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China A-shares opportunities in the humanoid robot supply chain

May 2024

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From manufacturing to service provision, robots have been transforming the way we live and work. The humanoid robot sector has been developing rapidly since 2023, driven by artificial intelligence (AI) breakthroughs such as reinforcement learning. The latest developments in AI models have strengthened the case for the application of humanoid robots for commercial and family use. We believe this trend has huge growth potential for the global robotics market.

Humanoid robots are robots that resemble the human body in shape and mimic human movements. Designed to perform tasks autonomously, recent AI technology advances have improved the interaction capabilities of these robots significantly, thereby creating large upside potential for the industry and its supply chain in terms of long-term demand.

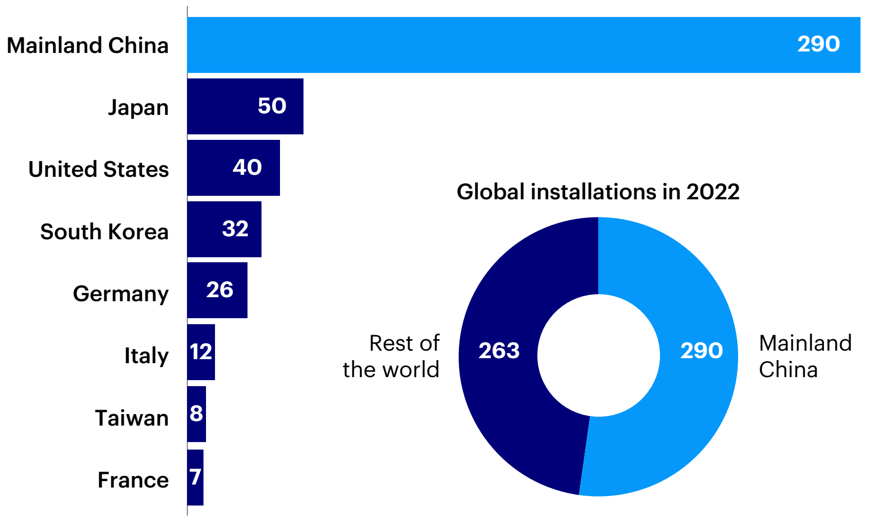
Macquarie expects the humanoid robot manufacturing volume to reach 9.4 million units by 2035E, delivering a volume compound annual growth rate (CAGR) of 69% over 2025 to 2035E. By 2035E, the bank estimates the global market size for humanoid robots will reach US $209 billion, resulting a 50% market CAGR over the ten-year period from 2025 to 2035E. [1]

China has emerged as a global leader in the production of robotics and automation technologies, thanks to its robust manufacturing infrastructure, skilled workforce, and government support for innovation. A key barrier to scaling the humanoid robot industry is making it affordable for family use by lowering manufacturing costs. China's low-cost advantages in the robotics supply chain could help give Chinese companies the strategic advantage to participate in the global supply chain for humanoid robots.

China has become a major player in the industrial and service robot sectors

China's market share of the industrial robot sector has been growing steadily since 2018. In 2022, China accounted for around 50% of the global market (Figure 1). This dominant position provides strong footing for the country to keep developing its technological know how and cost advantages in the robotics supply chain.

Figure 1 – New installations of industrial robots in 2022 (in thousands)



Source: International Federation of Robotics (IFR)

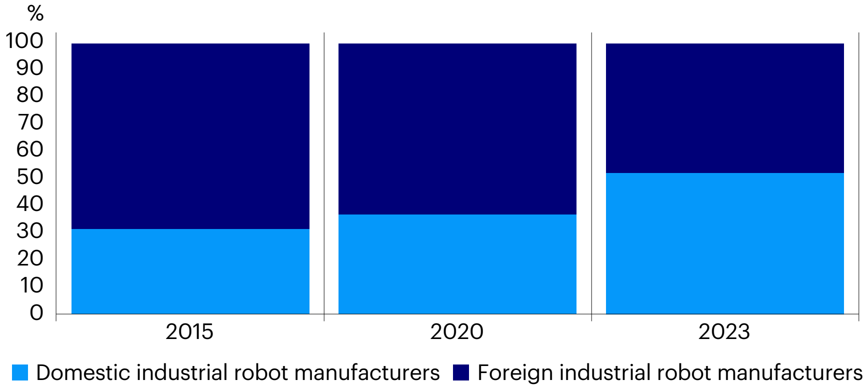
1. Humanoid robots - Tech giants invest in humanoid robot developers, Macquarie Equity Research, March 2024.

China A-shares opportunities in the humanoid robot supply chain

May 2024

Over the past decade, domestic players in China have been capturing an increasing market share of the global industrial robot sector due to cost advantages (Figure 2).

