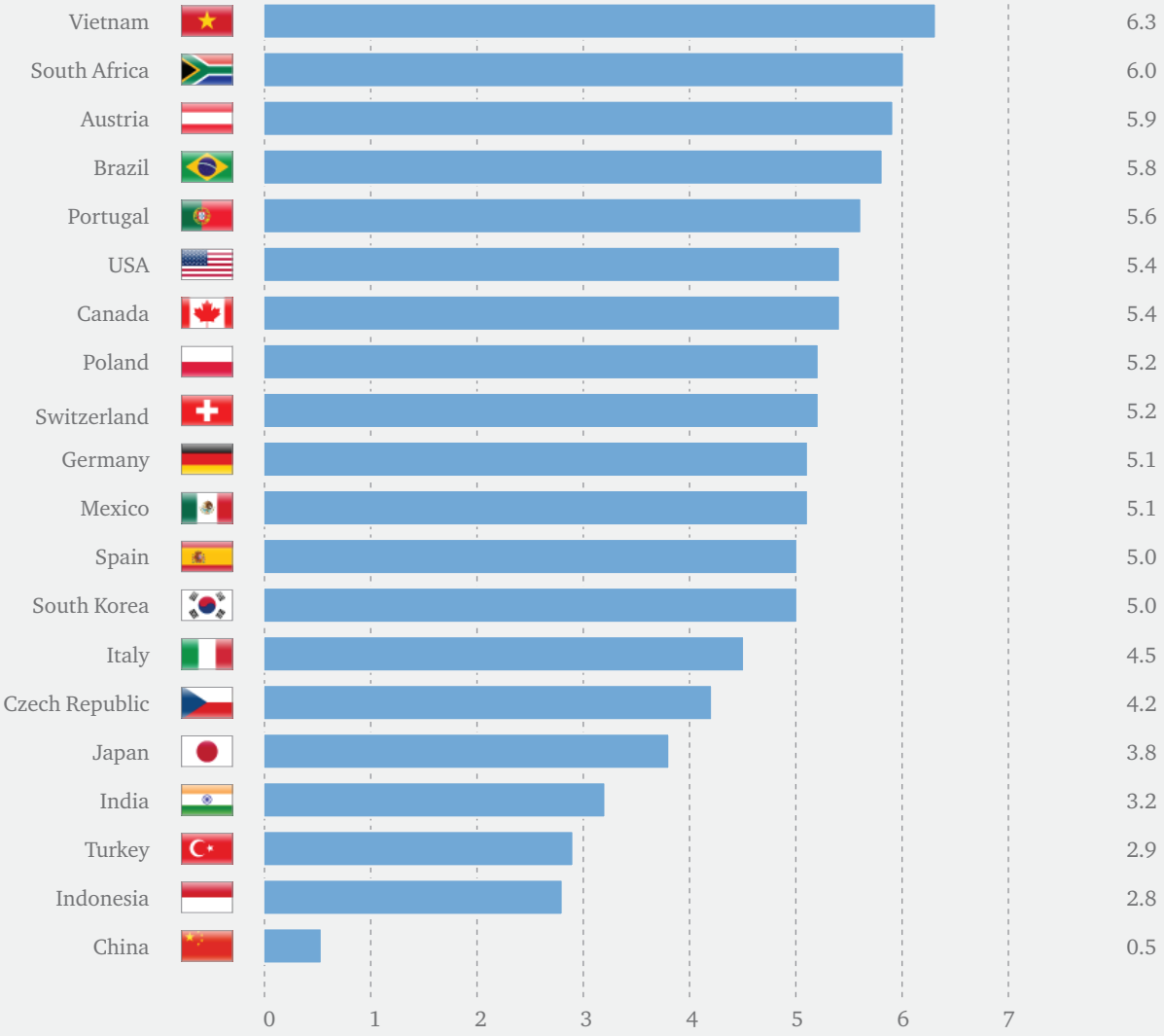
Number of births per year per 1,000 inhabitants.



The country and its people

Education expenditure [2014]

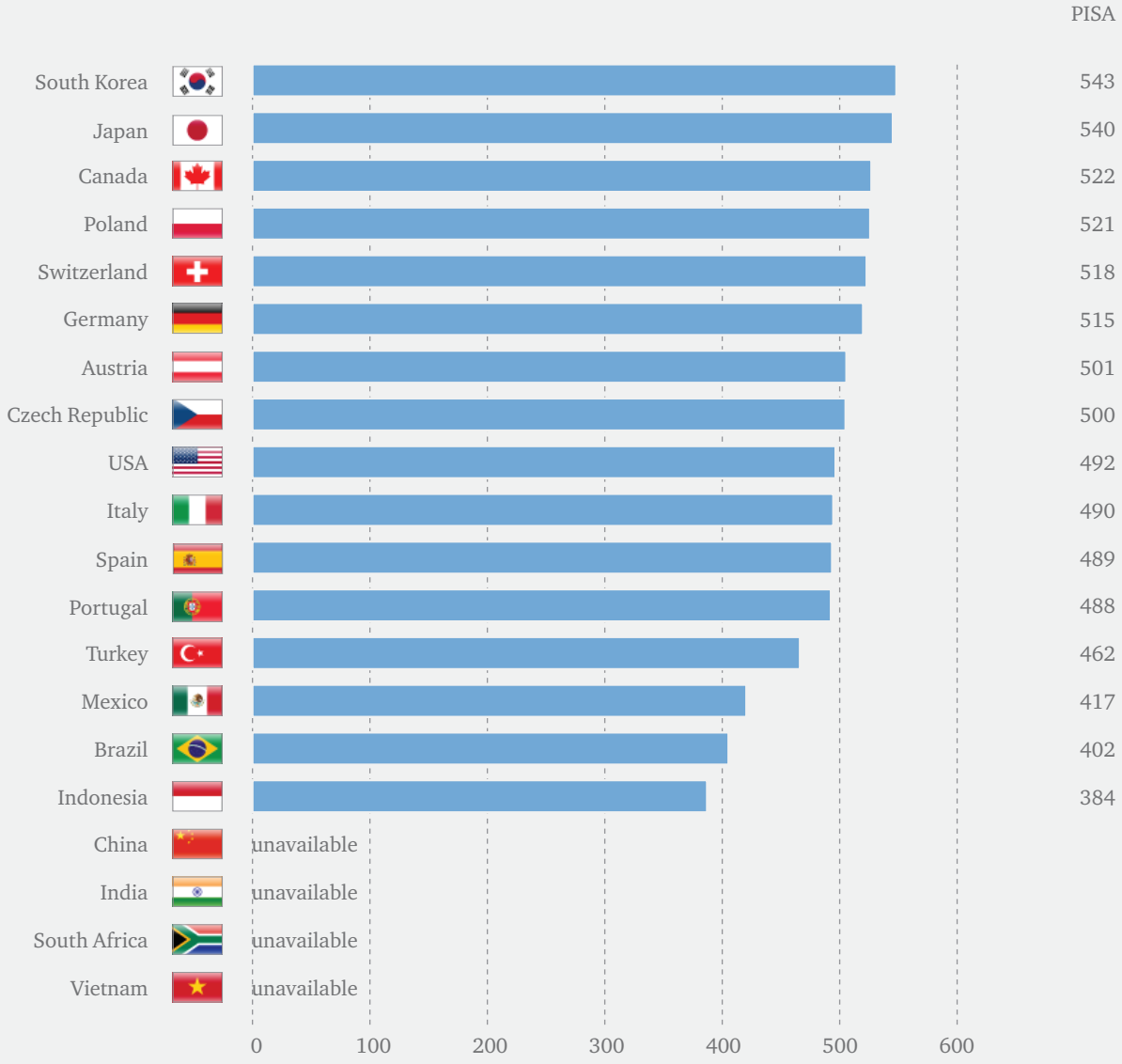
Ratio of educational expenditure in the gross domestic product per year. [%/GDP]



The country and its people

Results of the PISA Study [2012]

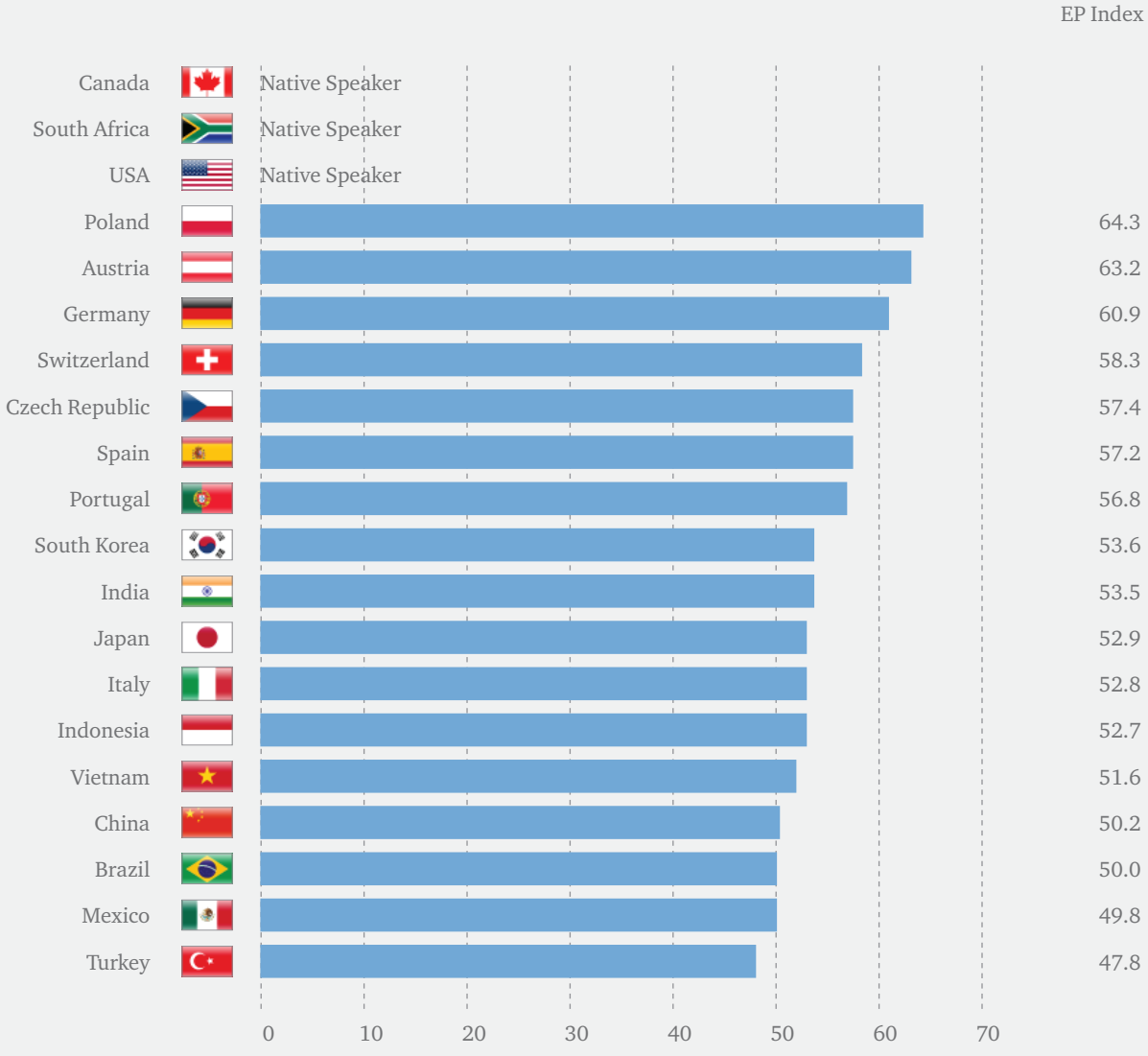
International studies of the achievements of pupils aged fifteen in most OECD member states and in an increasing number of partner countries. To measure everyday and work-related knowledge and skills, basic education in the areas of reading, mathematical and scientific competence is tested. The scales of difficulty and competency of the respective countries have been adjusted, so that the value of expertise in OECD states corresponds to a value of 500.



The country and its people

English Proficiency Index [2014]

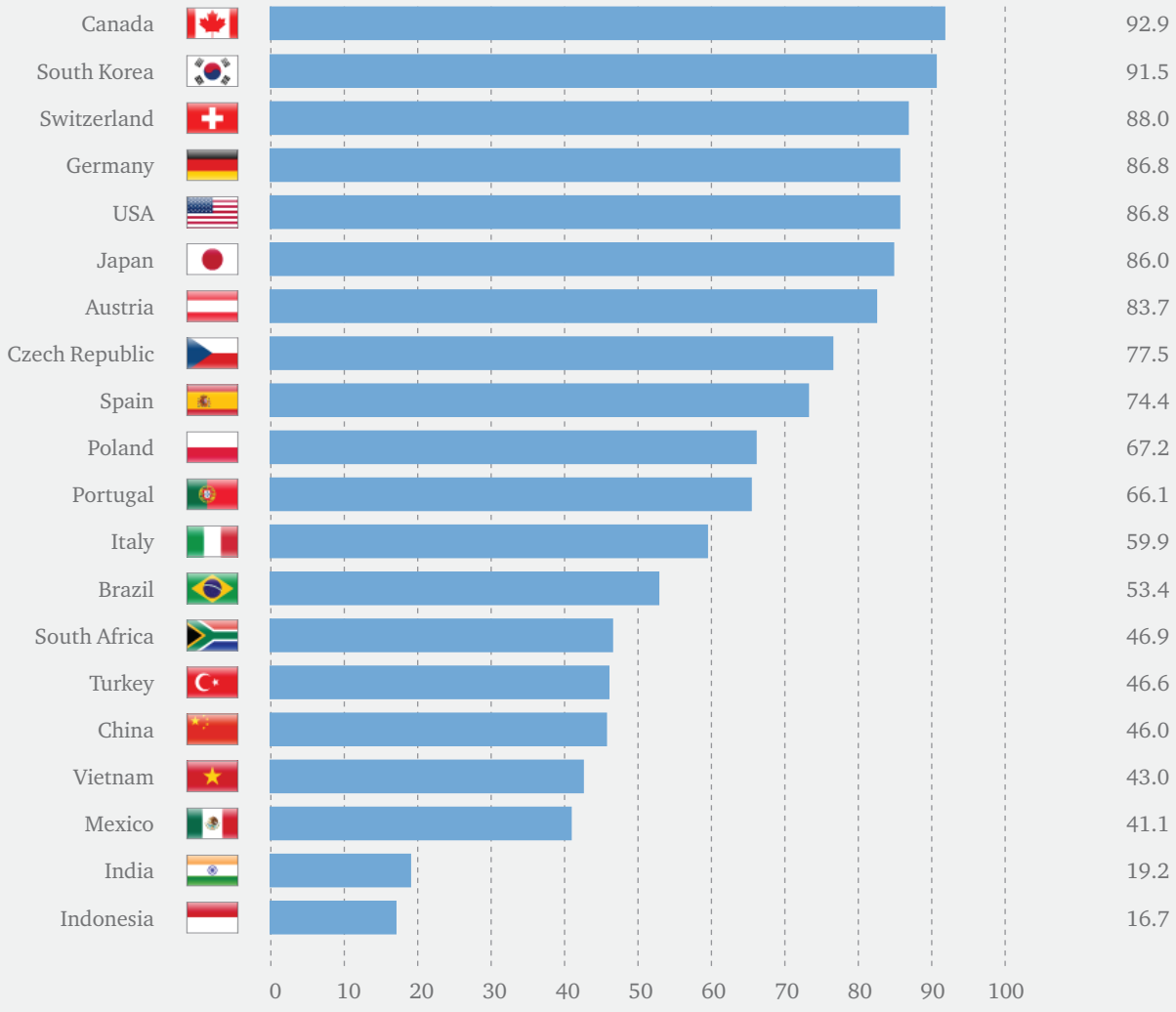
The English Proficiency Index uses tests results, in order to compare the English competency of adults of different countries. An index of 62 or larger implies that the knowledge of English is very good. Between 62 and 58, the English skills are evaluated as good; average competency lies between 52 and 58, while between 52 and 48, competency is considered to be low. A value under 48 indicates a very poor command of the language.



