BERNSTEIN
SOCIETE GENERALE GROUP

25 August 2026

Global Automation

Humanoid robotics: The road to real-world adoption -- the market size and ROI of four key applications


Jay Huang, Ph.D.
+852 2123 2631
jay.huang@bernsteinsg.com


Dien Wang, Ph.D.
+852 2123 2622
dien.wang@bernsteinsg.com


Robin Zhu
+852 2123 2659
robin.zhu@bernsteinsg.com


Min-Joo Kang
+852 2123 2644
minjoo.kang@bernsteinsg.com


Eunice Lee, CFA
+852 2123 2606
eunice.lee@bernsteinsg.com


Mark Shmulik
+1 917 344 8508
mark.shmulik@bernsteinsg.com


Elsa Fu
+852 2123 2617
elsa.fu@bernsteinsg.com


Weibin Liang, Ph.D.
+852 2123 2666
weibin.liang@bernsteinsg.com

What characterizes Humanoid Robotics in 2026 is the quick shift of focus from locomotion demonstration to commercial adoption (Exhibit 1). Previously, we analyzed the enabling technology progresses (see here) and the warehouse scenario (see here). In this note, we identify four key areas of adoption in the next five years, and show that their payback periods can soon fall below the 2.5-year threshold for accelerating adoption (Exhibit 5 to Exhibit 7). Combined, the four applications account for about half of our projected 1-million annual shipment in 2031 (Exhibit 11 and Exhibit 12). We also recommend a three-point formula for investors to track progress and pick winners.

Payback period. The four key applications are warehouse pick-and-place, factory material handling and inspection, urban and industrial patrol, and last-leg delivery to door (Exhibit 3 and Exhibit 4). These are the first to have reached or soon reach human performance levels. We analyze each application in China and the U.S. At currently available robot prices, the payback periods range from 1.0 (patrol in the U.S.) to 6.7 years (factory material handling and inspection in China) (Exhibit 5). Patrol in both U.S. and China already has payback below two years. In the other three applications, to achieve the 2.5-year payback, a typical threshold for accelerating adoption, humanoid robot prices would need to fall 30-50% from the current level in China (Exhibit 6) and 5-40% in the U.S. (Exhibit 7). Empirical evidence from the EV and battery industries shows that costs typically decline by 15-18% when volume doubles, with a much steeper curve at very small volumes (Exhibit 8). Therefore, we do not think robot pricing will remain a major hurdle for adoption in two to three years' time.

Potential market size. We deliberately leave other applications out of the scope of this note, such as installation and assembly in factories and almost all commercial and household applications. Those applications can potentially provide much bigger long-term TAM, and we have started to see proof-of-concept pilots, but we do not think they will become ready soon from a technology and ROI perspective (Exhibit 2). Across the four identified applications, our analysis suggests a potential market of approximately 10mn humanoid robots in China and 1mn in the U.S. (Exhibit 10). This is the potential "installed base". Factory material handling and inspection represents the largest opportunity. Further assuming an 8% replacement by 2031 (the "penetration ratio"), we derive an annual shipment of ~500k units in 2031 (Exhibit 11), accounting for ~50% of the humanoid robot market size we project in that year.

Picking winners. To identify front-runners embracing these first wave commercial opportunities, we recommend investors to track **three trajectories** of individual robot makers: 1) growth trajectory of real commercial sales and verifiable expansion of commercial customers, 2) performance improvement trajectory by using deployment data to close the reinforcement learning loop (rather than just the amount of data), 3) a trajectory moving toward the center of the industry ecosystem, and early evidence of "system integrators" gathering around certain robot makers (see here).

See the Disclosure Appendix of this report for required disclosures, analyst certifications and other important information. Alternatively, visit our Global Research Disclosure Website.

First Published: 24 Aug 2026 20:30 UTC Completion Date: 24 Aug 2026 15:00 UTC

DETAILS

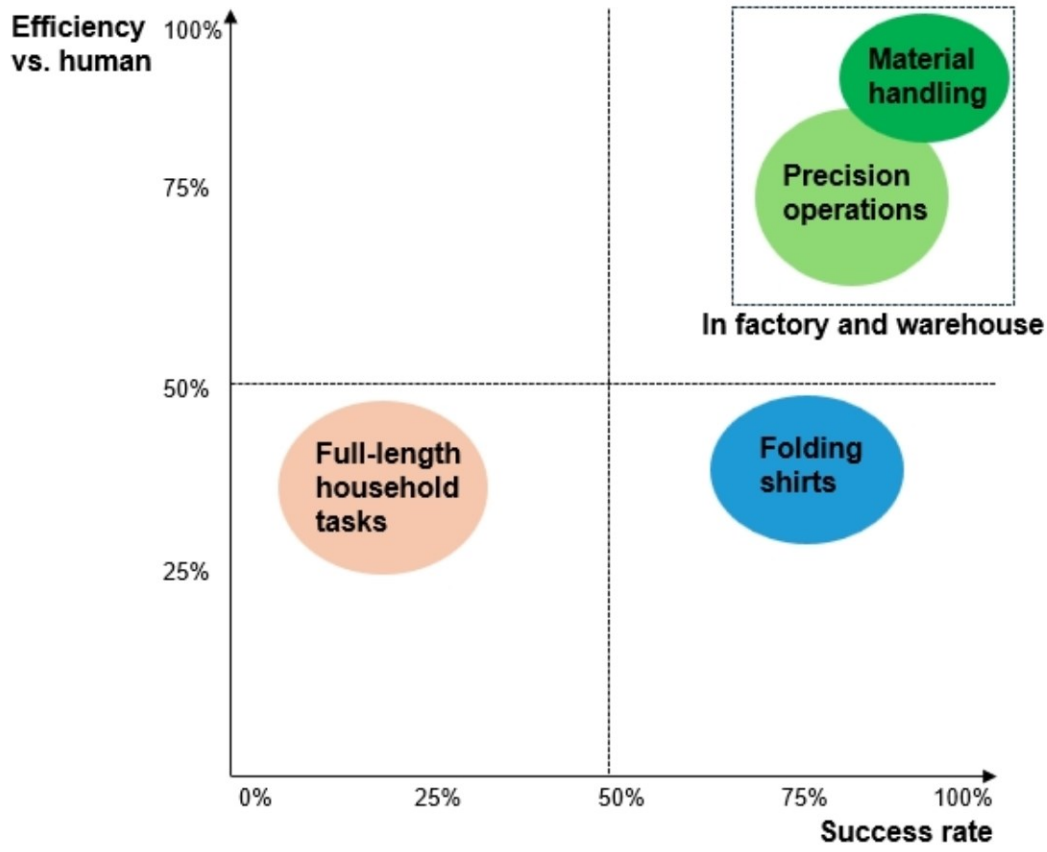
SUMMARY

EXHIBIT 1: **The Humaniod Robotics industry is shifting from locomotion demonstration to commercial adoption**

