Selected Essays

The Untold Story of Wan Gang and the Success of China's Electric Vehicle Industry

by
Prof Tan Kong Yam

China has transformed itself into the world's leading electric vehicle (EV) power. In 2024, Chinese consumers purchased more than 11 million EVs, constituting nearly 65% of global sales, and EVs made up almost half of new cars sold domestically. China produced about 58% of the world's EVs in 2023 and exported 1.28 million units in 2024. This dominance is the product of strategic government support, supply chain integration, fierce domestic market competition, and rapid technological innovation.

Policy and Government Support

Early Subsidies and Incentives

From 2009 to 2023, the Chinese government invested over US$230 billion into the EV sector. Consumers benefited from purchase subsidies and large tax exemptions, most recently a 520-billion-yuan (US$72 billion) tax break covering 2024–2027. Non-monetary incentives, such as licence plate privileges in major cities and exemptions from driving restrictions, further encouraged adoption.

Infrastructure Expansion

By September 2024, China had installed 11.4 million charging points, including over 3.3 million public chargers. This scale ensures widespread accessibility and reduces range anxiety. Infrastructure continues to expand with ultra-fast chargers, highway networks and smart charging integrated with the grid.

Policy Evolution

Direct purchase subsidies ended in 2022, replaced by the dual-credit system, mandating EV production quotas for automakers. To sustain momentum, China introduced a trade-in programme, offering up to 20,000 yuan per EV purchase. Initially temporary, the programme was extended into 2025 after drawing over 4 million applicants and retiring 2 million old vehicles.

The Critical Role of Wan Gang

Wan Gang, known as the "Father of China's EV Movement", was pivotal in shaping this policy trajectory. Trained in Germany and employed at Audi AG, Wan returned to China in 2000 to lead Tongji University's automotive research. He wrote an internal paper to then President Hu Jintao and Premier Wen Jiabao, arguing that China could not overtake the United States, European Union and Japan in internal combustion engine cars as these are too entrenched in the global market. It needed to leapfrog into electric cars to overtake the incumbents. In addition, he argued that the focus on electric car would also address China's serious energy security problem.

Though Wan was not a member of the Chinese Communist Party (CCP), Premier Wen appointed him as minister of science and technology (2007–2018) and placed Wan and his EV strategy at the heart of national strategy, driving programmes like the 863 Plan and the Medium- and Long-Term S&T Plan (2006–2020). Wan managed to secure subsidies, pilot projects, and R&D funding for batteries and charging. His advocacy led to EVs being designated as a strategic emerging industry in 2010.

Even after stepping down as minister in 2018, Wan remained influential as vice chairman of the Chinese People's Political Consultative Conference (CPPCC), an organ of the CCP, until 2023. He continues to advise on EV policy, backing the dual-credit system and trade-in programmes. Without his foresight and leadership, China's EV sector would likely not have received the sustained support that propelled it to global leadership.

Manufacturing and Supply Chain

Scale and Cost Advantages

China's EV industry enjoys economies of scale, producing nearly 60% of global EVs. This, combined with lower labour costs and streamlined processes, gives Chinese EVs a 20–40% cost advantage over their Western counterparts.

Vertical Integration

Firms like BYD exemplify vertical integration: producing batteries, motors and chips in-house. Vertical integration lowers costs, reduces supplier dependence and shields against price wars. BYD's structure allows it to cut prices while maintaining profitability, unlike many of its competitors.

Raw Material and Battery Chain Control

China dominates battery supply chains by:

- Processing two-thirds of global lithium, nearly 80% of cobalt, and essentially all-natural graphite;
- Producing 90% of cathode and nearly all anode materials;
- Manufacturing over 80% of global EV battery cells.

This control ensures cheaper battery packs – 30% less per kWh than Western equivalents – and provides China with both industrial and geopolitical leverage.

Technological Innovation

Battery Technologies

China leads in lithium iron phosphate (LFP) adoption, powering approximately 75% of new EVs by 2024. LFP is cheaper, safer and sufficient in range. Companies like CATL and BYD innovate with Blade batteries and fast-charging LFP cells that add 400 km in 10 minutes.

China also invests heavily in next-generation batteries:

- Solid-state batteries, with 6 billion yuan allocated to accelerate commercialisation;
- Sodium-ion batteries, which promise ultra-low cost for small EVs;
- Research into lithium-sulphur and silicon anodes, positioning China at the forefront of global innovation.

Smart and Connected Cars

Chinese EVs function as "smartphones on wheels". Automakers integrate proprietary operating systems, chips and AI assistants, often in partnership with companies like Huawei or Xiaomi. Features include OTA (over the air) updates (of software), voice control, facial recognition, and seamless integration with China's digital ecosystem (WeChat, Alipay, Baidu Maps).

