



Tooling in Turkey

2016

Dr. Wolfgang Boos
Dr. Michael Salmen
Thomas Kuhlmann
Felix Rittstiegl
Johan de Lange





**WBA
WERKZEUGBAU
AKADEMIE**

WBA Aachener Werkzeugbau Akademie

The WBA Aachener Werkzeugbau Akademie develops industry-specific solutions for the sustainable competitiveness of the tool making industry in a network of leading companies. Its activities focus on industrial consulting, further education, industry solution as well as research and development. Its own demonstration tool shop enables the WBA to test innovative approaches in the laboratory and quickly make them accessible for its partner companies. Key issues are further addressed in the current studies. These provide information about trends and developments of the market and competition.



Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University

Across the world, the Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University with its 900 employees stands for successful and forward-thinking research and innovation in the area of production engineering. Active in four different fields, research activities not only relate to fundamental theories and findings, but also to the application of findings in an industrial context. Furthermore, practical solutions are developed to optimize production. The WZL covers all sub disciplines of Production Technology with its four chairs of Production Engineering, Machine Tools, Metrology and Quality as well as Manufacturing Technology.

Imprint

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Authors:
Dr. Wolfgang Boos, Dr. Michael Salmen, Thomas Kuhlmann, Felix Rittstieg, Johan de Lange

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WBA Aachener Werkzeugbau Akademie GmbH
Karl-Friedrich-Straße 60, D-52072 Aachen
www.werkzeugbau-akademie.de

Laboratory for Machine Tools and Production Engineering (WZL)
of RWTH Aachen University
Steinbachstraße 19, D-52074 Aachen
www.wzl.rwth-aachen.de

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Spotlight

The Turkish economy has grown continuously in the past decades. The growth is mainly driven by the manufacturing industry, which profits from the geographic proximity to Europe as well as the still low factor costs. This development is accompanied by a continuously increasing demand for more sophisticated tools, which makes Turkey gain in significance for European tool shops as a sales market. At the same time, the number of Turkish tool shops that are capable of manufacturing tools of average complexity in good quality is rising. Thus, Turkey is also coming into the focus of European companies as a pro-

urement market. However, the Turkish tool market is non-transparent and the capabilities as well as the structures of the companies are very heterogeneous. Detailed knowledge of the market with respect to the abilities of potential suppliers or partners in the tool and die making industry is therefore increasingly valuable for successful tool procurement.



~ 40.5%

Rise in the production of machines and
machine components in Turkey from 2010
to 2015

~ 3,000

Number of tool shops in Turkey

~ 3.75 bn. €

Total revenue of the Turkish tool and die making
industry

> 72,000

Number of people employed in the Turkish
tool and die making industry



Executive Summary

Economic growth rates averaging above 5% per year in a decade overshadowed by a worldwide finance and debt crisis – the Turkish economy is a worldwide exception and has proven itself stable in the past years. However, there is a large disparity between the economically underdeveloped rural regions in eastern and southeastern Turkey and the economically prospering metropolitan areas in western Turkey. Currently, the large growth rate of the economy is being threatened by several factors. Apart from the large trade deficit and the high inflation rate, business risks result from the polarization of domestic politics, political unrest in the country itself and in neighboring nations as well as a rising wage level. On the other hand, there are just as many arguments for economic cooperation with Turkey. Cheap work conditions and a growing number of highly educated skilled workers are the foundation of the Turkish economy. Local production of high-quality goods, the presence of international OEMs and tier 1 suppliers as well as strong growth increase the attractivity of the Turkish market. A young consumer population shapes the dynamic domestic market, while the government creates attractive conditions for foreign investors.

As a result of the developing manufacturing industry, the local tool and die making industry has developed more and more in the past years. German manufacturing companies can profit from this in purchasing and German tool shops can contract value-creation tasks or entire tools. A successful cooperation with the correct company according to own requirements requires detailed market knowledge of the Turkish tool market. In numerous industry projects, the WBA Aachener Werkzeugbau Akademie and the Laboratory for Machine Tools and Production Engineering WZL of RWTH Aachen University have developed an approach for the analysis of tool markets as well as the systematic identification of capable tool shops. A substantial part of the system is the on-site audit of companies with high potential, which gives a detailed impression of key figures. The

detailed analysis of the Turkish tool and die making industry allows for a reliable evaluation of the capabilities of Turkish tool shops. The tool sector in Turkey is positioned very heterogeneously regarding their capabilities. There exist some tool shops that have reached a good level with respect to their processes and resources and therefore can manufacture tools of medium complexity in good quality. Beyond that, there are a number of companies that operate on a very low level with respect to technology and organization and mainly service the local market. Often there is great interest from the Turkish companies to build up business relationships with preferably western European partners. Despite the multitude of Turkish tool shops as well as their general interest in international cooperation, the search for a suitable partner for long-term collaboration poses a large challenge. In particular, foreign companies are missing an overview of the capabilities of potential cooperation partners. Furthermore, different German tool shops relate that successful long-term cooperation requires regular visits of the Turkish companies by its own employees. This approach is necessary to guarantee frictionless project flow as well as the receipt of tools of the desired quality on time.



5%

Average yearly growth rate of the Turkish economy from 2002 to 2014



Study Design

The present study is based on the results of an analysis by the WBA Aachener Werkzeugbau Akademie that was carried out in 2016 with support from the Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University. The focus of the study is the analysis of the capabilities of the Turkish tool market as well as its development potential. For this purpose, 82 internal and external tool shops in Turkey, mainly supplying the automobile, household appliances and electronics industries, were evaluated in detail.

The study describes the capabilities of Turkish tool shops with respect to their existing competences on the criteria of service spectrum, process, resources as well as industrial environment. The dimension “service” spectrum evaluates the complexity of the offered tools. With the dimension “process”, all customer-relevant aspects of the manufactured goods and services, for e.g. efficiency and reliability, are considered. Next to the evaluation of the tool shop itself, the supplier structure is also examined as it largely determines the flexibility of the tool shops and affects both the tool availability and tool costs. The dimension “resources” includes the analysis and evaluation of the existing manufacturing means as well as the level of qualification of the employees of the tool shop. In addition to these three dimensions, the industrial environment of the tool shop is characterized. The study presents the results of extensive research and company surveys. Further, impressions left on company visitors were considered, which validated the collected data. The detailed examination of the Turkish tool and die making industry allows for a reliable evaluation of the performance of Turkish tool shops.

A total of 1,073 tool shops were identified within the scope of the study. For 82 of these companies, an extensive survey was filled out, so that these companies could be evaluated in detail by means of a comparison of key figures. This comparison is with respect to the dimensions of service spectrum, process and resources. The 9 tool shops that achieved the best results in the comparison of key figures were subsequently visited in Turkey by WBA experts. The on-site audit also considered organizational and technological aspects. For the investigation of the supplier structure for the Turkish tool and die making industry, 70 suppliers were identified in total, of which 17 could be evaluated in detail.

The approach taken for conducting this study is based on the approach established in various international projects for the evaluation of tool and die markets by the WBA and WZL. Thereby, in particular, the experience gained for the evaluation of the performance of tool shops could be used. Together with its research partner, the Fraunhofer Institute for Production Technology, the WZL maintains the worldwide largest database of tool shops with over 1000 data sets from over 10 countries, none of which are older than 5 years.



1,073

Number of tool shops identified within the scope of the study



30.1

Average age of the Turkish population in years

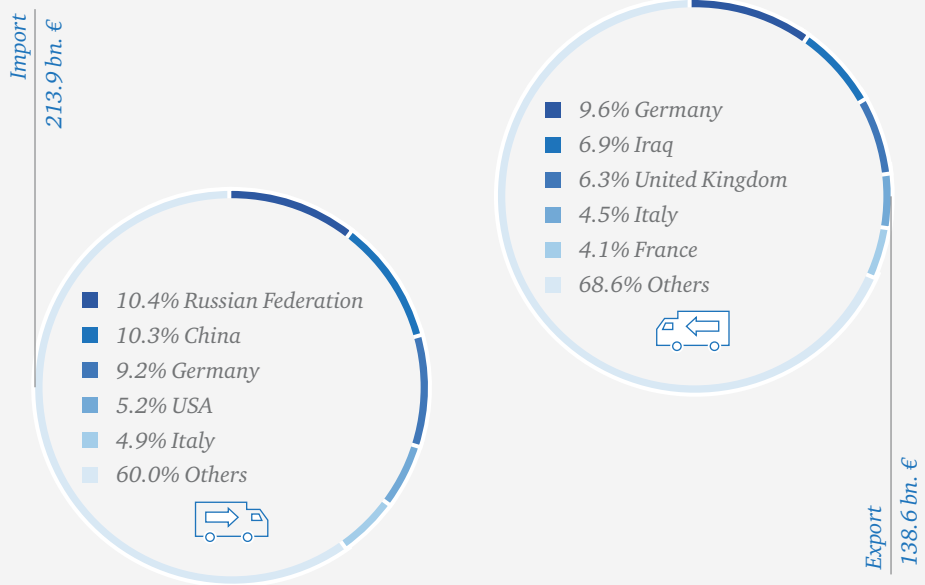
Industrial Development

Turkey is approximately 2.3 times larger than Germany and has about the same population size with 79.4 million. 73.4% of citizens live in urban agglomerations such as Istanbul, Ankara, Izmir and Bursa. The annual population growth rate in Turkey is 1.26% and thus is significantly higher than the German figure of 0.2%. The average age in Turkey is 30.1 years (average German age: 44.2 years). The number of school students is about 50% higher than in Germany. Despite the good economic conditions, the unemployment rate in Turkey is at a high level of 10.4%, with a youth unemployment rate of 19%.

