VMS鼎珮

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Technology and Consumer

Over the past two decades, China has delivered lucrative returns to many investors, the same drivers responsible for these returns will continue to drive domestic economic growth under the new environment. China's urbanization and industrialization trend has created a high-quality and skilled labor workforce, supported by well-established infrastructure. Leading the workforce are hardworking, creative, and spirited Chinese entrepreneurs – leaders who are committed to innovation and supply chain efficiency advancement.

The Chinese government has introduced supportive, sector-specific policies to encourage further development. Sectors that benefited and achieved global leading status in terms of technology and its applications include: quantum technology, aerospace and high-speed railways, power grids, mobile payment systems, short video platforms, local consumer products and retail services, and smart terminals for household and industrials. Other industries such as semiconductors, advanced materials, consumer electronics, and SaaS, are on track to catch up to their global counterparts. Lastly, Chinese companies have developed a clear advantage in fields such as EV, solar, energy storage, small household appliances, and textiles. Considering these developments, China remains an indispensable investment choice for investors.

Trends in Advanced Driver Assistance Systems – Executive Summary

In this section, we will analyze the Advanced Driver Assistance Systems ("ADAS") industry on: its current positioning, key drivers, and medium-term outlook, our core views are:

- Market penetration rate for Level 2-Level 3 ("L2-L3") autonomous driving systems ("ADS") is expected to continue its current upward trajectory, driven by consumer demand and EV sales. According to our internal estimates, the domestic market for L2-L3 systems will exceed RMB 50bn by 2027.
- OEMs will need their tier-1 suppliers to provide a one-stop solution, comprising of hardware, software/algorithmic, servicing, mass production and engineering capabilities.
- In the medium-term: 2023-26 is an opportunity for tier-1 suppliers to ramp up their capabilities, especially L2/L2+ solutions.[1] Starting 2026, L3 systems will begin market penetration, OEM and their tier-1 suppliers will need to make a choice between developing their own solutions or outsource. From a cost-optimization perspective, we expect industry leaders continue to maintain their position in the L2-L3 era.

[1]L2+ refers to autonomous driving regional controller solutions, which is able to complete intra-city/high speed point-to-point autonomous driving, with overall performance close to L3.

Figure 1: Evolution of AD Capabilities

Direction of Evolution

	Core Definition	Example	Degree of Driver Freedom
L1	• System controls speed **or** direction • Driver mainly operates vehicle	• Cruise control system • Auto braking system	• Intervene at any time
L2	• System controls speed **or** direction • System mainly operates vehicle	• Tesla's Autopilot • Turning on indication lights to merge	
L3	• Vehicle 100% system controlled • **Requires a driver**	• City/highway point-to-point self-driving vehicles • Waymo's road test vehicles	
L4	• Vehicle 100% system controlled • **Does not require a driver**, can go without a steering wheel • Only used in **specified areas**	• Driverless buses with set routes	• Standby not required
L5	• Vehicle 100% system controlled • Can be used anywhere	• Not implemented yet	

Source: SAE, VMS analysis

OEMs start to favor L2 and L2+ systems

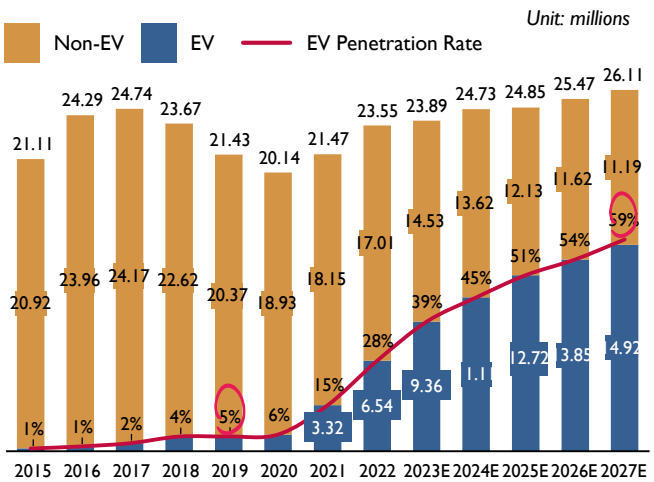
In the past 8 years, advanced ADS (L3 or above) continue to explore potential commercialization opportunities, including with Robotaxi, mining/industrial parks, driverless buses, sanitation vehicles and logistics transport, testing in controlled, semi-controlled, and open-road environments (Figure 1). However, we have yet to see a breakthrough in progress. Challenges remain in the technology, associated costs and policy support. The technology – pure vision, vision + LIDAR, vision + point cloud radar and other solutions – are not mature enough and results in a slower-than-expected ADS penetration rate in real life.

