
Humanoid robots perform during the opening ceremony of the 2026 Tianjin Fashion Week on June 12 © Tong Yu/China News Service/VCG/Reuters

**Joe Leahy** and **Tina Hu** in Beijing and **William Langley** and Shihuan Chen in Guangzhou

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In the workshops of the Sany truck plant in central China, the whirr of robots pressing and spraying vehicle panels has virtually replaced the chatter of humans.

The company is also trying to automate the final and most labour-intensive assembly phase, using humanoids — the frontier of robotics — in anticipation of labour shortages when China's population ages.

"China's demographic structure is shifting and the population is gradually shrinking — that is an undeniable reality," says Huang Tie, deputy general manager of Sany Truck Manufacturing, which is based in Changsha, in Hunan province. "For labour-intensive industries, we believe replacing humans with robots is inevitable."

The demographic change to which he refers — set to be one of the fastest in an ageing world — is China's biggest economic headwind. The country's working-age population aged 15 to 64, which peaked at 1bn in the last decade, is due to fall to just 300mn by 2100, according to UN figures — a decline that could prevent China from becoming the world's biggest economy.

An explosion in Chinese debt will place a huge burden on the shrinking population

FINANCIAL TIMES Sources: IMF; UN World Population Prospects 2024

Beijing now sees AI-enabled machines as a way out of the demographic trap. Last year the country installed more industrial robots than the rest of the world put together; it also makes most of the world's humanoids.

From Communist Party leaders in Beijing to business owners across China, there is a growing consensus that the country needs to embed "embodied artificial intelligence", as AI-controlled robots are known, into as many tasks as possible and as soon as possible.

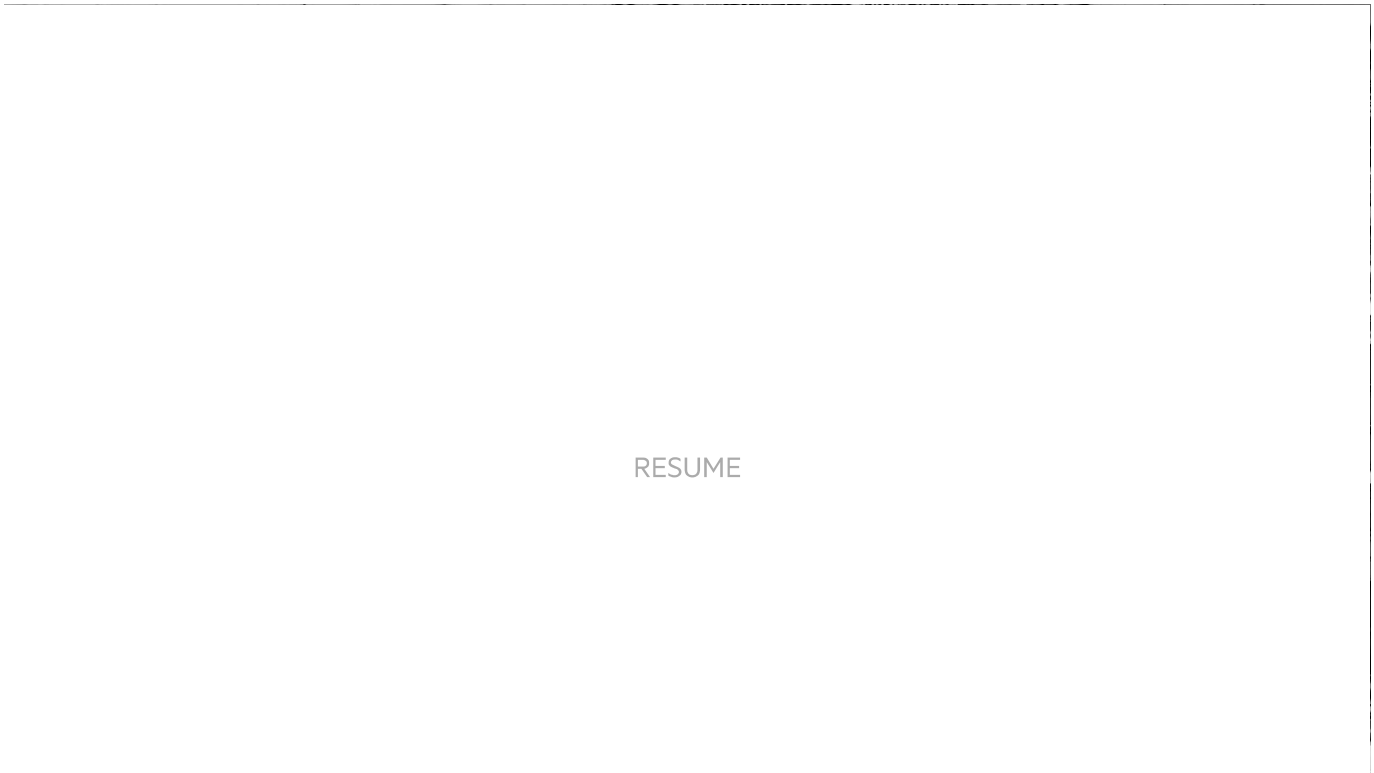
"We have not seen a transformation of this speed and scale since the industrial revolution," says Yuhan Zhang, principal economist of the China Center at the Conference Board.