ally. At the same time, Turkey has one of the largest trade deficits as a percentage of GDP. Measured by exports, Germany is the most important trade partner, followed by Iraq and the United Kingdom. The main import countries are Russia and China, closely followed by Germany. The economic performance of Turkey is pronouncedly different in the respective regions. The western regions, particularly the cities Istanbul, Bursa and Izmir, feature significantly further developed economy and industry in comparison to the eastern and southeastern regions of Turkey.

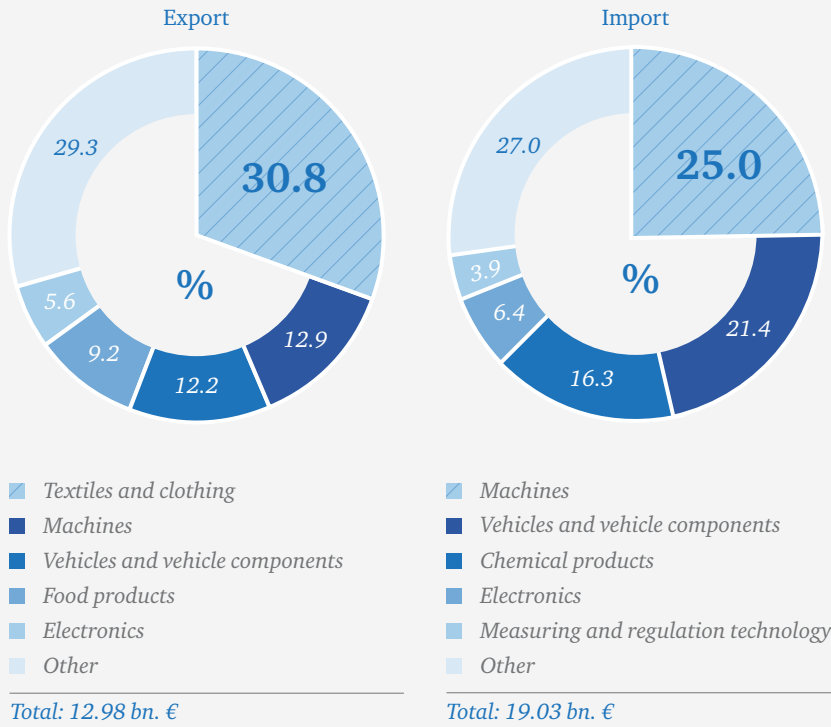
Modern Turkey looks back on a ninety-year phase of parliamentarianism, interrupted by military coups and times of crisis. In the past ten years, Turkey has developed into a prospering economy. The gross domestic product (GDP) of Turkey is ranked 18th internation-

Trade relationships 2015





International trade relations of Turkey and Germany 2015

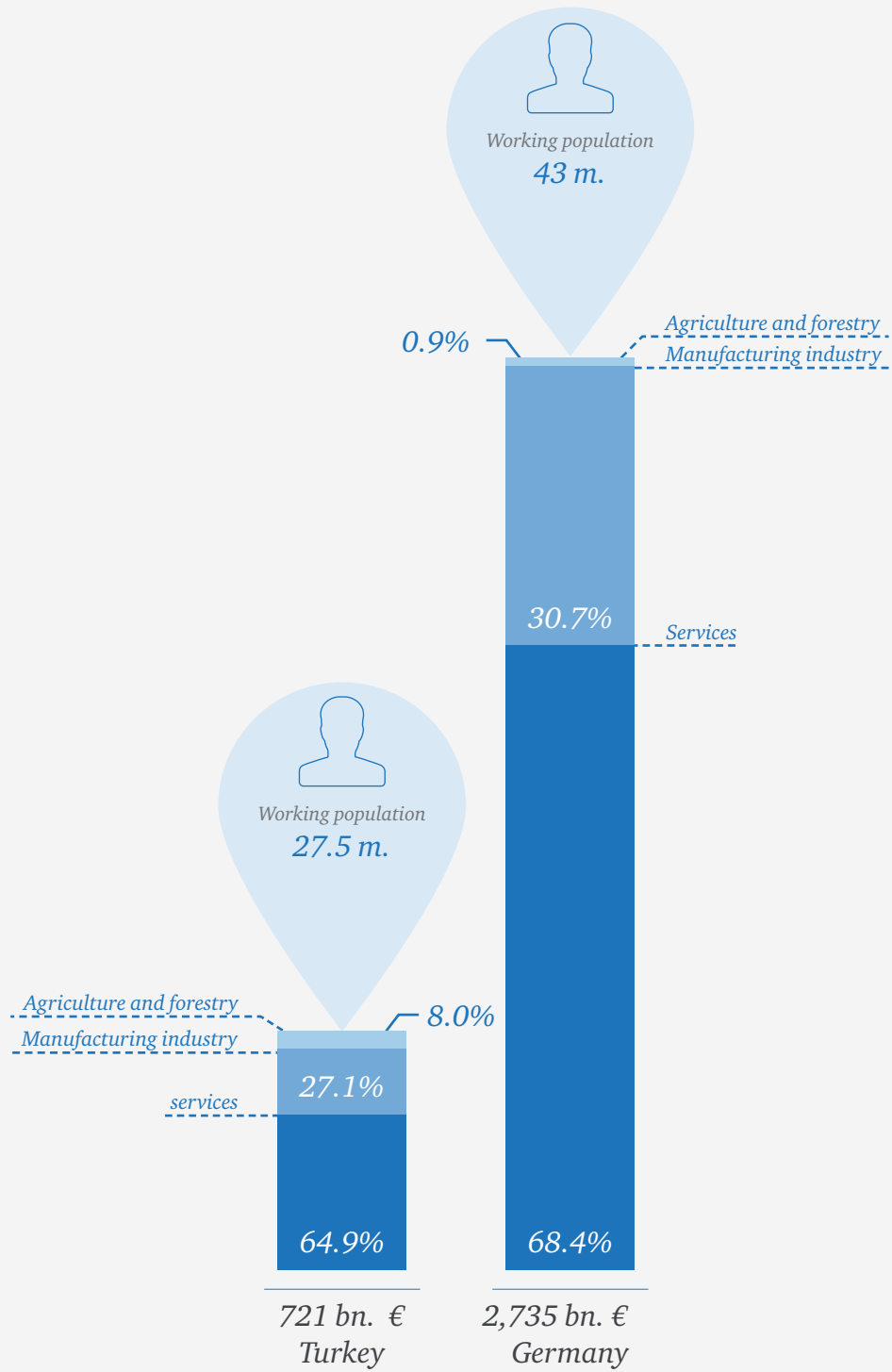


An economic crisis in 2000 and 2001 could be overcome by lifting customs duties as well as introducing political, business-friendly reforms, that specifically promoted foreign investment. The following economic growth led to a tripling of the Turkish GDP per capita from 2002 to 2012. In this timeframe and continuing to 2014, the average economic growth was 5% per year. In 2014, the GDP growth rate fell to 2.9% before recovering to 4% in the following year. However, the economic growth is confronted with a high inflation rate, which was 7.5% in 2015. Increasingly violent conflicts, debates about freedom of expression, the absent protection of minorities as well as the current involvement of Turkey in the refugee crisis lead to an increasing uncertainty amongst foreign business partners of Turkey. This uncertainty has intensified after the attempted coup by the military that failed in July 2016. This has led

to an involvement of the acting government in all parts of society, which has unforeseeable consequences for the future of the Turkish economy. However, similar events in the recent history of Turkey would indicate that the long-term effect on the economic development of Turkey will be manageable due to business-friendly politics. Nevertheless, negative effects can be observed at the moment that can be traced back to reduced investments and capital flow.