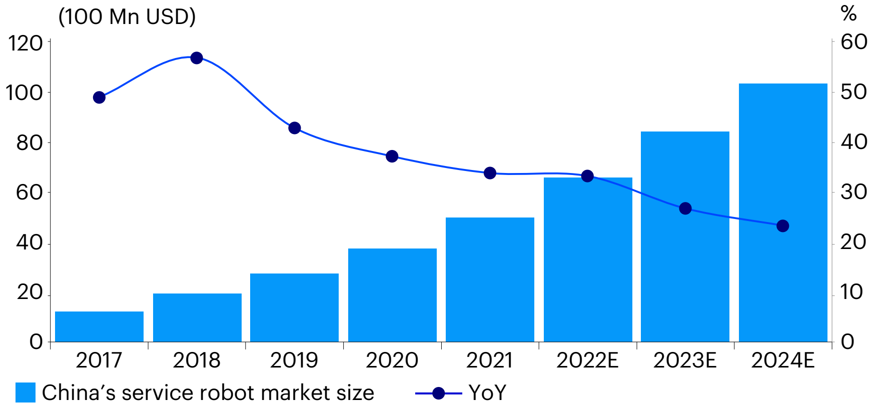
Figure 2 - Rising market share of domestic players from 2015-2023



Source: Qianzhan Intelligence

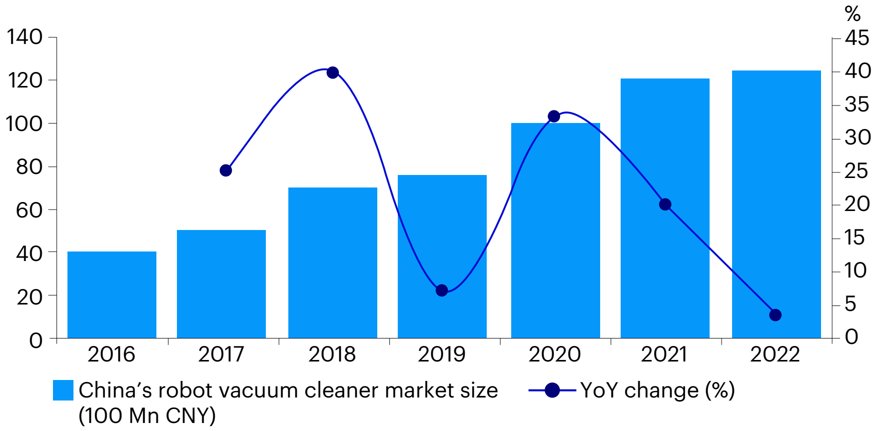
China's market share in the manufacturing of service robots for personal or professional use has also grown since 2017 (Figure 3), particularly in robot vacuum cleaners. While an American company leads the robot vacuum cleaner sector, Chinese competitors take the second and third places in terms of global market share.

Figure 3 – Market size of service robot industry in China



Sources: China Institute of Electronics, International Federation of Robotics (IFR)

Figure 4 - China's robot vacuum cleaner market size (2016-2022)



Source: huaon.com

China A-shares opportunities in the humanoid robot supply chain

May 2024

Support for the robotics supply chain at both central and local government levels

The Chinese government is also committed to supporting technological innovation and developing the country's robotics sector. In December 2022, the Ministry of Industry and Information Technology (MIIT) and several other government departments jointly issued a development plan for the robotics industry over the period covered by the 14th Five Year Plan (FYP) between 2021 and 2025. This marked the first specialized plan shared for the overall growth of the robotics industry and domestic production of core robotics components.

In late May 2023, the Shenzhen municipal government released an action plan for accelerating the high-quality development and high-level application of AI by encouraging various industries to apply AI technologies and develop highly intelligent industrial robots. The Ministry of Science and Technology and the National Development and Reform Commission (NRDC) also called for the establishment of a humanoid robot manufacturing innovation center in Guangdong province, leveraging the advantages of the Guangdong–Hong Kong SAR–Macao SAR Greater Bay Area in manufacturing, and carrying out large-scale applications of humanoid robots.

