

## INDUSTRY OVERVIEW

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### OVERVIEW OF GLOBAL AND CHINA’S INTELLIGENT MANUFACTURING EQUIPMENT INDUSTRY

Intelligent manufacturing equipment refers to advanced manufacturing equipment with sensing, analyzing, reasoning, decision-making, and execution capabilities, which are capable of replacing a part of manual operations. As the global manufacturing industry increasingly calls for transformation, intelligent manufacturing equipment has become a pivotal force in propelling industrial systems towards greater intelligence and precision. By deeply integrating cutting-edge cross-disciplinary technologies, such as advanced equipment manufacturing and AI technologies, intelligent manufacturing equipment is reshaping traditional production processes. It enables intelligent sensing, intelligent decision-making, and precise execution throughout the production process, substantially boosting productivity and product quality. Currently, intelligent manufacturing equipment plays a vital role in manufacturing sectors including aviation and aerospace, automotive, medical devices, new energy photovoltaics, shipbuilding, and rail transportation, providing robust support for the high-quality development of these industries. The following table sets forth an overview of the definition and classification of intelligent manufacturing equipment.

These definitions were first formally introduced in the “*the Twelfth Five-Year Development Plan for the Intelligent Manufacturing Equipment Industry*” 《“十二五”智能製造發展規劃》 issued by MIIT in 2012 and have been consistently adopted in subsequent national policy documents issued by the State Council and the MIIT, and thus represent the most official and authoritative definition and classification standard for intelligent manufacturing equipment. They are also included in the category of intelligent manufacturing equipment noted in the most recently released government policy documents. For example, in “*the Catalogue for Guiding Industry Restructuring (2024 Version)*” 《產業結構調整指導目錄2024年本》 issued by National Development and Reform Commission, industrial robots, intelligent inspection equipment, intelligent logistics equipment, additive manufacturing equipment, and intelligent sensors are categorized as intelligent manufacturing equipment. Similarly, in “*the Catalogue of Industrial Strategic Emerging Industries Classification (2023)*” 《工業戰略性新興產業分類目錄2023》 issued by the National Bureau of Statistics, industrial robots, major packaged equipment, intelligent inspection equipment, CNC machine tools, and special-purpose CNC equipment are classified as intelligent manufacturing equipment.

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### Definition and Classification of Intelligent Manufacturing Equipment

Classification	Definition
<b>CNC machine tool</b>	<ul style="list-style-type: none"> <li>A CNC machine tool is a machine tool equipped with a CNC system. It can perform various processes such as cutting, milling, boring, grinding, drilling, and shearing on complex-shaped metal parts and other materials.</li> <li>High-end CNC machine tools feature five simultaneous axes, and have intelligent, composite processing and high-performance network communication functions, enabling high-speed and high-precision processing of components.</li> </ul>
<b>Special-purpose CNC equipment</b>	<ul style="list-style-type: none"> <li>Special-purpose CNC equipment refers to advanced manufacturing equipment that integrates specialized manufacturing processes with intelligent control systems. It can process complex components using techniques such as welding, riveting, hydraulic extrusion, and cutting and shaping.</li> <li>High-end special-purpose CNC equipment, which uses high-efficiency, high-precision, and environmentally friendly techniques, includes equipment such as high-energy-beam welding equipment, automated riveting equipment, precision hydraulic forming equipment, and laser cutting equipment.</li> </ul>
<b>Industrial robots</b>	<ul style="list-style-type: none"> <li>An industrial robot is a multi-joint robotic arm or multi-degree-of-freedom device equipped with autonomous power and control capabilities. It can replace manual labor in tasks such as drilling, welding, riveting, assembly, painting, and cutting.</li> <li>High-end industrial robots specifically refer to those with six or seven axes, offering higher degrees of freedom and flexibility to meet the requirements of complex tasks.</li> </ul>
<b>Major packaged equipment</b>	<ul style="list-style-type: none"> <li>Major packaged equipment refers to systems integrating multiple intelligent manufacturing equipment, control systems, and industrial software to enable automation of production processes across sectors such as mining, oil drilling, construction, metallurgy, chemicals, printing, and textiles.</li> <li>High-end major packaged equipment, characterized by high technological barriers, is critical to national economic security. Examples include large-scale mining and metallurgical machinery, large-scale petrochemical processing plants, and deep-sea oil drilling systems.</li> </ul>
<b>Intelligent logistics equipment</b>	<ul style="list-style-type: none"> <li>Intelligent logistics equipment integrates sensing, digitalization, and AI to enable automated and intelligent functions like handling, conveying, palletizing, and sorting.</li> <li>High-end intelligent logistics equipment refers to fully automated systems requiring no manual intervention. Examples include automated guided vehicles, logistics drones, automatic palletizers, and automatic sorters.</li> </ul>
<b>Intelligent inspection equipment</b>	<ul style="list-style-type: none"> <li>Intelligent inspection equipment autonomously collect, process, and analyze data, perform feature extraction and recognition, and enable performance testing and fault diagnosis of systems or products.</li> <li>High-end intelligent inspection equipment includes those used in cutting-edge fields such as quantum information, virtual inspection, brain science, and aerospace, along with general-purpose ones for high-end needs such as chemical analysis and geometric measurement.</li> </ul>
<b>Others</b>	<ul style="list-style-type: none"> <li>Includes additive manufacturing systems, intelligent sensors and other manufacturing equipment.</li> </ul>

*Source: National Bureau of Statistics, CIC*

At present, the development of intelligent manufacturing equipment has become the focus in the global technological competition. In 2024, the market size of global intelligent manufacturing equipment industry reached RMB7,553.9 billion in terms of revenue, and it is projected to reach RMB11,305.7 billion in 2029, with a CAGR of 8.4% from 2024 to 2029. As a significant segment of the global market, China’s intelligent manufacturing equipment market has demonstrated robust growth and significant potential. In terms of revenue, the market size of China’s intelligent manufacturing equipment industry reached RMB2,458.7 billion in 2024, accounting for approximately 32.5% of the global market, and is projected to reach RMB4,068.1 billion in 2029, with a CAGR of 10.6% from 2024 to 2029.

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### ANALYSIS OF CHINA’S CNC MACHINE TOOL INDUSTRY

#### Definition and Classification of CNC Machine Tools

As one of the key representatives of intelligent manufacturing equipment, CNC machine tools stand out for their technological complexity and market significance. CNC machine tools are machines tools equipped with CNC systems capable of logically running processing programs defined by specific codes and encoded instructions. Under program control, CNC machine tools can automatically process parts, thereby enhancing both precision and efficiency. Currently, the PRC government has not introduced any national regulatory standards regarding the classification of CNC machine tools, and various classification methods exist within the industry. For example, based on structural features, CNC machine tools can be classified into vertical, horizontal, gantry, and turning-milling CNC machine tools. Based on the number of simultaneous axes, they can be classified into five-axis and non-five-axis CNC machine tools. Furthermore, based on technological levels, they can be classified into high-end, mid-end, and low-end categories. Among them, the classification based on technological level is a widely accepted approach and various policies have employed corresponding terms such as “high-end CNC machine tools.” For instance, “the Technology Roadmap for Key Fields of Made in China 2025” (《中國製造2025》重點領域技術路綫圖), issued by the National Manufacturing Strategy Advisory Committee, defined high-end CNC machine tools as those possessing high-speed, high-precision, intelligent, composite, multi-axis linkage, and networking and communication capabilities.

The table below sets forth an overview of the classification of CNC machine tools based on technological level with references to the standard in “the Practical Course for CNC Machine Tools”, a nationally certified official textbook for universities and published by Tsinghua University Press. The standard clearly expounds the criteria for various categories of CNC machine tools based on five dimensions, including multi-axis simultaneous control, feed rate, intelligent functions, multi-processing functions and communication and networking functions with high authority and reasonability.

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### Classification of CNC Machine Tools

Item	High-end CNC machine tools	Mid-end CNC machine tools	Low-end CNC machine tools
<b>Multi-axis simultaneous control</b>	<ul style="list-style-type: none"> <li>Five-axis simultaneous control</li> </ul>	<ul style="list-style-type: none"> <li>Three-axis simultaneous control or four-axis simultaneous control</li> </ul>	<ul style="list-style-type: none"> <li>Two-axis simultaneous control or three-axis simultaneous control</li> </ul>
<b>Feed rate (m/min)</b>	<ul style="list-style-type: none"> <li>24.0–100.0</li> </ul>	<ul style="list-style-type: none"> <li>15.0–24.0</li> </ul>	<ul style="list-style-type: none"> <li>8.0–15.0</li> </ul>
<b>Intelligent functions</b>	<ul style="list-style-type: none"> <li>Equipped with intelligent functions such as smart sensing, adaptive control, precision self-calibration, and real-time measurement optimization during processing</li> </ul>	<ul style="list-style-type: none"> <li>Equipped with machine probes and tool setters for on-machine measurement</li> </ul>	<ul style="list-style-type: none"> <li>No intelligent functions</li> </ul>
<b>Multi-processing functions</b>	<ul style="list-style-type: none"> <li>Integration of two or more complex processing functions, such as turning and milling</li> </ul>	<ul style="list-style-type: none"> <li>Integration of two or more complex processing functions, such as turning and milling</li> </ul>	<ul style="list-style-type: none"> <li>No multi-processing functions</li> </ul>
<b>Communication and networking functions</b>	<ul style="list-style-type: none"> <li>Equipped with high-performance communication interfaces such as recommend standard 232 (RS-232), recommend standard 485 (RS-485), direct numerical control (DNC), and manufacturing automation protocol (MAP), and has networking capabilities</li> </ul>	<ul style="list-style-type: none"> <li>No communication functions</li> </ul>	<ul style="list-style-type: none"> <li>No communication functions</li> </ul>
<b>Typical parts suitable for processing</b>	<ul style="list-style-type: none"> <li>Suitable for processing high-precision, complex-shaped parts, such as aerospace engine blades and marine propellers</li> </ul>	<ul style="list-style-type: none"> <li>Suitable for processing parts with rotational features, such as crankshafts, frames, disc-shaped parts</li> </ul>	<ul style="list-style-type: none"> <li>Suitable for processing simple flat parts with regular shapes, such as flanges and box bottoms</li> </ul>

Source: “The Practical Course for CNC Machine Tools”, CIC

From the technological perspective, five-axis CNC machine tools are classified as high-end CNC machine tools with higher level of multi-axis simultaneous control, processing speed, intelligent functions, multi-processing functions as well as networking and communication functions, and can achieve high-quality processing of various complex-shaped parts such as thin-walled and contoured components. Compared to non-five-axis CNC machine tools, they offer a wider range of applicable processing tasks and can meet the processing requirements of the vast majority of part categories, making them the mainstream technological pathway for processing at present.