Gross value added Turkey and Germany 2015



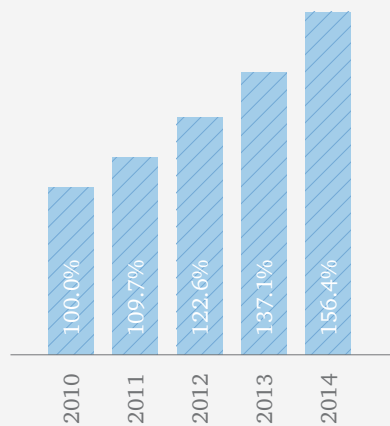


In comparison to Germany, the manufacturing industry in Turkey has a similar share of the gross value added. However, the proportion of people working in the manufacturing industry is substantially higher. Due to an increase of the minimum wage by 30% in Turkey in 2016, many companies are faced with a rise in personnel expenses. Compared to the average wage, the minimum wage is already among the highest of all industrialized nations. Nevertheless, studies show that more than 50% of Turkish workers receive less than minimum wage and thus the companies are not complying with work laws that are in place.

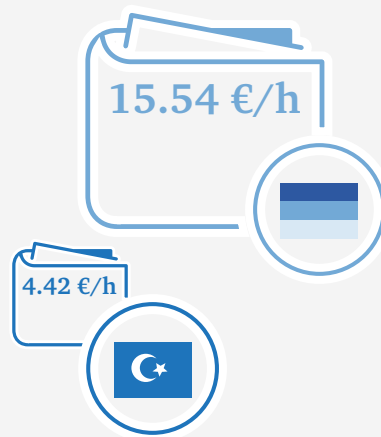
Indicative for the international trade relationships of Turkey is the geographic proximity to Europe and Asia. This makes the country an attractive location for European manufacturing companies that want access to central Asia and the Middle East as well as

relatively low factor costs. In 2015, the total foreign direct investment in Turkey was € 161.5 bn, which takes the 31st position in the worldwide ranking. A robust and sustained export development defines Turkish trade and is driven by the success of promising industries such as the automobile, household appliances and electronics industries. The companies belonging to these industries are especially interested in business relationships with western European partners. In order to survive the international competition, companies need to differentiate themselves from Asian competitors through product quality as well as professional customer communication.

Development of wage level in Turkey in the manufacturing industry

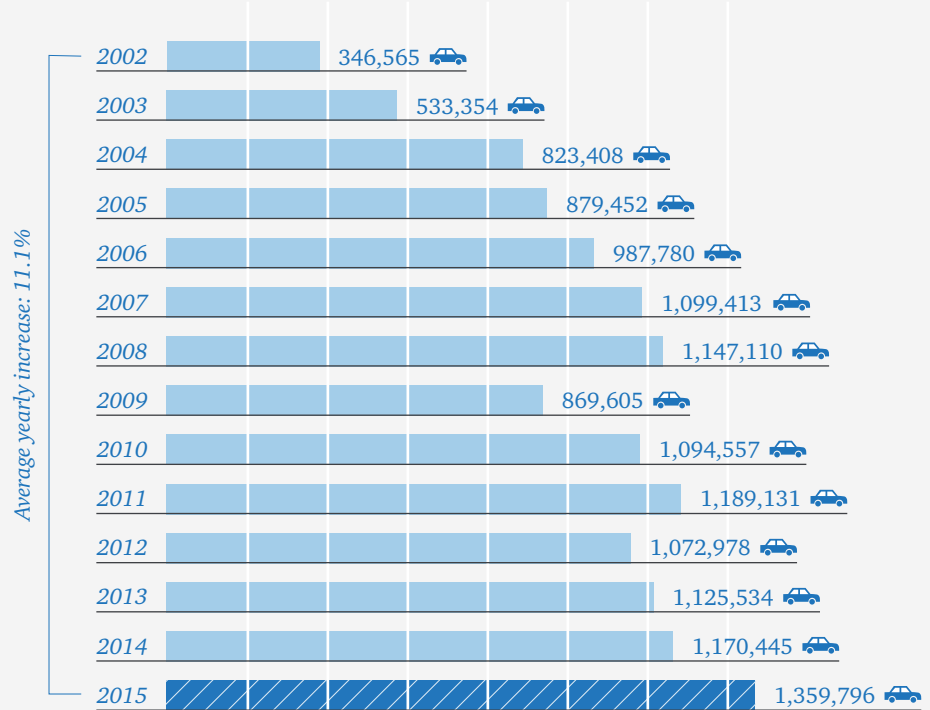


Average wage per hour in Germany and Turkey





Number of commercial and private vehicles produced in Turkey



Significant export drivers of Turkey are the automobile, household appliances and electronics industries. In particular, the automobile sector, which includes commercial and private vehicles, is gaining in importance in Turkey and has established itself internationally. Apart from the advantageous geographic location and an increasingly affluent society willing to consume, national subsidies benefit the industry. Measured by the number of automobiles produced annually, Turkey currently is ranked 15th worldwide, with an average growth rate of 11% since 2001. A similar development has taken place in household appliances and electronics industries. Next to domestic manufacturers such as Arcelik, Vestel and Beko, numerous

leading companies from this sector are now represented in Turkey by now. As a result, the entire industry sector has developed a considerable export surplus. In total, the value of electronics manufactured in Turkey annually is approximately € 23.7 bn, which is 19th worldwide, and has a growth rate of about 4%. The large trade deficit overall can be led back to the import of energy resources as well as cost-intensive semi-finished products that are used or rather processed in Turkey.

Automobile industry in Turkey (excerpt)

Bursa



FIAT KARSAN GULERYUZ RENAULT

Eskisehir



Ford

Kocaeli



ISUZU HYUNDAI Ford HONDA

Konoya



TUMOSAN

Izmir



BMC

Sakarya




Otokar TOYOTA IVECO

Ankara



MAN

Aksaray



Mercedes-Benz

Adana



MITSUBISHI MOTORS

Ankara



arçelik

Manisa



ARISTON VESTEL INDESIT

Düzce



ferroli

Eskisehir



arçelik

Kayseri



KUMTEL

Adana



MITSUBISHI MOTORS

Tekirdag

B/S/H/

Istanbul



PHILIPS beko GRUNDIG MITSUBISHI MOTORS

Kocaeli



Carrier arçelik

Sakarya



DAIKIN

Bilecik



DemirDöküm Vaillant

Household appliances and electronics industry in Turkey (excerpt)



Structure of the Tool and Die Making Industry

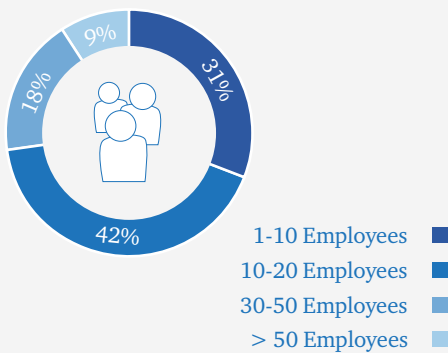


The Turkish tool and die making industry comprises of about 3000 companies, which can mainly be assigned to injection mold making. The largest share of tool shops is located in the regions around Istanbul, Bursa and Ismir. Measured by revenue and employee number, Turkish tool shops are generally smaller than their German competitors.

goes large fluctuations as they often depend on the model cycle of these large customers.

For many German customers, the Turkish tool and die making industry has already developed into an interesting partner. Especially in the area of simple tools and as an extended workbench, Turkish tool shops have been able to establish themselves as strategic partners. So far German manufacturers barely source premium tools from Turkey, although a positive trend can be observed. In existing cooperations, the German side often values the reliability and flexibility of their Turkish partner. Further, communication often is easy as most companies employ English or even German-speaking workers. Nevertheless, experts of the Turkish tool and die making industry find that the local level is not adequate for complex tool projects without intensive supervision. The reason which is always cited is the insufficient education and training level, which is seen in engineering and design as well as in other value-creating areas. While Turkey does meet the fundamental requirements for properly training specialists, the lack of tool-specific specialists limits the development of tool shops towards international competitiveness. Furthermore, inadequate machinery prevents the manufacture of complex and highly precise parts. Thus, Turkey continues to rely in imports in the more expensive price range in order to supply local production plants with the necessary tools.

