

# The Involution Dividend

*China built the engineers. AI broke the clock. Here is where the capital goes.*

Santy Gegenschatz · Draft 0.2 · September 5, 2026 · 29 min read

## Preface: three things you can see

You can see the next decade from three vantage points, and none of them is a forecast. They are observations. Anyone can make them. Almost nobody prices them.

The first is that the richest society in history has decided to fight itself. The United States still has the deepest capital markets, the best laboratories, and the reserve currency. It also has a politics that resets its industrial strategy every four years, shuts its own government for weeks at a time, and has turned the admission of foreign engineers into a culture-war item. None of this shows up in a quarterly earnings call. All of it shows up in the rate at which physical things get built.

The second is that China is producing engineers at a rate the world has never seen, and that they are good. Ten to one at the bachelor's level. Nearly two to one at the doctoral level. The top of the Nature Index. And that talent is not being pointed at apps. It is being pointed at motors, reducers, sensors, batteries, magnets, and the control software that runs them, on top of an industrial base that already makes most of the world's physical goods.

The third is that the frontier AI labs have changed the rules of certain games. Things that took hours take seconds. Things that took months take hours. Not everywhere, and this is the part almost everyone gets wrong, but in specific fields the cognitive step of

the work has collapsed to near zero cost. Wherever that has happened, the constraint has moved from thinking to building, and building needs capital, fast.

Put the three together and you get a picture that I think is close to inevitable. The capacity to design will be abundant and cheap. The capacity to build will be scarce and Chinese. The profit will accrue to whoever owns the slow steps of the process, and because of a peculiarity of how China treats its own shareholders, it will not accrue to China.

This essay is an attempt to paint that picture in enough detail to trade it. It is written in the spirit of a document I admire, which laid out a similar set of trendlines for AI in 2024 and was mostly right about the trend and catastrophically wrong about the leverage. I will come back to that. First, the observations.

## I. The polarization tax

Growth is made of long-dated projects. A semiconductor fab takes four years from ground-break to first wafer. A high-voltage transmission line takes a decade to permit. A nuclear plant, in the United States, takes fifteen years if it is built at all. Every one of these needs a policy environment that outlasts the electoral cycle that started it.

The United States no longer offers that. Consider what happened to the two largest industrial-policy bets of the decade. The CHIPS Act and the Inflation Reduction Act were passed in 2022. By 2025 the second had been substantially unwound and the first was being renegotiated project by project. A company that broke ground in 2023 on the strength of a tax credit had, by the time it poured the last of the concrete, a different set of rules. In October 2025 the federal government shut down for forty-three days, the longest closure in its history. In September 2025 a \$100,000 fee was placed on the visa category through which most foreign-born engineers enter the country.

None of this is a judgement about which side is right. It is an observation about variance. Polarization is a tax on anything that takes longer than one election to pay off, and the things that take longer than one election are exactly the things that compound. The share of Americans who hold a very unfavourable view of the other party has

roughly tripled since the 1990s. That number is not on any balance sheet, but it is in every discount rate applied to a ten-year physical project on American soil.

There is a second, quieter cost. A polarized society spends its best minds on the fight. The marginal Harvard graduate in 1995 went to a lab or a bank. The marginal one in 2025 goes to a think tank, a campaign, a content operation, or a law firm that sues the other side. That is not nothing. It is the opportunity cost of a civil argument that has no end condition.

Meanwhile, the other large economy on earth runs five-year plans, and executes them. You may find that system distasteful. I find parts of it distasteful. But the fifteenth plan, covering 2026 to 2030, will be carried out, and the thirteenth and fourteenth were, and that continuity is worth more to a fab or a grid than any tax credit.

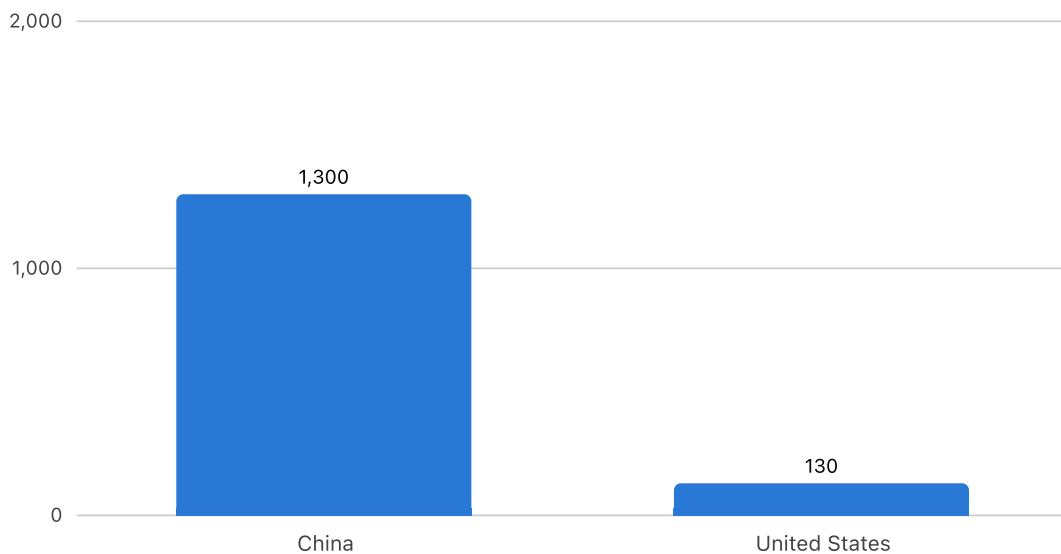
The United States is not going to lose its capital markets, its dollar, or its labs. What it is losing, visibly, is the rate at which it converts ideas into infrastructure. Keep that in mind, because the rest of this essay is about a world in which ideas become nearly free and infrastructure becomes the whole game.