The country and its people

Access to internet [2014]

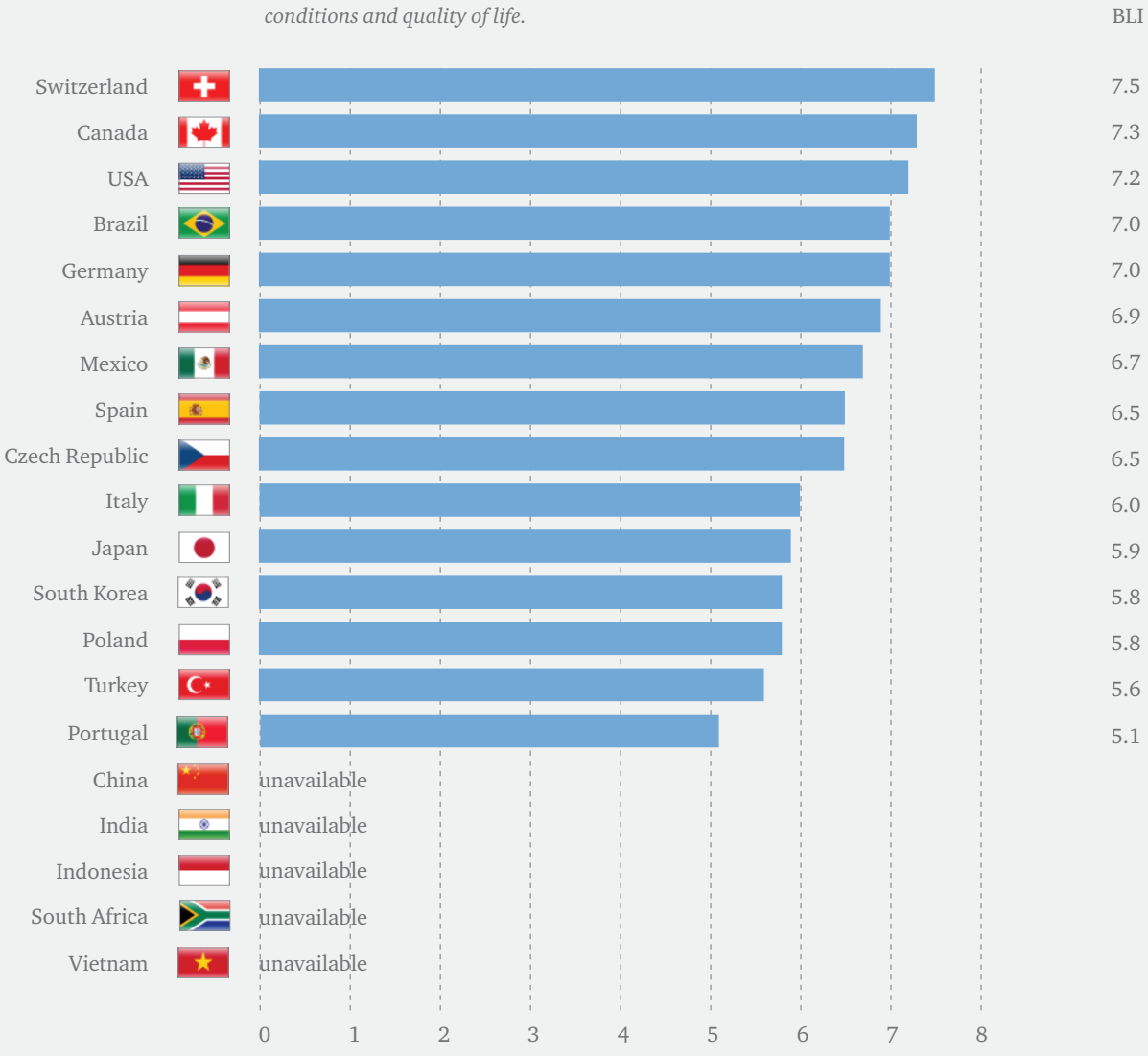
Percentage of population with internet access.



The country and its people

Satisfaction with living conditions [2015]

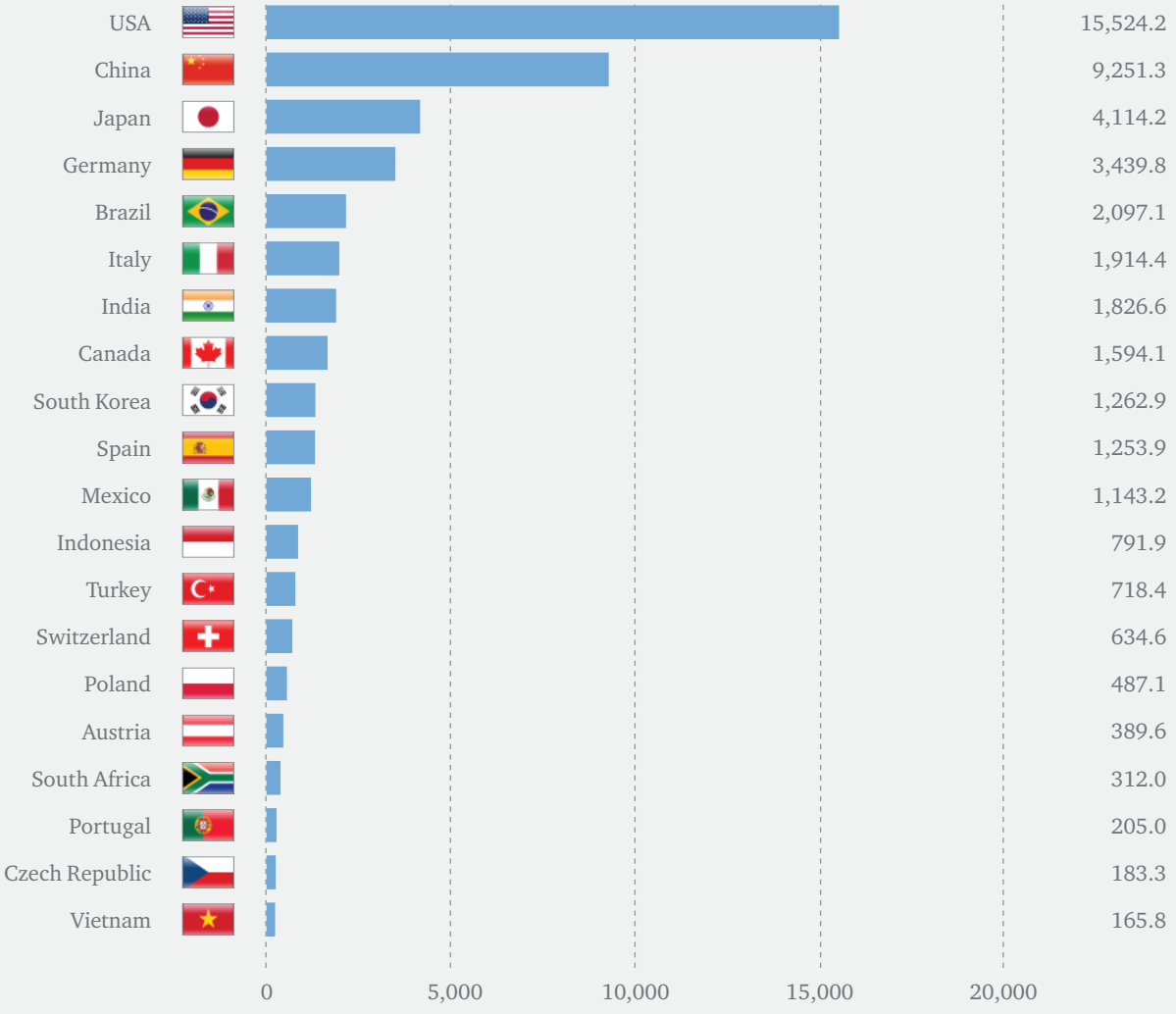
Satisfaction with the living conditions represented by the Better-Life-Index of the OECD. The calculation is based on eleven topics regarding material living conditions and quality of life.



The country and its people

Gross domestic product (nominal) [2014]

Total value of all goods produced within a year in an economy after deduction of all inputs.

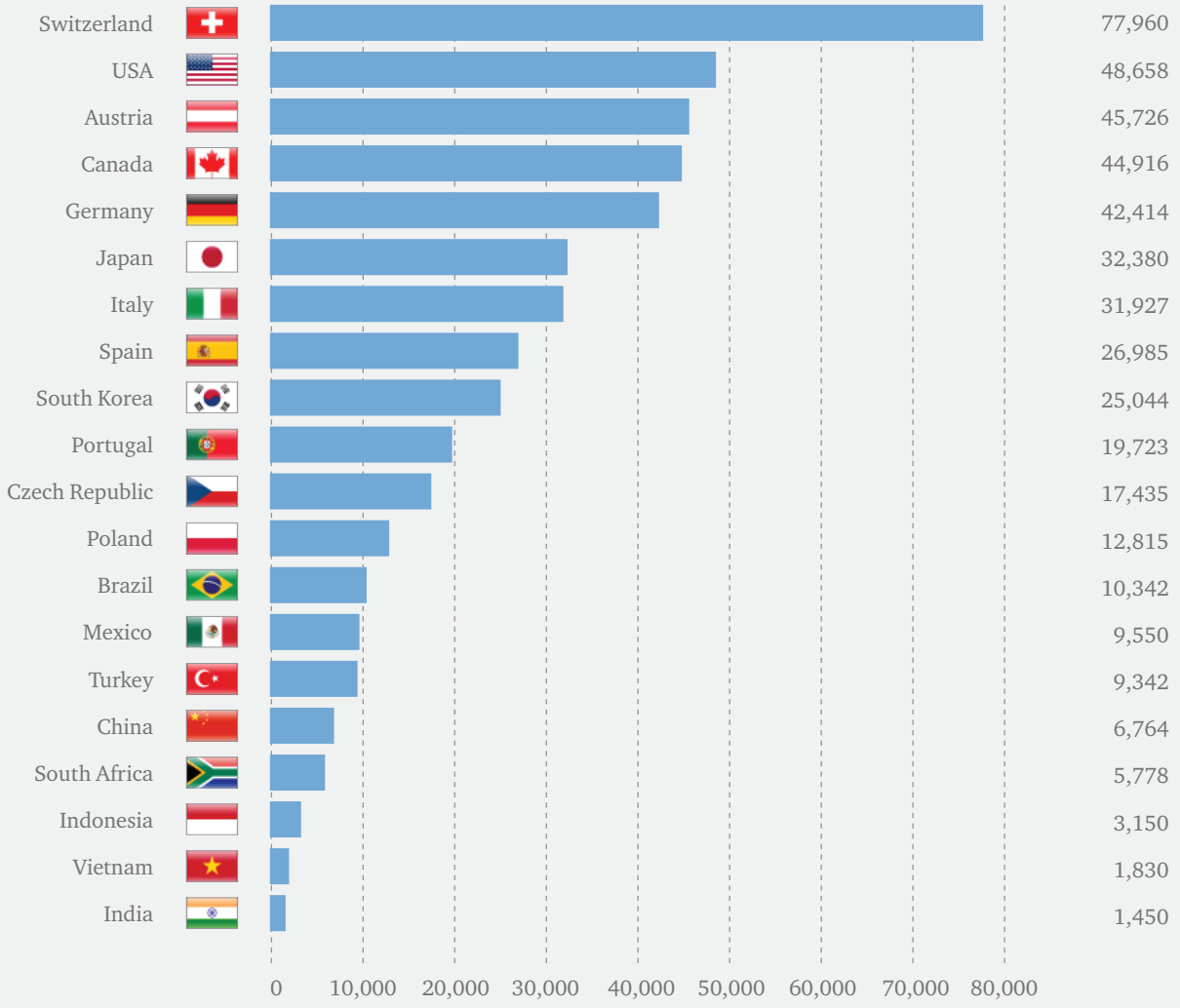


The economy and the industry

Gross domestic product (nominal) per capita [2014]

Total value of all goods produced within a year of an economy after deduction of all inputs per inhabitant.