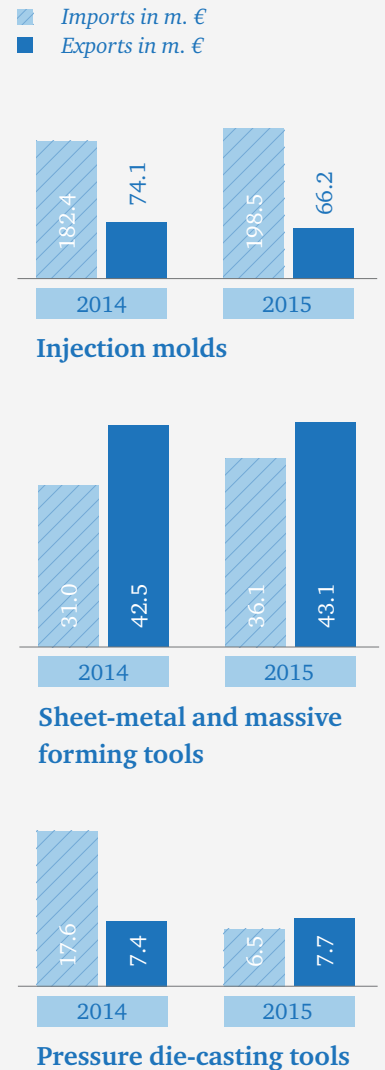
Employee structure tool and die making industry Turkey



Much like the overall Turkish economy, the tool and die making industry has shown constant growth for years. Between 2007 and 2011 the manufacture of tools in Turkey has approximately tripled, followed by a constant annual growth of about 10% since 2011. Since 2010 both the tool imports and exports have doubled. Exports in the area of sheet-metal and massive forming tools as well as imports of pressure die-casting tools have particularly grown. Positive, but moderate growth is expected in the future.

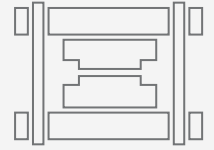
The majority of Turkish tool shops are companies that serve the local market. However, several larger tool shops have specialized themselves on international customers in and outside of Turkey. These customers include large international companies that are primarily in the automobile, household appliances and electronics industries. Thus, the order position of Turkish tool shops under-

Product portfolio tool and die making industry Turkey





Service Spectrum



The Turkish tool and die making industry is mainly angled at the large international companies of the automobile, household appliances and electronics industries located in Turkey. This illustrates the overview of sectors in which Turkish tool shops are active. With 87%, the majority of all tool shops manufacture tools for the automobile industry.

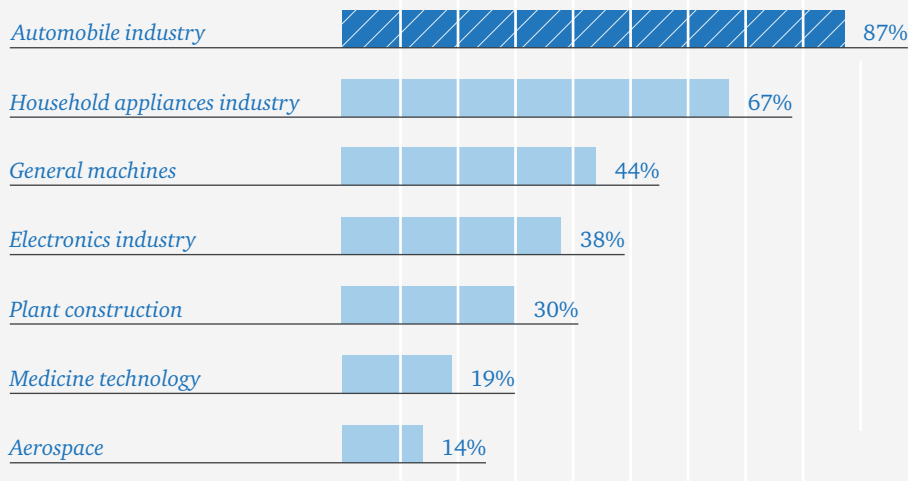
Individual tool shops supply international customers. These companies are usually large and highly specialized and are capable of manufacturing medium-complex tools with high quality. When looking at the country of origin of customers, the domestic market makes up the lion's share of revenue with 80%. The second-strongest market is



87%

Share of surveyed tool shops that supply the automobile industry

Industry sector distribution tool shops Turkey



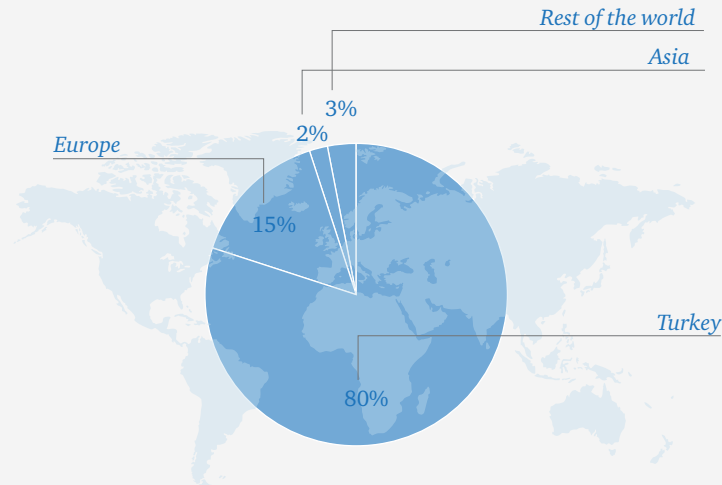
[Multiple responses possible]

67% also supply the household appliances industry, 44% general machines and 38% the electronics industry. Further customers come from plant construction (30%), medicine technology (19%) as well as aerospace (14%).

Europe with 15%, followed by Asia with 2%. The remaining 3% divide themselves among the rest of the world. However, it should be noted that often even for international customers the tools are destined for production in Turkey.



Revenue distribution of the Turkish tool and die making industry according to customer region



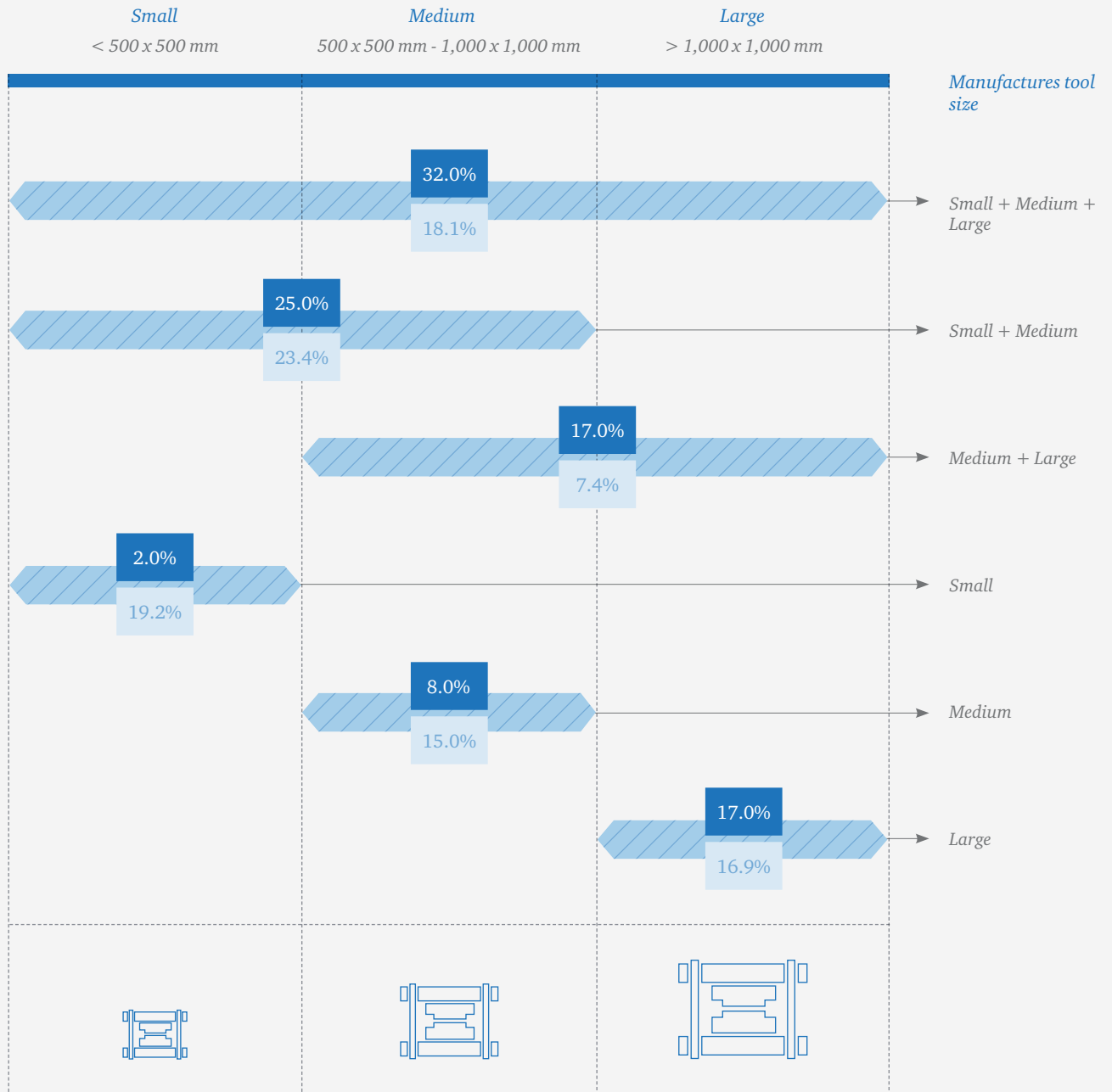
With regard to the tool focus, injection mold making dominates in Turkey with 60%. Punching tools are made by 45% and sheet-metal forming tools by 44% of tool shops. By contrast, the manufacture of pressure die-casting tools (17%) and massive-forming tools (8%) is not as widespread. There exist Turkish companies that can manufacture relatively elaborate tool concepts. For example, 64% of injection molds are multi-cavity tools. Punching and sheet-metal forming tools are primarily made as progressive tools (45%) and transfer tools (39%). However, the complexity of these tools should be seen as simple to medium in comparison to German standards. Based on the analysis it can be seen that many Turkish tool shops are not focused by size of their tools. Merely 2% of tool shops exclusively manufacture small (smaller than 500 x 500 mm), 8% exclusively manufacture medium-sized (between 500 x 500 mm and 1000 x 1000 mm) and 16% only make large tools (larger than 1000 x 1000 mm). Conversely, 32% manufacture tools of all sizes. Also, 25% of compa-