Whether it is intricate industrial processes, such as factory quality control, or elite service industry jobs, such as preparing Michelin star-level meals, all are under scrutiny for automation.

President Xi Jinping has consistently championed the robot revolution, declaring in 2014, just two years after taking power: "Not only do we need to upgrade our robots, we also need to capture markets in many places."

The Communist Party's latest five-year plan calls for "new forms of work involving human-machine collaboration", and "embodied intelligence in posts with labour shortages, high-risk environments, and other conditions".

The country now has to manage the transition from human to robot.




Robots demonstrate their abilities in a packing factory © Reuters

"Who gains and who loses remains an open question, but the adjustment costs are likely to be significant," says Zhang of the Conference Board.

China already has high youth unemployment and an increasing population of "gig" workers without permanent jobs, following the collapse of its property market starting in 2021, which has undermined domestic demand and household confidence.

China's gig workforce numbers around 320mn and is drawn from both the highly educated middle classes and low-skilled migrant workers. If Beijing moves too fast on AI and robotics, it risks leaving both groups without satisfactory job opportunities.

This month Liu Qiangdong, the head of one of China's largest ecommerce companies, JD.com, warned that robots would "sooner or later" replace his 700,000 delivery workers.

And if there is one thing that obsesses the Communist Party almost as much as its race with the US for tech supremacy, it is maintaining social cohesion.

"A lot of the people we're talking about are college graduates who will be out of jobs and this is the demographic group that the government is very, very worried about," said Minxin Pei, professor of government at Claremont McKenna College in California.

While migrant labourers have "much less social capital and capacity for political action", "when you're talking about urban young people, typically only children in whose education the entire family has invested, that will be a huge social problem".

## Humanoids in the machine

China has rolled out its robots at an impressive clip. Between 2021 and 2024, the country doubled the number of units installed in its factories to 2mn, the most in the world, according to the International Federation of Robotics.

In 2020 robots produced domestically accounted for only 30 per cent of installations. By 2024 they made up 57 per cent of new units. As of last year, China had 166 industrial robots per 10,000 workers.

"The emphasis on robotics is in part due to the realisation that there will be fewer and fewer people," says Bert Hofman, a World Bank veteran now at the National University of Singapore.

Now Beijing is targeting the humanoid sector with subsidies and policy as it previously did with industrial robots. Last year, Beijing announced a Rmb1tn fund over 20 years for "new productive forces" — advanced technology that includes robotics.

This month local governments and state-owned enterprises were ordered to include "embodied artificial intelligence" in manufacturing, logistics, retail and healthcare industries. The goal is to install at least 10,000 AI-powered robots in commercial settings nationwide this year.