## II. The engineer flood

Let me lay out what I mean by capability, because the word gets used loosely.

**Talent supply.** China graduates roughly 1.3 million engineers a year. The United States graduates about 130,000. That is a ten-to-one ratio at the bachelor's level. Broaden it to all STEM disciplines and China produces around 3.57 million graduates annually, more than 40% of all its university output. At the doctoral level, China was projected to produce over 77,000 STEM PhDs a year by 2025, against roughly 40,000 in the US, and about 45% of those come from its most elite institutions. If you strip international students out of the American figure, the ratio is more than three to one.

## Engineering bachelor's degrees per year, thousands



Ten to one. And the tail of a distribution with 1.3 million draws is a very long tail. Source: Fortune (Jan 2026); CSET Georgetown; WorldRankd 2026.

► View data

You can argue about quality, and you should. Not every one of those engineers is good. But the tail of a distribution with 1.3 million draws is a very long tail, and that tail is now being pointed at motors, reducers, sensors, and control systems.

**Quality, measured.** The metrics that are hardest to game have all flipped within a decade. In the Nature Index, which counts contributions to a fixed set of the world's best journals, Chinese institutions overtook American ones in 2023 and have widened the lead every year since. Among the top tier of AI researchers, more did their undergraduate degree in China than in the United States. A third of the engineers at the leading American labs were trained, in whole or in part, in Chinese universities. When the visa fee arrived in 2025, the labs objected loudly and then quietly opened offices in Singapore, London, and Zurich.

**What engineers actually do to an economy.** The compounding mechanism is not that smart people invent things. It is that the marginal cost of attempting a hard engineering project falls when engineers are abundant. BYD, CATL, DJI, and the entire Chinese solar supply chain are not stories about a single genius. They are stories about a firm being able to put four hundred engineers on a problem that a Western competitor would staff with forty, and iterate ten times faster because of it. That is what a large

stock of trained engineers buys you: the option to try. And options that are cheap to exercise get exercised.

**Where they are pointed.** This is the part that matters for the next decade. In 2015 the best Chinese graduates went to Tencent and Alibaba, and Beijing let them. After 2021 Beijing decided that consumer internet was not where it wanted its engineers, and it made that decision stick with a regulatory campaign that erased roughly a trillion dollars of market value. The engineers went where the state pointed: semiconductors, batteries, robotics, biotech, aerospace, power. Whatever you think of the method, the result is that the largest cohort of engineers ever trained is now working on physical systems.

### III. The clock breaks

Now the third observation, which is the one that makes the first two urgent.

In 2024 the frontier labs shipped models that could write competent code. In 2025 they shipped models that could carry out multi-hour engineering tasks with occasional supervision. By 2026 the length of task a frontier model can complete unsupervised has been doubling roughly every seven months, and it has been doing so for six years. If you extend that line, and I do, then by 2028 a model works for a week on its own and by 2030 for a quarter.

You do not need to believe the extrapolation to see what has already happened. Here is a partial list of things that have gone from months to hours, or from hours to seconds, in fields I have watched closely:

- Predicting the structure of a protein went from a doctoral thesis to a database lookup. Two hundred million structures now exist that did not exist in 2020.
- A literature review across ten thousand papers went from a summer to an afternoon.
- The first working version of a piece of software went from a team of five for a quarter to one engineer for a day.
- Chip floor-planning, circuit layout, and verification, once the bottleneck of every tape-out, now run in hours with human review.

- Legal drafting, financial modelling, patent search, and regulatory filing preparation, the paperwork of capitalism, have collapsed in cost by an order of magnitude.

Each of these is a game whose rules have changed. In each case the binding constraint used to be cognitive throughput: the number of trained humans who could think about the problem in parallel. That constraint is gone. Whatever step of a process consisted mainly of thinking is now approximately free.

Here is what follows, and it is the hinge of the whole essay. When one step in a process becomes free, the other steps become the bottleneck. The value of the process does not vanish. It migrates. It moves from the people who used to do the thinking to whoever controls the steps that still take time.

And the steps that still take time are the physical ones. A drug whose molecule was designed in an hour still needs a three-year trial. A chip whose layout was verified overnight still needs a fab that took four years to build. A robot whose control policy was trained in a week still needs a harmonic reducer that a factory in Jiangsu makes at a rate of so many thousand a month. A power plant whose engineering drawings were produced in a day still needs a turbine, a transformer, and a permit.