nies make small and medium-sized tools and 17% manufacture medium-sized and large tools. The comparison with German tool shops demonstrates that they have a strong focus in the offered tool spectrum.

The typical weights of tools made in Turkey also vary significantly between companies. While 30% of companies typically manufacture tools with a weight under one ton, 26% reach tool weights under 10 t, 32% under 20 t and 12% make tools with a weight over 20 t.



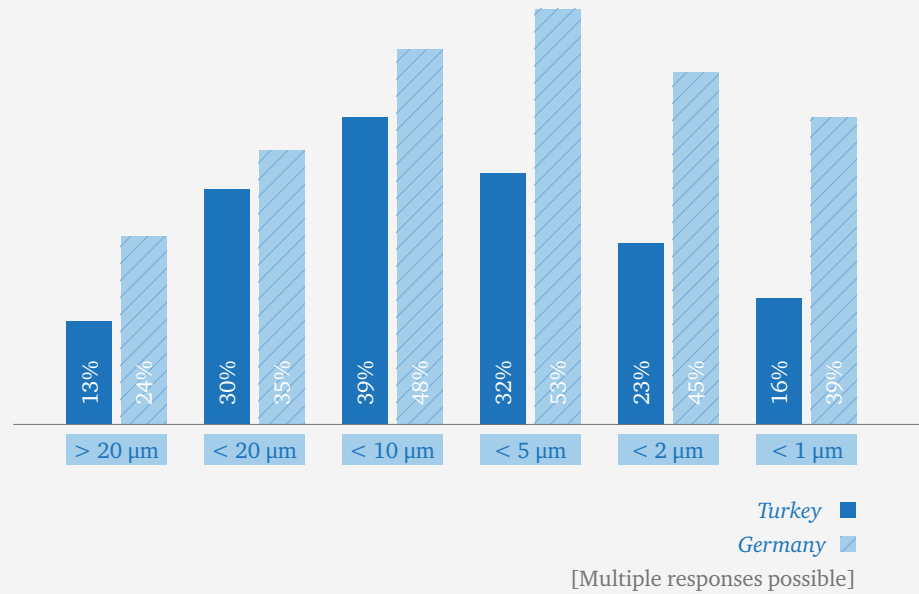
Distribution of companies according to manufactures tool size



■ Turkey
 ■ Germany



Required surface finish



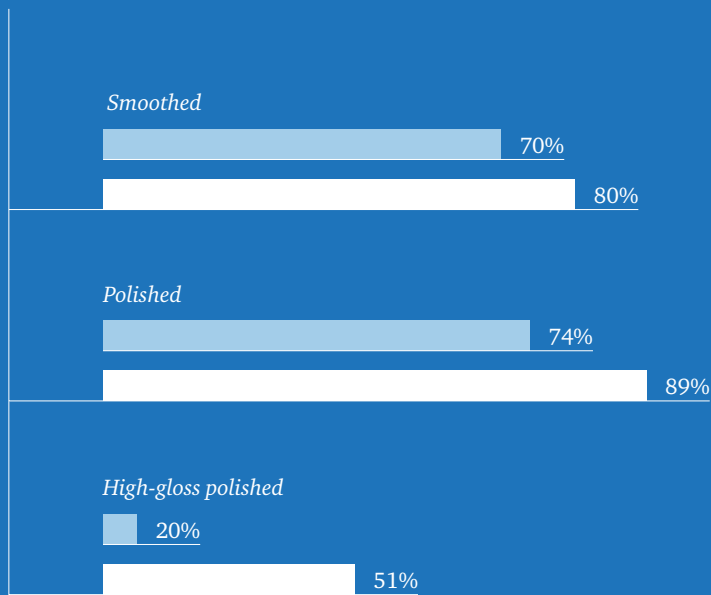
With respect to the achievable quality demands and tolerances, Turkish companies show a lower level than their German counterparts.

While in Turkey the most common requirement for surface finish is < 10 µm, in Germany < 5 µm is most commonly demanded by the customer. For the finish of the tool, it is also not as common to require smoothed (70%), polished (74%) or high-gloss polished (20%) surfaces as in Germany. Tolerances are usually required in the area from < 20 µm in Turkey, whereas in Germany < 10 µm is most common. That only tools with low quality requirements are requested and ordered from Turkish tool shops indicates a lower precision in tool manufacturing. The lower exactness in tool manufacturing can also be seen in the smallest contour radius

that can be milled. While 72% of German tool shops are able to mill radii smaller than 0.5 mm, only 4% of Turkish tool shops can achieve this.

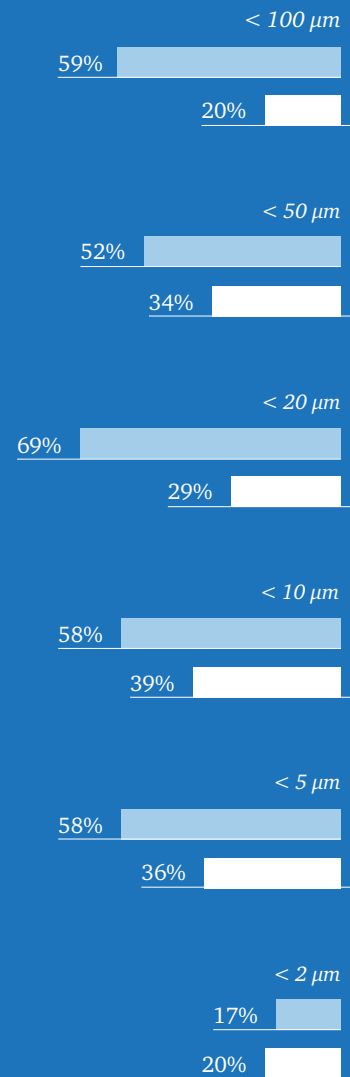
In conclusion, the Turkish tool and die making industry is generally capable of manufacturing tools with good quality. However, tools with especially small required tolerances, intricate geometries as well as surface requirements can only be manufactured in few cases.