L2 and L2+ systems are increasingly important during the consumers' decision making process. For OEMs, they would prefer cost effective systems with reliable performance and ability to decouple. This replacement trend is similar to central console control screens replacing radio and CD players in cars. Per information gathered from several prominent industry forecasters and our analysis , the market penetration rate of L2 and L2+ systems will increase to ~45% in 2025 (vs 25% in 2022).

EV represents new growth within the stagnant auto industry

China's passenger vehicle market is becoming saturated, with annual sales expected to stabilize at 25 million new cars in the next 5 years (Figure 2). Meanwhile, EV's market penetration is increasing rapidly and autonomous driving ("AD") is set to benefit from this growth, we believe L2/L2+ systems' penetration rate will increase quickly, from 25.9% in 2022A to 49.0% by 2026E.[2]

Figure 2: Passenger Vehicle Sales and EV Penetration Rate



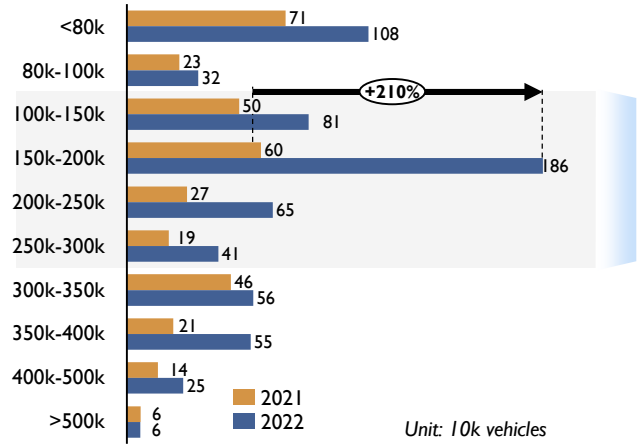
Source: CAAM, Gasgoo Research Institute, VMS analysis

[2]*Source: Gasgoo Research Institute, expert calls, VMS analysis*

L2 systems are a must-have for EVs priced between RMB 150-200k

According to 2022 EV sales figures, EVs priced between RMB150-200k saw the highest sales growth, selling over 1.26 million vehicles (Figure 3). Through on-site research that we conducted at the 2023 Shanghai Auto Show, we found that L2 systems have become a standard feature in newly released models within this price range, while L2+ systems are a popular option for mid to high-end models. As AD continues to penetrate into the EV market, it may also boost penetration rate in traditional gas cars.

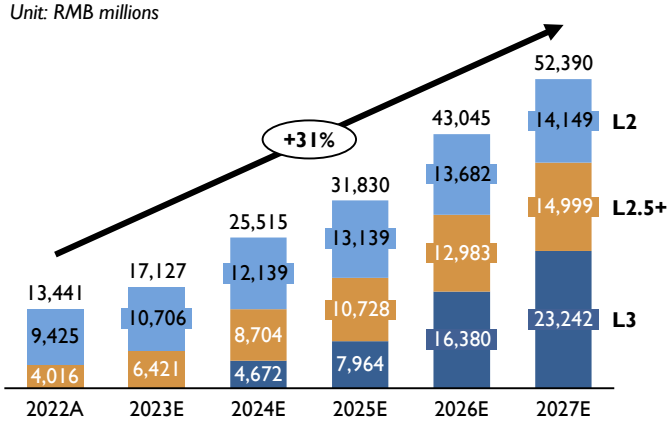
Figure 3: Price and Volume of EV Models Sold



Source: CAAM, VMS desk research and analysis

Figure 4: L2 and L2.5+ expected to take the lead in volume

Unit: RMB millions



Source: HIS, CAAM, Gasgoo Research Institute, VMS research and estimates

The addressable market size for L2 and L2+ related systems are relatively stable, allowing for hardware costs such as millimeter-wave radar, vision and domain controllers, to come down stably (Figure 4).