Design becomes abundant. Building stays scarce. Capital moves to the scarce thing. This is the whole thesis in four sentences, and the rest of the essay is about who owns the scarce thing.

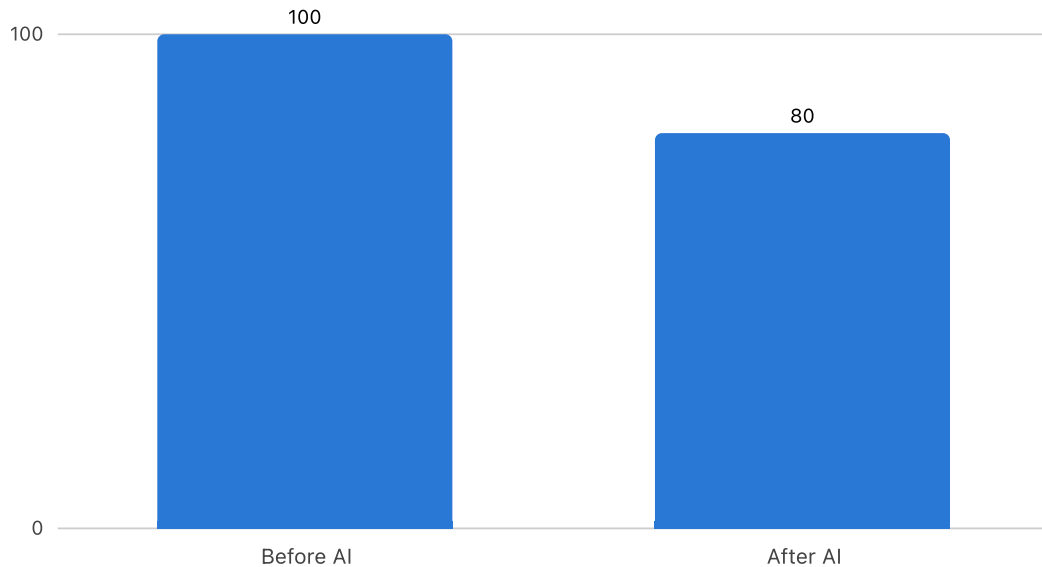
## IV. The other eight steps

Before we get there, a correction to the hype, because it is the correction that tells you where to look.

Take any real-world process and write it out as ten steps. A drug: target identification, molecule design, synthesis, in-vitro testing, animal studies, phase one, phase two, phase three, regulatory review, manufacturing scale-up. A chip: architecture, RTL, verification, physical design, tape-out, mask set, wafer fabrication, packaging, test, ramp. A building: site selection, design, permitting, financing, foundation, structure, systems, finishing, inspection, occupancy.

Now suppose frontier AI makes two of those ten steps a hundred times faster. That is a fair description of what has happened. Design and verification, the cognitive steps, are now nearly instantaneous. The other eight are governed by chemistry, physics, biology, concrete, and bureaucracy, and they take exactly as long as they did in 2019.

**Total time for a ten-step process when AI makes two steps 100x faster**



Two steps went from 10 to 0.1 each. The process got 20% faster. The other eight steps now own 99.8% of the schedule. Source: Author's arithmetic; this is Amdahl's law.

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The result is a 20% improvement in the end-to-end process. Not a hundredfold. Twenty percent. This is Amdahl's law, and it has been known to computer engineers since 1967: the speed-up of a system is capped by the fraction of it you did not speed up. We now have a machine that is, on the cognitive steps, unmatched by any human, and the drug still takes eight years to reach the patient.

Most people who look at this conclude that AI is overhyped. That is the wrong conclusion. The right conclusion is that the eight slow steps are where the entire value of the acceleration now sits. If you can shorten a slow step by even a fraction, you capture a larger share of the process than the labs that made the fast steps free. And if you cannot shorten it, then owning it is a toll booth on every acceleration that happens upstream.

Look at what the slow steps have in common. They are physical. They are capital-intensive. They require regulatory continuity. They require a dense supply chain within a short logistics radius. They benefit from a workforce of engineers who are willing to spend a decade on a reducer.

Now go back and reread Sections I and II. The country that has taxed its own long-dated projects with polarization is weak on exactly these steps. The country with the engineer flood and the five-year plans is strong on exactly these steps. The clock broke in San Francisco, and the beneficiaries of the broken clock are in Shenzhen, Suzhou, and Hefei.

That is the mispricing. Western investors have correctly priced the labs. They have not priced the eight steps, because the eight steps are boring, and they are in China.

## V. The industrial base

Here is what the eight steps look like when a country has spent twenty years building them.

In 2025 China produced 16 million electric cars, 20% more than its domestic market could absorb, and exported more than 2.5 million of them, double the previous year. In June 2026, monthly car exports crossed one million units for the first time. In 2024 China installed more solar capacity in a single year than the United States has installed in its entire history. It makes roughly 80% of the world's batteries, 90% of its processed rare earths, and the majority of its electrolyzers, transformers, and industrial robots.