Company	Robot	Est. price	Customer	Start time	Industry	Task	Note
Boston Dynamics	**Stretch**	$150,000	NFI, DHL, etc.	2022	Warehouse	Unload and upload boxes	1) Moved over a million customer boxes in under a year at multiple sites, **up to 700 cases per hour**; 2) **Wheeled design with gripper arms (7 DoF), vision systems, and dedicated safety system;** 3) Gripper with sensing tech and pneumatic control
Boston Dynamics	**Atlas**	$150,000	Hyundai and Google DeepMind	2026	Automotive and tech	TBD	1) Deployment scheduled in 2026; 2) Learned behaviors can be redeployed across fleets
Agility	**Digit**	$250,000	GXO, Amazon, Mercado Libre, Schaeffler, Toyota, etc.	2024	Warehouse	Move a tote from an AMR to a conveyor	1) **98% accuracy** and 100k+ totes moved with GXO; 2) Over 65k hours work; 3) Units per hour lower than human**;** 3) **75% components sourced in the US**
Figure	**Figure 02**	$130,000	BMW	2025	Automotive	Load sheet-metal into welding fixtures	1) 10-hour shifts Mon to Fri: 90,000+ parts loaded, 1,250+ runtime hours, contributed to 30,000+ BMW X3 vehicles 2) KPIs including **cycle time, placement accuracy (balancing speed with precision), and interventions** 3) Critical data generated for Figure 03 design
Figure	**Figure 03**	$130,000	BMW	2026	Automotive	Pick components up and sort them into a sequencing trolley	1) Improved **hands with tactile sensors and palm cameras;** 2) Enhanced safety, wireless charging, audio functions;
Apptronik	**Apollo**	N/A	Mercedes-Benz	2025	Automotive	Assemble kits and deliver p	1) First trained by teleoperation with the goal of autonomous working; 2) 25kg payload capacity
Unitree	**G1/H2**	$12,000 /$28,000	NIO, Geely, Schneider	2024	Automotive, Electrical equipment	Assemble parts, patrol, and conduct inspections	1) **High success rates for simple tasks,** but lower success rates for long-sequence tasks involving 10-20 steps and small parts; 2) **Customers can customize the payload**
Agibot	**G2**	$85,000	Longcheer	2025	Electronics	Pick and place the tablet into the testing fixture	1) **Capable of performing the work of one operator across two daily shifts;** 2) **>99.5% overall success rate;** 18-20 sec per process; up to 310 units/hour throughput; 3) **Wheeled design**
UBTECH	**Walker S**	$138,000	11 companies incl. BYD, Geely, Foxcon, SANY	2024	Automotive, electronics, machinery	Six tasks incl. box handling, SPS sorting, quality inspection, screw tightening, part installation, and process material handling	1) On-time over **10k hours i**n Zeekr factory; 2) **3-minute autonomous battery swap;** 3) Failure rate <0.5%; 4) 15kg payload
Robotera	**Star 1/L7**	$40,000-$60,000	SF Express	2025	Warehouse	Sort parcels	1) **90% human efficiency in certain applications ; 2) 95% accuracy**
Leju	**KUAVO**	N/A	STEP, Hongqi Auto, etc.	2025	Automotive, machinery	Load boxes, handle materials, and conduct inspections	1) Over 100 units delievered in factories; 2) 50% human efficiency at the beginning of 2025
Galbot	**S1**	$140,000	CATL	2026	Battery	Load materials	**Wheeled design** with dexterous hands
Xiaomi	**N/A**	N/A	Xiaomi	2026	Automotive	Load materials	Tested for **four months,** achieving over **90% success rates** across multiple tasks (self-tapping nut assembly,console side panel installation, and bin folding)

Non-exhaustive: we have selected major industrial use cases from humanoid companies in both USA and China. Boston Dynamics is owned by Hyundai (not covered) and UBTECH and Unitree are public (not covered). Xiaomi is covered by Bernstein Asian Autos team. Agility agreed to go public through a merger with the SPAC Churchill Capital Corp XI. Other companies mentioned in the list are private.
Source: company websites, industry news, AlphaSense, Bernstein analysis

EXHIBIT 2: **Factory and warehouse applications are the first to reach human performance levels**



Source: Physical Intelligence, "Task adaptation of Vision-Language-Action model: 1st Place Solution for the 2025 BEHAVIOR Challenge" by Larchenko and etc., industry news, Bernstein analysis

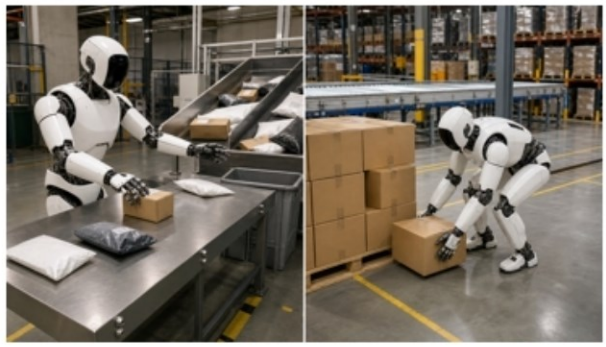
EXHIBIT 3: **We analyze four key areas of adoption in the next five years (Illustrative pictures generated by Perplexity; pilot/deployment projects listed below the pictures)**

Patrol: urban and industrial



Unitree G1/H1, LimX Tron-1 (multi-modal biped)

Warehouse ops incl. sorting and handling



Agility Digit, Boston Dynamics Stretch, Robotera Star 1/L7

Delivery to door (one robot paired with one courier, each serving one building)



Amazon is reportedly testing solutions that pair a robot with a courier to serve different buildings

Factory: material handling and inspection



Figure 02/03, Apptronik Apollo, Agibot G2, UBTECH Walker S, Leju KUAVO, Galbot S1, Unitree H2, Xiaomi