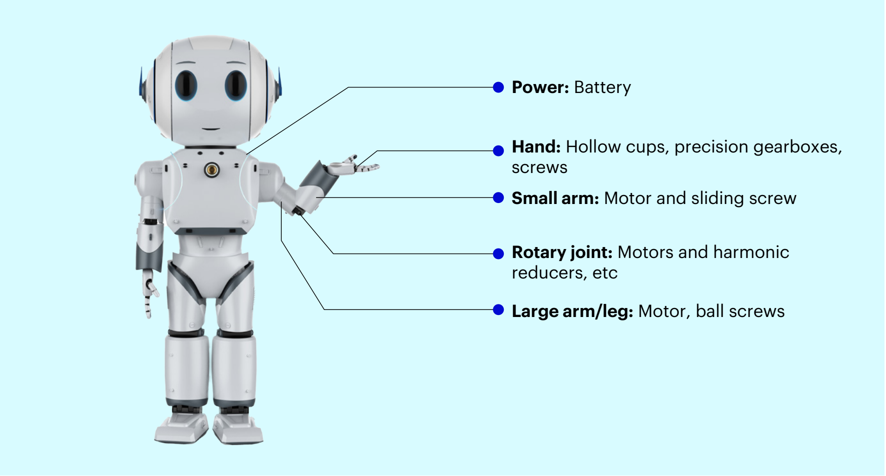
Later in June of 2023, the Beijing municipal government announced the *Beijing Robotic Industry Innovation and Development Action Plan (2023-2025)* aimed at promoting the city as an innovation center for humanoid robots and targeting to generate revenue of more than 30 billion yuan from the robot industry by 2025. [2]

Major components in the humanoid robot supply chain

The humanoid robot supply chain has evolved from the industrial robot supply chain. Humanoid robots share a lot of common hardware components with industrial robots such as servo motors, precision reducers and robot controllers.

At the same time, these robots need to have better machine vision and perception capabilities than their industrial counterparts, given the need to navigate various terrains and obstacles and identify objects. This requires components such as image sensors, millimeter wave radars, as well as two dexterous hands that can handle complicated and precise movements. Humanoid robots also need to be trained in AI machine learning models to navigate their surroundings, unlike industrial robots that can follow a predefined route in a confined environment. AI generated content (AIGC) technology is also required to ensure humans can communicate with the robot and give it commands.

Figure 5 – Key operation and control components of a humanoid robot



Source: Invesco, for illustrative purposes only.

2. China's Robot Revolution, Progress in Adoption of Industrial Robots and the Challenges Ahead, January 2024.

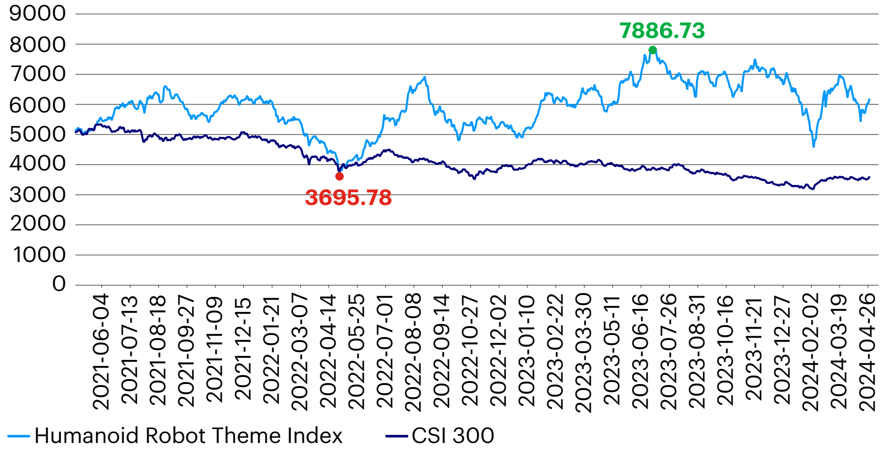
China A-shares opportunities in the humanoid robot supply chain

May 2024

Investment implications of the humanoid robot supply chain on the China A-shares market

The growing demand for humanoid robot components could bring about significant opportunities to invest in the robotics supply chain in China. Chinese manufacturers can leverage on their cost-effectiveness and expertise in the production of industrial and service robot components. We are positive on those China A share robotics companies that specialize in key incremental components used in humanoid robots that have the least overlap with industrial robots, for example, companies that make planetary roller screws, 3D vision sensors, and hollow cup motors.

Figure 6 - Performance of the humanoid robot theme index versus the CSI 300 (April 2021- March 2024)



Source: Wind, data as of March 2024. **Past performance is not a guarantee of future results.**

Conclusion

We believe China's competitive position in the robotics supply chain can play a central role in driving growth in the humanoid robot market. Furthermore, the government's support for innovation bodes well for this sector going forward. As the global demand for humanoid robots grows, we are positive on China robotics component manufacturers in the medium to long term.

With contributions from Monica Uttam, Thought Leadership and Insights, Asia Pacific.

China A-shares opportunities in the humanoid robot supply chain

May 2024

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China A-shares opportunities in the humanoid robot supply chain

May 2024