This matters for physical AI because the humanoid supply chain is, to a striking degree, the EV supply chain repurposed. The same die-casters, motor makers, battery cells, and power electronics. The Yangtze River Delta now hosts what is probably the most vertically integrated robotics supply chain on earth, with component suppliers within a two-hour logistics radius of the assemblers.

**Speed of iteration.** In August 2025, the fastest humanoid robot in the world ran 100 metres in 21.50 seconds. In August 2026, at the same event, in the same city, a robot ran it in 9.32 seconds. Usain Bolt's record is 9.58. Twelve months. The time was cut in half.

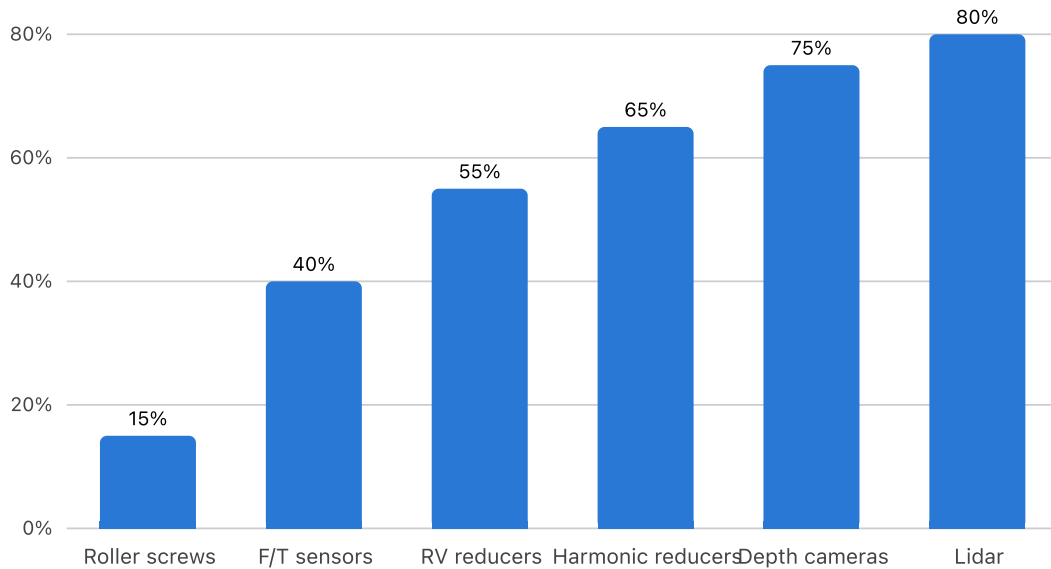
I want to be careful about what this does and does not mean. A robot sprinting is not a robot working. At the same Games, the machines that outran Bolt struggled to hammer a nail. Different start, different rules, different physics. It is not a fair comparison to a human athlete and I am not going to pretend it is.

But as a measure of the rate of improvement of an engineering system, it is close to unprecedented. And it did not happen in Boston or Palo Alto. It happened in Beijing, with 2,056 robots from 666 teams, in a stadium built for the Winter Olympics, at an event most Western investors have never heard of.

Notice, too, what the sprint and the nail tell you about the ten steps. Running is a control problem. It is software, the fast step, and it improved a hundredfold in a year. Hammering a nail is a dexterity problem, which means force sensing, compliant actuation, tactile feedback, and the hardware that delivers them. It is a slow step, and it did not improve much. The Games were a live demonstration of Amdahl's law.

Here are the other data points. Frameless torque motor deliveries from a single Chinese supplier rose more than twenty-fold in 2025. Domestic substitution of harmonic reducers reached ~65%. Solid-state lidar is ~80% domestic, depth cameras ~75%. These are components that five years ago were essentially Japanese, German, or American monopolies.

### Domestic substitution rate of humanoid components, China, 2026



The unlocalised end of this chart is where pricing power lives. Source: China Securities Investment Consulting (2026); Tianxia Gongchang Research (2026).

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**Software.** The DeepSeek moment in January 2025 demonstrated that frontier reasoning models could be trained at a fraction of the assumed cost. Whatever you think of the specifics, it ended the argument that Chinese AI was structurally years behind. For robotics, where the model has to run on the machine, cheaply, in real time, efficiency is the whole game, and it is the game China's engineers turned out to be good at.

**Demand-side scale.** China's national action plan targets 100,000 deployed humanoids by 2027. BYD, CATL, and Foxconn alone represent demand for tens of thousands of systems. Nowhere else on earth has a domestic customer base that can absorb early-generation robots at that scale and provide the deployment data to improve them. Deployment data is itself a slow step, and China will own most of it.

Put these together and the conclusion is hard to avoid: if general-purpose robots become a real industry in the next decade, the centre of gravity of that industry will be in China. Not because of subsidies, though there are subsidies. Because of engineers, and because of the eight steps.