Autonomous Driving

Companies like Xpeng, Baidu and NIO invest in self-driving technologies. Xpeng's XNGP system offers highway and urban driver-assist features. Chinese firms leverage massive driving datasets and lidar/vision systems, supported by permissive domestic regulations. By 2025, several models are offering hands-free navigation in selected cities, advancing China's role in the global autonomous race.

Market Trends and Challenges

Adoption and Variety

China leads in EV adoption: nearly 50% of new car sales in 2024 were electric. More than 300 models are available on the Chinese market, covering every segment from $5,000 microcars to luxury sedans. EVs are expanding rapidly beyond first-tier cities, reaching smaller towns and rural buyers.

Price Wars and Overcapacity

Fierce competition among approximately 100 EV makers has triggered price wars. Tesla and BYD repeatedly slashed prices, with BYD's Seagull now selling for under 56,000 yuan (US$7,800). Margins have collapsed, leading to government warnings against "reckless price-cutting" and "involution". Consolidation is expected, with weaker start-ups likely to exit the market or merge with other players.

Global Expansion and Trade Barriers

China became the largest auto exporter in 2023. Brands like BYD, SAIC's MG, and Geely have been expanding in Europe, Southeast Asia and Latin America. However, geopolitical frictions are rising, with:

- EU anti-subsidy investigation and tariffs of10–38%;
- US tariffs up to 100% on Chinese EVs and the US Inflation Reduction Act (IRA) rules excluding Chinese batteries from subsidies.

To adapt, Chinese automakers are localising production abroad. BYD is building plants in Hungary, Indonesia, Uzbekistan, Turkey, Brazil, Mexico and Thailand; NIO is expanding in Poland. Over 18 projects are under way in Europe alone, bypassing tariffs and boosting local integration.

Outlook

Domestic Targets

China aims for new energy vehicles (NEVs) – comprising hybrids, fully electric EVs as well as fuel cell EVs – to reach 48% of sales by 2026 and 58% by 2027, milestones it is already on track to surpass. Some analysts predict 70–80% market share by 2030.

Its policies will emphasise:

- Expanding ultra-fast and rural charging networks;
- Accelerating solid-state battery commercialisation;
- Promoting sustainable industry consolidation.

Global Impact

By 2030, Chinese automakers could capture one-third of the global auto market. Their strengths – low cost, fast cycles and advanced features – are forcing foreign car manufacturers to accelerate EV adoption. Strategic alliances between Chinese and foreign manufacturers (e.g., Volkswagen–Xpeng, Stellantis–Leapmotor) suggest a future of both competition and collaboration.

Technological Frontier

China will continue to lead in:

- Battery breakthroughs (solid-state, sodium-ion);
- Smart mobility ecosystems integrated with digital platforms;
- Autonomous driving fuelled by vast data and government-backed infrastructure.

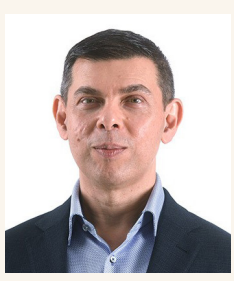
The main challenges it encounters will be geopolitical trade frictions, domestic overcapacity and brand trust abroad. Still, China's EV ecosystem has already reshaped global standards, making clean, connected, and, increasingly, autonomous mobility the global norm.

Conclusion

China's EV rise is the product of strategic policy, supply chain dominance, rapid technological progress and bold visionaries like Wan Gang. Having turned EVs from a niche technology into a mass-market reality, China is now setting the pace for the global auto industry. Its next challenge will be balancing domestic consolidation with global expansion amid rising trade tensions, while continuing to lead in the technologies that will define the car of the future.

Professor Tan Kong Yam is Emeritus Professor of Economics, Nanyang Technological University. He taught at the RSIS Graduate School in Academic Year 2024/2025 as the NTUC Professor of International Economic Relations, RSIS.

The Emerging Fluid, Flexible Gx World Order



by
Warren Fernandez

A year after the return of US President Donald Trump for his second term, the world is still reeling from the shock and awe of the arrival of a "revolutionary chieftain" in Washington.

The late US Secretary of State Henry Kissinger used the term to refer to radical and revisionist leaders, such as Hitler and Napoleon, who were often driven by historical angst, personal animus or "Shakespearean forces", as American author Robert Kaplan puts it, referring to "the inner demons that drive all powerful leaders to a certain degree of madness", as exemplified in the Bard's plays. These radicals and revisionists sought to upend the order and stability Kissinger believed was critical to global equilibrium