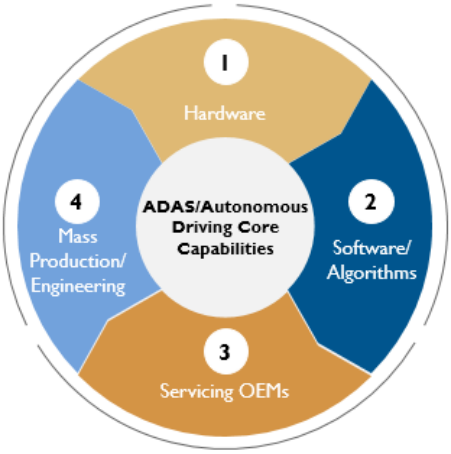
The L3 systems' outlook will largely rely on LiDARs' cost reduction rate, as well as if the 4D point cloud radars will replace LiDARs to become the mainstream sensor program. Based on our preliminary research, the industry is generally optimistic about the 4D point cloud radar and we expect L3 systems' hardware may continue to change.

ADS providers need to demonstrate they are well-rounded and able to achieve technological advancement and commercialization

It is increasingly complex and challenging to develop and improve AD systems, suppliers who are overly niche may not be able to meet OEMs' requirements (especially domestic OEMs). Tier-1 suppliers need to provide a one-stop solution, with features including:

1. **Hardware:** automobile-grade hardware selection and production capabilities, strong "know-how" on certain types of sensors and hardware, such as LiDAR, millimeter-wave radars, domain control solutions, etc.
2. **Software/algorithmic:** Algorithms and closed-loop data capabilities for sensing, planning, and controlling, to ensure continuous improvement in real-world scenarios.
3. **Serving OEMs:** to provide decoupling, customization, and other solutions to OEMs, especially domestic ones; this is also the main shortcoming for international suppliers.
4. **Mass production and engineering:** to match the OEMs' production needs and provide engineering and cost-effective solutions (Figure 5).

Figure 5: Strong "Flywheel Effect" in AD



Source: VMS analysis, expert interviews

Trend Projection: 2023-26 is a window of opportunity for domestic tier-1 suppliers

In the early days of L1 and L2 development, OEMs adopted "black box" solutions from global suppliers and their needs for cost control, product customization, and servicing were never fulfilled.

After L2 and L2+ were introduced, domestic OEMs gained more traction in the EV market, with some even taking the lead. These OEMs favored domestic tier-1 suppliers who had a good grasp on their technology, servicing capabilities, and decoupling solutions. According to market research, domestic tier-1 suppliers have become the main source for L2 and L2+ systems.

Domestic chip makers are also starting to make way in the market and meeting domestic OEMs' need for supply chain security. We believe that in the next 2-3 years, domestic tier-1 suppliers will be able to ramp up their production volume as L2/L2+ systems continue to increase market penetration. Suppliers who can deliver one-stop solutions will likely have a first-mover advantage and win more contracts.

2025: L3 era begins

According to market and VMS research, L3 systems are expected to start penetrating the passenger vehicle market in 2025 and become a key investment direction for OEMs.

"From the industry's "Pareto efficient" point of view, we believe that the L3 era will leave enough room for the survival of tier-1 suppliers as well as for L2/L2+ suppliers to maintain their existing market share."

OEMs without proprietary R&D capabilities will need to maintain their competitive edge in the L3 era through direct investments and acquisitions. At the same time, they will need to maintain a more dynamic relationship with their L2/L2+ suppliers, striking a balance between economies of scale and product differentiation. From the industry's "Pareto efficient" point of view, we believe that the L3 era will leave enough room tier-1 suppliers to survive. L2/L2+ leading suppliers should take advantage of the coming 3 years to grow and maintain their existing market share.

Healthcare

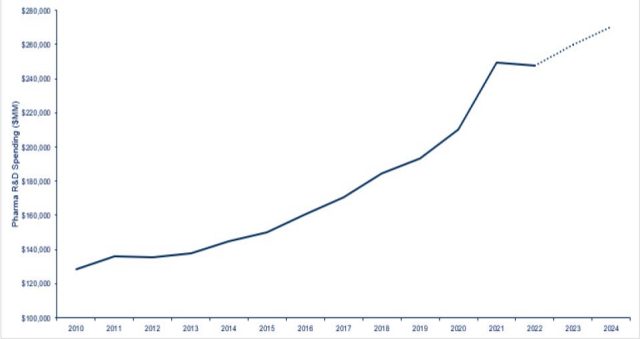
Clinical CROs, the navigator for innovative drug companies?