From the market share perspective, the market size of five-axis CNC machine tools accounted for approximately 10.0% of the overall CNC machine tool market size in terms of revenue in 2024. However, in high-end application scenarios such as aviation and aerospace, where most parts are complex in shape and require high processing accuracy, five-axis CNC machine tools have become indispensable core processing equipment. In the aviation and aerospace sector, the market share in terms of revenue of five-axis CNC machine tool in the has already exceeded 30.0%. Looking forward, with the increasing demand for processing complex parts due to the upgrades and transformation of downstream manufacturing sectors and cost reductions due to technological advancements, the cost-effectiveness of five-axis CNC machine tools is expected to surpass that of non-five-axis CNC machine tools. Consequently, the market size and market share of five-axis CNC machine tool are poised to grow rapidly, displacing non-five-axis CNC machine tools to become the mainstream processing equipment.

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### Latest Developments of Multi-axis CNC Machine Tools

The latest developments of multi-axis CNC machine tools primarily revolve around product innovations and technological breakthroughs:

- ***The launch of six-axis CNC machine tools.*** A few leading suppliers have launched CNC machine tools with six or more simultaneous axes, but due to high technical difficulty and limited market acceptance, they have not achieved large-scale commercialization. In terms of technical difficulty, these machine tools require an additional simultaneous axis on the basis of five-axis CNC machine tools, leading to complex mechanical structures and facing more severe geometric errors and thermal deformation issues, thus many suppliers are still in R&D stage of such products. While some suppliers claimed to have launched six-axis CNC machine tools, but in fact they only added an independent axis on top of the existing five-axis CNC machine tool structure, and this axis does not contribute to the simultaneous control, thus not constituting the true six-axis CNC machine tools. In terms of market acceptance, CNC machine tools with six or more simultaneous axis, although superior in processing accuracy and flexibility, are high in cost and currently used only for the processing of highly complex part such as aerospace integral disk cavities or large propeller root. In contrast, five-axis CNC machine tools possess five degrees of freedom and can achieve one-time clamping and interference-free processing of tool to workpiece on any spatial surface, which already meets the processing requirements of the vast majority of complex parts. Consequently, the market acceptance of six-axis CNC machine tools is far below that of five-axis CNC machine tools.
- ***Advancements in intelligent and ultra-precision processing technology.*** Certain suppliers have introduced multi-axis CNC machine tools that incorporate cutting-edge technologies such as deep learning and virtual simulation. Deep learning technology automatically refines processing paths and parameters through the analysis of extensive accumulated data, thereby reducing manual intervention. Virtual simulation technology enables pre-processing simulation and optimization, proactively identifying potential issues and facilitating timely adjustments, thus effectively minimizing errors and waste. Concurrently, advancements in ultra-precision processing technologies such as nanoscale cutting and laser interferometer calibration have greatly enhanced the processing accuracy of multi-axis CNC machine tools, catering to the high-precision demands of high-end manufacturing sectors such as aviation and aerospace. The application of these technologies is propelling multi-axis CNC machine tools towards heightened processing efficiency and precision.

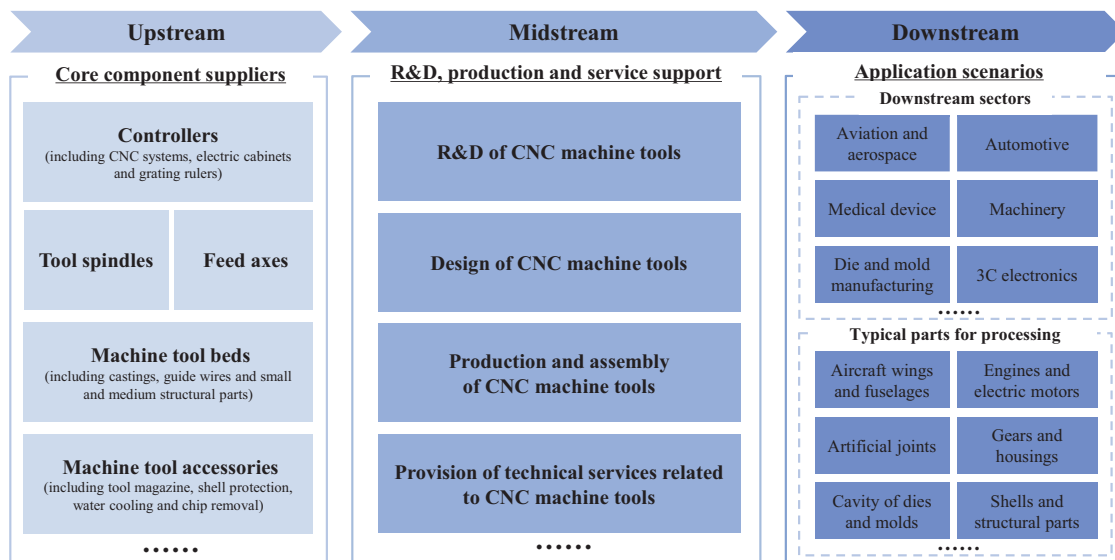
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### Value Chain of CNC Machine Tool Industry

The upstream of the CNC machine tool industry comprises various core component suppliers, mainly including controllers, tool spindles, feed axes, machine tool beds, and machine tool accessories. The midstream comprises CNC machine tool suppliers that primarily engage in R&D, design, production and assembly of CNC machine tools, while providing entire machine tools and supporting technical services to downstream clients. The downstream includes manufacturers across a wide range of industries, such as automotive, aviation and aerospace, medical devices, machinery, die and mold manufacturing, and 3C electronics.

As foundational industrial manufacturing equipment, CNC machine tools play a vital role across numerous application scenarios, with different sectors requiring specific types. In die and mold manufacturing, machinery, and 3C electronics, non-five-axis CNC machine tools are predominantly used to meet processing needs for relatively regular shapes like housings, shafts, gears, and planes. In these areas, particularly within the 3C electronics sector, the five-axis CNC machine tools employed are generally smaller in size and lower in price, serving as supplements to non-five-axis CNC machine tools for the precision processing of a limited number of complex components. In contrast, in manufacturing sectors such as aviation and aerospace, automotive, and medical devices, most critical components feature complex characteristics or irregular curved surfaces and require extremely high precision. As a result, larger, more technically advanced, and higher-value five-axis CNC machine tools are the primary types in demand. Non-five-axis CNC machine tools in these sectors are mainly used to assist five-axis CNC machine tools in rough processing of a limited number of small parts. The following chart sets forth the value chain of CNC machine tool industry.

### Value Chain of the CNC Machine Tool Industry



Source: CIC

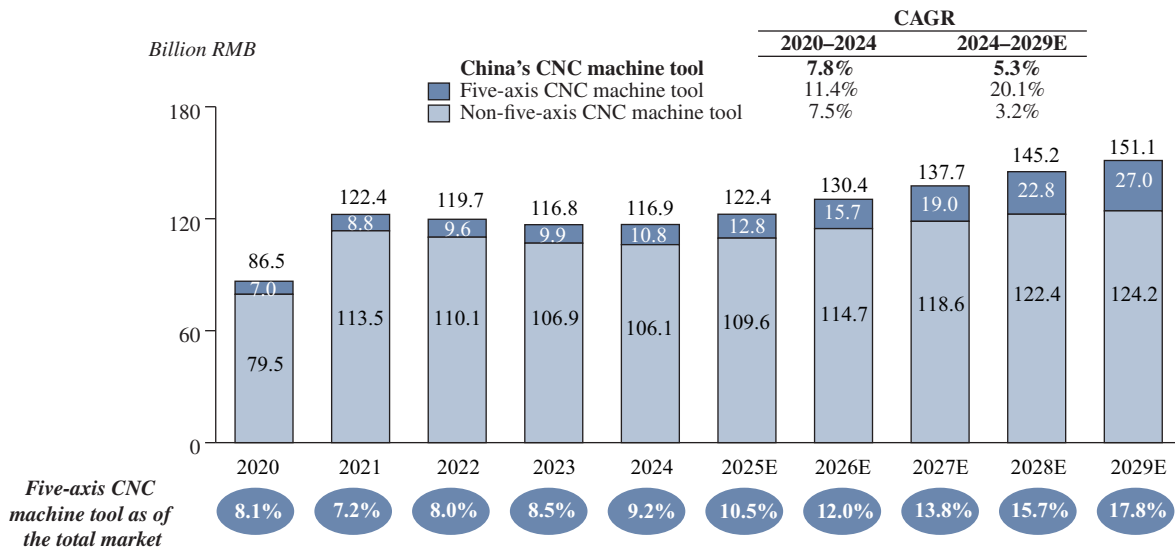
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### Market Size of China’s CNC Machine Tool Industry