"Humanoids and robots will be the next key driver of China's export machinery over the coming 5 to 10 years," Morgan Stanley economists said in a report released last month, drawing parallels between the development of humanoids and robots and that of the EV industry a decade ago.

China accounted for 90 per cent of the 13,000-16,000 humanoid robots that were shipped globally last year, they said. Sales of China's homegrown humanoids would rise to about 50,000 units this year, higher than any other country, they added.

Among Chinese businesses, however, there is debate over what to do with the new humanoids.

Eric Guo, chief executive and founder of AI² Robotics, a producer of humanoids based in China's southern tech city of Shenzhen, says such androids are not yet "very good at doing tasks that are too easy or too hard".

China has rapidly expanded its use of industrial robots ...

Annual installation of industial robots

Thousand units | Share (%)

China Rest of the world

... with its robot stock surpassing 2mn units

Operational stock of industrial robots, 2024

Thousand units | Share (%)

FINANCIAL TIMES

Source: International Federation of Roboti

Their intricate joints, hands and expensive AI software make them unsuitable for easy, predictable and highly repetitive tasks that an industrial robot might handle well.

At the same time, environments that are too unpredictable or complicated are "too hard" for androids, Guo says. "One typical example is people's apartments. They are [currently] too difficult for a robot to work in."

But, he adds, in the long term, humanoids will take over millions of factory jobs, such as dangerous or unpleasant tasks. "There are fewer people who want to do manufacturing work compared with office work," Guo says.

Cao Yuran, senior marketing manager at Li Gong Industry, whose plant in Guangzhou makes bulky silver-coloured humanoids, says they are better suited to high-value meticulous manufacturing tasks, such as precision screw-driving, glue application or bespoke garment making — tasks typically done by highly skilled workers.

"Master craftsmen will become more and more scarce, as younger generations have no desire to enter factories as apprentices," Cao says.

But teaching a robot to mimic a human is brutally difficult. It cannot inherently feel the texture or resistance of a piece of fabric, for instance, or easily navigate dynamic situations in real production environments.

The gap between ambition and reality remains wide with humanoids, says Laila Khawaja, a technology analyst at Gavekal, a research group, because robot brain capability is limited.

To close that gap, an astronomical amount of training data is needed, Li Gong's Cao says. Sensing an opportunity, his company recently began selling its data-collection kits — essentially a backpack with gloves and a bike helmet equipped with cameras and sensors.

Human workers wearing these can transmit real-time data to help train humanoids. On a production line shown to the FT, Li Gong workers donned the suits while sorting parts, screwing things together and doing other tasks next to a line of half-assembled hanging humanoids.

Cao notes that the industry is realising that it will take "at least tens of millions of hours of data" before humanoid robots can truly reach their breakthrough moment. Bridging this data deficit is the industry's next great collective hurdle, he says.