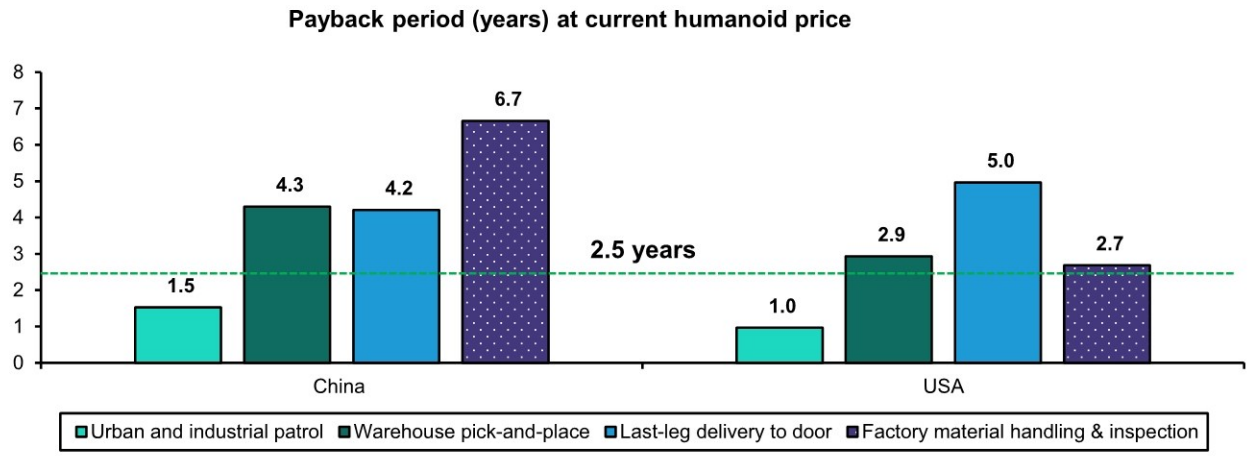
Non-exhaustive: we have selected major industrial use cases from humanoid companies in both USA and China. Boston Dynamics is owned by Hyundai (not covered) and UBTECH and Unitree are public (not covered). Xiaomi is covered by Bernstein Asian Autos team. Agility agreed to go public through a merger with the SPAC Churchill Capital Corp XI. Other companies mentioned in the list are private.
Source: pictures generated by Perplexity referencing real-world pilot cases, Bernstein analysis

EXHIBIT 4: **Payback period is calculated by the "pay" (upfront investments) divided by the "back" (annual net savings)**

Activities		"Pay" (upfront investments)	"Back" (annual net savings/earnings)	
			Gross savings/earnings	Supporting costs
Patrol	Urban and industrial incl. security checks, meter reading, and power line inspection, etc.	**1) Robot procurement costs** $25k and $75k for patrol and delivery in China and U.S. $65k and $150k for warehouse and factory in China and U.S.	3.8 substituted labor per robot considering both productivity and working hour difference	**1) Robot maintenance and electricity costs** (15% of robot price annually; 10% for "agv+cobot" solution)
Warehouse	Sorting, handling, etc.	**2) Robot integration costs** 30% of robot price for humanoids 40% of robot price for "agv + cobot" solution	2.8 substituted labor per robot	**2) Added operator costs** (2-5 humanoids looked after by 1 operator)
Delivery to door	Last-leg package delivery to door		**U.S.:**1.3 substituted labor per robot assuming pairing each robot with a courier **China:** Doorstep delivery by robots generates an additional 2 RMB per order than delivery to stations or parcel lockers	
Factory	Material handling and inspection		2.4 substituted labor per robot	

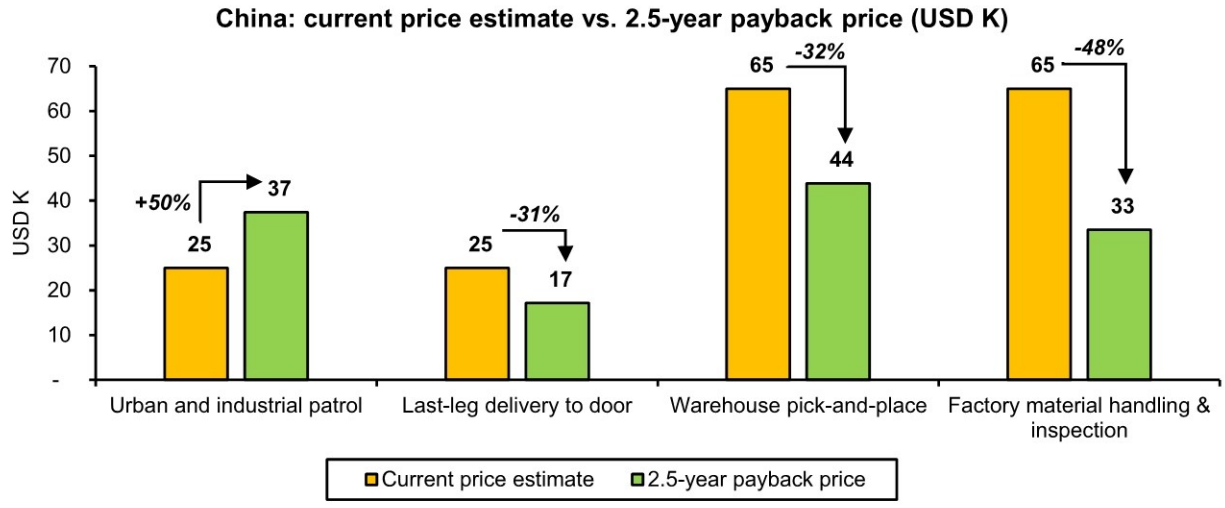
Source: Bernstein analysis

EXHIBIT 5: **At currently available robot prices, the payback periods range from 1.0 (patrol in the U.S.) to 6.7 years (material handling and inspection in China)**