China biotechs – still embracing their "China for China" strategy – are faced with significant challenges under the current macroeconomic backdrop. With a global economic slowdown and geo-political tension between the US and China, many companies are encountering difficulties in raising new funds. As capital markets cool down during these volatile periods, multiple projects often needs to be shelved or delayed. At the same time, countries are tightening their regulatory policies in the post-COVID era and exerting more pressure on drug prices. This adds further limitations on companies, especially those solely focused on servicing a single market. China's innovative drug companies face intense competition from domestic peers on both pricing and product quality. Consequently, they are compelled to look beyond China and seek integration with overseas healthcare ecosystem players. Conversely, global biotech companies need to better utilize the advantages China can offer – a large population and lower cost that can be translated into better profitability – in order to swiftly achieve clinical research breakthroughs and successfully commercialize more products.

As domestic innovative drug makers embark on the wave of 'going global', who will ultimately reap the benefits?

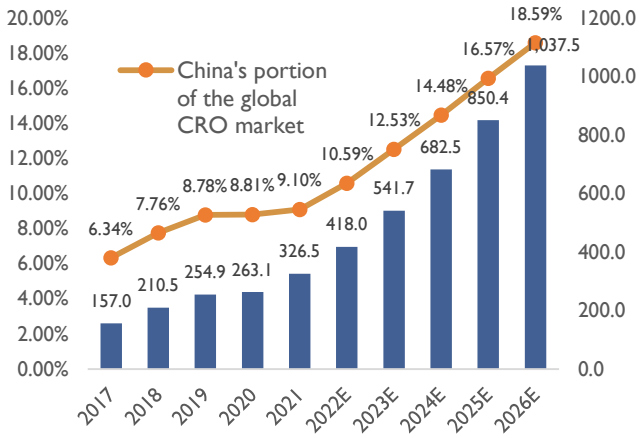
Despite fundraising slowdowns in 2022, the healthcare industry has remained relatively stable, with slight uptick in some areas (Figure 6). In the first half of 2023, total number of new drug registration applications increased 41% YoY, reaching 8,266. Additionally, China's clinical CRO market also grew at 26% CAGR from 2022 to 2026 (Figure 7). However, the Chinese innovative drug market is plagued by product and target homogenization. Despite the fact that Chinese drug companies have shown higher rankings in terms of their R&D pipeline and number of commercialized drugs among global peers in recent years, slow movers among all often face difficulties in recruiting patients and pricing pressure during new product launches.

Figure 6: Pharma R&D Spending, 2010-2024



Source: VMS desktop research

Figure 7: China Clinical CRO Market



Source: VMS desktop research

From a capital markets perspective, if China's innovative drug companies refrain from expanding overseas, it would be challenging for them to benefit from price premium in international markets and improve overall profitability, thus limiting their growth. For some domestic players, their survival hinges on overseas expansions. To achieve this , they must first conduct and successfully complete global, multi-center clinical trials. Given this context, small and medium-sized clinical research organizations ("CRO") with global operations and international business experiences are expected to greatly benefit.

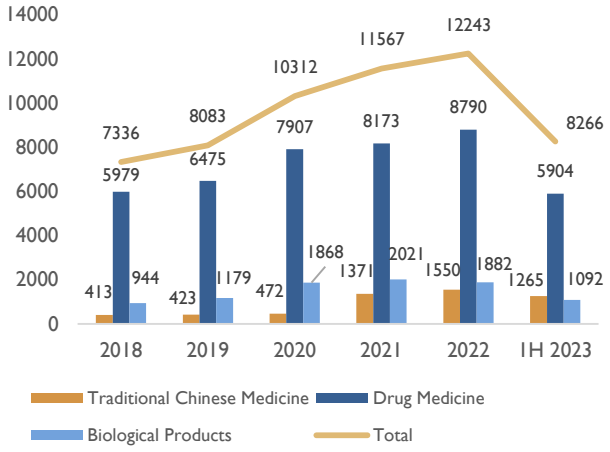
Compared to multinational CROs, these small and medium-sized CROs have a better understanding of Chinese corporate culture, making it easier for them to establish efficient communication with domestic companies. Additionally, their client operating teams are bilingual and capable of conducting clinical trials in both English and Chinese, providing a localized service that the multinational peers may not be able to offer. In the current market environment, innovative drug companies need to control their R&D costs and improve capital efficiency, Smaller CROs are more cost effective compared to multinational counterparts. They are more familiar with their clients' internal operations and able to offer better capital utilization solutions. Moreover, their globalized operation capabilities allow them to remain competitive and meet the needs of drug companies.