I think most Western investors accept this intellectually and have not priced it. The consensus position is still that China copies, that its robots are demos, that the real thing will come from Tesla or Figure. The sprint time says otherwise. So does the nail. The fact that these machines can't yet do useful work is a description of this year, and the rate of change is the fastest I have seen in any hardware category.

## VI. The trap

Here is where most people who agree with everything so far go wrong. They buy Chinese stocks.

Consider the record.

MSCI China's total return from its launch in 1992 through the early 2020s was, in dollar terms, roughly zero. Over the same period Chinese GDP grew something like thirty-fold. The S&P 500 returned about ten times. An investor who correctly predicted in 1992 that China would become the world's manufacturing superpower and expressed that view through Chinese equities made approximately nothing for thirty years.

The CSI 300, the onshore blue-chip index, launched at 1,000 in 2005, hit nearly 6,000 in 2007, and spent most of the following seventeen years between 3,000 and 4,000 while the economy underneath it quadrupled.

This is not an accident or a temporary discount. It is policy. The Chinese state does not want you, or any minority shareholder, to capture the surplus its engineers create. It wants that surplus to go to consumers as lower prices, to workers as employment, and to the state as strategic position. It says so, in documents, and it acts accordingly. There are at least six mechanisms.

**1. Dilution.** China treats its stock market as a financing channel for industrial policy. IPO and secondary issuance expand the share count almost as fast as aggregate earnings grow, so earnings per share barely move. The United States runs the opposite machine: net buybacks shrink the share count every year, so even mediocre earnings growth compounds per share. Same GDP growth, opposite arithmetic.

**2. Whom the company serves.** An American board answers to shareholders, imperfectly. A Chinese board answers to the state first, then to employment, then to market share, and then, some distance back, to minority equity holders. When Beijing decides it wants cheap electric cars, or cheap robots, it gets them. The price cut comes out of your margin.

**3. Involution.** This is the Chinese term, 内卷, for competition so intense it becomes self-destructive. Local governments subsidise entrants in every strategic sector, so you get two hundred EV makers and six hundred robot teams, and profit competes to zero. Beijing has now started publicly pressuring automakers to end the price war. That it has to say everything.

**4. Index composition.** The headline indices are heavy with state banks, oil majors, and telecoms: low return on equity, capital-hungry, dividends set by policy rather than economics.

**5. The closed capital account.** For thirty years Chinese households could not buy the S&P 500, so they bought apartments. Equities became a retail casino, with retail turnover above 70% and valuation booms and busts disconnected from earnings. Household wealth went into property. Property starts are now down roughly 72% from their 2021 peak.

**6. Regulatory tail risk.** The for-profit education sector was eliminated by decree in 2021. The Ant Group IPO was cancelled days before listing. Any Chinese equity position is a call option the state can cancel, and that option is not free.

Now watch these forces operate on the single best company in the single industry where China has most obviously won.

BYD is the largest EV maker on earth. It outsells Tesla in Europe. Its first-half 2026 exports rose 71% to more than 790,000 vehicles. Its R&D spend is 2.3 times its net profit. By any measure of capability it is a triumph.

Its revenue fell 3.2% in Q2 2026, the fourth straight quarter of contraction. Domestic deliveries fell 16% in the first half. First-half profit fell 20.5%. The Q2 profit rebound of 30% missed the ~48% analysts expected. Gross margin on overseas sales was 22%. Gross margin on the domestic business was whatever is left after that, and the answer is not much.

That is the thesis in one company. Capability: extraordinary. Domestic profit: competed away, on purpose. The money was abroad.

Robotics is a year or two behind and running the same play. Unitree, arguably China's most celebrated humanoid maker, listed on the STAR Market in August 2026. A week later, at the Games, its robot finished last in the opening 100m heat. AgiBot won the practical-task events. Beijing's own innovation centre won the sprints. Six hundred and sixty-six teams. This is not an industry with a moat. It is an industry about to eat its own margins, and it will do so with the state's blessing, because cheap robots are the point.

## VII. Where the money went last time

The Chinese-capability-Western-profit pattern is not new. It has run at least four times.

**Solar.** China won solar completely. It manufactures the overwhelming majority of the world's panels. Module prices collapsed by more than 90%. Almost every Chinese solar manufacturer has at some point gone bankrupt, been restructured, or traded below book. The winners were the buyers of cheap panels, meaning utilities, installers, and every household with a roof, and the equipment suppliers upstream who sold the tools to build the factories.

**LCD panels.** Japan invented the technology. Korea scaled it. China took the market. Japanese firms won the science and lost the industry, the phrase now used inside Japanese robotics companies as a warning about what happens next.

**Smartphones.** China assembles nearly every phone on earth. The profit went to Apple, Qualcomm, TSMC, ARM, and the Japanese and Korean component makers. Foxconn, the assembler, runs on low-single-digit margins. The Chinese handset brands that won domestic share, Huawei, Xiaomi, Oppo, fought a decade of involution for it.

**Electric vehicles.** Covered above. The capability is Chinese. The margin is in Europe, Southeast Asia, and Latin America.