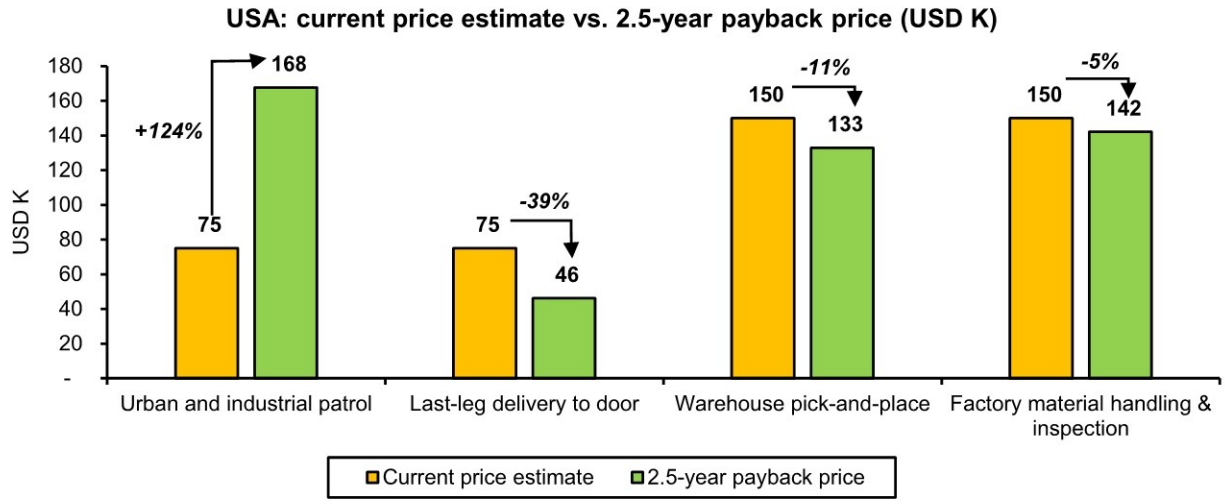
Source: company filings, company news, Bernstein analysis and estimates

EXHIBIT 6: **Patrol already has payback below two years. In the other three applications, to achieve the 2.5-year payback, a typical threshold for sharply accelerating adoption, humanoid robot prices would need to fall 30-50% from the current level in China**



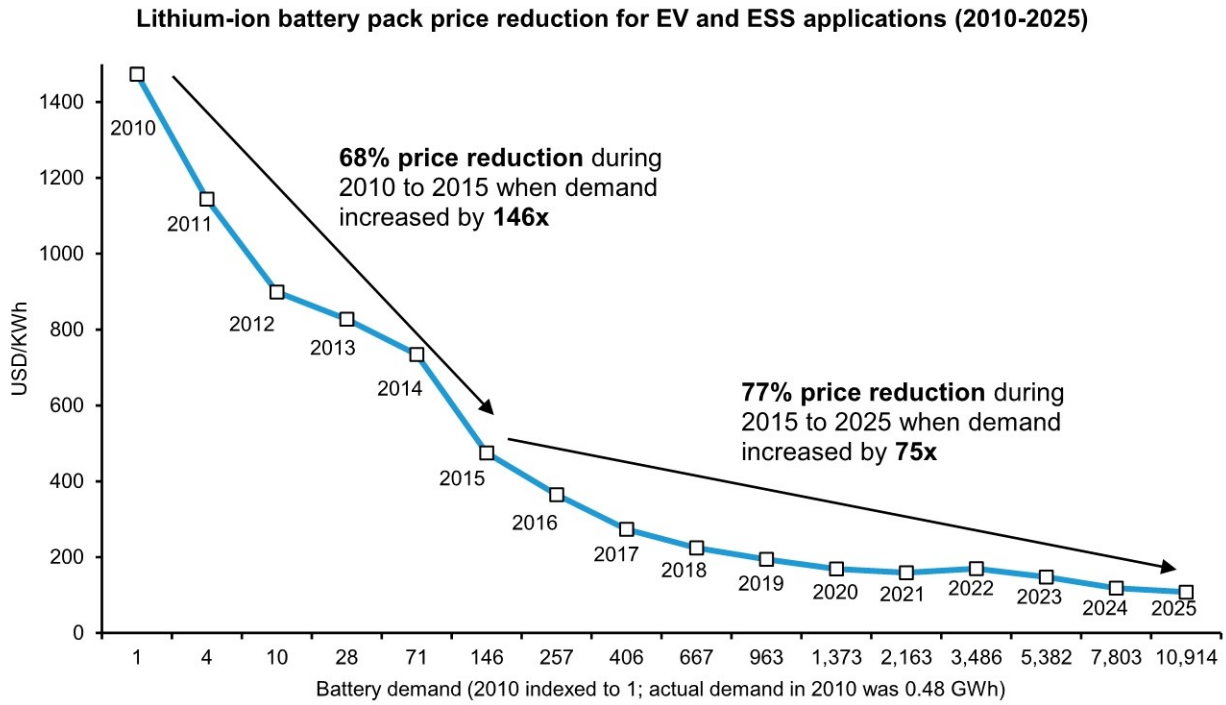
Source: Bernstein analysis and estimates

EXHIBIT 7: **Patrol already has payback below two years. In the other three applications, to achieve the 2.5-year payback, a typical threshold for sharply accelerating adoption, humanoid robot prices would need to fall 5-40% from the current level in the U.S.**



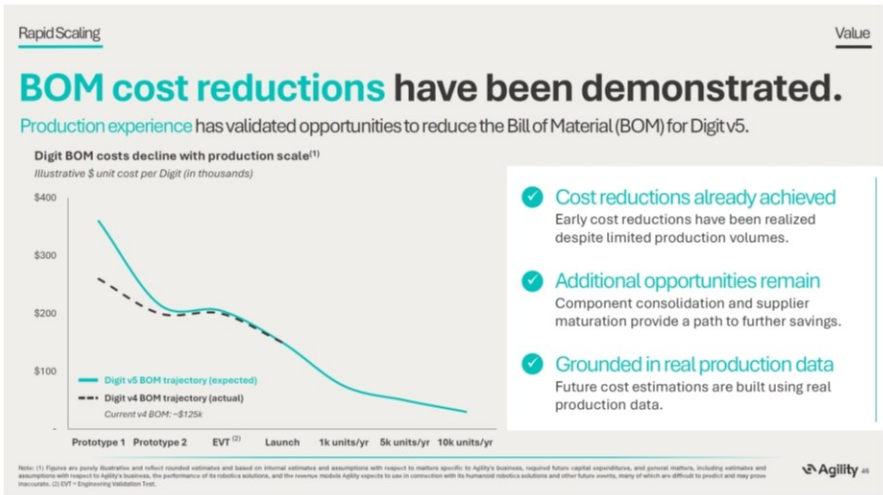
Source: Bernstein analysis and estimates