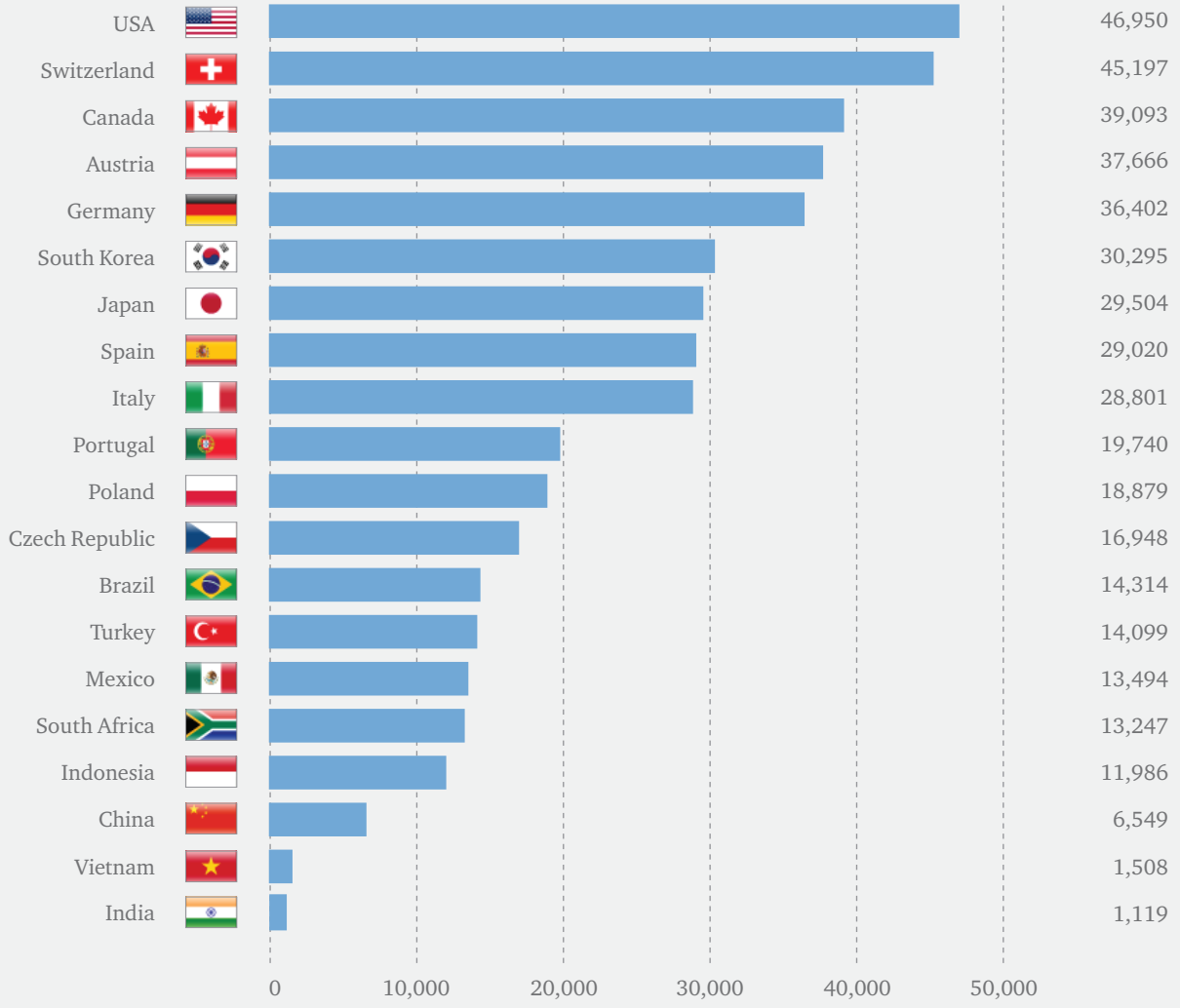
[€]



The economy and the industry

Income per year and capita [2015]

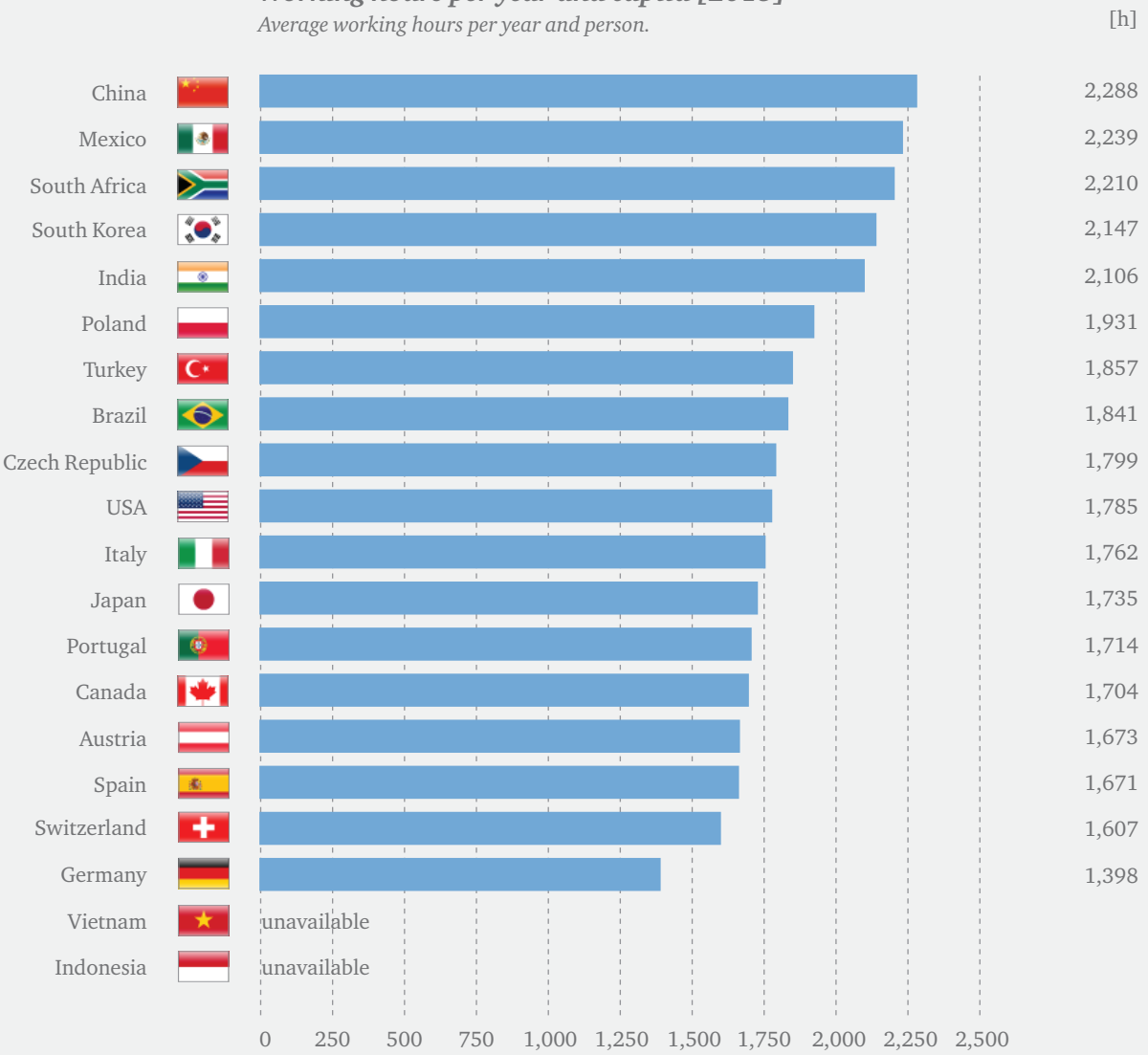
Average gross annual income per person.



The economy and the industry

Working hours per year and capita [2013]

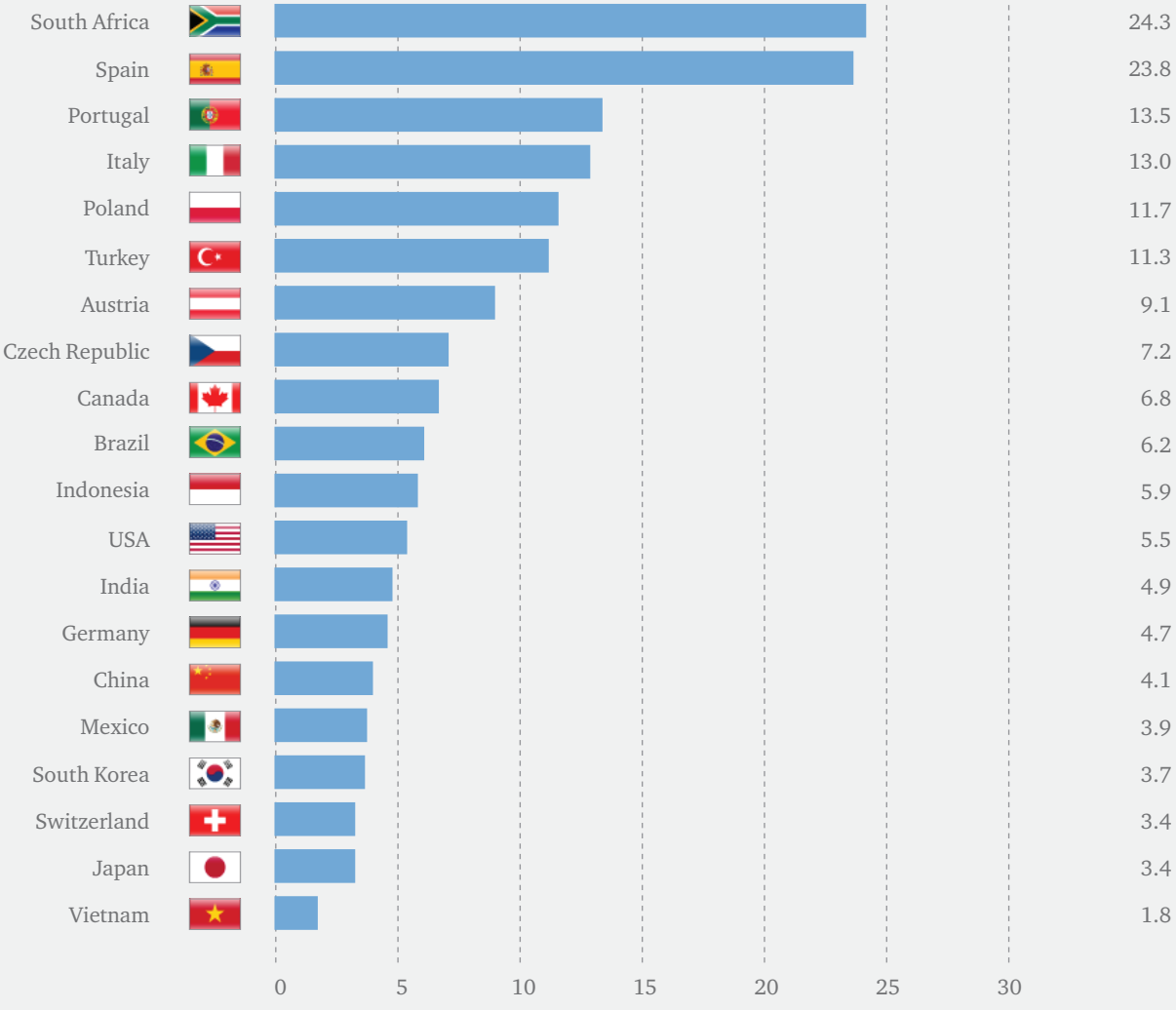
Average working hours per year and person.



The economy and the industry

Rate of unemployment [2014]

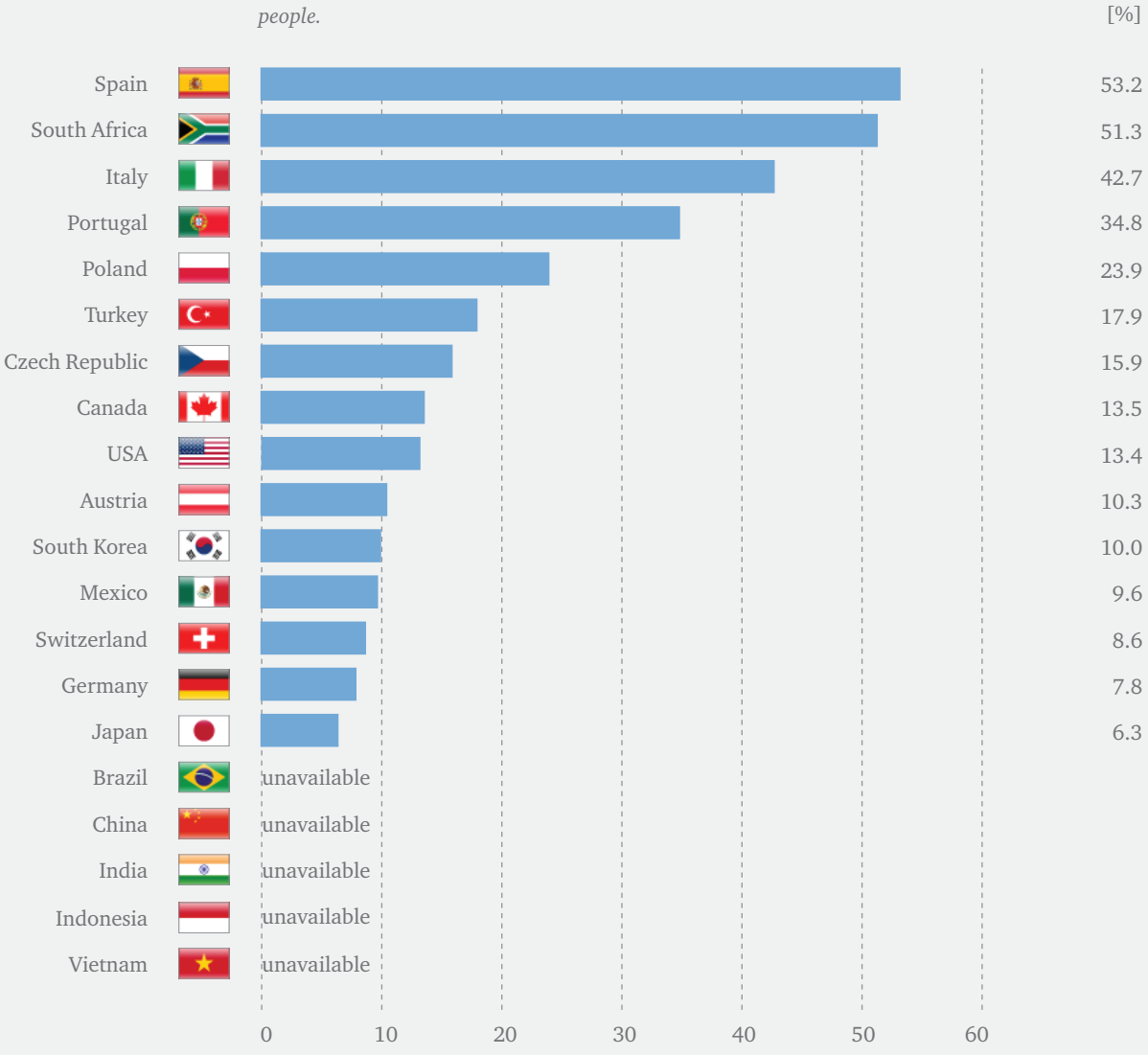
Ratio of registered unemployed to the sum of registered unemployed and the civil labor force.