#### *Market size of China’s CNC machine tool industry by number of simultaneous axes*

As a global manufacturing powerhouse, China’s extensive manufacturing needs have created significant market opportunities for CNC machine tools. In terms of revenue, the market size of China’s CNC machine tool industry grew from RMB86.5 billion in 2020 to RMB116.9 billion in 2024 and is projected to increase steadily to RMB151.1 billion by 2029, with a CAGR of 5.3%. Five-axis CNC machine tools, featuring five simultaneous axes, enable high-speed and high-precision processing of parts with complex features or surface through the coordinated action of three linear axes and two rotary axes. They also offer intelligent, composite processing, and high-performance network communication capabilities, positioning them as high-end equipment in CNC machine tool classification. With the ongoing industrial structure upgrading in China, five-axis CNC machine tools are gaining rapid market penetration as core equipment in manufacturing sectors, due to their advantages in precision, efficiency, and flexibility. The market size of China’s five-axis CNC machine tool market increased from RMB7.0 billion in 2020 to RMB10.8 billion in 2024, accounting for approximately 9.2% of the overall market in 2024. Looking ahead, the continuous advancement of related technologies is expected to drive a steady decrease in the cost of five-axis CNC machine tools and significantly enhance their usability and operational convenience, leading downstream manufacturing sectors’ increased preference of choosing five-axis CNC machine tools as processing equipment. Therefore, five-axis CNC machine tools are expected to further capture the market share of non-five-axis CNC machine tools, driving the market size to RMB27.0 billion by 2029, with a CAGR of 20.1%, accounting for 17.8% of the overall market in 2029. The following chart sets forth the market size of China’s CNC machine tool industry divided by the number of machine tool simultaneous axes.

**Market Size of China’s CNC Machine Tool Industry, in terms of Revenue, by Number of Simultaneous Axes, 2020–2029E**



Source: CMTBA, GACC, MIR, CIC

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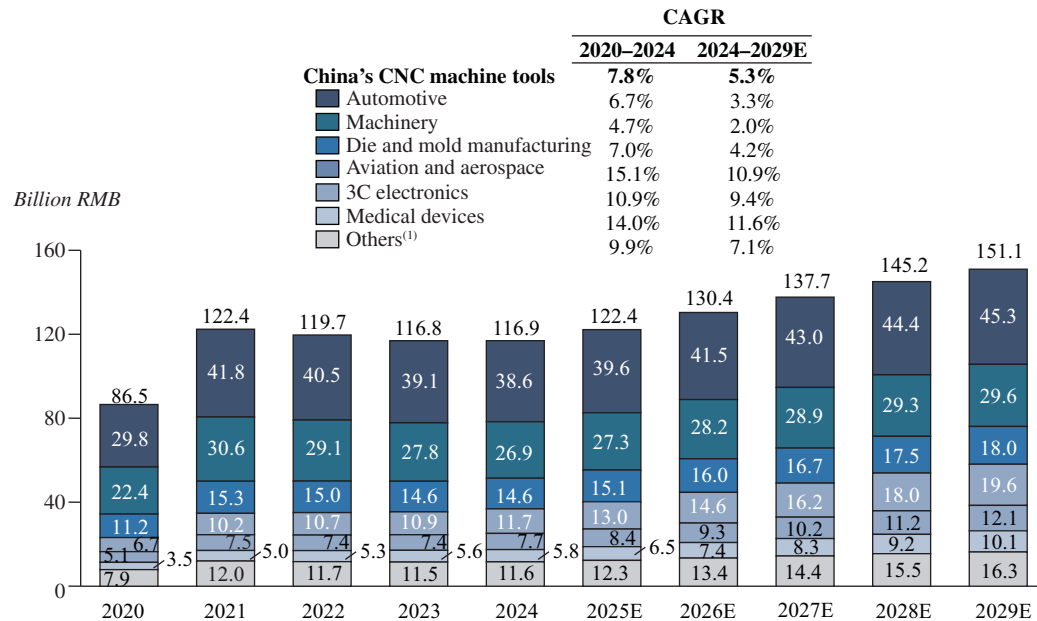
China’s CNC machine tool industry exhibits a clearly stratified pattern in the localization process. Non-five-axis CNC machine tools have relatively low technical barriers, and in 2024, the localization rate surpassed 75.0%, indicating a mature domestic supply system. In contrast, the R&D and manufacturing of five-axis CNC machine tools depend on various core hardware and software technologies. Due to technological barriers of five-axis CNC machine tools, the localization rate of which was only 55.0% in 2024, remaining in a critical stage of domestic substitution. In this context, leading domestic suppliers are accelerating breakthroughs through independent R&D, bringing key performance indicators such as processing precision and operational stability up to international standards. This progress is gradually dismantling overseas dominance and promoting substitution. With ongoing technological validation and growing market confidence, the localization rate of five-axis CNC machine tools in China is projected to exceed 75.0% by 2029.

### *Market size of China’s CNC machine tool industry by downstream application scenarios*

Currently, major downstream application scenarios for CNC machine tools include automotive, machinery, and die and mold manufacturing. In terms of revenue, in 2024, the market sizes of CNC machine tools in these sectors reached RMB38.6 billion, RMB26.9 billion, and RMB14.6 billion, respectively, accounting for 33.0%, 23.0%, and 12.5% of the total market in China, respectively. In addition, the demand for high-end manufacturing in aviation and aerospace, 3C electronics, and medical devices sectors is expected to further grow. The market sizes for these sectors are projected to grow from RMB11.7 billion, RMB7.7 billion and RMB5.8 billion in 2024 to RMB19.6 billion, RMB12.1 billion and RMB10.1 billion in 2029, with CAGRs of 10.9%, 9.4% and 11.6%, respectively. The following chart sets forth the market size of China’s CNC machine tool industry divided by downstream application scenarios.

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### Market Size of China’s CNC Machine Tool Industry, by Downstream Application Scenarios, in terms of Revenue, 2020–2029E



Note:

- (1) The market size of China’s CNC machine tools in other sectors include the market sizes of CNC machine tools in sectors such as railway transportations, shipbuilding, new energy photovoltaics, low-altitude economy and robotics.

Source: CMTBA, GACC, MIR, CIC

## ANALYSIS OF CHINA’S FIVE-AXIS CNC MACHINE TOOL INDUSTRY

### Definition and Core Advantages of Five-axis CNC Machine Tools

Five-axis CNC machine tools refer to CNC machine tools with five-axis simultaneous functionality and are currently the most advanced category of CNC machine tools in the industry. Five-axis CNC machine tools feature high-speed, precision, intelligent, and multi-processing functions along with network communication functions, enabling high-precision and high-efficiency processing of complex-shaped components. As the demand for processing complex precision parts continues to grow due to the ongoing upscale of downstream manufacturing sectors, coupled with technology advancements and cost reduction that have increased its affordability, five-axis CNC machine tools are expected to be widely used in aviation and aerospace, automotive, die and mold manufacturing, shipbuilding, new energy photovoltaics, integrated circuit equipment, as well as emerging fields such as low-altitude economy (primarily unmanned aerial vehicles, UAVs) and robotics.

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Five-axis CNC machine tools additionally incorporate rotary axes (typically two) based on non-five-axis CNC machine tools (e.g., three-axis CNC machine tools), enabling the cutting tool or workpiece to tilt at any angle. Compared with non-five-axis CNC machine tools, five-axis CNC machine tools allow tools to move relative to the workpiece along linear feed axes and enable tools to approach the workpiece at more flexible angles, offering significant advantages in processing capability, quality, and efficiency. Therefore, five-axis CNC machine tools are the preferred solution for achieving efficient, and precise processing of complex spatial surfaces.

- ***Expanded application scope.*** Five-axis CNC machine tools offer flexible tool and workpiece positioning and diverse processing paths. Tools can approach the workpiece from any direction and cut at the optimal angle, enabling high-precision processing of complex-shaped components and satisfying the diverse needs across various manufacturing sectors.
- ***Enhanced processing quality.*** Five-axis CNC machine tools can complete multi-surface processing in a single setup, with adjustable position and orientation of the tool or workpiece. This effectively prevents tool interference, undercutting, overcutting, as well as reference errors caused by multiple fixturing, significantly improving processing quality and precision.
- ***Increased processing efficiency.*** Five-axis CNC machine tools achieve high-precision, high-efficiency, and compound machining by consolidating multiple processes, reducing both the floor space required for equipment and the transfer time of workpieces between different processing units. This substantially boosts processing efficiency and brings greater economic benefits to manufacturing.

### Core Technologies of Five-axis CNC Machine Tools

The core technologies of five-axis CNC machine tools encompass the design and manufacturing processes of the machine tool’s main structure, the core algorithms and measurement-control technologies of CNC systems, the design and manufacturing technologies of core components, multi-axis simultaneous processing and programming software. The breakthroughs in these core technologies not only require the accumulation of knowledge across multiple disciplines such as machinery, control, and software engineering, but also rely on the deep integration and collaborative innovation of these fields. The complex technological framework established high entry barriers for the five-axis CNC machine tool industry. The following table sets forth the core technologies of five-axis CNC machine tools.