Required surface characteristics



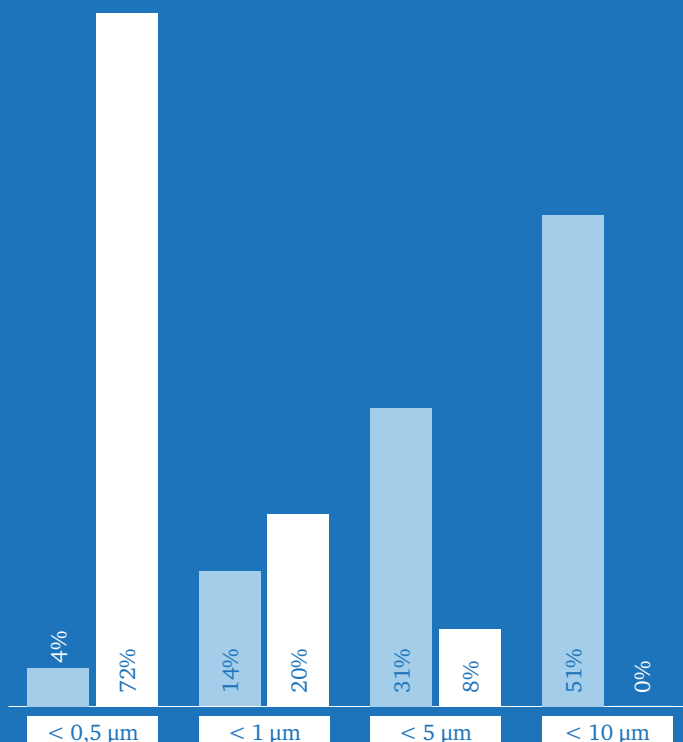
[Multiple responses possible]

Required tolerances



[Multiple responses possible]

Size of the smallest possible contour radius that can be milled



■ Average Turkey
■ Average Germany



Process

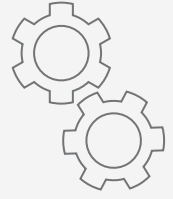
The ability to manufacture tools of good quality as determined in the previous section is also evident in the number of orders placed in Turkey by leading international manufacturing companies. However, most companies that purchase Turkish tools are not German. So far, German companies have been rather reserved in this regard. Apart from the direct assignment of tool projects to Turkish companies, it can be noticed that only parts as well as entire tools are commissioned via multi-leveled assignment chains. The inclusion of Turkish tool shops in international projects and assignment chains is only made possible by the fact that these tool shops generally have professional processes for order processing, in addition to the previously described product quality. In particular, internationally active Turkish companies have their own project management. They are experienced in handling large projects in English with international customers. However, in order to reach a high reliability and on-schedule delivery it is necessary for the ordering company to intensively supervise the tool shops – on site in Turkey if necessary.

The capabilities of tool shops are influenced largely by the quality of their internal processes. Certifications are a suitable instrument to verify process standards. The most common international standard for quality management, the ISO 9001, is also the most widely used one in Turkey, with 55% of Turkish tool shops certified according to it. By comparison, the stricter automobile-manufacturer-specific quality management norm TS 16949 is only certified for 10% of companies. Certifications for other standards are only found sporadically.

Next to common independent international standards for quality management, manufacturing companies often define their own

design standards. Compliance with these design standards is stipulated when awarding contracts for tool projects to suppliers. This approach is also common in Turkey, with the bulk of Turkish tool shops capable of meeting the high standards demanded in the design. For example, 57% of companies state that they work with design standards required by the customer. A large part of these companies work with standards from Ford (53%) and VW (44%). As well, standards from BMW (34%), Daimler (30%), Bosch (28%), GM (24%) and other OEMs find use.

The form of organization of tool production can be differentiated between traditional shop-floor-orientation and modern industrial flow production. While in Germany most companies utilize industrial flow production, in Turkey the traditional approach is almost exclusively implemented. Thus, a large part of tasks is carried out manually and automation solutions are not widespread. Also, modern approaches to shop floor management for the optimization of manufacturing are used in rudimentary forms at best.



57%

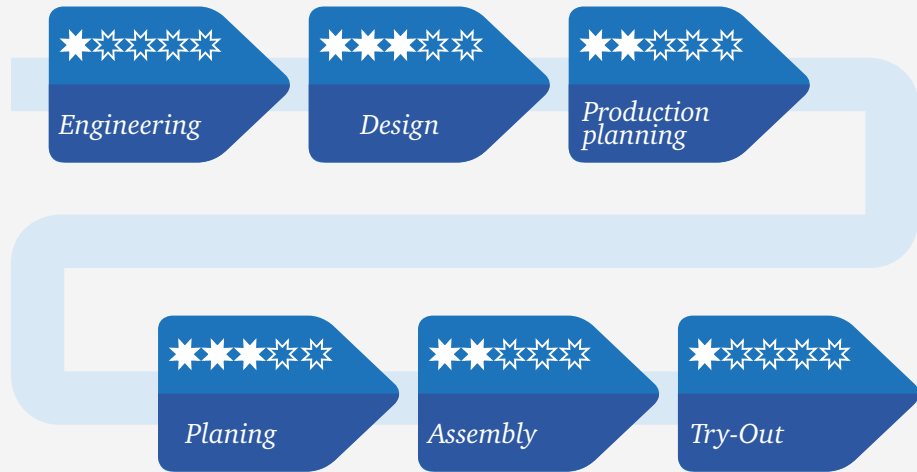
Share of the surveyed companies that work according to the design norms specified by the customer



The following graphic shows a summary of a qualitative evaluation of the competences of Turkish tool shops, broken down into the main process steps of tool making. This qualitative evaluation was validated by the study's authors through extended visits on-site at the Turkish tool shops as well as via conversation with German tool purchasers. Thus, it can be confirmed that Turkish tool shops possess little competence in the area of engineering, i.e. the method development as well as design and simulation of tools. The competence in design is good, but is below the German average. Also, only common international norms are utilized for construction systems. Unfortunately, a shortage in well-trained tool design engineers hampers the development of competence in design in the medium term. Due to the generally discontinuous CAx chains and insufficiently developed planning systems, the competence in production planning is rudimentary. The competence in mechanical production is well-developed, yet

does not reach the level of German companies. A detailed inspection of the competences in mechanical production can be seen in the chapter about resources. As a relatively high amount of expenses go into assembly and manual labor, the competence in this area is modest. For example, very intensive manual regrinding is common. In general, Turkish tool shops do not have their own try-out machines and therefore exhibit no or little competence in the qualification of tools.

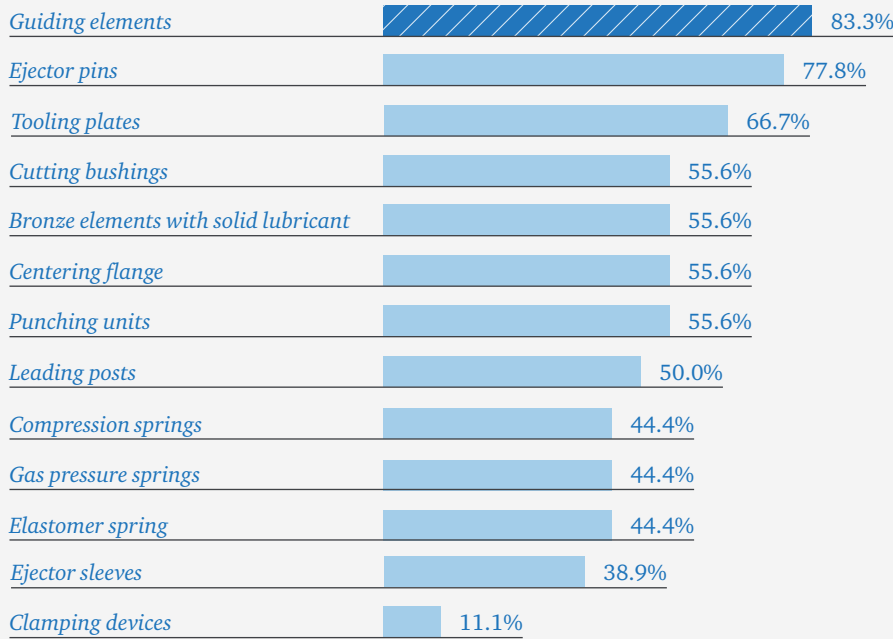
Qualitative competence evaluation of the Turkish tool and die making industry



[Qualitative analysis]



Offered product portfolio of suppliers of standard components



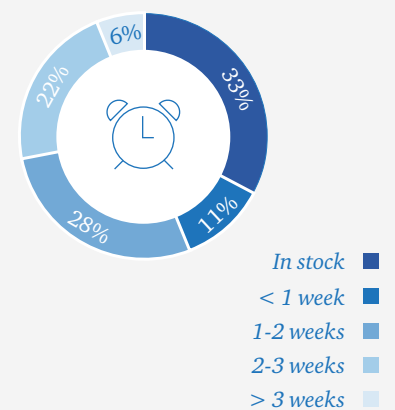
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Furthermore, characteristic for Turkish tool shops is a higher real net output ratio compared to German competitors. Turkish tool shops can fall back on broad base on domestic suppliers as well as popular international suppliers. For example, in the tool making regions of Turkey around Istanbul, Bursa and Izmir, there are a number of local suppliers for external processing as well as for standard components for tool making. Further, products of many leading international suppliers of standard components are sold via local distributors. About two thirds of the surveyed companies source from local suppliers within 50km. One third use local suppliers that are further than 50km away.