The economy and the industry

Rate of youth unemployment [2014]

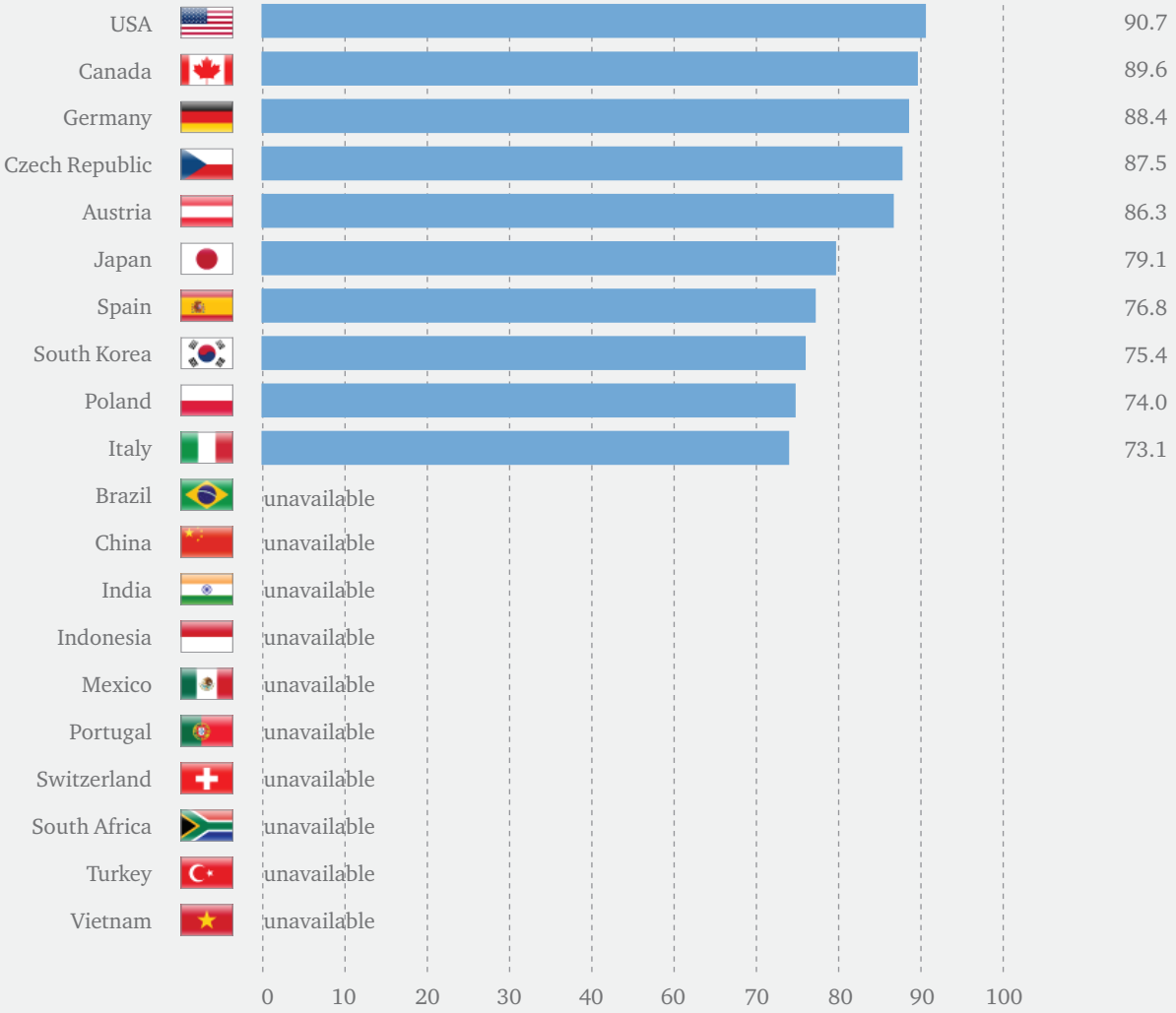
Ratio of the number of unemployed young people, excluding those presently studying or being absent for other reasons from the labor market, in relation to the sum of all young people. People between age 15 and 24 are counted as young people.



The economy and the industry

Basic computer knowledge [2013]

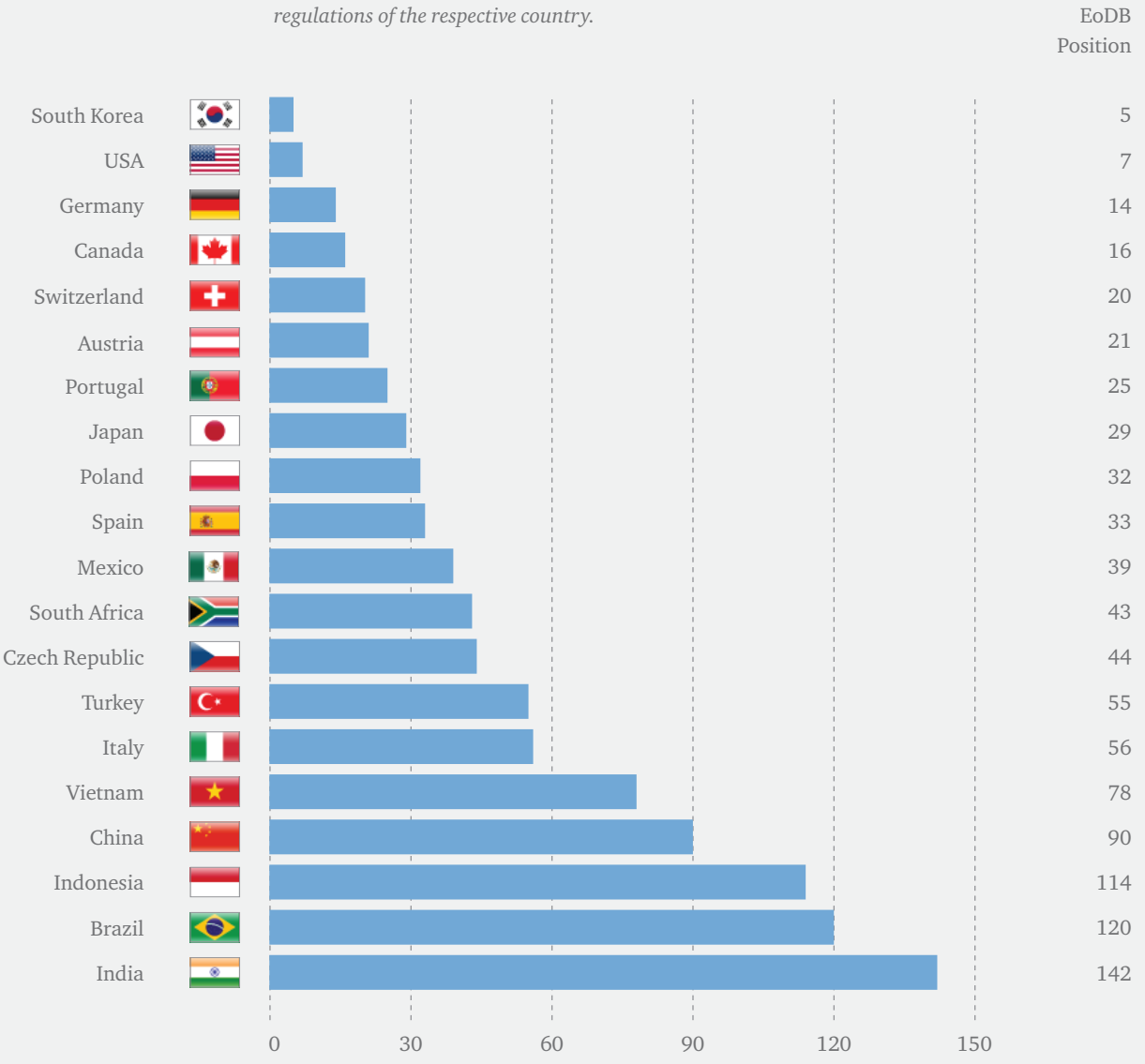
Population with basic computer knowledge in percent.



The economy and the industry

Business Climate Index [2014]

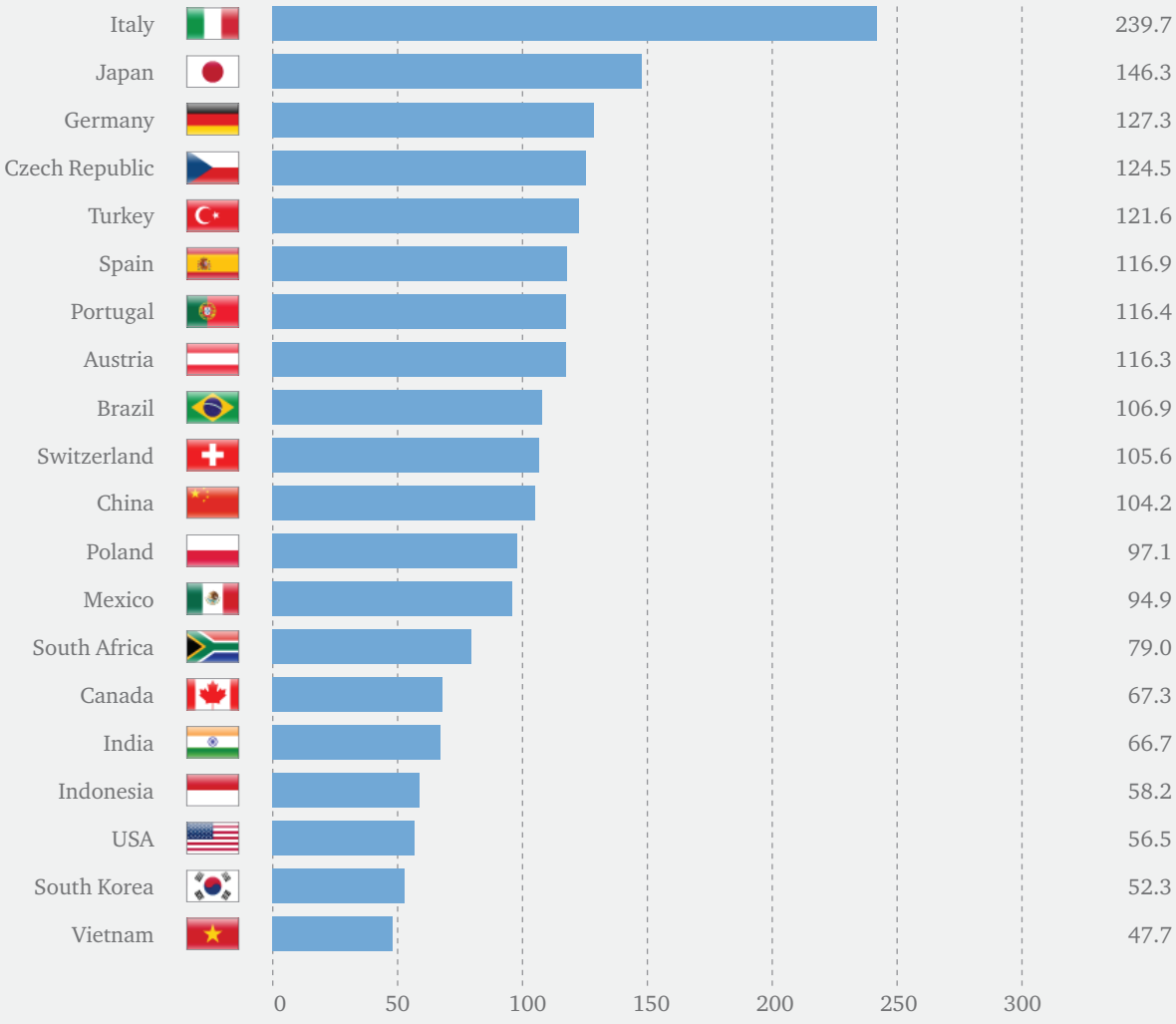
Business Climate Index presented by the Ease of Doing Business Index of the World Bank. Ranking of 189 countries for comparison of terms of business. The first position characterizes the most enterprise-friendly country with the lowest barriers for establishing or growing a business. The survey is based on laws and regulations of the respective country.



The economy and the industry

Energy prices [2013]

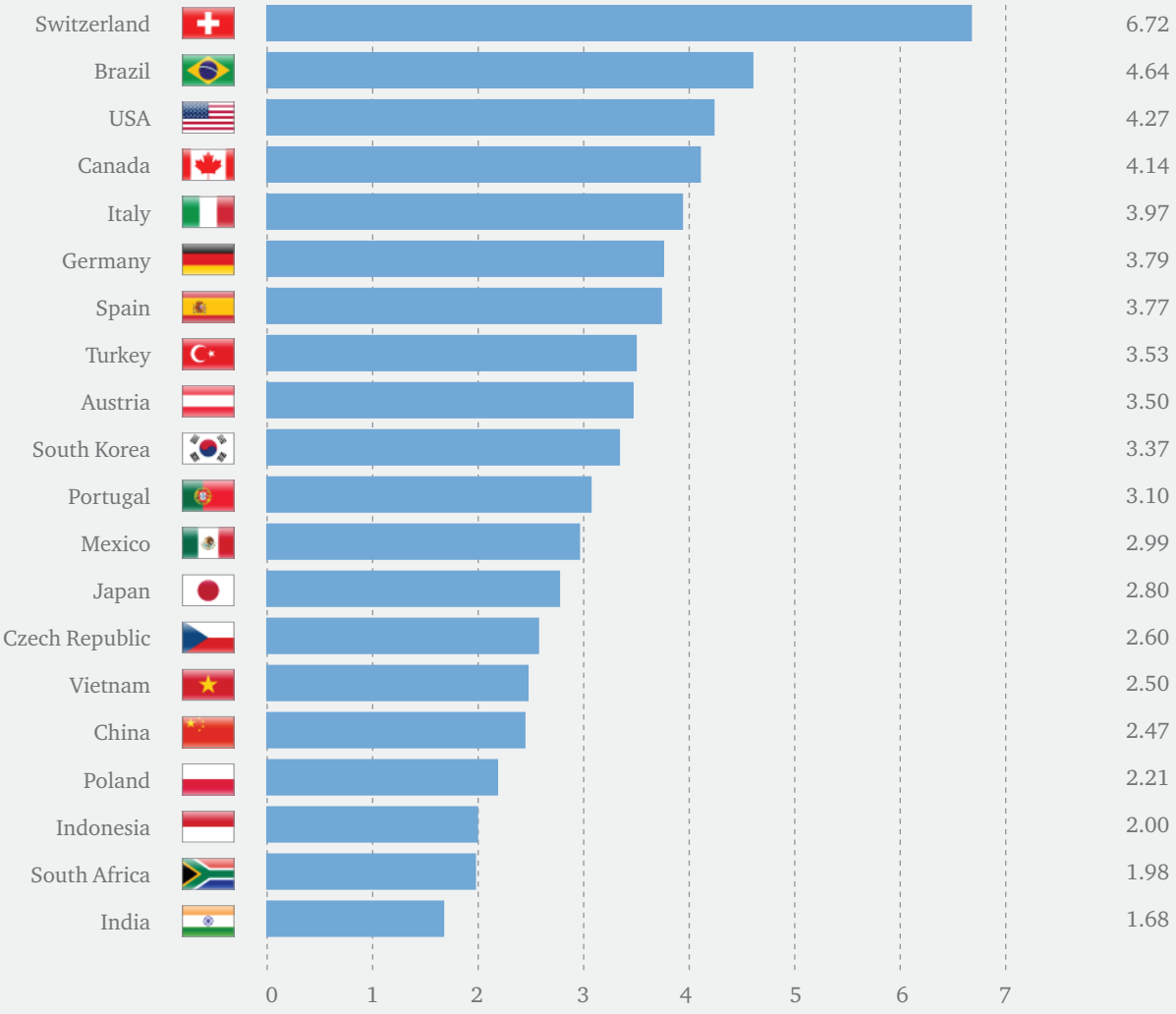
Average market prices for electricity.