EXHIBIT 8: **Empirical evidence from the EV and battery industries shows that costs typically decline by 15-18% when volume doubles, with a much steeper curve at very small volumes**



Source: Bernstein's Global Energy Storage team, BlommbergNEF

EXHIBIT 9: **Similarly, Agility and other major humanoid players expect significant cost reductions as production scales**



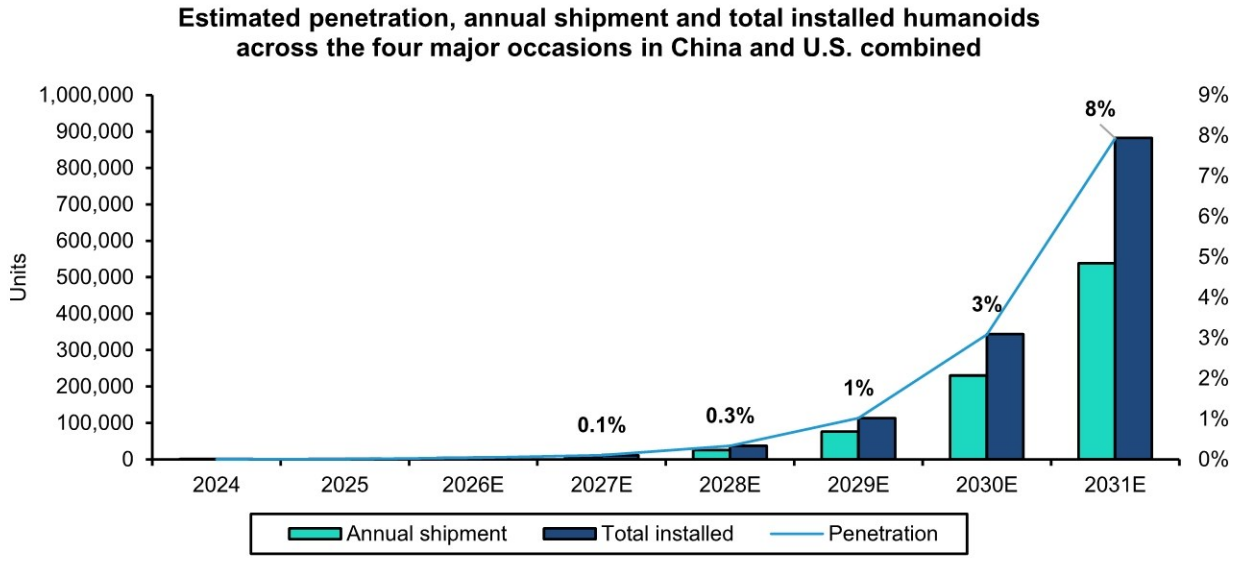
Source: Agility (June 2026 investor presentation), Bernstein analysis

EXHIBIT 10: **Across the four applications, our analysis suggests a potential market of approximately 10mn humanoid robots in China and 1mn in the U.S. Factory material handling and inspection represents the largest opportunity**

	No. of robots (Mn)		=	No. of workers (Mn)		X	% Addressable		X	Substituted labor per robot	
	China	USA		China	USA		China	USA		China	USA
Urban and industrial patrol	1.8	0.0		6.8	0.2		100%	100%		3.8	3.8
Warehouse pick-and-place	0.5	0.1		1.4	0.4		90%	90%		2.8	2.8
Last-leg delivery to door	1.6	0.4		3.4	1.0		50%	50%		1.1	1.3
Factory material handling & inspection	6.0	0.6		17.1	1.8		85%	85%		2.4	2.4
Total	**9.9**	**1.2**		**28.7**	**3.5**						

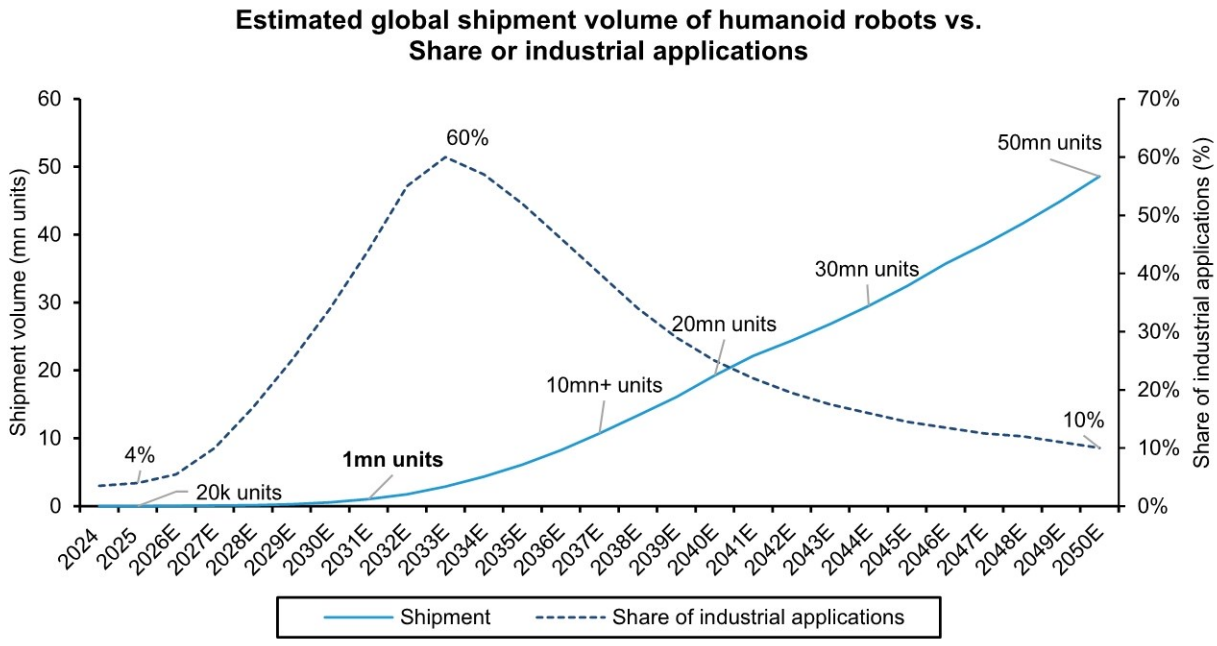
Our key assumptions are color coded in red.
Source: Bernstein analysis and estimates

EXHIBIT 11: **We estimate that these four use cases will achieve ~8% penetration over the next five years, reaching an installed base of ~900k units and annual shipments of 500k+ units by 2031**



Source: Bernstein analysis and estimates

EXHIBIT 12: **Near-term adoption concentrates on industrial applications and the four applications will account for ~50% of the humanoid robot market size in 2031**



Source: Bernstein estimates and analysis

DETAILED PAYBACK ANALYSIS

The charts below illustrate our payback analysis and the sensitivity of payback periods to robot prices. In each scenario, payback period is calculated as upfront humanoid investment divided by annual costs saved after deployment or annual net earnings. We have translated all figures in USD. Five major observations:

1) **Current payback periods** range from **1.0 to 6.7 years**.