In the area of standard components, Turkish tool shops generally only make use of international products for high quality requirements or rather customer specifications and prefer local suppliers otherwise. The product port-

folio of local Turkish manufacturers of standard or catalogue components is very broad and characterized by high availability and very short delivery times. The standard component manufacturers are strongly focused on the Turkish market and have a broad base of main customers due to long-term customer relationships. The driving factor in the competitive environment of standard component manufacturers is the cost of their products, which is usually significantly lower than that of foreign suppliers. The products offered are characterized by a moderate but sufficient quality for the Turkish tool and die making industry.

Average delivery time of a catalogue order in Turkey



NATUREL
KAYSI
40.TL

TOMATO
36.TL

KAYSI
40

VISNE
50.TL

GUAVA
AYVA
50.TL

PLAK
ERIK

PAPAYA
50.

MELON
KAVUN
50.

MELON
LIMON
50.

ORANGE
50.

GINCIR
ZENCEFIL
50.

COCONUT
50.TL

GILEK
STRAWBERRY
50.

APPLE
50.



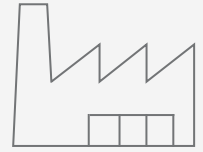
Resources

The production technologies as well as machinery available determine the achievable quality of the manufactured workpiece and the flexibility in production. Also, the age of the individual machines can give information about the technological capabilities of different companies. Like in Germany, the production technology of milling has high relevance in Turkey. Accordingly, the average number of machines is highest here. In general, the production machines of Turkish companies are significantly younger than those of German corporations. However, they are usually simpler machines that are less elaborately equipped. For example, modern 5-axis milling machines are rarely encountered in Turkish tool shops, much like automation solutions such as CAM interfaces, rapid clamping systems, palletizing systems and part changers. Copper electrodes, and not graphite electrodes, are almost exclusively used for sink erosion. The average share of CNC capable machines is lower in Turkey compared to Germany. The share of CNC capable machines is particularly low for sink erosion and turning in contrast to Germany. Accordingly, the lower efficiency of Turkish production machines can be seen in the average number of machines per € 1,000,000 revenue. While in Turkey, for example, an average of 4.7 milling machines are implemented to generate € 1,000,000 of revenue, German tool shops only require 0.8 milling machines.

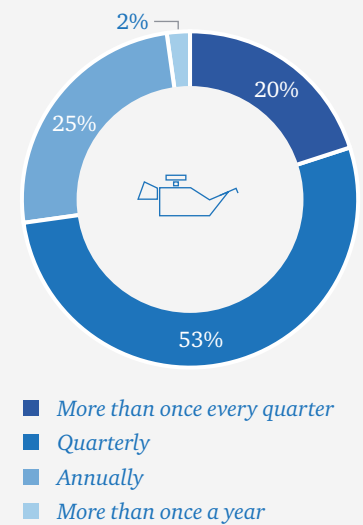
Regular maintenance is required in order to guarantee the highest possible quality with tool machines. In Turkey, a mixed situation regarding the typical maintenance intervals can be seen. According to the underlying study, 20% of the tool shops service their machines more than once every quarter, 53% every quarter, 25% more than once a year and 2% annually.

Productive manufacturing machines alone do not guarantee high quality when manufacturing tools. The area of try-out must be correspondingly equipped. However, in Turkey it is very uncommon that a tool shop has their its try-out machines available. Internal tool shops sometimes have the possibility to utilize production machines of their company's series production.

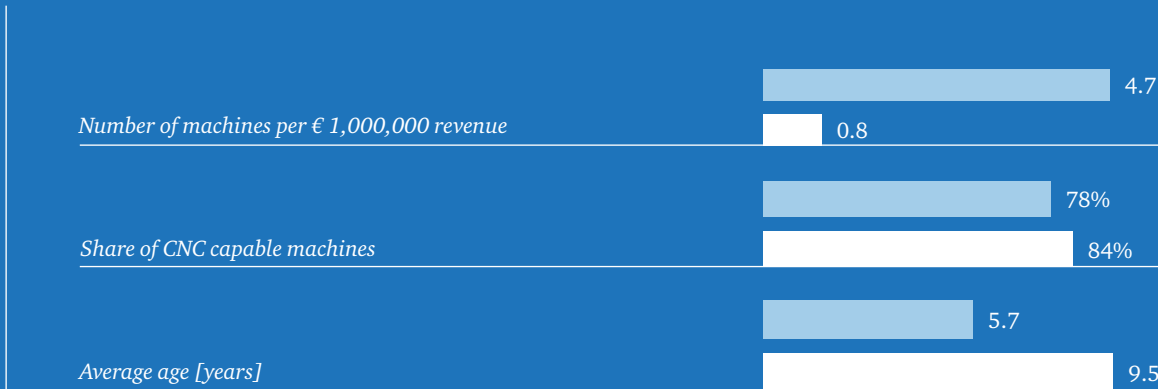
Another deciding resource for tool shops is well-qualified employees. While the Turkish education system does principally offer different technical education programs, such as technical schools and university courses, they do not have courses specifically for tool making, e.g. an apprenticeship to tool makers or a higher education programs with a focus on tool making. This leads to large qualification problems for the Turkish tool and die making industry, in particular in the areas of design and engineering (compare: competence evaluation in chapter "Process").



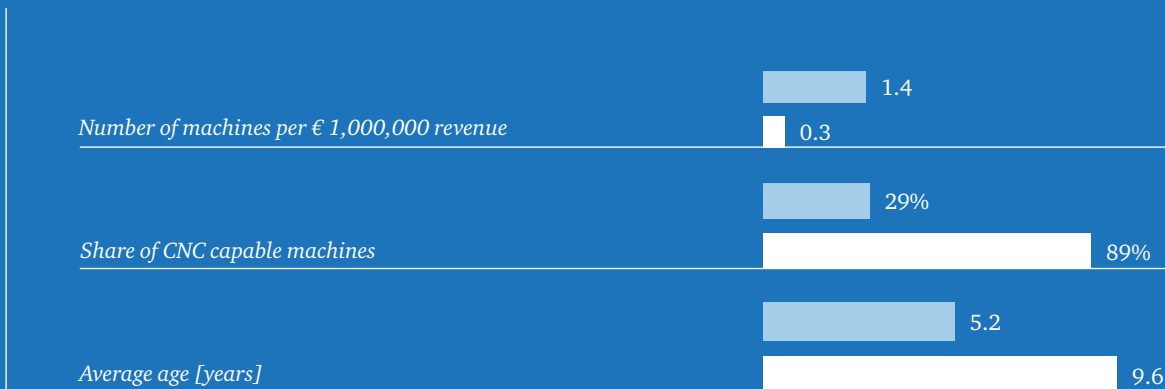
Maintenance intervals for production machines