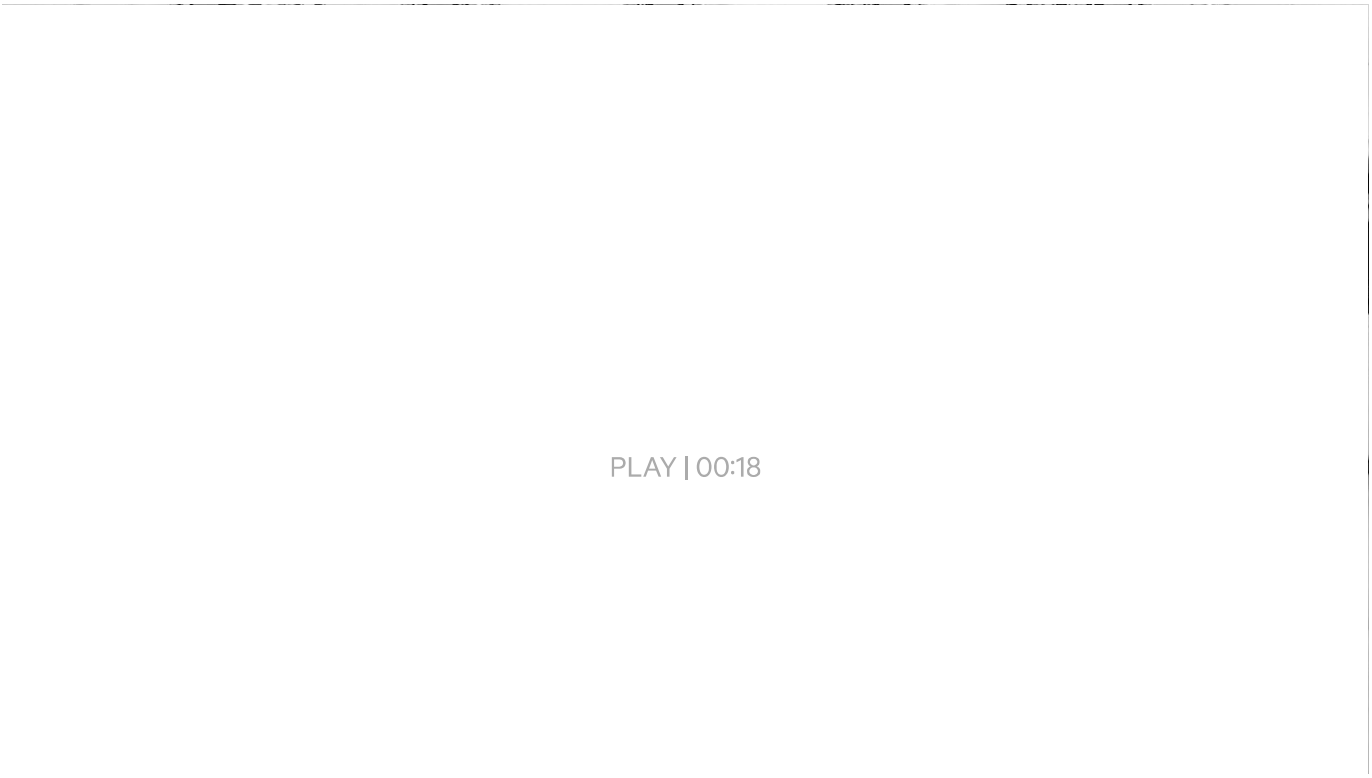
## Michelin-starred bots

The robot revolution is quickly hollowing out employment not just in manufacturing but also in services, the area many policymakers had hoped would absorb redundant factory workers.

At Huazhu, one of China's largest hotel operators and the owner of Germany's Steigenberger chain, guests can check themselves in using self-service terminals while robots handle their luggage, food deliveries and even some room cleaning. A bottle of water can be dispatched to a room within seconds via a delivery robot. Huazhu says such services, developed in partnership with Tencent, have been rolled out to more than 3,200 hotels.

Automation has reduced the staff-to-room ratio to 0.1, meaning a 100-room hotel can operate with about 10 employees, according to the company, compared with the industry benchmark for economy hotels of 30 to 80 workers per 100 rooms. The company's founder, Ji Qi, told partners at a company conference that "we hope to turn hotels from labour-intensive businesses into technology-driven enterprises".

At the Beijing showroom of Linkerbot, a producer of humanoid hands, a robot plays a keyboard while another bangs a drum in an android mini-orchestra.




Robots showcase the ability to synchronise their movements © Reuters

The company says humanoids will compensate for China's "skills mismatch" — doing factory jobs people either do not want to do or for which labour is short. The idea is also to "democratise" the abilities of top craftspeople by teaching robotic hands to perform skills that "only a tiny fraction of humanity has ever mastered".

"Take cooking: our goal is not simply to prepare edible food, but to learn, through high-precision hardware combined with large-scale AI models, the wok technique and knife logic of a Michelin-starred chef," Linkerbot said in a statement.