The economy and the industry

Big Mac Index [2015]

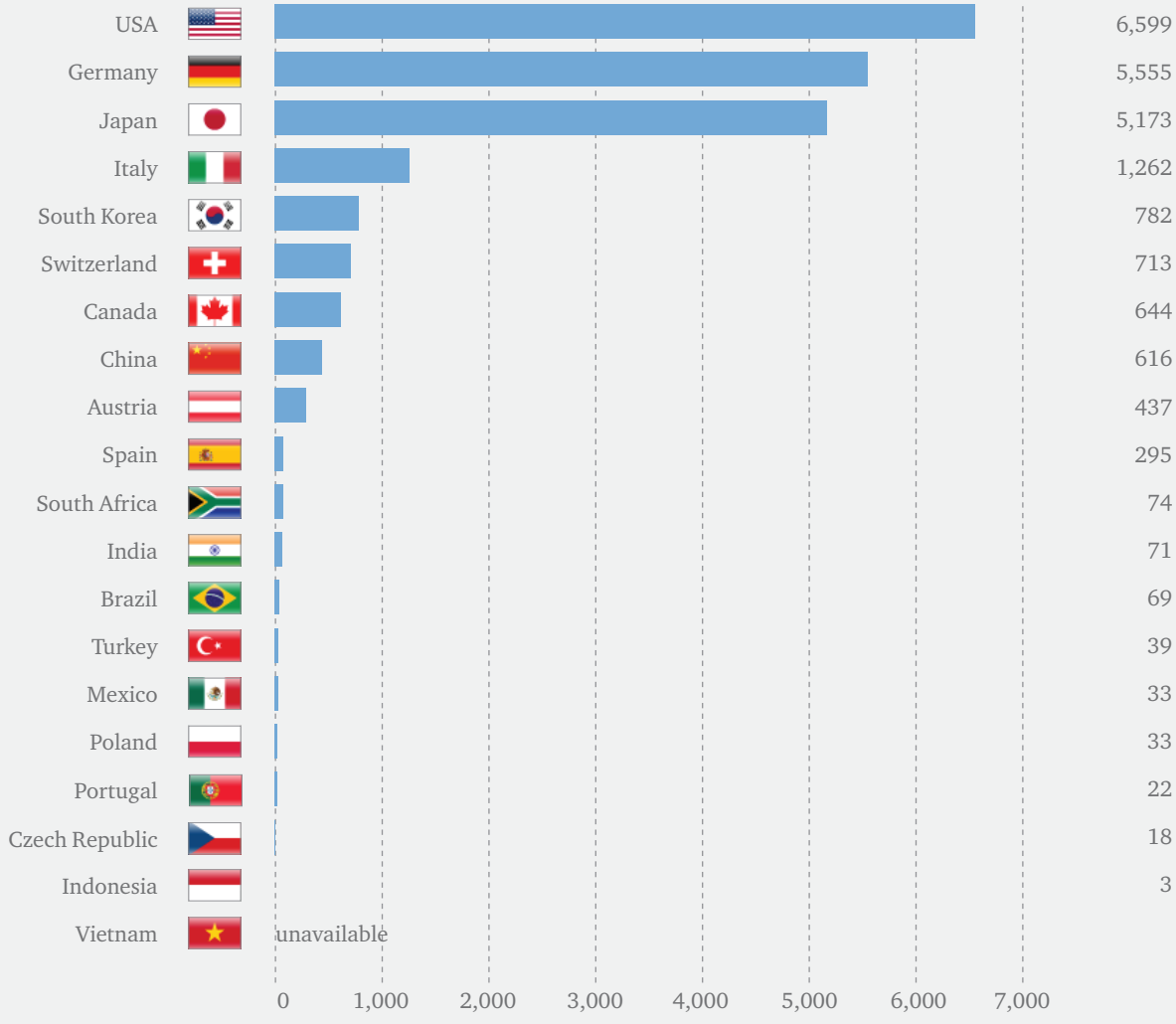
Big Mac Index measures the purchasing power parity by comparing different countries on the basis of the price of a Big Mac in each country.



The tool manufacturing and the tools

Patent registrations in the tool and die industry in the years 2000 to 2011

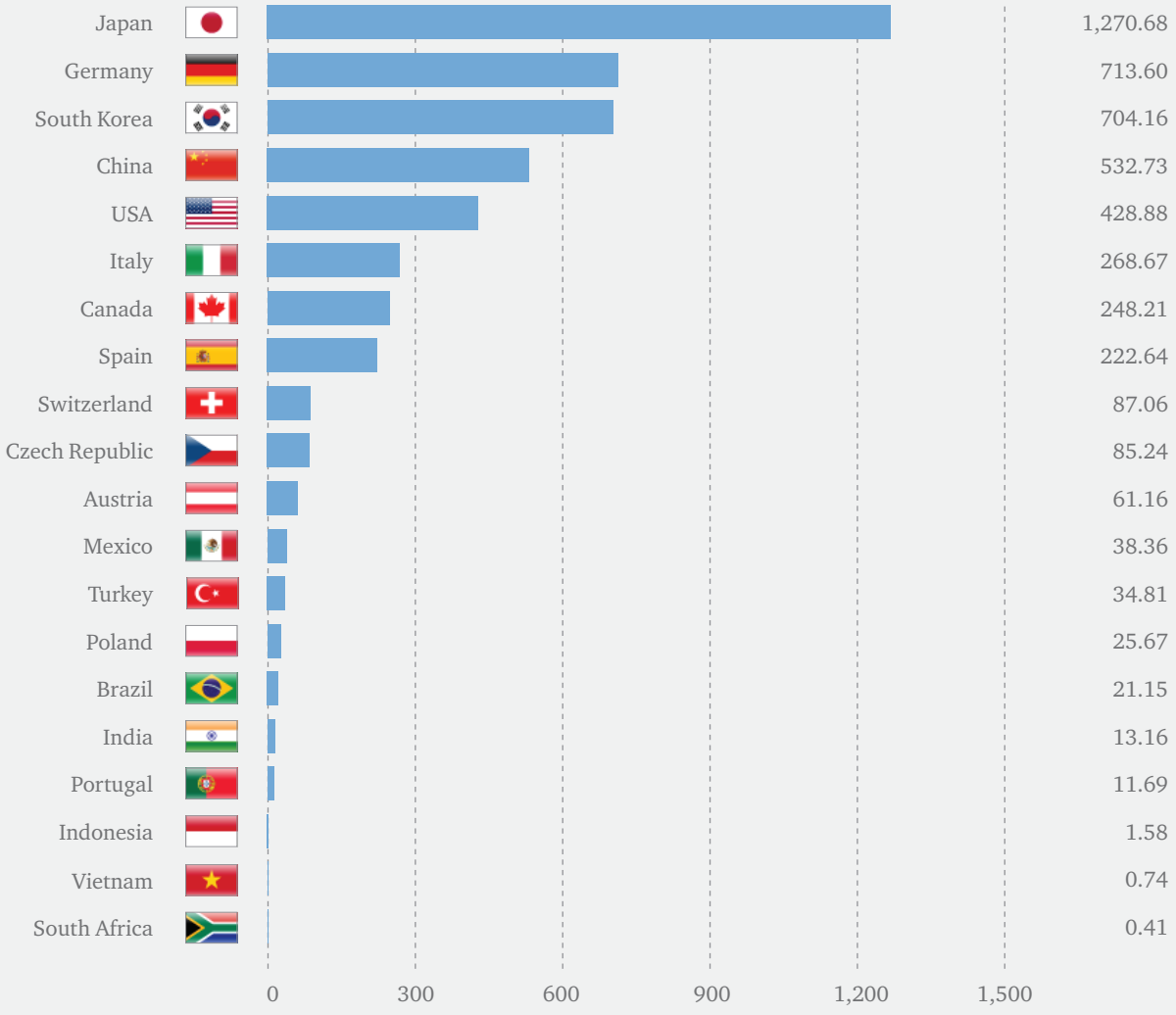
Patent registrations per year per country in the tool and die industry between 2000 and 2011.



The tool manufacturing and the tools

Tool exports – solid and sheet metal forming tools [2013]

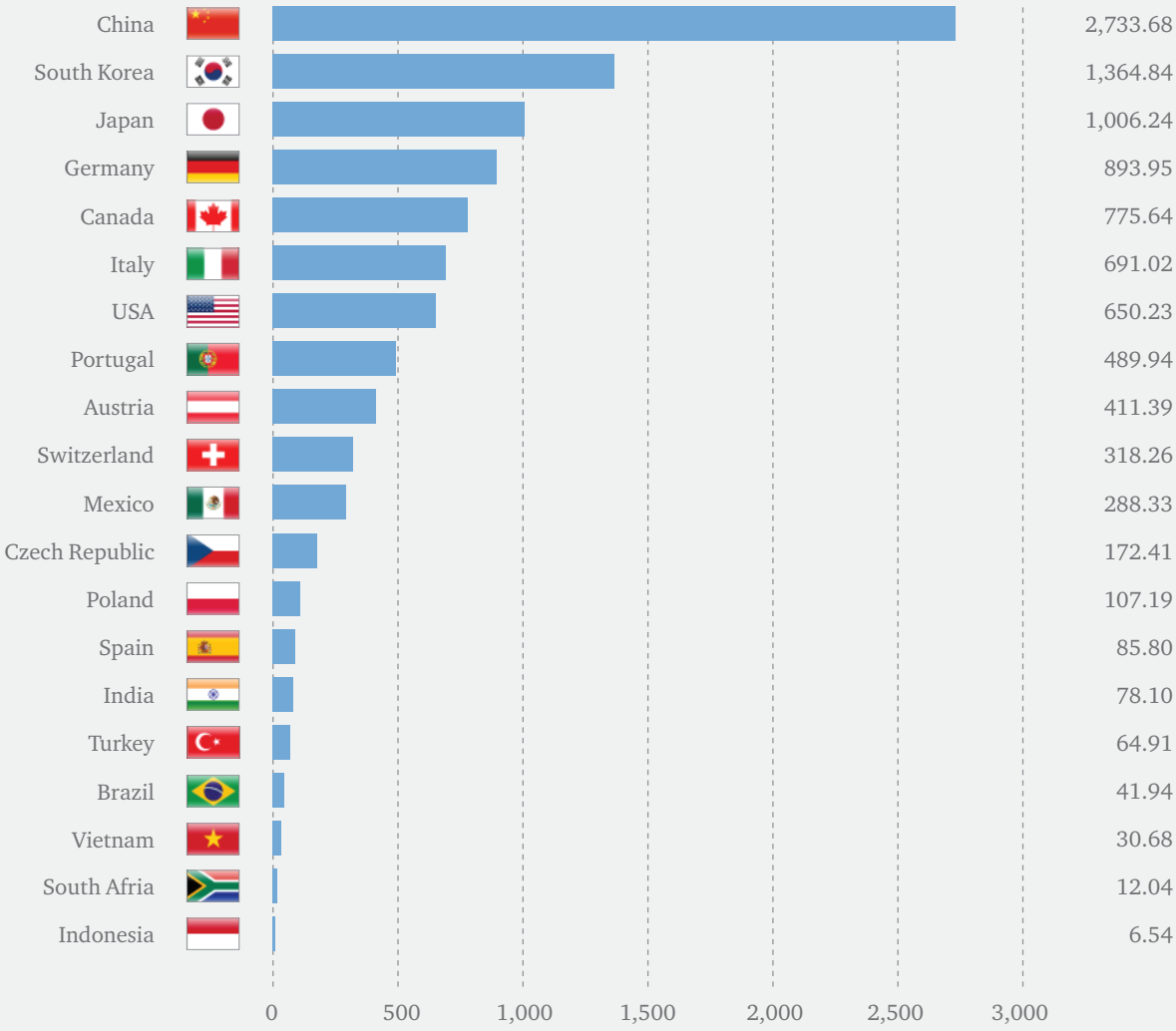
Value of exports of solid and sheet metal forming tools. [m €]



The tool manufacturing and the tools

Tool exports – injection molds [2013]

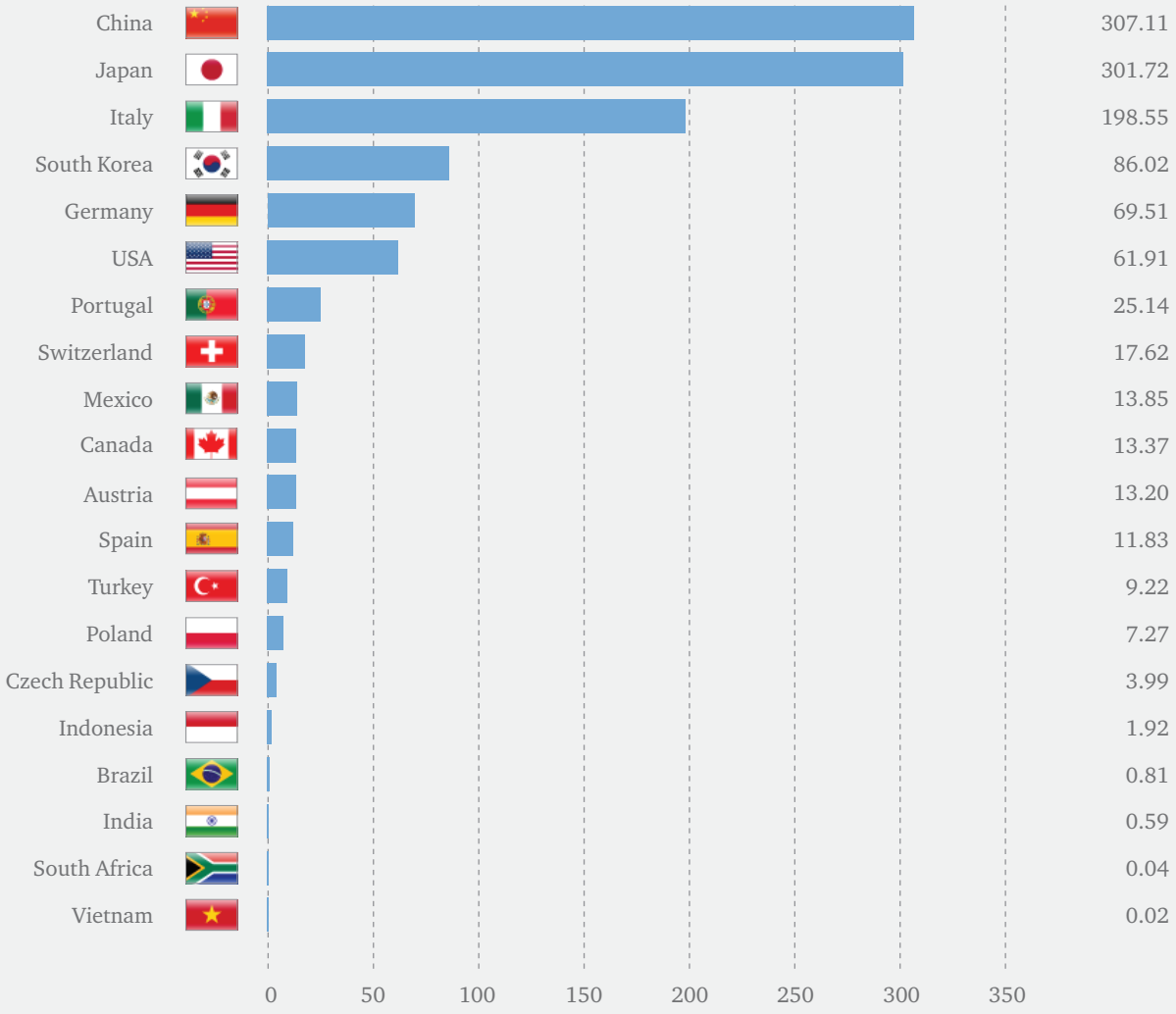
Value of exports of injection molds. [m €]