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### Core Technologies of Five-axis CNC Machine Tools

Category	Core technology	Analysis
<b>Design and manufacturing process of the machine tool's main structure</b>	High-performance materials technology	<ul style="list-style-type: none"> <li>Utilizes high-strength alloy steel, composite materials, and other advanced materials to enhance the overall rigidity and stability of the machine tool, reducing deformation and vibration during machining while improving workpiece accuracy and surface quality.</li> </ul>
	Structural rigidity optimization technology	<ul style="list-style-type: none"> <li>Optimizes the machine tool's structural design through frame-type structures or reinforcing ribs to enhance stability during complex part machining and minimize errors caused by structural deformation.</li> </ul>
	Digital design technology for the machine tool's main structure	<ul style="list-style-type: none"> <li>Employs computer-aided design (CAD) and computer-aided engineering (CAE) tools to optimize the design efficiency and quality of the machine tool's main structure, shorten R&amp;D cycles, and reduces R&amp;D costs.</li> </ul>
	Complex precision components and entire machine manufacturing technology	<ul style="list-style-type: none"> <li>Ensures precision in component machining and machine tool assembly through high-precision manufacturing processes, enhancing overall machine performance for stable and efficient processing of complex parts.</li> </ul>
<b>Core algorithms and measurement-control technologies of CNC systems</b>	Multi-axis simultaneous control algorithms	<ul style="list-style-type: none"> <li>Develops advanced control algorithms, such as micro-segment control and predictive control algorithms, to improve machining accuracy and efficiency, enabling high-precision processing of complex surfaces.</li> </ul>
	On-machine measurement and compensation technology	<ul style="list-style-type: none"> <li>Integrates in-built measuring devices, such as touch probes, tool setters, scanning systems, to measure workpiece machining accuracy, tool dimensions, and other parameters in real time, ensuring processing precision.</li> </ul>
	Closed-loop feedback technology	<ul style="list-style-type: none"> <li>Monitors real-time position, velocity, and other data of machine tool components via sensors, feeding this information back to the control system to enhance dynamic performance and ensure stability throughout the machining process.</li> </ul>
	Precision calibration technology	<ul style="list-style-type: none"> <li>Calibrates the machine tool's geometric and kinematic accuracy using high-precision measurement equipment, such as laser trackers and ballbar testers, to maintain long-term high-precision processing capabilities and extend service life.</li> </ul>
<b>Design and manufacturing technologies of core components</b>	High-speed and high-precision rotary axes	<ul style="list-style-type: none"> <li>Implements precision bearings and advanced drive technologies, such as torque motor drives, to achieve extremely high rotational speeds and precision, enhancing machining efficiency and surface quality for complex surfaces and high-precision parts.</li> </ul>
	High-torque heavy-duty rotary axes	<ul style="list-style-type: none"> <li>Features large-diameter bearings and high-strength transmission components designed to withstand heavy loads and torques, meeting the machining demands of large parts and high-strength materials while ensuring stable, precise performance.</li> </ul>
	High-speed electric spindles	<ul style="list-style-type: none"> <li>Integrates the motor and spindle into a single unit, offering high rotary speeds, precision, and a compact structure to support high-speed cutting and precision machining.</li> </ul>
	High-torque electric spindles	<ul style="list-style-type: none"> <li>Optimizes motor and transmission systems to deliver substantial torque at low speeds, ensuring stable performance under heavy cutting loads and improving efficiency and quality for high-strength material and large-part machining.</li> </ul>
	Multi-functional composite processing spindles	<ul style="list-style-type: none"> <li>Integrates multiple machining functions including milling, drilling, welding and riveting through advanced design, enabling flexible switching between processes on a single spindle to enhance machining versatility and efficiency.</li> </ul>
<b>Multi-axis simultaneous processing and programming software</b>	Intelligent processing path planning	<ul style="list-style-type: none"> <li>Uses optimization algorithms and AI to automatically generate optimal tool paths based on workpiece geometry, material properties, and processing requirements, minimizing tool collisions and unnecessary movements while improving efficiency and surface quality.</li> </ul>
	Matching of cutting parameters	<ul style="list-style-type: none"> <li>Selects appropriate cutting parameters including speed, feed rate based on workpiece material, tool type, and processing requirements to optimize machining efficiency and reduce tool wear.</li> </ul>
	Software development for programming	<ul style="list-style-type: none"> <li>Develops specialized CAM software for five-axis CNC machine tools to convert design models into executable CNC programs, enhancing programming efficiency, reducing human error, and shortening machining cycles.</li> </ul>

Source: CIC

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### Market Size of China’s Five-axis CNC Machine Tool Industry

#### *Market size of China’s five-axis CNC machine tool industry by structures.*

According to different structural features, five-axis CNC machine tools can be divided into five-axis horizontal CNC machine tools, five-axis turning-milling CNC machine tools, five-axis vertical CNC machine tools and five-axis gantry CNC machine tools. The following table sets forth the classification of five-axis CNC machine tools by structures.

#### Classification of Five-axis CNC Machine Tools by Structures

Category	Structural features	Types of parts suitable for processing	Size	Technical complexity for manufacturing
<b>Five-axis horizontal CNC machine tools</b>	<ul style="list-style-type: none"> <li>The spindle is placed horizontally</li> </ul>	<ul style="list-style-type: none"> <li>Suitable for processing box parts</li> </ul>		
<b>Five-axis turning-milling CNC machine tools</b>	<ul style="list-style-type: none"> <li>Equipped with both the milling spindle and turning spindle, and can complete multiple processes at one time</li> </ul>	<ul style="list-style-type: none"> <li>Suitable for processing parts with multiple machining requirements, such as turning, milling and drilling</li> </ul>		
<b>Five-axis vertical CNC machine tools</b>	<ul style="list-style-type: none"> <li>The spindle is placed vertically</li> </ul>	<ul style="list-style-type: none"> <li>Suitable for processing small and medium-sized structural parts</li> </ul>		
<b>Five-axis gantry CNC machine tools</b>	<ul style="list-style-type: none"> <li>Possess a portal frame structure with the spindle arranged vertically or horizontally, and the worktable is usually large in size</li> </ul>	<ul style="list-style-type: none"> <li>Suitable for processing large structural parts</li> </ul>		

High Low

Source: CIC

Five-axis vertical and gantry CNC machine tools are highly versatile. Moreover, with less complexed structural configuration and transmission system, they are lower in the technical complexity for manufacturing. Therefore, they have good market promotion advantages and are currently the mainstream models of five-axis CNC machine tools in the market. In addition, domestic suppliers have mastered core technologies and mature processes, and have gradually achieved a high localization rate through economies of scale. In contrast, five-axis horizontal and turning-milling CNC machine tools have high technical complexity and development costs, and are mainly used in more advanced and sophisticated scenarios. At the same time, such products from domestic suppliers still lag behind overseas suppliers in terms of reliability and brand influence, leading to a lower rate of localization. With the growing demand for high-end manufacturing in downstream sectors and the continuous improvement of suppliers’ technological maturity, the market size and localization rate of China’s five-axis horizontal CNC machine tools and turning-milling CNC machine tools are expected to continue to grow. In terms of revenue, the market size of China’s five-axis horizontal CNC machine tools and five-axis turning-milling CNC machine tools increased from RMB1,016.9 million in 2020 to RMB1,362.4 million in 2024, with a CAGR of 7.6%, and is expected to grow to RMB2,508.2 million in 2029, with a CAGR of 13.0%. The localization rate of China’s five-axis horizontal CNC machine tools and five-axis turning-milling CNC machine tools is expected to increase from 38.0% in 2024 to 51.5% in 2029.

## INDUSTRY OVERVIEW

### *Market size of China’s five-axis CNC machine tool industry by downstream application scenarios.*

The growing demand for high-end manufacturing is driving the increased adoption of five-axis CNC machine tools across various application scenarios in China, leading to significant market expansion. The aviation and aerospace sector currently represent the most significant application scenario, accounting for 35.6% of the overall five-axis CNC machine tool market size in China in 2024, respectively. Moreover, the vigorous development of general sectors, such as the automotive, die and mold manufacturing and emerging sectors represented by low-altitude economy and robotics, is expected to drive the continuous growth in the demand for five-axis CNC machine tools. The following chart sets forth the typical parts processed by five-axis CNC machine tools in major application scenarios.

### Typical Parts Processed by Five-axis CNC Machine Tools in Major Application Scenarios

Application scenarios	Typical parts processed by five-axis CNC machine tools
<b>Aviation and aerospace</b>	<ul style="list-style-type: none"> <li>In order to meet the performance requirements of long-lifespan and lightweight structure, the new generation of aircraft and spacecraft adopts a large number of new technologies, new structures and new materials, and its parts gradually show the characteristics of thin-walled integral frame structure. Five-axis CNC machine tools can meet the high-precision processing of such complex parts, and are mainly used for <b>the processing of aircraft wings, fuselages, tail and other structural parts, as well as key parts such as housings and blades in aircraft engines.</b></li> </ul>
<b>Automotive</b>	<ul style="list-style-type: none"> <li>As the automotive industry transforms towards electrification and intelligence, high-precision, high-efficiency parts processing and integrated die-casting have become a trend. Five-axis CNC machine tools can meet the above needs and are mainly used for precision processing of complex parts such as <b>engines, electric motors, electric motor transmission housings, cylinder heads, and battery housings for new energy vehicles.</b></li> </ul>
<b>Die and mold manufacturing</b>	<ul style="list-style-type: none"> <li>With the acceleration of product updates in the die and mold manufacturing field, processing equipment with dispersed processes will be replaced by flexible and automated equipment with centralized processes. Five-axis CNC machine tools can reduce the number of clamping operations and achieve high-quality processing of complex-shaped molds. They are mainly used for <b>die and mold processing with complex curved surfaces and deep cavity structures.</b></li> </ul>
<b>Emerging sectors (including robotics and low-altitude economy)</b>	<ul style="list-style-type: none"> <li>As emerging technology fields, low-altitude economy and robotics have extremely high requirements for processing accuracy and surface quality for some complex parts. Five-axis CNC machine tools can meet the stringent processing requirements of these parts with their many performance advantages. In the low-altitude economy sector, five-axis CNC machine tools are mainly used for processing <b>fuselage structural parts such as wings and fuselage frames, as well as key parts such as blades and turbine rotors in UAV engines;</b> In the robotics sector, five-axis CNC machine tools are mainly used for processing <b>parts with complex spatial structures such as arm supports, thigh supports, and hip joints.</b></li> </ul>