Allen Zhang, founder and CEO of Shanghai-based humanoid producer Matrix Robotics, says that in the long run humanoid makers might earn more revenue from the software powering their devices than the hardware. Their humanoids could offer licensed services that mimic a skilled human practitioner for a fee.

For example, Zhang says, he could rent a humanoid with the skills of a master chef to a customer. "The use of that skill will cost you maybe $9.99," he adds.

## The threat to jobs

The rule of China's Communist Party has long rested on an unwritten social contract of economic development in exchange for curbs on personal freedoms and civil rights.

The economic consequences of the demographic decline threaten to undermine that contract, but so too may the government's embrace of AI and robotics.

## Labour's share of income in China has risen over the past decade

Labour compensation in households as a % of gross national income, 1992-2024


FINANCIAL TIMES

Source: National Bureau of Statistics, FT calculation

The collapse in the birth rate — itself largely caused by Beijing's former one-child-per-family policy — is set to hit growth, consumption and the government's budget in the remainder of this century and make the country's debt much harder to repay.

But the transition to robotics may kill jobs even faster than the reduction in the working-age population.

In a document published this month, China's cabinet called for the improvement of "the early warning and handling system for employment risks related to artificial intelligence applications and to strengthen joint responses to related labour relations risks".

The shifts towards AI and automation are rebalancing income in favour of capital and away from labour, academics say, a dilemma for the Communist Party, which pursues state-led capitalism but also claims to represent the interests of workers.

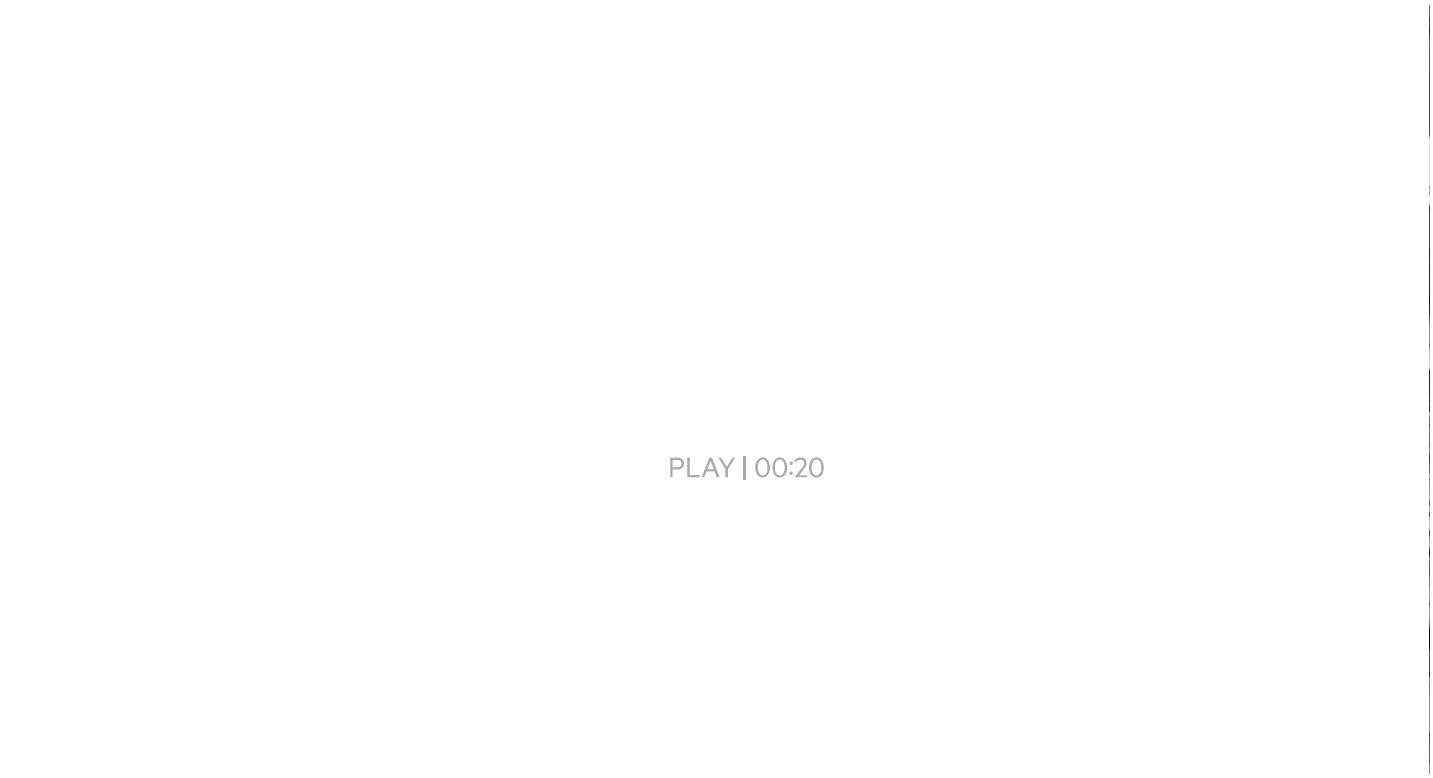
Qiu Xincheng, an economist at Peking University's Guanghua School of Management, says the proportion of national income that is received by workers has traditionally been about two-thirds. But AI and automation are set to change that.