The tool manufacturing and the tools

Tool exports – die casting molds [2013]

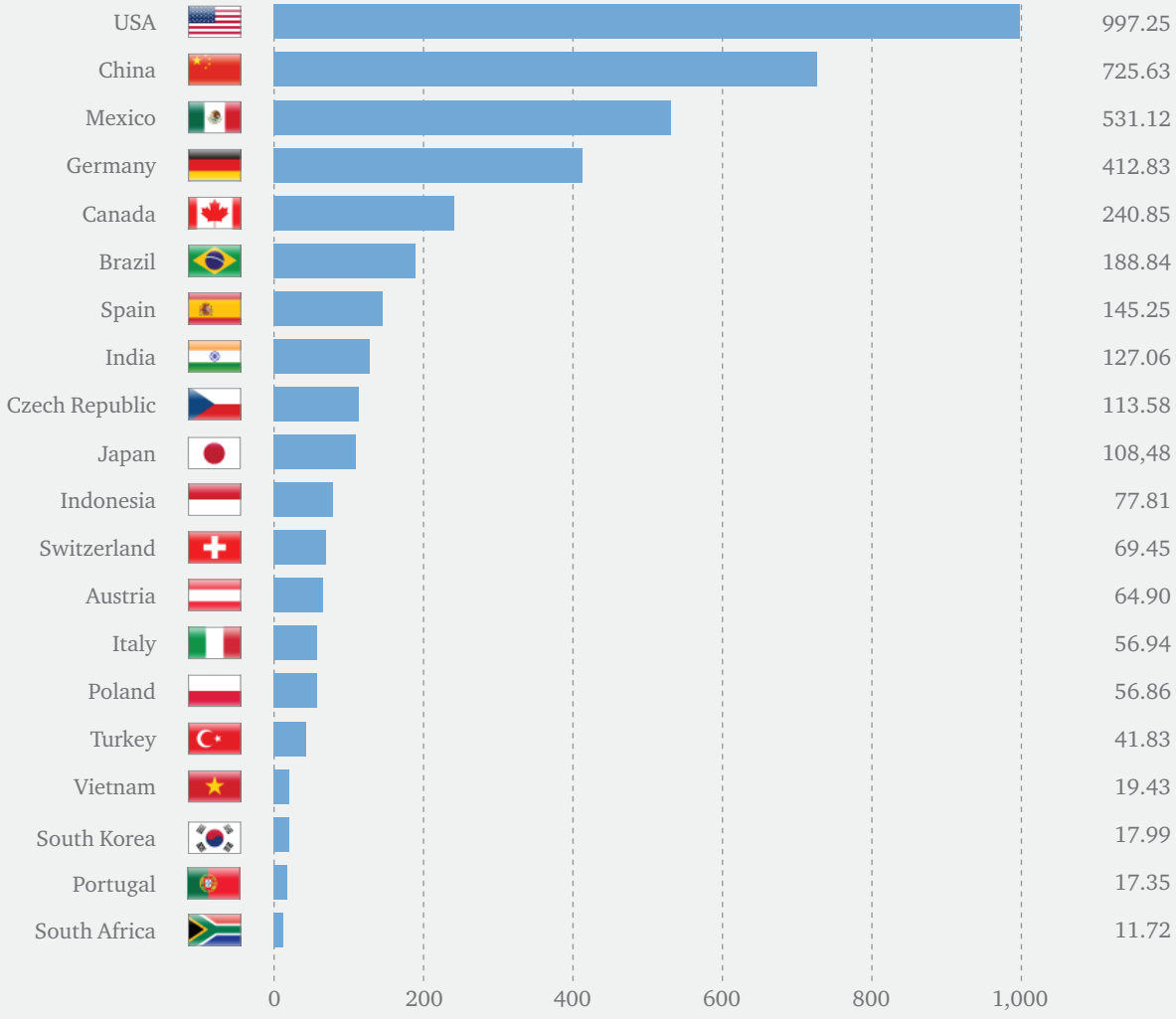
Value of exports of die casting molds.



The tool manufacturing and the tools

Tool imports – solid and sheet metal forming tools [2013]

Value of imports of solid and sheet metal forming tools. [m €]

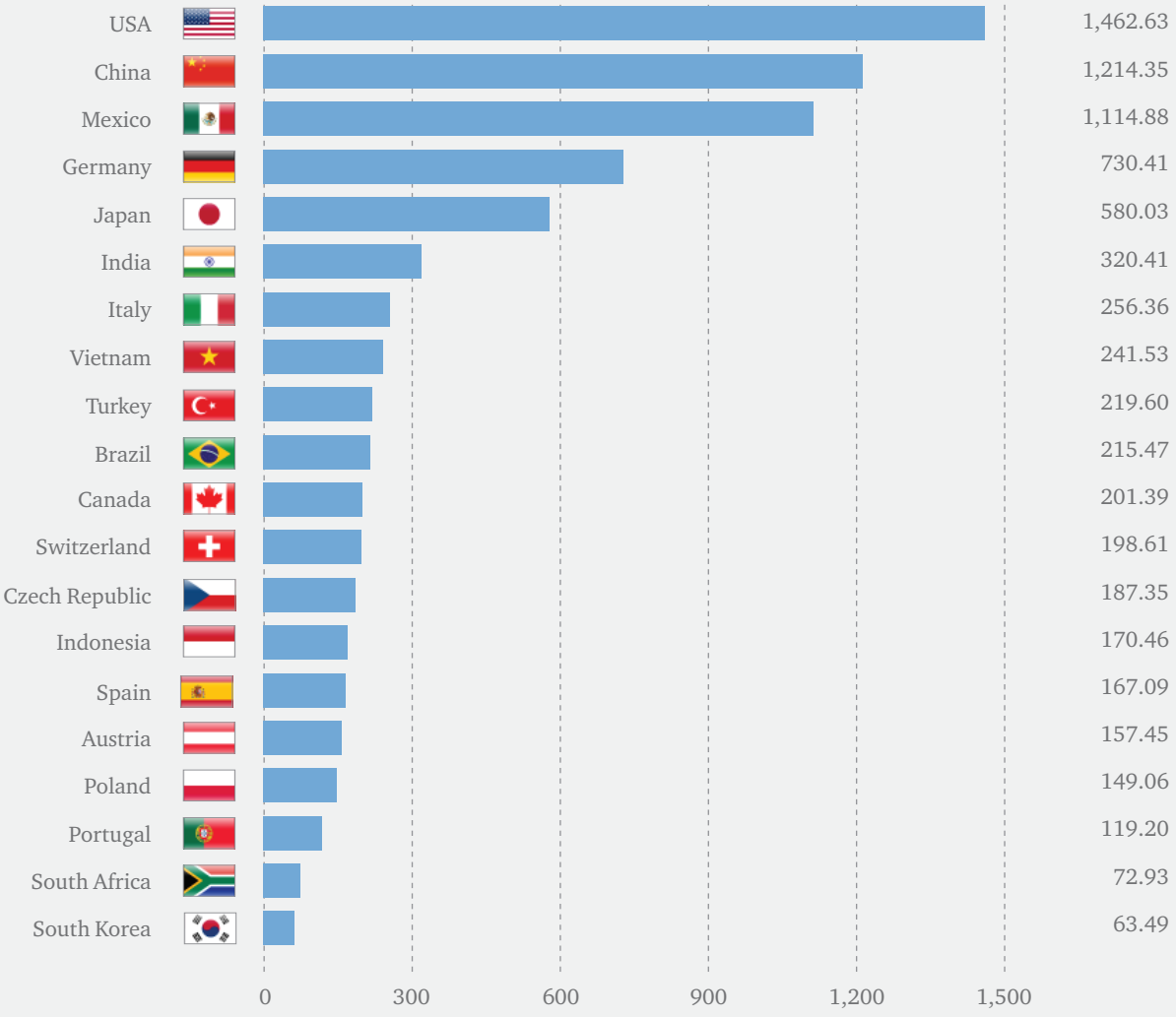


The tool manufacturing and the tools

Tool imports – injection molds [2013]

Value of imports of injection molds.

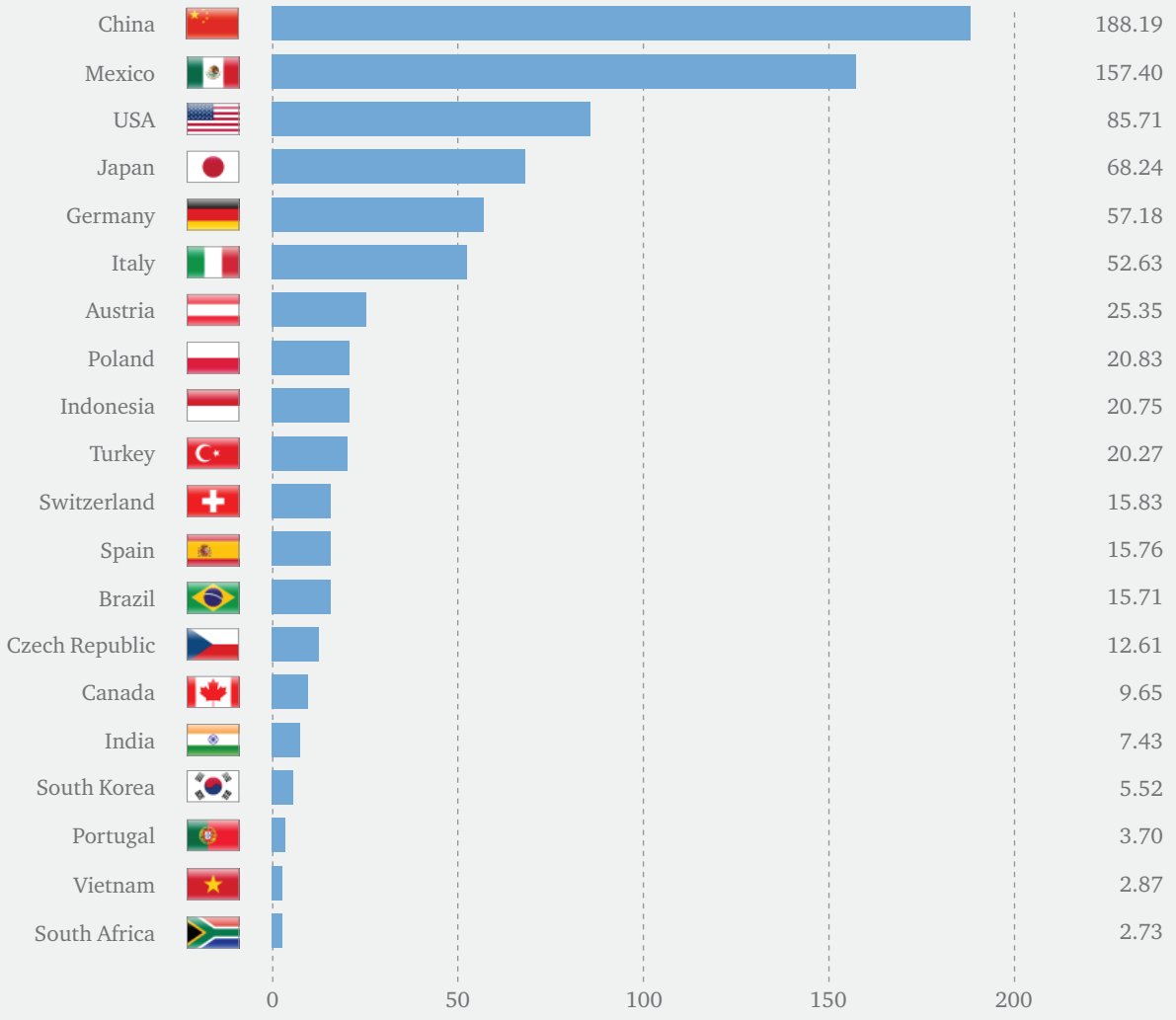
[m €]



The tool manufacturing and the tools

Tool imports – die casting molds [2013]