Source: CIC

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## INDUSTRY OVERVIEW

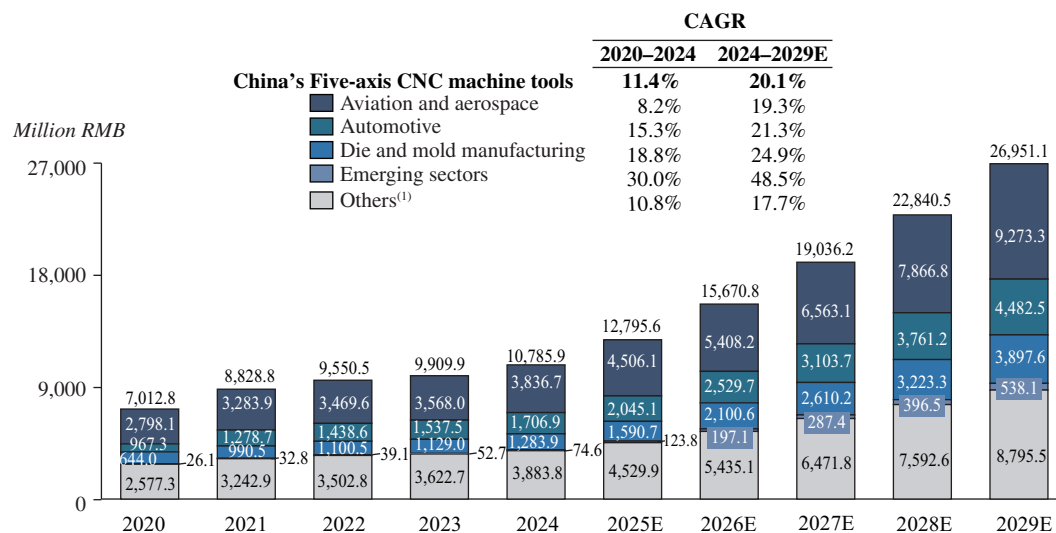
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- **Aviation and aerospace sector.** Characterized by its high technological intensity and product value, the aviation and aerospace sector is considered as the high-end manufacturing sector. Currently in this sector, commonly used five-axis CNC machine tools include five-axis vertical, horizontal, and gantry CNC machine tools, which can cover full-size machining scenarios ranging from small or medium-sized complex parts to super-large structural components. Meanwhile, multiple types of more advanced and high-performance five-axis CNC machine tools have emerged in the market, designed for special processes and complex parts, such as the dual five-axis mirror milling machine tool that solves the machining challenges of large thin-walled components like aircraft fuselage skins and rocket tank bottoms, the horizontal flip-type milling five-axis machine tool that enables machining of large structural parts such as aircraft fuselages and rocket bodies, and the friction stir welding five-axis machine tool that achieves highly reliable welding of rocket tanks. The increased frequency of rocket launches in China and the expected robust growth of the commercial spaceflight market are further propelling the expansion of China’s five-axis CNC machine tool market. At the same time, the mass production of domestic large aircraft such as the C919 is boosting the production capacity of five-axis CNC machine tools for aircraft components. In terms of revenue, the market size of China’s five-axis CNC machine tools in the aviation and aerospace sector grew from RMB2,798.1 million in 2020 to RMB3,836.7 million in 2024 with a CAGR of 8.2%, and is projected to reach RMB9,273.3 million by 2029, representing a CAGR of 19.3%. The localization rate of China’s five-axis CNC machine tools in the aviation and aerospace sector is also expected to increase from 50.6% in 2024 to 70.0% in 2029.
- **General industrial sector.**
  - **Automotive sector.** In the automotive sector, the transition towards electrification and intelligence is placing higher demands on the precision and efficiency of component processing, driving the increased application of five-axis CNC machine tools in the automotive sector. In terms of revenue, the market size of China’s five-axis CNC machine tools in the automotive sector grew from RMB967.3 million in 2020 to RMB1,706.9 million in 2024, representing a CAGR of 15.3%, and is projected to reach RMB4,482.5 million by 2029 with a CAGR of 21.3%. The localization rate of China’s five-axis CNC machine tools in the automotive sector is also expected to increase from 56.4% in 2024 to 80.0% in 2029.
  - **Die and mould manufacturing sector.** With the increasing demand across various industries for complex-shaped dies and moulds, and the transformation towards automated and intelligent processing in die and mould manufacturing, the market size in terms of revenue of China’s five-axis CNC machine tools in the die and mould manufacturing sector has increased from RMB644.0 million in 2020 to RMB1,283.9 million in 2024 with a CAGR of 18.8%, and is expected to reach RMB3,897.6 million in 2029 with a CAGR of 24.9%.

## INDUSTRY OVERVIEW

- Emerging sectors.** The vigorous development of emerging sectors represented by low-altitude economy and robotics is expected to drive the continuous growth in the demand for five-axis CNC machine tools. In terms of revenue, the market size of five-axis CNC machine tools in emerging sectors (including robotics and low-altitude economy) has increased from RMB26.1 million in 2020 to RMB74.6 million in 2024 with a CAGR of 30.0%, and is expected to reach RMB538.1 million in 2029 with a CAGR of 48.5%. The following chart set forth the market size of China’s five axis machine tool industry by downstream application scenarios in terms of revenue.

**Market Size of China’s Five-axis CNC Machine Tool Industry, by Downstream Application Scenarios, in terms of Revenue, 2020–2029E**



Note:

- (1) The market size of China’s five-axis CNC machine tools in other sectors include the market sizes of five-axis CNC machine tools in sectors such as medical devices, 3C electronics, machinery, shipbuilding, new energy photovoltaics and integrated circuit equipment.

Source: CMTBA, GACC, MIR, CIC

### Growth Drivers of China’s Five-axis CNC Machine Tool Industry

- The machine tool industry has reached the bottom of its cycle and is approaching a peak period of equipment replacement.** China’s machine tool industry follows a typical technological iteration cycle of approximately ten years. The last production peak occurred around 2011 to 2014. Currently, the industry is at the intersection of a downturn adjustment phase and a new wave of demand release. In addition, with the replacement cycle (typically eight to ten years) of traditional machine tools approaching and environmental standards becoming more stringent, downstream companies are accelerating the replacement of outdated models. This has created a rigid demand foundation for the penetration of five-axis CNC machine tools.

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## INDUSTRY OVERVIEW

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- ***Overseas technology blockades drive the surge in the demand for domestic substitution.*** Developed countries have long regarded five-axis CNC machine tools as strategic equipment, imposing technical blockades and export restrictions. As a result, downstream companies face considerable challenges in accessing relevant products, negatively affecting the supply chain stability. To mitigate supply chain risks and ensure the autonomous, secure, and controllable development of high-end manufacturing equipment, accelerating the localization of five-axis CNC machine tools has become a national strategy and an industry-wide consensus. Consequently, domestic downstream companies are increasingly favouring products from domestic suppliers.
- ***Technological breakthroughs support cost reduction and application expansion.*** Systematic breakthroughs of suppliers in core technologies of five-axis CNC machine tool suppliers have significantly reduced their dependence on the imported technology systems of five-axis CNC machine tools. Meanwhile, their ability of independent R&D and large-scale production of precision functional components have further driven down the manufacturing costs. Furthermore, the adoption of intelligent technologies such as AI and digital tools enable the adaptive processing and predictive maintenance of the five-axis CNC machine tool, thus reducing its total production and usage costs. The advancements and increasing maturity of these technologies are further lowering machine costs and complexity, accelerating their penetration across various application scenarios.
- ***Favourable policies and regulations are driving the industry forward.*** The PRC government introduced a series of supportive policies emphasizing the intelligent manufacturing and the autonomous development of high-end equipment, creating a favourable environment for the development of China’s five-axis CNC machine tool industry.
- ***Promoting localization of core components.*** In September 2023, the MIIT and six other departments jointly issued “the Work Plan for Steady Growth of the Machinery Industry” (《機械行業穩增長工作方案》). The plan calls for building high-level platforms for demand-supply matching, and supports industry associations in organizing exhibitions and forums in fields such as machine tools to promote technical exchanges, international cooperation, and upstream-downstream integration across the industrial chain. In December 2023, the National Development and Reform Commission released “the Guiding Catalogue for Industry Restructuring” (《產業結構調整指導目錄》), explicitly classifying items such as “CNC systems and industrial software for high-end CNC machine tools” and “critical components, accessories, and tools for high-end CNC machine tools” as encouraged industries. These policies have created a positive market environment for the localization of five-axis CNC machine tool components.