Four for four. The pattern is: China wins the industry; the assembly commoditises; the profit pools form (a) upstream in components with pricing power, (b) downstream in

whoever consumes the now-cheap output, and (c) abroad, wherever the product is sold outside the involution zone.

Notice that this pattern is Amdahl's law wearing a different coat. Assembly is the step China made fast and cheap. The profit went to the steps that stayed slow: the lithography tool, the chip, the customer's balance sheet. Every time China accelerates a step, the value moves to the adjacent step it did not accelerate.

There is no reason to expect robotics, or any of the AI-compressed fields, to be the exception. There is a specific reason to expect them to be textbook cases.

## VIII. The map

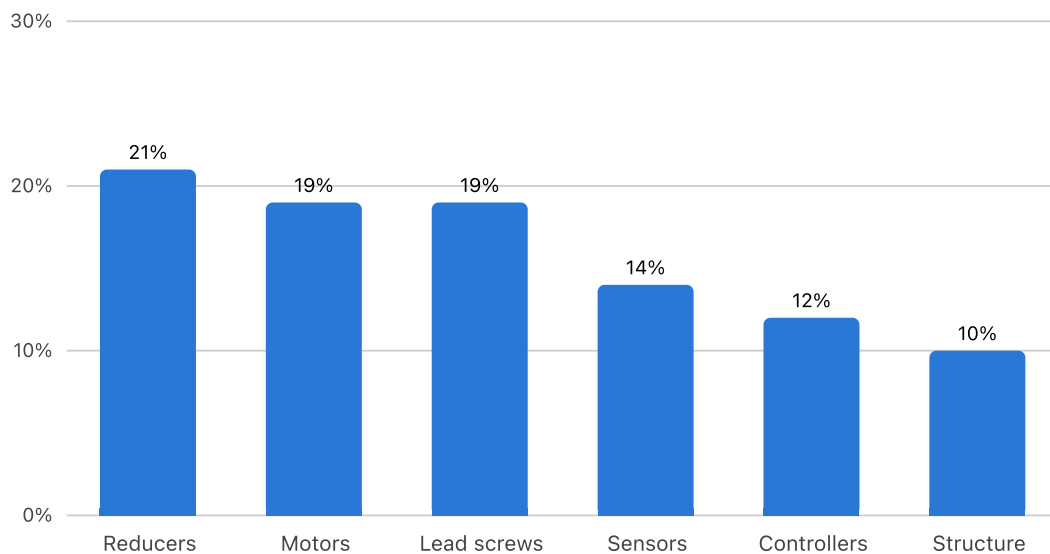
So: design is free, building is scarce, the builders are in China, and China will not let you profit from the builders directly. Where does the capital go?

I think of it as two maps laid on top of each other. The first is the robotics supply chain, because that is where the pattern is most legible right now. The second is the set of AI-compressed fields where the slow steps are about to become the whole business.

### Map one: the robotics supply chain

Start with the bill of materials. A humanoid robot at an average price of about ¥350,000 breaks down into six cost categories that account for 95% of the machine.

## Humanoid robot bill of materials, share of cost



At an average selling price of about ¥350,000. The body is the assembly; the value is in the joints. Source: China Securities Investment Consulting (2026).

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The body, the thing in the video, the thing that runs the 100m, is the assembly. Assemblies commoditise. Chinese humanoid ASPs are expected to fall to ¥100,000–150,000 by 2030. Unitree's G1 already starts at ¥99,000.

So the first-order conclusion is: **do not own the assembler**. Unitree, UBTech, AgiBot, and the several hundred teams behind them are where the excitement is and where involution will land. They will build extraordinary machines and they will do it at margins that make BYD look luxurious.

Then follow the BOM upstream and look for two things: components that China has not yet localised, and components where the supplier's customers are outside China.

**Layer 1: the bottlenecks.** Not everything has been localised, and the gaps are precisely where pricing power lives.

*Planetary roller screws.* Humanoid linear joints don't run on ordinary ball screws. They need planetary roller screws, which distribute load across many contact points. Domestic substitution is only around 15%. This is arguably the most consequential near-term bottleneck in the industry and almost nobody outside it talks about it. A-

share companies have announced tens of billions of yuan of investment into screw capacity. Whoever cracks it at scale has years of pricing power before the next round of involution catches up.

*Six-axis force/torque sensors.* Roughly 60% import-dependent. Calibration-intensive, metrology-heavy, hard to automate. Supplied by a handful of specialist vendors globally. This is the component that hammers the nail.

*RV reducers.* About 55% domestic. This is the component that matters most for industrial arms rather than humanoids, and China's gap here is still significant.

*Harmonic reducers.* ~65% localised, so the window is closing, but the leader is instructive. LeaderDrive holds an estimated 30–40% of the Chinese market, supplies UBTech and AgiBot, and has filled small-batch R&D orders for Tesla and Figure. Its two founding brothers became billionaires in 2025. Its FY2025 net profit roughly doubled. A single humanoid needs 20 to 40 of these, a volume industrial robots never required.

The pattern to look for: a component with high import dependency today, a credible domestic challenger, and a product that goes into every unit. That combination is rare and it is where the next LeaderDrive comes from.