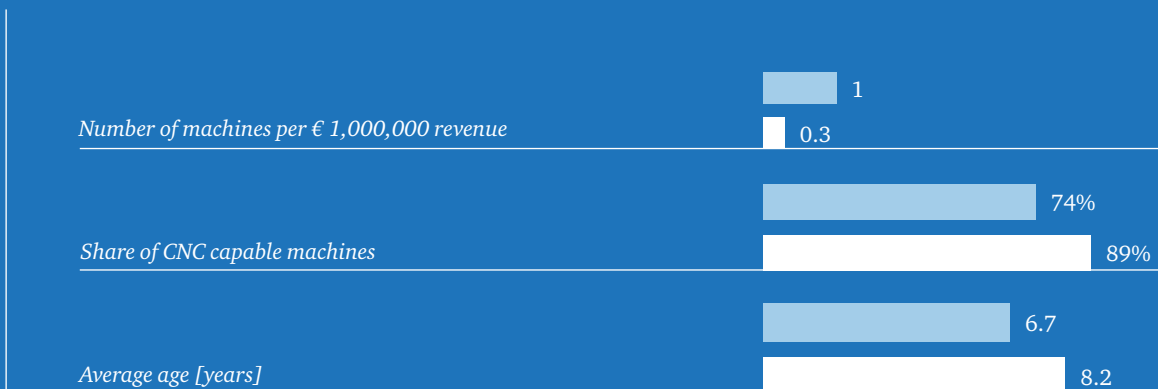
Technology milling



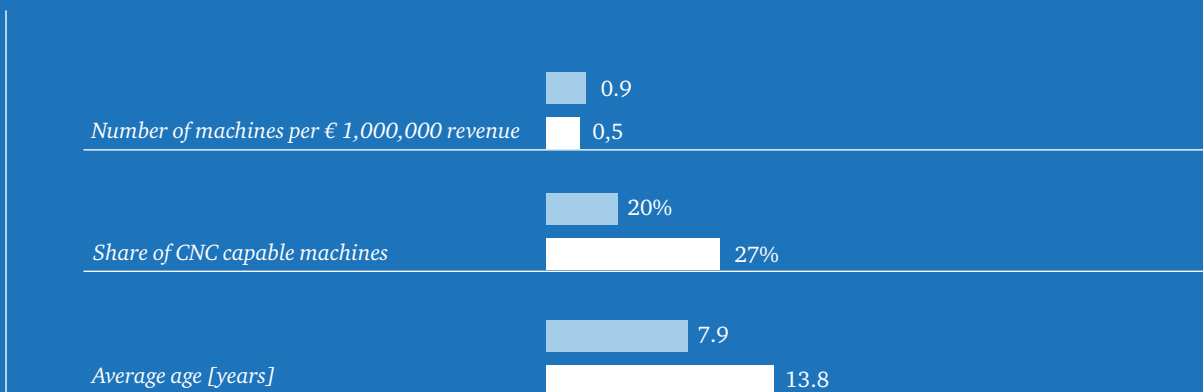
Technology sink erosion



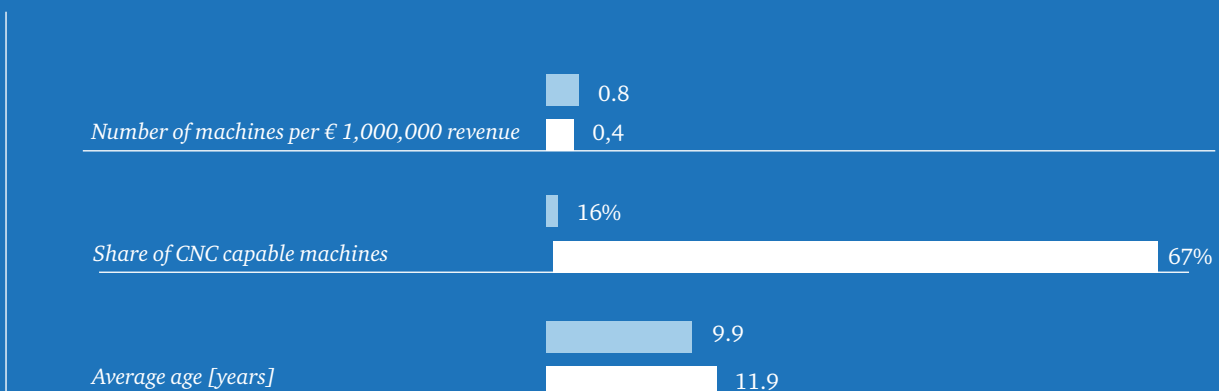
Technology wire erosion



Technology grinding



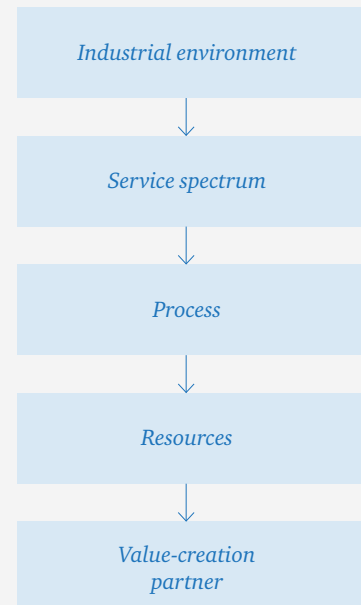
Technology turning



Summary

In the last decade, Turkey has developed into a modern, capable economy. Recent political developments, however, indicate a slowing of economic growth. Nevertheless, a positive development of the Turkish economy is predicted in the long-term. The upswing in the future will also be carried by the expansion of production capacities of high-value industries, such as the automobile, household appliances and electronics industries. This expansion will further the technological and organizational development of tool shops, which currently only manufacture tools from medium to low complexity. This will mean that companies based in Turkey will increasingly be able to fall back on a capable local tool supply. Apart from the increasing attractiveness of Turkey as a production location, the Turkish market is also growing as a sales market. With economic growth, the living standards of Turkey's young consumer society is improving, implying that high-quality and expensive products can increasingly be afforded. This leads to a further rise in the market presence of international manufacturing companies. Apart from the cheaper work conditions, which are primarily caused by the high availability of skilled workers and low factor costs, servicing the growing local market is increasingly the focus of these companies. The increasing demand, the fulfillment of market-specific customer requirements with new derivatives and the shortening of product lifecycles affect the continually rising need for tools. Due to the increasing capabilities of Turkish tool shops as well as a large sales market, many German tool shops are wondering how far they should integrate Turkish companies into their own value-creation chains and make use of the existing potential. In order to answer this question, the Aachen-based tool experts of the WBA conducted an extensive study for the evaluation

of the capabilities of Turkish tool shops. A total of 1073 potential tool shops were identified, of which 82 were evaluated in detail and 9 companies were audited on-site by a team of experts. Additionally, 70 manufacturers of standard components were identified, of which 17 were evaluated with a key figure comparison.



Industrial Environment

Due to the considerable number of tool shops, the geographic location and the business-friendly framework, Turkey has a large market potential for sourcing tools. Tool manufacturing is almost exclusively located in the regions of Istanbul, Bursa and Izmir.

Service Spectrum

The Turkish tool and die making industry manufactures tools of low to medium complexity, mostly for locally-based large international manufacturers of automobiles, household appliances and electronics. Injection mold manufacturers are a little more common than punching tool shops and sheet-metal forming tool shops. With regard to the surface quality, surface characteristics, tolerances and possible contour radii, the Turkish tool and die making industry reaches a good quality but not that of German companies.

Process

The competences for making tools in the different process steps of the value-creation chain range largely among Turkish tool shops. For example, most tool shops do not have a noteworthy competence in engineering or try-out, but reach very good results in design and production. Manufacturing is usually shop-floor-oriented but usually works without a modern shop-floor management system. Through a relatively high staff deployment, the comparably outdated production organization can still reach good production results. Larger, internationally

active Turkish tool shops generally have a well-functioning method for order processing, which allows for tool projects to be carried out with a high professionalism. However, the contracting company must guarantee an intensive supervision.

Resources

Turkey has a number of young, well-educated professionals, but is missing training and further education offers specifically for the tool and die making industry. On the technological side, Turkish tool shops tend to have young machinery that is usually rather simply equipped. Modern manufacturing machines, such as 5-axis milling machines, are only found in rare cases.

Conclusion

The Turkish tool market has large potential. Strategic partnerships in the area of tool accompaniment for series applications can support the sale of highly-complex tools from Germany. Furthermore, local tool shops can already be used as an “extended workbench” with some limitations. The exploitation of the full potential of the tool market requires a long-term supplier qualification and an intensive supervision on site. For the coming years, a continuation of the growth of the producing industry in general, and the tool and die making industry in particular, is expected. Therefore, German tool shops should find themselves suitable local partners and deliberately develop them further to create a competitive advantage.

Authors



Dr. Wolfgang Boos

CEO
WBA Aachener Werkzeugbau Akademie



Dr. Michael Salmen

Department Head of Business Development
Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University



Thomas Kuhlmann

Group Leader, Business Development
Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University



Felix Rittstieg

Research Assistant, Business Development
Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University



Johan de Lange

Research Assistant, Business Development
Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University

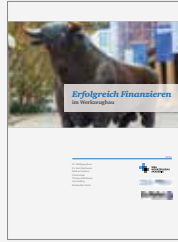
Our Studies



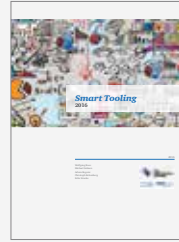
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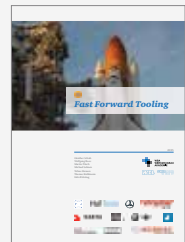
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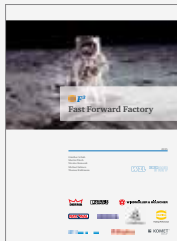
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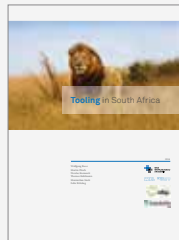
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D-52072 Aachen

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**Laboratory for Machine Tools and Production Engineering
(WZL)**

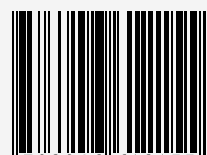
of RWTH Aachen University

Steinbachstraße 19

D-52074 Aachen

www.wzl.rwth-aachen.de

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