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## INDUSTRY OVERVIEW

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- **Facilitating machine tool renewal and consumption.** In March 2024, the State Administration for Market Regulation and six other departments jointly released “the Action Plan for Optimizing Standards Regulating Equipment Renewals and Trade-ins of Consumer Goods” (《以標準提升牽引設備更新和消費品以舊換新行動方案》), which proposed the development and implementation of standards for large-size, high-precision, and high-complexity CNC machine tools, and promoted equipment upgrades and remanufacturing. In August 2024, the State Council and the National Development and Reform Commission jointly issued “the Guidelines on Regulating Procurement Management of Central Enterprises” (《關於規範中央企業採購管理工作的指導意見》), requiring central enterprises to take the lead in adopting innovative products, especially in key fields such as high-end CNC machine tools, thereby providing strong policy support for the development of five-axis CNC machine tools.
- **R&D subsidies.** Various municipal governments across China have introduced policies to provide R&D subsidies to machine tool suppliers. In December 2021, the Taizhou Municipal Government issued “the Several Policies on Accelerating the High-quality Development of the Manufacturing Industry in Taizhou (Machine Tool Equipment Chapter)” (《台州市加快推進製造業高質量發展若干政策(機床裝備篇)》), which proposes to provide a certain proportion of R&D subsidies to suppliers who independently developed key functional components such as CNC systems for the first time and have established an effective supply chain. In March 2024, the Industry and Information Technology Bureau of Shenzhen Municipality released “the Several Measures for Promoting the High-quality Development of the High-end Equipment Industry Cluster in Shenzhen” (《深圳市關於推動高端裝備產業集群高質量發展的若干措施》), which suggests to provide financial support to suppliers engaged in the R&D of ultra-precision CNC machine tool technologies.
- **Tax incentives.** In July 2023, the Ministry of Finance and the State Taxation Administration jointly issued “the Notice on the Policy of Additional Value-added Tax (VAT) Deduction for Machine Tool Companies” (《關於工業母機企業增值稅加計抵減政策的通知》), which proposes to grant additional deductions on VAT for companies involved in the production and sale of advanced machine tools, key functional components, and CNC systems. In September 2023, the MIIT and four departments jointly released “the Announcement on Increasing the Additional Deduction Ratio of R&D Expenses for Integrated Circuit and Machine Tool Companies” (《關於提高集成電路和工業母機企業研發費用加計扣除比例的公告》), which proposes to increase the ratio of additional deductions for R&D expenses incurred by machine tool suppliers, aiming to provide tax incentives to support innovation in high-end CNC machine tool technology.

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## INDUSTRY OVERVIEW

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- ***Procurement support.*** In March 2024, the MIIT and six other departments jointly issued “the Implementation Plan for Promoting Equipment Renewal in the Industrial Sector” (《關於推動工業領域設備更新實施方案》), which emphasizes the promotion of the upgrade of CNC machine tools and the related components and equipment, and suggests to financially support key procurement projects that meet specified criteria. In September 2024, the MIIT issued “the Guiding Catalogue for the Promotion and Application of the First Unit (Set) of Major Technical Equipment (2024 Edition)” (《首臺(套)重大技術裝備推廣應用指導目錄(2024年版)》), which aims to provide a certain percentage of financial subsidies to companies that purchased the first set of high-end CNC equipment or other major technical equipment and insured them with comprehensive insurance.

### Future Trends of China’s Five-axis CNC Machine Tool Industry

- ***New materials and new structural technologies promote breakthroughs in the performance of five-axis CNC machine tools.*** As downstream application scenarios increasingly demand high-end processing, such as the processing of complex curved surfaces, the performance of five-axis CNC machine tools continues to evolve toward higher speed, greater precision, and larger working span. Among these innovations, the application of new materials centered on carbon fiber composites has become key to overcoming traditional technical bottlenecks. With high specific stiffness, low density, and near-zero thermal expansion, carbon fiber composites can be applied to machine bed components such as the saddle, crossbeam, column, and spindle box of machine tools with span over three meters to significantly reduce overall machine weight and energy consumption, while enhancing structural rigidity, vibration resistance, and thermal stability. This provides a disruptive solution that enables five-axis CNC machine tools to maintain both precision and stability at high speeds, unlocking strong application potential and broad market prospects across multiple scenarios, especially in the high-precision processing of large components in the fields of automotive, semiconductor equipment, die and mold manufacturing, aviation and aerospace, shipbuilding, and energy.
- ***AI technologies are transforming application models of five-axis CNC machine tools.*** Existing CNC systems and programming software involve complicated steps and depend heavily on manual input in manufacturing process decisions, resulting in low efficiency. In the future, CNC systems empowered by AI technologies can bring revolutionary improvements to programming and process decision-making. For example, generating processing instructions directly from 3D model reduces programming complexity and processing cycle, and integrating multi-modal large models to possess multi-dimensional cognitive capabilities thereby achieving intelligent decision-making in processing. In addition, AI technologies, when combined with digital twin technology, enable virtual debugging and energy optimization, allowing the machine to predict potential faults, automatically adapt to environmental parameters, and perform real-time precision calibration.

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## INDUSTRY OVERVIEW

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- ***Five-axis CNC machine tools are expected to gradually replace non-five-axis machine tools.*** Five-axis CNC machine tools have clear advantages in processing accuracy and efficiency. With the transformation and upgrading of downstream manufacturing sectors, five-axis CNC machine tools are well-positioned to handle a wide range of complex processing tasks, expanding their presence across various application scenarios, and better adapt to the trend of high-end manufacturing. Moreover, continuous technological progress is further improving their cost-effectiveness. In contrast, non-five-axis CNC machine tools show obvious limitations in processing complex parts and are unable to meet the demands of modern manufacturing for high-efficiency and high-precision processing. With superior capabilities and economic benefits, five-axis CNC machine tools are expected to replace traditional two-axis, three-axis, and four-axis models and become the mainstream processing equipment in the industry.
- ***Domestic suppliers of entire machines and core components are rapidly emerging.*** Domestic suppliers of five-axis CNC machine tools and core components are rapidly emerging. Through technological breakthroughs, service upgrades, and collaboration among industry, academia, and research institutions, they are propelling the development of the industry. In the midstream of value chain, domestic suppliers are achieving technological advances through independent R&D, and their product performance is becoming increasingly comparable to international standards. With competitive pricing and localized services, domestic suppliers are accelerating the replacement of imported equipment. Meanwhile, the industry is shifting from single-machine sales to full-process integrated solutions that combine process optimization, intelligent programming, and operational support, greatly increasing customer value. Furthermore, with strong policy support, the localization of core components has made great progress. Leading suppliers are increasing investment in R&D and gradually overcoming technical barriers in key components, enhancing the autonomy and security of the supply chain. Last but not least, domestic suppliers are integrating resources through industry-academia-research collaborations to promote technological iteration and align with market demands, laying a foundation for the sustainable development of the industry.
- ***Expansion of five-axis CNC machine tools from industrial to consumer applications.*** Driven fundamentally by technological innovations, the application scenarios of five-axis CNC machine tools are extending from industrial to consumer markets. Through miniaturized equipment design, optimization of production costs, and machine learning-based automatic toolpath generation, the financial and technical barriers to equipment acquisition and operation are significantly reduced. These technological innovations have enabled five-axis CNC machine tools to extend beyond traditional industrial manufacturing into consumer-oriented scenarios such as creative design, educational practice, and personalized production. Such extensions meet the demand for high-precision and customized manufacturing in scenarios including precision model manufacturing and custom jewellery processing, thereby providing consumers with accessible channels to industrial-grade precision machining.

## INDUSTRY OVERVIEW

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### Challenges of China’s Five-axis CNC Machine Tool Industry

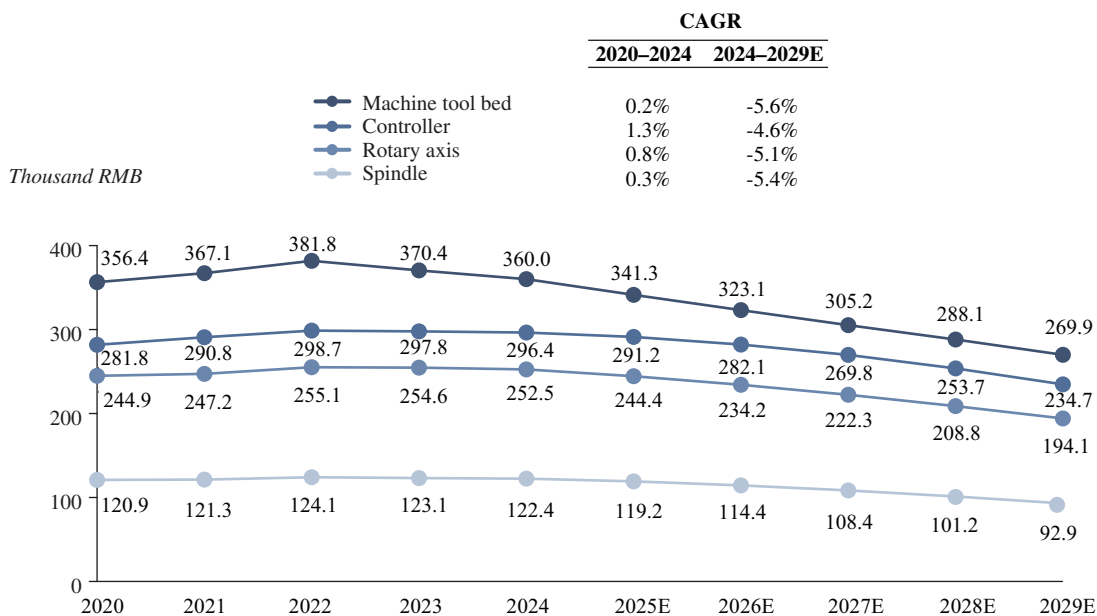
- ***Intense market competition.*** China’s five-axis CNC machine tool market is highly competitive, with overseas suppliers from Germany and Japan holding important positions due to their early entry and advanced technological capabilities. Although domestic suppliers have made notable progress in technology research and development in recent years, they still face significant challenges in brand recognition, product stability, and processing precision compared with these overseas competitors.
- ***Insufficient independent supply of core components.*** Five-axis CNC machine tools place high demands on the quality and reliability of key parts. In areas such as CNC systems, encoders, grating rulers, spindles, and rotary axes, domestic products still lag behind overseas counterparts in terms of precision and reliability. Most of these components are still imported, which not only increases production costs but also exposes suppliers to potential risks from overseas technology blockades and market restrictions, affecting the long-term sustainability of their business.
- ***Shortage of talent and rising labour cost.*** The five-axis CNC machine tool industry requires a large number of highly skilled professionals with interdisciplinary expertise in both technology development and machine operation. However, due to the relatively late start of the industry in China, there is a lack of experienced talent, and the talent cultivation system remains underdeveloped. To attract and retain qualified personnel, suppliers are required to offer higher salaries and better benefits, which increases their operating costs.
- ***Limited receptivity of five-axis CNC machine tools in the general industrial market due to high complexity.*** Many downstream traditional manufacturing companies have insufficient understanding of five-axis CNC machine tools. Although they may be aware of the tools’ high-precision and high-efficiency processing strengths, they continue to rely on low- to mid-end equipment due to the lack of necessary technical personnel and use experience of five-axis CNC machine tools, making it difficult for them to fully utilize the machines’ performance. As a result, promoting five-axis CNC machine tools in the general industrial market remains challenging and has become a constraint on the industry’s further development.