Compared to large Chinese CROs, the competitive edge of smaller domestic providers are their flexibility, price advantage, and better customer services. As a result, an increasing number of innovative drug companies choose to collaborate with them. Lastly, further to their global operational capabilities and business experience, the small and medium-sized CROs have sound professional knowledge, multi-center clinical trials management capability, resource integration and coordination, as well as global vision and strategy. These factors will ultimately determine the success of drug companies in overseas markets.

The key success factor for overseas companies to penetrate China's clinical market and enhance their market exposure is selecting the right partner.

According to Informa Pharma Projects, the total number of drugs under development globally in 2022 was 20,109, representing 8.22% increase YoY, nearly double of that in 2021 (4.76%), and significantly higher than the average growth rate in the past five years (6.25%). As the total number of drugs in development and quality requirements continue to grow (Figure 8), drug makers in developed countries are facing new challenges: rising R&D costs and increasingly shorter drug life cycles. Recent data from Evercore IS confirms the upward trends in R&D costs, compelling drug makers to seek alternative solutions for long-term profitability improvement.

Figure 8



Source: VMS desktop research

China as a large country with a huge patient population, offers significant advantages for drug companies worldwide. The availability of a large sample size for clinical trials makes China an attractive market. Companies can enroll a substantial number of cases and complete the trials with better time efficiency. Leveraging this "China efficiency", drug companies can cut down on time and cost in launching new products, thereby speeding up the drug development process. With these benefits, China has emerged as a key market for overseas biotech companies to conduct clinical trials, many have chosen to place their APAC trials in China anticipating better returns for future expansions in this region.

However, these overseas companies must comply with China's rules and regulation in order to successfully establish themselves in the market. This includes familiarizing with local laws and regulations, the healthcare system, and meeting patients' needs and expectations. China's legal and regulatory environment is very complex and constantly evolving, making the selection of the right CRO to partner with a crucial success factor for drug companies looking to enter the APAC market. In this aspect, traditional multinational CROs may struggle to provide cost effective solutions and may find themselves incompatible with China's regulatory environment. On the other hand, smaller CROs, which are more agile and still possess global operations capabilities and international business experience, can better ensure their business operations are compliant with the latest regulatory requirements while understanding the needs of their overseas clients. Thus, making them an essential tool for overseas innovative drug companies to successfully penetrate into the APAC region.

Clinical CROs with global capabilities have become scarce resources under the current wave of consolidation within healthcare sector

The downturn in the capital market has posed challenges for global innovative drug companies, but it has also opened up many new opportunities. Chinese companies have a clear need for global expansion, and China's inherent advantages provide a promising environment with new possibilities for overseas drug companies. Currently, both domestic and overseas companies are seeking to expand beyond their familiar territories, yet there is a scarcity of CROs with the necessary capabilities in the market to guide them in overcoming these challenges and assist them in realizing the expansion plans.

Under the current wave of consolidation in the global healthcare industry, choosing the right partner has become crucial for drug makers to achieve cost-efficiency and long-term profitability. This entails finding a partner who is well-versed in the latest rules and regulations, familiar with both local and overseas business environment, and possesses comprehensive patient knowledge. Small and medium-sized CROs, equipped with global operational capabilities, international business experience, and a deep understanding of local languages and culture, can play a significant role in facilitating global expansion strategies and improving R&D efficiency for both domestic and overseas biotech companies. This transition will enable Chinese biotech and pharmaceutical companies to start evolving from "China Innovation" to true "Global Innovation." Moreover, it will drive the transformation of the CRO industry from competing for scale/size to specialization and globalization, fueled by differentiated global vision and professional service.

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