**Layer 2: rare earths and magnets.** High-torque actuators depend on neodymium-iron-boron permanent magnets. China controls approximately 69% of global rare-earth mining and around 90% of magnet processing and refining. Elon Musk has publicly said magnet supply constraints affected Optimus production.

This is the one part of the chain where the involution logic reverses. Beijing does not subsidise competition in rare earths; it consolidates and protects the position as a strategic asset, and since 2025 it has used export licensing as a diplomatic instrument. That makes the magnet chain the rare Chinese sector where the state's interest and the shareholder's interest point the same direction, and it makes the few ex-China producers, in the United States and Australia, the beneficiaries of every export control.

**Layer 3: the export arbitrage.** BYD's overseas gross margin is 22%. Its domestic margin is a knife fight. The same split will appear in robotics components, and it is the single cleanest profit pool in the thesis.

A Chinese reducer or motor maker selling to Tesla, Figure, or 1X earns Western pricing on Chinese costs. American technologists are reportedly carrying Chinese actuator parts home in their suitcases because domestic lead times are impossible. That demand is not going to be involuted away, because the buyers are outside the zone where local governments subsidise entrants.

The filter is simple: which Chinese component makers already have Western customers, and what share of revenue do those customers represent? That number, more than any sprint time, tells you who gets paid. Nobody has published the table. We are building it.

**Layer 4: the Japanese precision layer.** Harmonic Drive Systems, Nabtesco, Yaskawa, Fanuc. These companies hold the high-precision end of reducers, servos, and controls, and they are the ones who coined the LCD warning. They may lose the volume market. They are unlikely to lose the top of it quickly, and they offer something no Chinese equity can: Western governance, no VIE structure, no regulatory call option.

I hold this layer with less conviction than the others, because the LCD lesson cuts against it. The honest expression is a pair: long the Chinese challenger in a component, short the Japanese incumbent in the same component, and let the localisation rate decide. Where the challenger is not yet investable, the incumbent is the hedge.

**Layer 5: the compute.** Humanoid computing is 10–20% of BOM and sits almost entirely on one supplier's silicon. This is the most obvious profit pool and the most crowded trade, and in July 2026 it was the trade that blew up the largest thesis fund in history. It belongs on the map. It does not belong in a book that is supposed to be uncorrelated with the consensus.

**Layer 6: the buyers.** This is the layer that makes the "not China" half of the argument literal.

The solar lesson was that when China commoditises a technology, the wealth transfer goes to whoever consumes it. If humanoid ASPs fall to ¥100,000, about \$14,000, a general-purpose robot costs roughly what a rich-country employer pays a warehouse worker in three months.

The winners are then the companies whose cost structure is dominated by manual labour in high-wage countries, who can deploy robots at scale, and who compete against firms that can't. Logistics, fulfilment, elder care, construction, food service, agriculture

in the developed world. Chinese overcapacity becomes a subsidy to every Western company that can absorb the output.

This is the least obvious part of the thesis and, I think, the part with the longest runway. It is also the hardest to underwrite today, because the robots can't yet hammer the nail. But the sprint time says the nail is a matter of years, not decades.

## **Map two: the slow steps of the AI-compressed fields**

Robotics is the field where the pattern is most visible because the hardware is the whole product. But the same logic applies to every field where AI has made the design step free. In each, ask: what are the eight slow steps, who owns them, and can they be bought?

**Drug development.** Molecule design is now fast. Trials are not. The value moves to the organisations that run trials faster, the manufacturing that scales a biologic, and the regulatory capacity that approves it. China now starts more clinical trials than the United States and runs them at roughly a third of the cost. The out-licensing of Chinese-discovered molecules to Western pharma went from a curiosity in 2020 to roughly a third of all big-pharma in-licensing deals by 2025. The Western pharma company that buys the molecule and owns the trial infrastructure is the buyer in the solar sense. The Chinese biotech that sells it is the export arbitrage.

**Semiconductors.** Chip design is fast. Fabs are not. The lithography tool, the wafer, the substrate, the packaging, and the power to run the fab are the slow steps. Most of them are owned by companies in the Netherlands, Japan, Taiwan, and Korea, which is why those companies have compounded while Chinese chip designers have not. The Chinese fab buildout is real, involuted, and largely uninvestable. Its equipment suppliers are not.

**Energy.** Engineering a power plant is fast. Building it is slow. AI data centres have turned electricity into the binding constraint of the whole industry, and the slow steps, meaning turbines, transformers, switchgear, grid interconnection, and the permits for all of them, have order books stretching into the 2030s. China makes most of the world's transformers and solar modules and exports them at involuted prices. The buyers, the developers and utilities in the countries that can permit fast, capture the spread.

**Materials.** Discovering a candidate material is now a search over a database of millions of predicted structures. Making a ton of it is a chemical plant. The plant is slow, capital-intensive, and increasingly Chinese, and the customers who can qualify a new material into a product first are the buyers.