2) Despite higher robot prices, **the U.S. generally offers faster payback than China** because labor costs are typically 3-5x higher.

3) Among the use cases analyzed, **patrol delivers the most attractive economics** in both markets (<2 years payback) driven by a higher substituted labor per robot and lower robot prices. On the other hand, **factory applications face longer payback** due to higher robot prices and lower substitute ratio (assuming two shifts), especially in China (6.7 years), where manufacturing wages are 23% of U.S. levels. Delivery to door faces a longer payback mainly due to low substitute ratio (assuming pairing one robot with one courier).

4) For the material handling and installation use cases, we also compare the payback of humanoid robots with “AGV + cobot” solutions. In short, while “AGV + cobot" solutions currently offer a shorter payback period (4 years and 2.6 years in China and U.S. respectively vs. 6.7 years and 2.7 years from humanoids), we expect humanoid robots to achieve better economics over time as production scales.

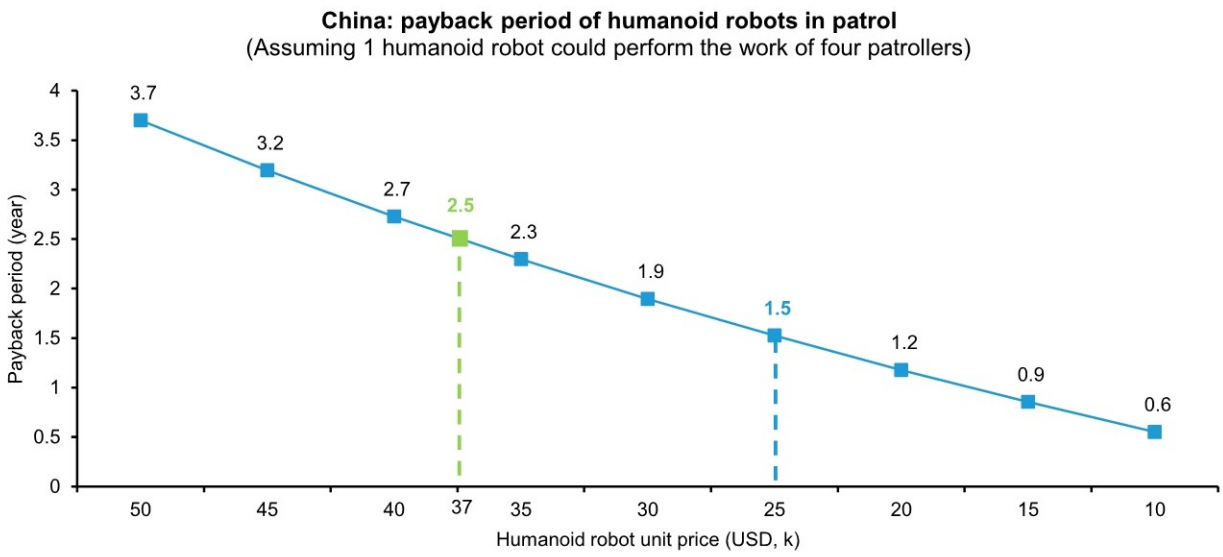
5) Overall, **ROI is already compelling for patrol globally and for three of the four use cases in the U.S., even at today's robot prices.** To achieve a 2.5-year payback, robot price would need to fall to $30-40k in China (17k for delivery to door) and could remain at $130-140k (46k for delivery to door) in the U.S. As scale and supply chain efficiencies drive costs down, similar to EV and batteries (Exhibit 8), where **costs decline by 15-18% when volume doubles, robot pricing should not be a major concern.**

EXHIBIT 13: **Estimated payback period: humanoid patrol in China**

Estimated payback period of humanoid robots for patrol in China				
USD				
Upfront investment				
Upfront investment	# of humanoid robots	Robot unit price	Integration cost (% of robot price)	Sub-total
Procurement and system integration of humanoids	8	25,000	30%	**260,000**
Before replacement				
Annual labor cost	# of workers	Unit labor cost		Sub-total
Patrol staff	30	11,143		**334,286**
After replacement				
Annual robot maintenance & electricity cost	# of humanoid robots	Annual robot cost (% of robot price)	Unit cost	Sub-total
Humanoid robots	8	15%	3,750	30,000
Annual labor cost	# of operators	Unit labor cost		Sub-total
Operators	12	11,143		133,714
				163,714
Annual cost saved				**170,571**
Payback years				**1.5**
Assumptions				
Unit Labor cost (USD)				
Basic annual wage				8,571
Plus: welfare+miscellaneous (% of basic annual wage)				30%
Total annual wage				11,143
Robot cost (USD)				
Robot cost				
Purchase price				25,000
Integration & setup (30% of price)				7,500
Maintenance & electricity (15% of price)				3,750
Operation mode & efficiency				
# of patrol staff substituted by 1 humanoid				4
# of humanoid robots looked after by 1 operator				5
USD/RMB				7

Apart from the operators looking after humanoids, we estimate each shift will have 2 additional operators to conduct on-site monitoring and respond to incidents.
Source: Bernstein analysis