## INDUSTRY OVERVIEW

### Historical Price Changes of Raw Materials in China's Five-axis CNC Machine Tool Industry

Machine tool beds, controllers, rotary axes, spindles, and machine tool accessories are the core components of five-axis CNC machine tools, typically accounting for approximately 30.0%, 28.0%, 20.0%, 10.0%, and 10.0% of the total raw material cost, respectively. Among all, the machine bed serves as the foundational structure that supports and bears all components of the machine tool, ensuring the reliability and durability during high-speed and high-precision processing. As the size of the five-axis CNC machine tool increases, the demand for machine tool bed materials will increase, leading to a further rise in related costs. The controller is the most important part of the five-axis CNC machine tools and is responsible for precisely controlling the motion of the tool and the workpiece. As performance requirements such as processing precision continue to rise, the share of the controller in total cost is expected to further increase. The spindle and rotary axis provide cutting power and execute processing operations, making them essential to completing high-quality processing tasks. The prices of the above core components are affected by the material shortage caused by COVID-19 in the past few years, leading to an increase from 2020 to 2022. In the future, as the supply-demand dynamics gradually stabilize, and the localization rate increase, the corresponding price are expected to decline. The following chart sets forth the historical and forecast price changes of the core components for a vertical five-axis CNC machine tool with a maximum machining stroke of 300mm, which is now the mainstream five-axis CNC machine tool model in the market. In high-end manufacturing sectors such as the aviation and aerospace, the commonly used model are usually larger in size and more complex in structure, resulting in significantly higher costs for their core components compared to mainstream models.

**Historical and Forecasted Price Changes of Core Components for  
Five-axis CNC Machine Tools, 2020–2029E**



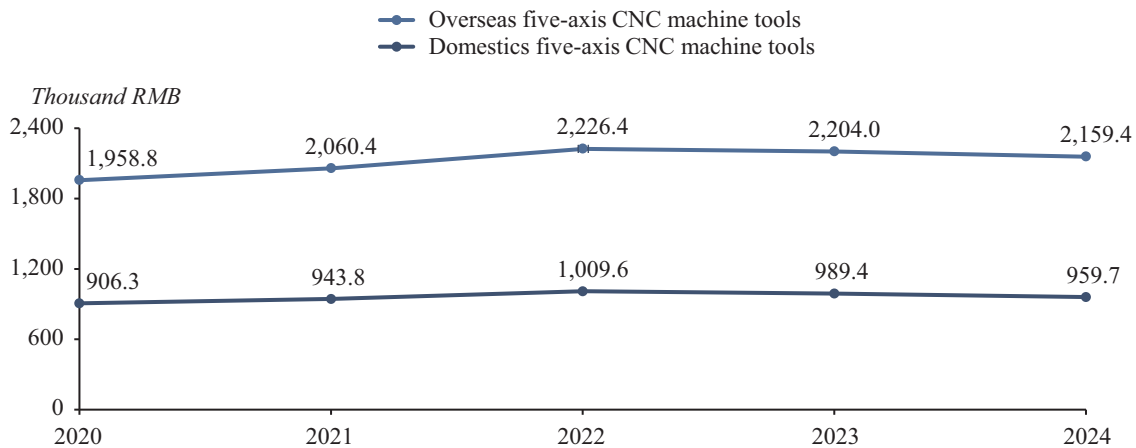
Source: GACC, Annual Reports, CIC

## INDUSTRY OVERVIEW

### Historical Price Changes of Domestic and Overseas Five-axis CNC Machine Tools

The price of five-axis CNC machine tools is influenced not only by factors such as application scenarios and size but also by brand attributes. Generally, for the same model, the price of a five-axis CNC machine tool from an overseas brand is approximately more than twice that of a domestic brand. Taking a vertical five-axis CNC machine tool with a maximum machining stroke of 300mm as an example, in 2024, the average price of the domestic five-axis CNC machine tools from is around RMB959.7 thousand, while the average price of the overseas five-axis CNC machine tools is around RMB2,159.4 thousand.

#### Price Changes of Domestic and Overseas Five-axis CNC Machine Tools, 2020–2024



Source: CMTBA, CIC

### Competitive Landscape of China’s Five-axis CNC Machine Tool Industry

#### *Ranking of five-axis CNC machine tool suppliers by revenue from five-axis CNC machine tools in China*

China’s five-axis CNC machine tool industry comprises both overseas and domestic suppliers. Historically, overseas suppliers have held a dominant position in the industry due to their early entry and established expertise. However, with the rapid development of China’s five-axis CNC machine tool industry, domestic suppliers are emerging, demonstrating a clear trend of domestic substitution. Domestic suppliers are progressively expanding their market share by leveraging their continuously improving technical capabilities, competitive product offerings, and efficient and reliable service responsiveness. In terms of revenue from five-axis CNC machine tools, the market share of domestic suppliers increased from 18.0% in 2020 to 55.0% in 2024 and is projected to exceed 75.0% by 2029. This demonstrates a positive growth momentum, signifying the significant trend towards domestic substitution.

## INDUSTRY OVERVIEW

China’s five-axis CNC machine tool industry is characterized by a large number of suppliers and intense market competition, and the competitive landscape is relatively concentrated. In 2024, in terms of revenue from five-axis CNC machine tools, the total market share of the top five five-axis CNC machine tool suppliers reached 44.8%. In particular, we ranked fifth among all suppliers and third among domestic suppliers in China’s five-axis CNC machine tool industry, with a market share of 4.3%. The following table sets forth the rankings of top five five-axis CNC machine tool suppliers by revenue from five-axis CNC machine tools in China.

### Ranking of China’s Five-axis CNC Machine Tool Suppliers, in terms of Revenue from Five-axis CNC Machine Tools, 2024

Ranking	Supplier	Location of corporate headquarters	Revenue (RMB million)	Market share <sup>(1)</sup>
1	Company A <sup>(2)</sup>	China	~1,550.0	14.4%
2	Company B <sup>(3)</sup>	Japan	~1,200.0	11.1%
3	Company C <sup>(4)</sup>	Germany	~1,100.0	10.2%
4	Company D <sup>(5)</sup>	China	514.1	4.8%
<b>5</b>	<b>The Group</b>	<b>China</b>	<b>469.2</b>	<b>4.3%</b>
	<b>Sub-Total</b>		<b><u>~4,833.3</u></b>	<b><u>44.8%</u></b>

*Notes:*

- (1) The market share is obtained by dividing the supplier’s revenue from five-axis CNC machine tools by the market size of China’s five-axis CNC machine tool industry.
- (2) Company A is a non-listed company founded in 1994 and headquartered in Beijing, China. It is mainly engaged in the R&D, production and sales of precision CNC machine tools.
- (3) Company B is a company listed on the Tokyo Stock Exchange founded in 1948 and headquartered in Tokyo, Japan. It is mainly engaged in the R&D, production and sales of CNC turning centers, milling machines, and additive manufacturing systems.
- (4) Company C is a non-listed company founded in 1926 and headquartered in Mindelheim, Germany. It is mainly engaged in the R&D, production and sales of universal machining centers and automated manufacturing systems.
- (5) Company D is a company listed on the Shanghai Stock Exchange founded in 2008 and headquartered in Dalian, China. It is mainly engaged in the R&D, production and sales of five-axis CNC machine tools, high-end CNC systems, key functional components and flexible automated production lines.

*Source: Annual Reports, CIC*

## INDUSTRY OVERVIEW

### *Ranking of five-axis CNC machine tool suppliers by revenue from five-axis CNC machine tools in the aviation and aerospace sector in China*

The aviation and aerospace sector is a significant application scenario for five-axis CNC machine tools and currently represents the largest share as of the total market size of China’s five-axis CNC machine industry. In 2024, the market size of China’s five-axis CNC machine tools in the aviation and aerospace sector reached RMB3.8 billion, accounting for 35.6% of the China’s five-axis CNC machine tool market. In terms of revenue from five-axis CNC machine tools in the aviation and aerospace sector in 2024, the Group ranked first among all suppliers in China’s five-axis CNC machine tool industry, with a market share of 11.6%. The following table sets forth the rankings of five-axis CNC machine tool suppliers by revenue from five-axis CNC machine tools in the aviation and aerospace sector in China.