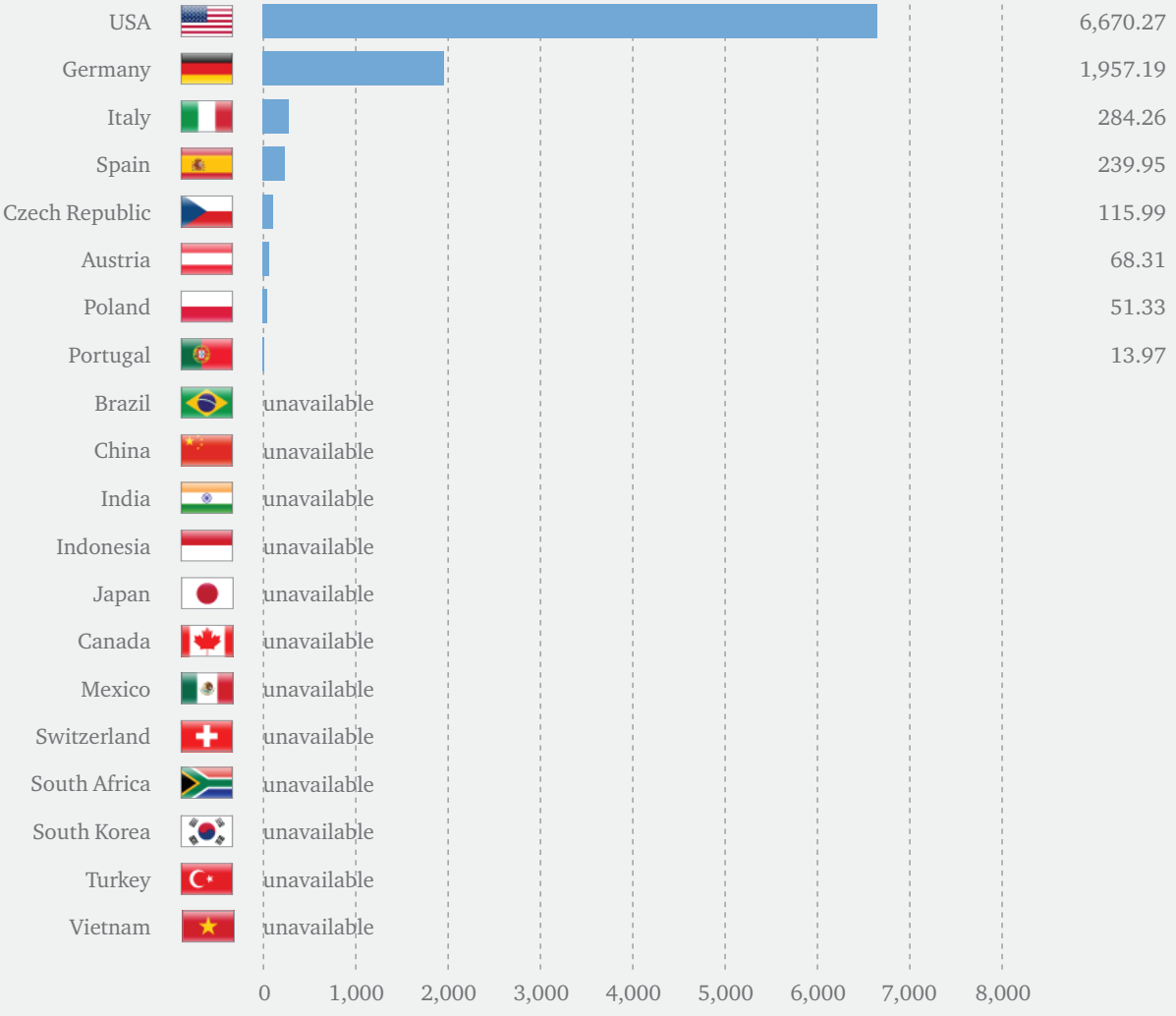
Value of imports of die casting molds. [m €]



The tool manufacturing and the tools

Tool production - solid and sheet metal forming tools [2013]

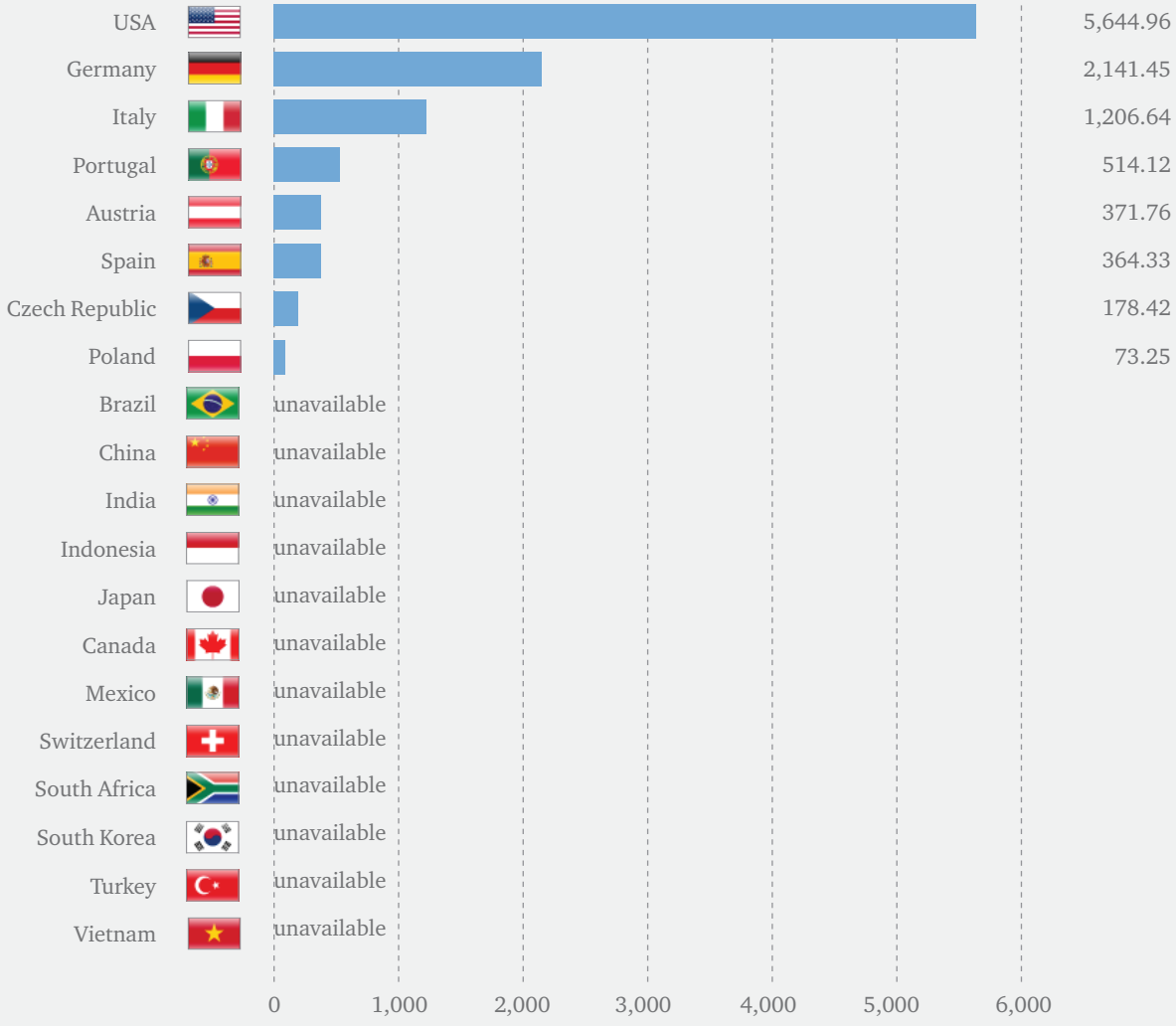
Value of total production of solid and sheet metal forming tools. [m €]



The tool manufacturing and the tools

Tool production - injection molds [2013]

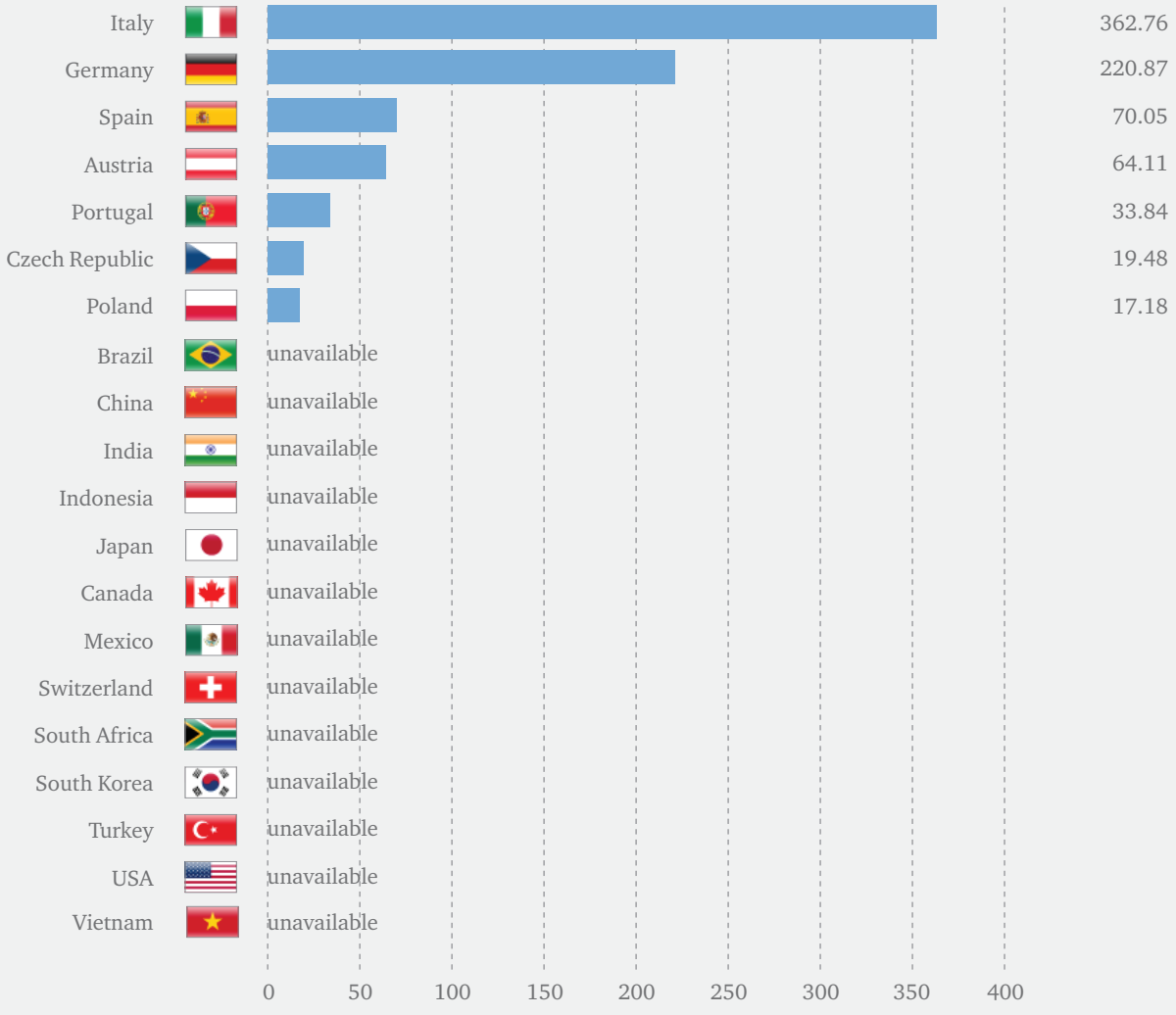
Value of total production of injection molds. [m €]



The tool manufacturing and the tools

Tool production - die casting molds [2013]

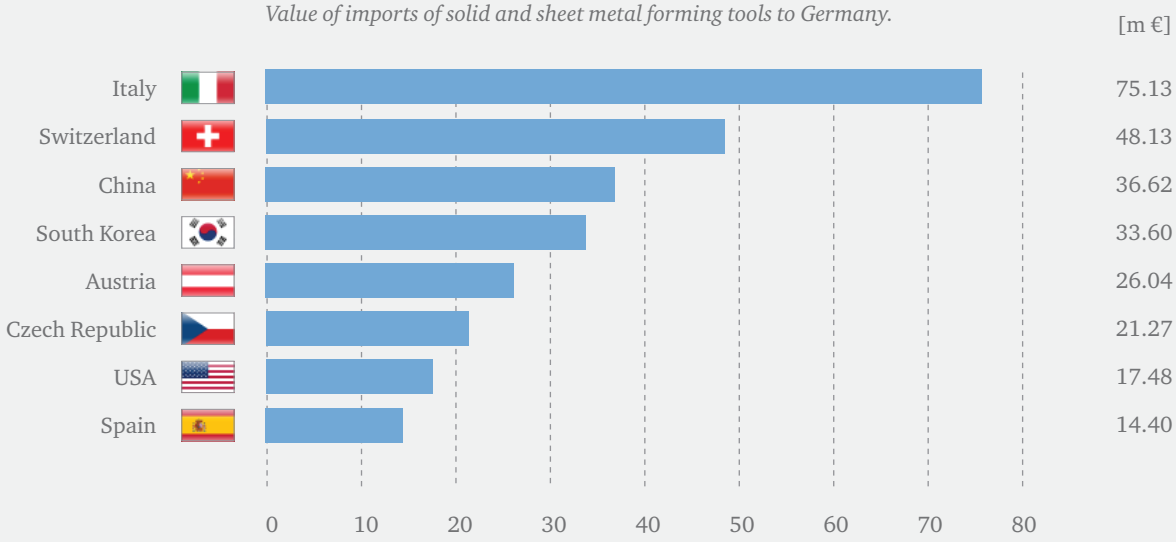
Value of total production of die casting molds. [m €]



The tool manufacturing and the tools

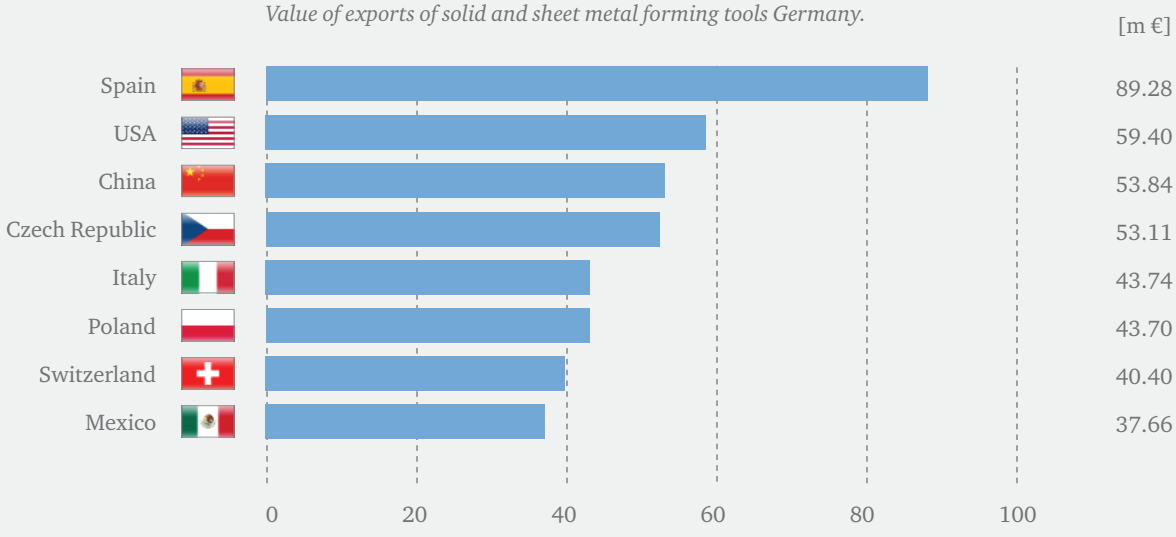
Tool imports to Germany – solid and sheet metal forming tools [2014]

Value of imports of solid and sheet metal forming tools to Germany.