EXHIBIT 14: **Payback sensitivity: humanoid patrol in China**



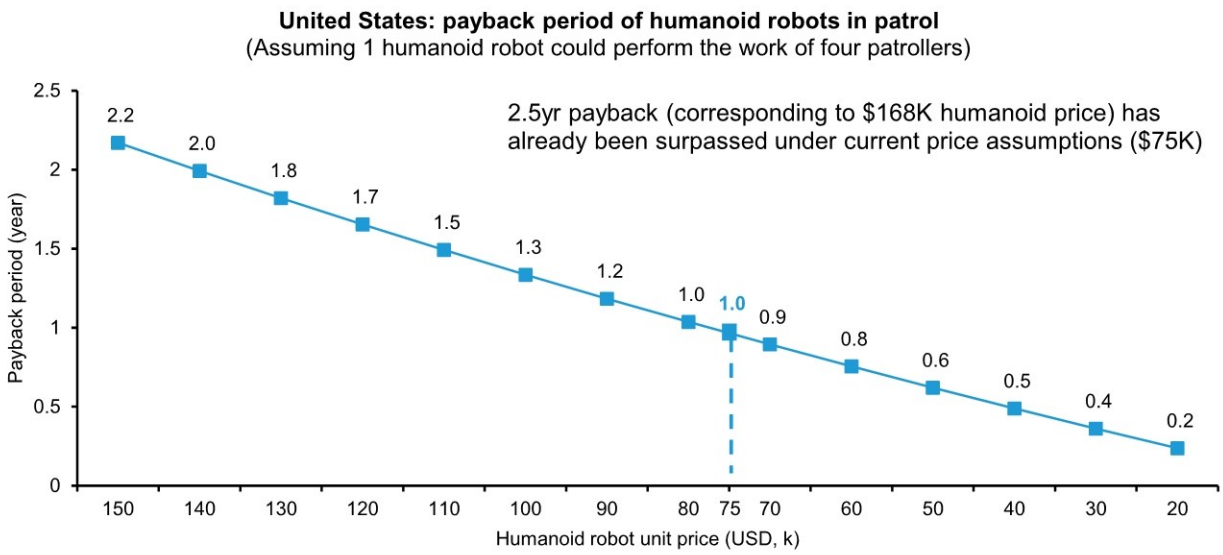
Source: Bernstein analysis

EXHIBIT 15: **Estimated payback period: humanoid patrol in the U.S.**

Estimated payback period of humanoid robots for patrol in the U.S.				
USD				
Upfront investment				
Upfront investment	# of humanoid robots	Robot unit price	Integration cost (% of robot price)	Sub-total
Procurement and system integration of humanoids	8	75,000	30%	**780,000**
Before replacement				
Annual labor cost	# of workers	Unit labor cost		Sub-total
Patrol staff	30	49,920		**1,497,600**
After replacement				
Annual robot maintenance & electricity cost	# of humanoid robots	Annual robot cost (% of robot price)	Unit cost	Sub-total
Humanoid robots	8	15%	11,250	90,000
Annual labor cost	# of operators	Unit labor cost		Sub-total
Operators	12	49,920		599,040
				689,040
Annual cost saved				**808,560**
Payback years				**1.0**
Assumptions				
Unit Labor cost (USD)				
Basic annual wage				38,400
Plus: welfare+miscellaneous (% of basic annual wage)				30%
Total annual wage				49,920
Robot cost (USD)				
Robot cost				
Purchase price				75,000
Integration & setup (30% of price)				22,500
Maintenance & electricity (15% of price)				11,250
Operation mode & efficiency				
# of patrol staff substituted by 1 humanoid				4
# of humanoid robots looked after by 1 operator				5
USD/RMB				7

Apart from the operators looking after humanoids, we estimate each shift will have 2 additional operators to conduct on-site monitoring and respond to incidents.
Source: Bernstein analysis