#### **Ranking of China’s Five-axis CNC Machine Tool Suppliers, in terms of Revenue from Five-axis CNC Machine Tools in the Aviation and Aerospace Sector, 2024**

Ranking	Supplier	Location of corporate headquarters	Revenue (RMB million)	Market share <sup>(1)</sup>
1	<b>The Group</b>	<b>China</b>	<b>445.3</b>	<b>11.6%</b>
2	Company B	Japan	~380.0	9.9%
3	Company C	Germany	~330.0	8.6%
4	Company E <sup>(2)</sup>	China	~270.0	7.0%
5	Company A	China	~250.0	6.5%
	<b>Sub-Total</b>		<b><u>~1,675.3</u></b>	<b><u>43.6%</u></b>

*Note:*

- (1) The market share is obtained by dividing the supplier’s revenue from five-axis CNC machine tools in the aviation and aerospace sector by the market size of China’s five-axis CNC machine tool in the aviation and aerospace sector.
- (2) Company E is a non-listed company founded in 2015 and headquartered in Shanghai, China. It is mainly engaged in the R&D, production and sales of high-end CNC machine tools.

*Source: Annual Reports, CIC*

## INDUSTRY OVERVIEW

### *Comparison of top five suppliers in China’s five-axis CNC machine tool industry*

In terms of application scenario and product portfolio, the Group mainly focuses on providing five-axis CNC machine tools in the aviation and aerospace sector. Particularly, it has achieved breakthroughs on commercializing high-barrier products such as dual five-axis mirror milling machines and large-span carbon fiber composite five-axis machine tools. This has made the Group one of the most diversified and competitive suppliers in terms of product offerings. In contrast, other leading suppliers primarily cater to a more dispersed range of downstream sectors, offering product portfolios limited to commonly used five-axis CNC machine tools, with less emphasis on researching and developing new products using innovative materials and structural technologies.

In terms of processing portfolio, compared with other major domestic and overseas suppliers in China’s five-axis CNC machine tool industry, the Group provides one of the most comprehensive ranges. It supports not only conventional milling, turning, boring-milling, and drilling, but also advanced processes such as friction stir welding and riveting. This diverse portfolio enables the Group to address a broader spectrum of complex and high-end application scenarios. With respect to product performance indicators that reflect processing efficiency, precision, and applicability, such as the maximum linear axis feed rate, rotary axis positioning accuracy, five-axis RTCP accuracy, and processing stroke range, the Group’s products demonstrate strong overall performance, outperforming domestic peers across multiple dimensions and are comparable to those of leading overseas suppliers operating in China. The following table sets forth a competitive analysis of the products offered by the top five suppliers in China’s five-axis CNC machine tool industry.

### **Competitive Analysis of Top Five Five-axis CNC Machine Tool Suppliers in China, 2024**

Company	Product portfolio of five-axis CNC machine tools	Processing portfolio	Maximum linear axis feed rate (m/min)	Maximum rotary axis positioning accuracy (")	Five-axis RTCP accuracy (mm)	Maximum processing stroke range (mm)
The Group	<ul style="list-style-type: none"> <li>• More than seven product categories</li> </ul>	<ul style="list-style-type: none"> <li>• Milling, turning, boring-milling, drilling, stir welding, riveting</li> </ul>	120	3"	0.02	300–35,000
Company A	<ul style="list-style-type: none"> <li>• More than three product categories</li> </ul>	<ul style="list-style-type: none"> <li>• Milling, turning, boring-milling, drilling, graphite machining</li> </ul>	18	5"	0.03	50–2,000

## INDUSTRY OVERVIEW

Company	Product portfolio of five-axis CNC machine tools	Processing portfolio	Maximum linear axis feed rate (m/min)	Maximum rotary axis positioning accuracy (")	Five-axis RTCP accuracy (mm)	Maximum processing stroke range (mm)
Company B	<ul style="list-style-type: none"> <li>More than two product categories</li> </ul>	<ul style="list-style-type: none"> <li>Milling, turning, boring-milling, drilling, grinding, ultrasonic machining, laser, additive manufacturing</li> </ul>	60	5"	0.03	200–18,100
Company C	<ul style="list-style-type: none"> <li>More than five product categories</li> </ul>	<ul style="list-style-type: none"> <li>Milling, boring-milling, drilling</li> </ul>	100	5"	0.04	200–2,000
Company D	<ul style="list-style-type: none"> <li>More than five product categories</li> </ul>	<ul style="list-style-type: none"> <li>Milling, boring-milling, drilling, grinding, laser additive/subtractive manufacturing</li> </ul>	60	5"	0.03	200–8,000

*Source: Annual Reports, Official Websites, Product Manuals, CIC*

### Entry Barriers for China’s Five-axis CNC Machine Tool Industry

- Technical and process barrier.** The research, development, and manufacturing of five-axis CNC machine tools involve the integrated application of a wide range of advanced technologies. These include high-rigidity mechanical structure and material design, high-precision CNC system control for multi-axis simultaneous motion, and computer programming technologies suitable for complex surfaces and tool paths. Furthermore, five-axis CNC machine tools are applied across a broad range of application scenarios, and different industries have varying requirements for product forms and manufacturing processes. To ensure adaptability, suppliers must be proficient in diverse manufacturing processes. Consequently, the complexity of related technologies and processes requires strong research capabilities and long-term technical accumulation, which are difficult for new entrants to achieve in a short period.

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## INDUSTRY OVERVIEW

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- **Manufacturing barrier.** Five-axis CNC machine tools are complex large-scale intelligent manufacturing equipment composed of numerous parts and components. To ensure high processing accuracy and reliability, suppliers must exercise strict control over the production environment and every stage of the manufacturing process. This requires deep expertise in combining materials, components, and techniques, as well as strong production capabilities to ensure product quality. For new entrants, establishing a complete set of major packaged equipment manufacturing capabilities in a short time presents a major challenge.
- **Financial barrier.** The development cycle of five-axis CNC machine tools is long, requiring substantial capital investment in equipment acquisition, process development, and R&D. Only suppliers with sufficient financial resources can continuously invest in innovation to maintain competitiveness and support sustainable development. As a result, the industry sets a high bar for capital strength, forming a clear financial barrier for new participants.
- **Talent barrier.** The five-axis CNC machine tool industry is highly technology-intensive and requires the integration of complex, interdisciplinary knowledge across machinery, automation, and software development. As a result, high requirements are placed on the technical competence and experience of R&D and engineering personnel. Suppliers must make significant investments in talent development. In 2024, the average proportion of China’s five-axis CNC machine tool suppliers’ R&D investment as of their revenue reached approximately 30.0%. New entrants often lack the ability to allocate such resources and to cultivate talent with the necessary cross-disciplinary expertise in the short term.
- **Brand barrier.** In the five-axis CNC machine tool industry, the performance, reliability, and stability of the equipment are directly tied to the quality of part processing. Therefore, the brand influence, product service quality, and market reputation of suppliers have become critical factors for customer decisions. The overall brand strength built by suppliers over time is a key for order acquisition and serves as a significant barrier to entry for new market participants.

## SOURCE OF INFORMATION

In connection with the [REDACTED], we engaged CIC, an independent market research consultant, to conduct an analysis of, and to prepare a report about China’s five-axis CNC machine tool industry. The CIC Report has been prepared by CIC independent of the influence of our Group and other interested parties. We have agreed to pay CIC a total fee of RMB450,000 for the preparation and use of the CIC Report, and we believe that such fees are consistent with the market rate. CIC is a consulting firm founded in Hong Kong and provides professional industry consulting services across multiple industries. CIC’s services include industry consultancy services, commercial due diligence and strategic consulting.

## INDUSTRY OVERVIEW

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CIC conducted both primary and secondary research using a variety of resources. Primary research involved interviewing key industry experts and leading industry participants. Secondary research involved analyzing data from various publicly available data sources. The market projections in the commissioned report are based on the following key assumptions: (i) given China’s enduringly stable political system, effective social governance and robust economic foundation, it is anticipated that the overall social, economic and political environments in China will remain stable during the forecast period; (ii) according to the National Bureau of Statistics of China, key economic indicators such as Gross Domestic Product (“GDP”), industrial added value, and urbanization rate have shown an upward trend in China over the past decade. Therefore, we believe that the economic and industry development in China is likely to maintain a steady growth trajectory during the forecast period, accompanied by continuing urbanization; (iii) related key industry drivers such as the machine tool industry has reached the bottom of its cycle and is approaching a peak period of equipment replacement, overseas technology blockades drive surging domestic substitution demand, technological breakthroughs support cost reduction and application expansion, and favorable policies and regulations are driving the industry forward are likely to propel continued growth in China’s five-axis CNC machine tool industry throughout the forecast period; and (iv) there will be no extreme force majeure event or unforeseen industry regulation that may significantly or fundamentally affect the relevant market and industry.

Unless otherwise specified, all data and forecasts contained in this section are derived from the consultancy report of CIC. Our Directors have confirmed that there has been no adverse change in the market information since the date of publication of the CIC Report, which may qualify, contradict or impact the information in this Industry Overview section. Each of our Directors and the Joint Sponsors has exercised reasonable care in selecting and identifying the named information sources, compiling, extracting and reproducing the information, and ensuring that there has been no material omission of the information in this Industry Overview section.