Tool exports from Germany – solid and sheet metal forming tools [2014]

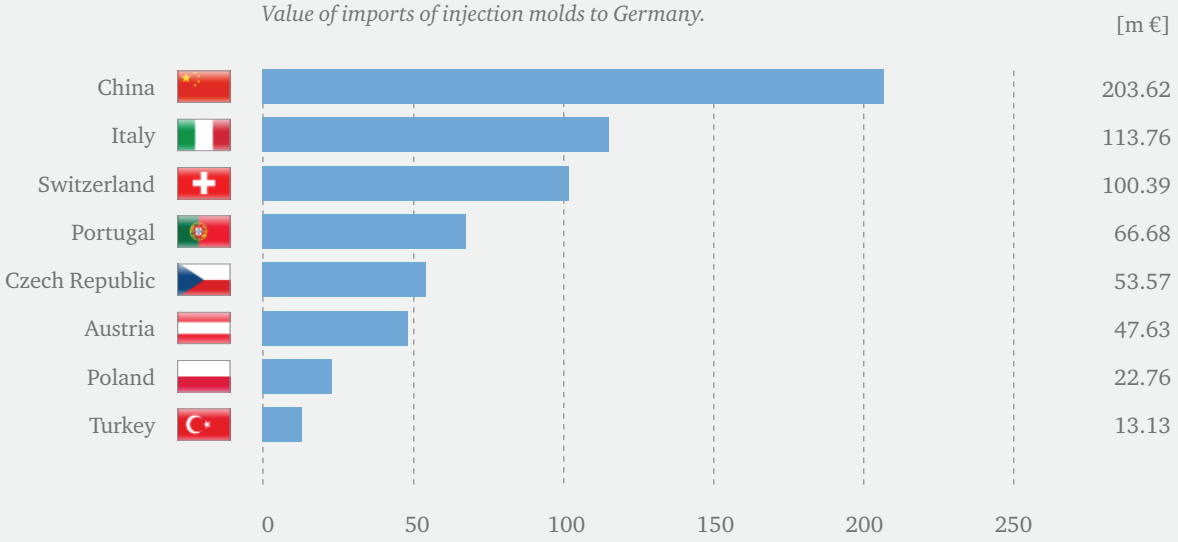
Value of exports of solid and sheet metal forming tools Germany.



The tool manufacturing and the tools

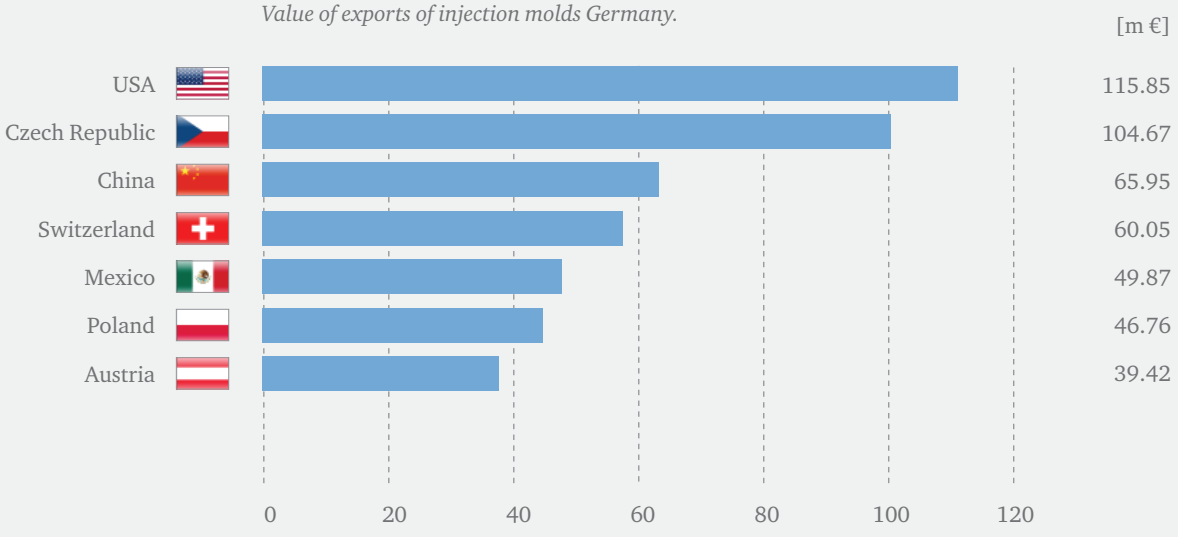
Tool imports to Germany – injection molds [2014]

Value of imports of injection molds to Germany.



Tool exports from Germany – injection molds [2014]

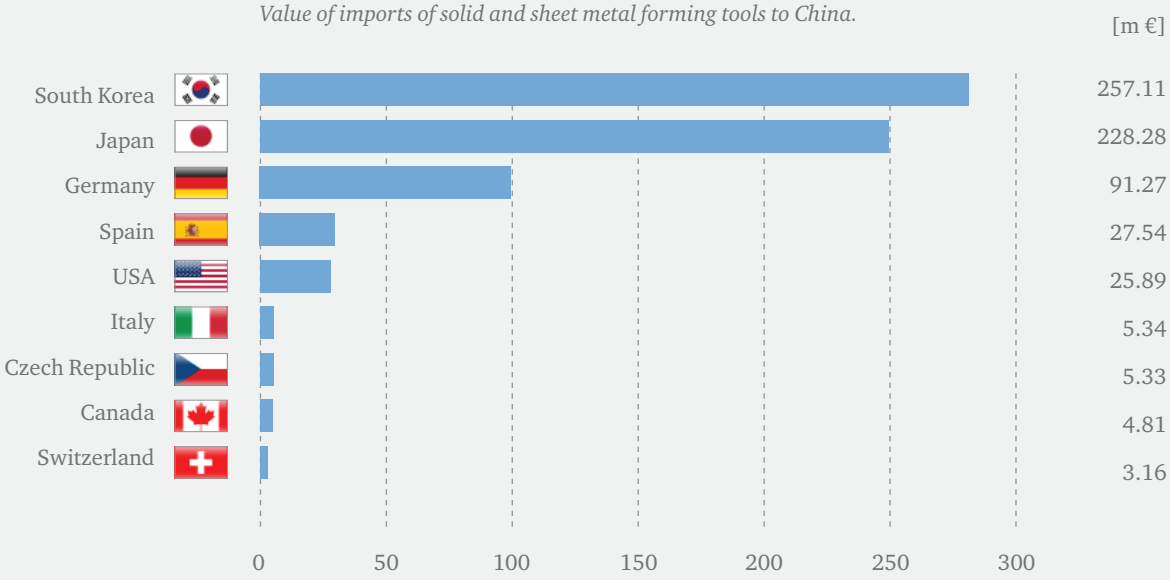
Value of exports of injection molds Germany.



The tool manufacturing and the tools

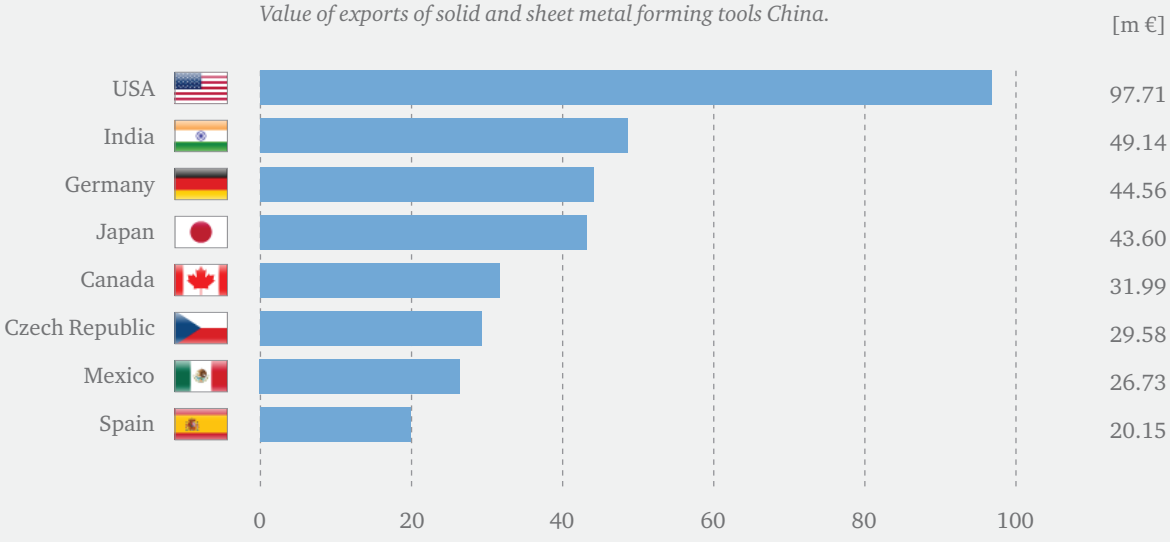
Tool imports to China – solid and sheet metal forming tools [2014]

Value of imports of solid and sheet metal forming tools to China.



Tool exports from China – solid and sheet metal forming tools [2014]

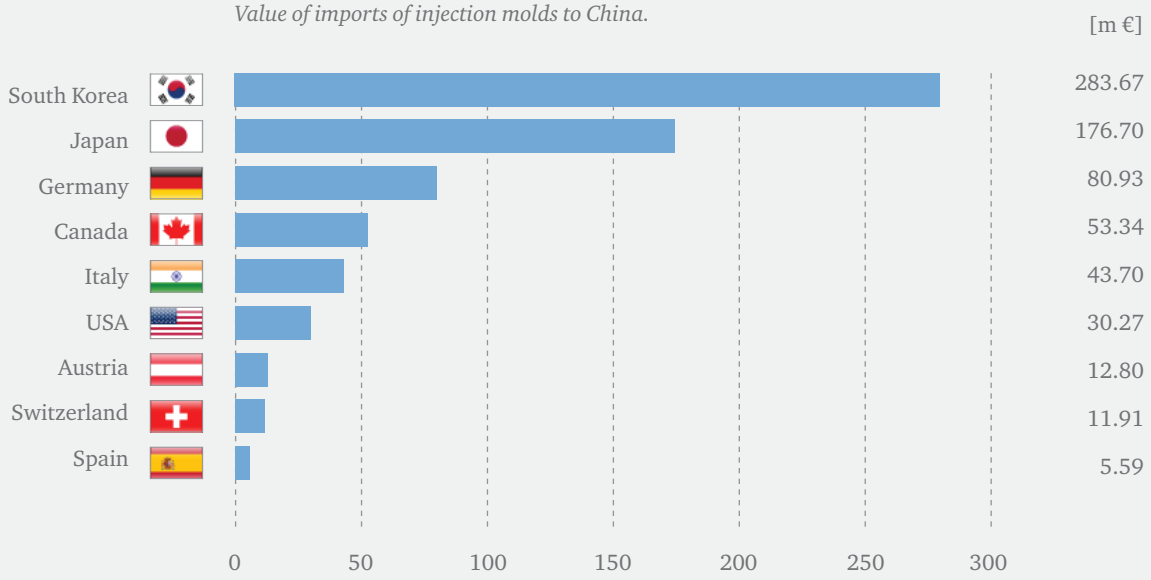
Value of exports of solid and sheet metal forming tools China.



The tool manufacturing and the tools

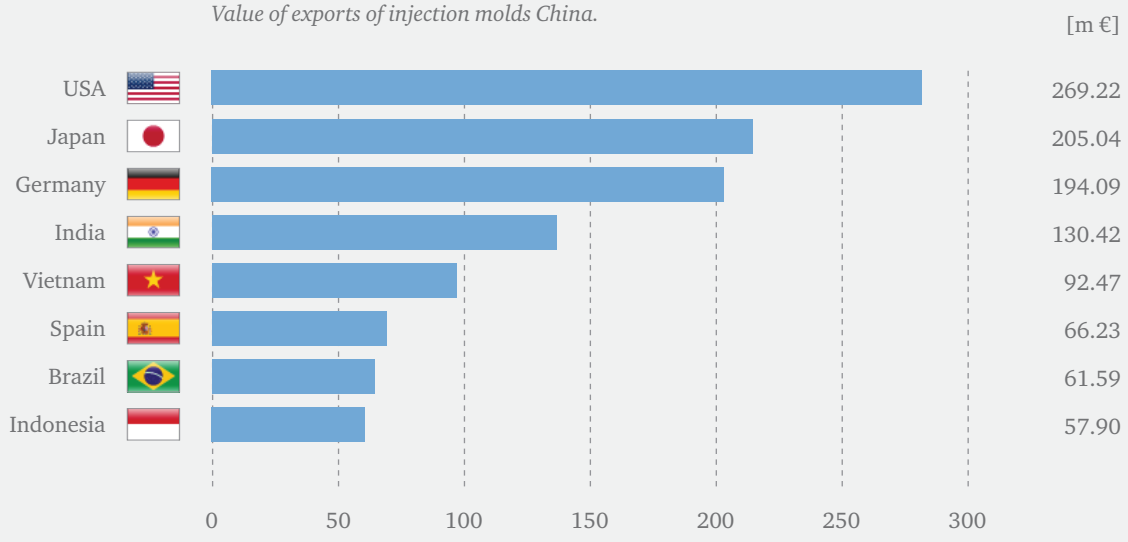
Tool imports to China – injection molds [2014]

Value of imports of injection molds to China.



Tool exports from China – injection molds [2014]

Value of exports of injection molds China.



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Study methods

For a better interpretation of the tooling portfolio and the position of the individual markets, the methodology for the creation of the WOT-Radar is briefly explained.
The dimensions, market size and tooling competence, build the two axes of the WOT-Radar, while the future development potential of the markets is added as a third dimension.
In each dimension, individual key figures are presented in the categories „The country and its people", „The economy and the industry" and „The tool manufacturing and the tools". The actual values are not easily comparable and this calls for a scoring system. Within this scoring system, the scale is divided into equally sized intervals and every market is evaluated on a scale of 1 to 10, with 1 being the lowest and 10 being the highest possible score. To determine the final value of a market in the dimensions market size and tooling competence, a mean values of all available data in each dimension is calculated. The dimension future development potential is derived from key figures measured over a certain time span based on the afore mentioned scoring system. Key figures given in USD are converted to Euros using an exchange rate of €1 = US$ 0.89. Solid and sheet metal tools, injection molds and die casting molds build up the main tooling categories. Other types of tools are not included in the evaluation.

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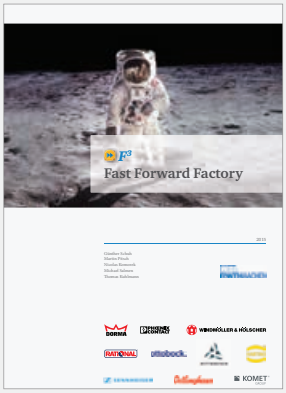
Our studies

World of Tooling
2015

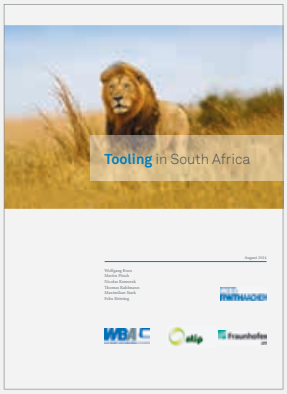
Getaktete Fertigung im Werkzeugbau
2015



F³ Fast Forward Factory
2015

Tooling in China
2015

Erfolgreich Planen im Werkzeugbau
2015



Tooling in South Africa
2014