"If capital produces most of the output in the economy, then capital will earn the most income," Qiu says. China's policymakers will need to rethink the tax system to redistribute income more evenly, he adds.

Other academics recommend that as the share of labour income declines, the government should gradually reduce personal income tax for individuals, raise taxes for companies, and impose duties on robots. They also advocate increasing retraining of workers for other roles and reforming China's social-security system.

Qiu says there are still many unknowns with the robot and AI transition, however, such as whether it might create new categories of work for humans.

"When the steam engine appeared, people first saw the unemployment of craftsmen. It was hard to see that we were going to have railroads, the modern factory, modern finance and the new middle class," Qiu says.




Industrial robots have been installed in factories in the past decade © Reuters

There are signs new jobs are being created. This year, nine Chinese universities launched undergraduate degrees in embodied AI, with large companies ranging from Huawei and Xiaomi offering jobs in the area.

JD.com's Liu said he has already signed contracts with about 120 schools to retrain his delivery workers for jobs such as robot repair and maintenance.

Not all workers are convinced. Last month, when Shenzhen's government announced new rules that pave the way for the development of autonomous taxis citywide, existing drivers were outraged, arguing that the competition would threaten their livelihoods.

Few expect China, which sees itself as locked in a close race with the US for tech supremacy, to slow down. It will instead rely on its strong surveillance state to help contain social pressures and introduce measures to alleviate unemployment — such as retraining — while pursuing self-reliance and global manufacturing dominance, analysts say.

"For now, they're not going to worry about the social consequences because the national security imperative is so overwhelming for them," says Claremont McKenna College's Pei, referring to Beijing's strategic goal of gaining technological superiority over the US. "So they will just charge ahead and cross that bridge [social strains] when they come to it."

In that, the government will have the support of China's factory owners. Even the most traditional industries, such as construction materials, are diving into AI-enabled processes.

Liu Xungong, vice-president at Guangdong Dongpeng Holdings, a ceramic tiles and bathroom products maker in Foshan, says that since the company began speeding up automation in 2021, it has reduced workers by 40 per cent and increased production by 32 per cent.

He cites the company's latest changes, an AI-driven quality inspection process, implemented partly through partnership with Chinese tech giants such as ByteDance, the owner of short-video app TikTok, which has eliminated the need for an estimated 40-50 highly experienced people.

Liu's rationale is blunt: "Humans get fatigued and require rest but AI does not."

*Data visualisation by Haohsiang Ko and Keith Fray*

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