**Construction.** Design and permitting documents are fast. Concrete, steel, labour, and inspection are slow. This is the field where humanoids arrive last and matter most, and where the developed-world deployer of Layer 6 is most obviously the beneficiary.

In every one of these fields the shape is the same. The fast step got faster and cheaper and its practitioners got poorer. The slow steps got relatively more valuable. China owns more of the slow steps than anyone, refuses to let you profit from them directly, and sells their output abroad at prices that make the foreign buyer rich.

The trade is to buy the slow steps China does not own yet, the Chinese suppliers who sell abroad, the ex-China owners of chokepoints, and the buyers who consume the cheap output. It is also to bring capital, quickly and at scale, to the slow steps that can be shortened, because the first firm to compress a slow step in an AI-accelerated field captures the whole acceleration.

## IX. The portfolio

I am not going to tell anyone what to buy. But the structure that falls out of the argument is clear enough to state.

**Long:** bottleneck components with high import dependency and credible domestic challengers; component leaders with meaningful Western revenue; the rare-earth magnet chain, on both sides of the export-control line; the equipment and chokepoint suppliers to the Chinese buildout in chips, energy, and materials; the developed-world deployers who buy the cheap output; and, in size, the firms that shorten a slow step in an AI-compressed field.

**Avoid or short:** the humanoid assemblers as a group. Not because they will fail, many will build superb machines, but because 666 teams and a 70% ASP decline is not a business, it is a public service. More broadly, avoid any Chinese company whose output the state has decided should be cheap.

**Sizing:** modestly, and with no leverage. Everything in Section VI still applies to the Chinese names in this book. The thesis being right and the position surviving are different problems.

On that last point, a word about the essay this one is modelled on. In June 2024 a former lab researcher published a long document arguing that the AI trendlines were real and that almost nobody was pricing them. He was right. He founded a fund on the essay, it returned several hundred percent in two years, and in July 2026 it lost most of that in four weeks because it was levered roughly four times and the stocks it owned fell by a third. The thesis survived. The fund did not.

This fund will be built so that the only person who can close a position is the person who holds the thesis. No borrowed money, ever. Position caps. A drawdown covenant in the documents, with an independent risk manager who has the authority to enforce it and is paid in a way that does not depend on the thesis being right. That is not caution for its own sake. A thesis that takes years to play out is only worth holding if you are still in the game when it does.

## X. What would make me wrong

A thesis without a kill condition is a religion. Here are mine.

1. **America heals.** If the United States finds a way to make ten-year industrial commitments that survive an election, the polarization tax disappears and the fab, the grid, and the trial move home. Watch the permitting reform bills and the fate of the next industrial-policy act. I would welcome being wrong about this.
2. **The slow steps fall to AI too.** Amdahl's law only binds while the eight steps stay slow. If AI-driven robotics compresses fabrication, if in-silico trials replace phase two, if permitting becomes an automated review, then the value does not migrate to the builders, it evaporates, and the labs win everything. This is the bull case for AI and the bear case for this essay. Watch whether any slow step has shortened by more than half.
3. **Consolidation happens fast.** If Beijing's anti-involution campaign actually works and the robotics sector consolidates into three or four national champions within

five years, the assemblers do become investable and the component squeeze is less severe. Watch the number of funded humanoid companies; if it falls by half, revisit.

4. **The bottlenecks localise faster than expected.** If roller screws go from 15% to 70% domestic in three years, the pricing-power window closes before it opens. Watch the localisation rate.
5. **Export markets close.** Tariffs, national-security restrictions on Chinese robotics imports, or a Taiwan contingency would kill the export arbitrage and trap the entire industry inside the involution zone. This is the largest risk and I have no edge on it.
6. **The nail stays unhammered.** If practical dexterity stalls, if the machines get faster but not more useful, then this is a sports league, not an industry, and Layer 6 never arrives.
7. **The pattern breaks.** Maybe this is the time Chinese shareholders finally get paid. Buybacks are rising. Governance is improving at the margin. If I see Chinese robotics companies shrinking their share count and reporting margins that expand through a price war, I will have been wrong about the most important thing.

## XI. The one-paragraph version

The United States is taxing its own growth with a politics that cannot hold a ten-year commitment. China is producing engineers at ten times the American rate and pointing them at physical systems, on top of an industrial base that already makes most of the world's hardware. The frontier labs have made the cognitive step of every process nearly free, which by Amdahl's law moves all the value to the slow, physical, capital-hungry steps, and those steps are disproportionately Chinese. But China has, four times in a row, produced enormous capability and near-zero shareholder returns, on purpose, because it wants the surplus to go to consumers and the state. So the trade is not to buy China. It is to buy the slow steps: the bottleneck components China has not localised, the Chinese suppliers who sell to the West at Western prices, the ex-China owners of chokepoints, and the rich-country companies that get to buy the cheap output. Be right about China. Don't get paid by China. And never borrow to do it.

### SOURCES

All figures as of September 2026 unless noted. Nothing here is investment advice.

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- China GDP: National Bureau of Statistics Q1/Q2 2026; MERICS.
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- MSCI China and CSI 300 long-run returns: index provider data; author calculations.