EXHIBIT 16: **Payback sensitivity: humanoid patrol in the U.S.**



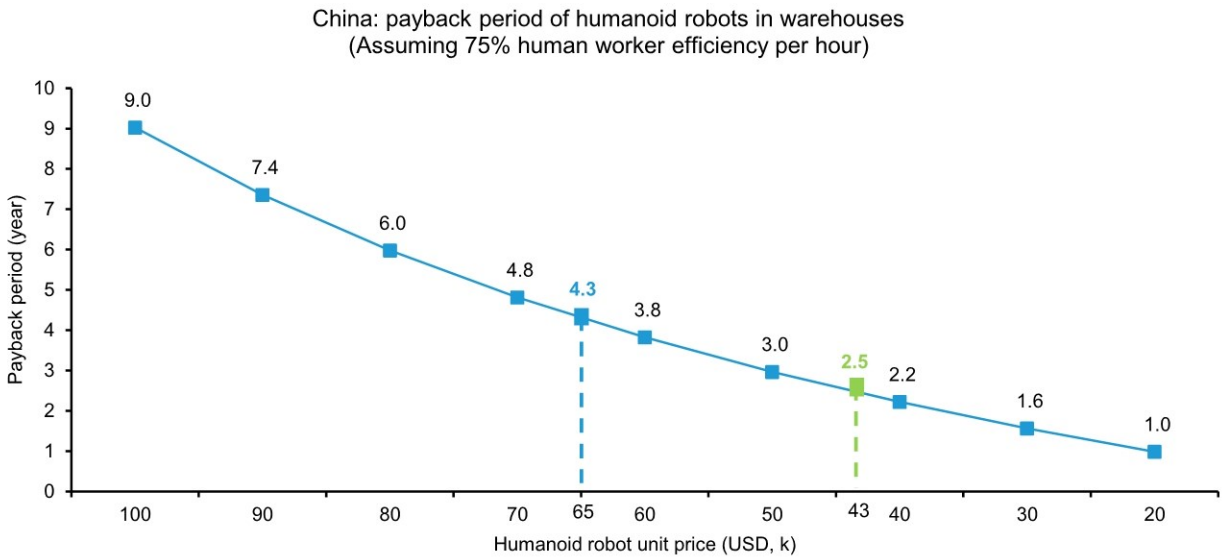
Source: Bernstein analysis

EXHIBIT 17: **Estimated payback period: humanoids in China's warehouses**

Estimated payback period of humanoid robots in China's warehouses				
Illustration of economics (every 2 humanoid robots in warehouse, all in USD)				
Upfront investment				
Upfront investment	# of humanoid robots	Robot unit price	Integration cost (% of robot price)	Sub-total
Procurement and system integration of humanoid robots	2	65,000	30%	**169,000**
Before replacement				
Annual labor cost	# of workers	Unit labor cost	Implied shifts (relative to robot)	Sub-total
Warehouse workers	1.5	19,061	3.7	**105,845**
After replacement				
Annual robot maintenance & electricity cost	# of humanoid robots	Annual robot cost (% of robot price)	Unit cost	Sub-total
Humanoid robots	2	15%	9,750	19,500
Annual labor cost	# of operators	Unit labor cost	Implied shifts (relative to robot)	Sub-total
Operators	0.7	19,061	3.7	47,042
				66,542
Annual cost saved				**39,303**
Payback years				**4.3**
Assumptions				
Unit labor cost (USD)				
Basic annual wage				14,663
Plus: welfare+miscellaneous (% of basic annual wage)				30%
Total annual wage				19,061
Robot cost (USD)				
Robot cost				
Purchase price				65,000
Integration & setup (30% of price)				19,500
Maintenance & electricity (15% of price)				9,750
Operation mode & efficiency				
Humanoid robots' working efficiency relative to human workers per hour				75%
# of humanoid robots looked after by 1 operator				3
Working time & shifts				
Working hours per day - human				8
Working hours per day - robot (with battery swap)				22
Implied shifts per day (human relative to robot)				2.8
Working days per year - human (i.e. 52 weeks*5 working days per week)				260
Working days per year - robot (assume 15 days of maintenance per year)				350
Implied shifts per year (human relative to robot)				3.7
USD/RMB				7

The payback period estimate is different from our previous version as we update our estimate on current robot unit price from $50K to $65K.
Source: Bernstein analysis

EXHIBIT 18: **Payback sensitivity: humanoids in China's warehouses**



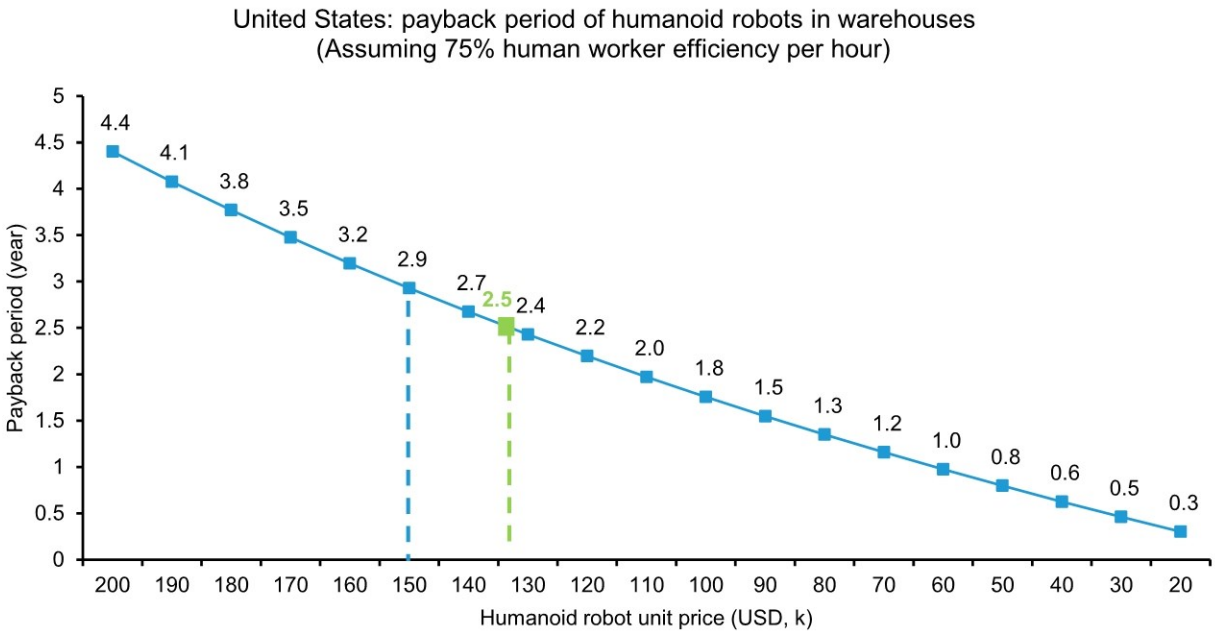
Source: Bernstein analysis

EXHIBIT 19: **Estimated payback period: humanoids in the American warehouses**

Estimated payback period of humanoid robots in the U.S. Warehouses				
Illustration of economics (every 2 humanoid robots in warehouse, all in USD)				
Upfront investment				
Upfront investment	# of humanoid robots	Robot unit price	Integration cost (% of robot price)	Sub-total
Procurement and system integration of humanoid robots	2	150,000	30%	**390,000**
Before replacement				
Annual labor cost	# of workers	Unit labor cost	Implied shifts (relative to robot)	Sub-total
Warehouse workers	1.5	57,744	3.7	**320,647**
After replacement				
Annual robot maintenance & electricity cost	# of humanoid robots	Annual robot cost (% of robot price)	Unit cost	Sub-total
Humanoid robots	2	15%	22,500	45,000
Annual labor cost	# of operators	Unit labor cost	Implied shifts (relative to robot)	Sub-total
Operators	0.7	57,744	3.7	142,510
				187,510
Annual cost saved				**133,137**
Payback years				**2.9**
Assumptions				
Unit Labor cost (USD)				
Basic annual wage				44,419
Plus: welfare+miscellaneous (% of basic annual wage)				30%
Total annual wage				57,744
Robot cost (USD)				
Robot cost				
Purchase price				150,000
Integration & setup (30% of price)				45,000
Maintenance & electricity (15% of price)				22,500
Operation mode & efficiency				
Humanoid robots' working efficiency relative to human workers				75%
# of humanoid robots looked after by 1 operator				3
Working time & shifts				
Working hours per day - human				8
Working hours per day - robot (with battery swap)				22
Implied shifts per day (human relative to robot)				2.8
Working days per year - human (i.e. 52 weeks * 5 working days per week)				260
Working days per year - robot (assume 15 days of maintenance per year)				350
Implied shifts per year (human relative to robot)				3.7
USD/RMB				7

Source: Bernstein analysis

EXHIBIT 20: **Payback sensitivity: humanoids in American warehouses**



Source: Bernstein analysis

EXHIBIT 21: **Estimated payback period: humanoids in China's delivery to door**

Estimated payback period of humanoid robots in China's parcel delivery to door
Each courier transports a humanoid robot to an area, where the courier and robot are each assigned to one building
Assuming each order generate 2 RMB (0.29 USD)

Illustration of economics in one delivery station, all in USD

Upfront investment in humanoid robot solutions

Upfront investment	# of humanoid robots	Robot unit price	Integration cost (% of robot price)	Sub-total
Procurement and system integration of humanoids	2	25,000	30%	**65,000**

Annual net revenue

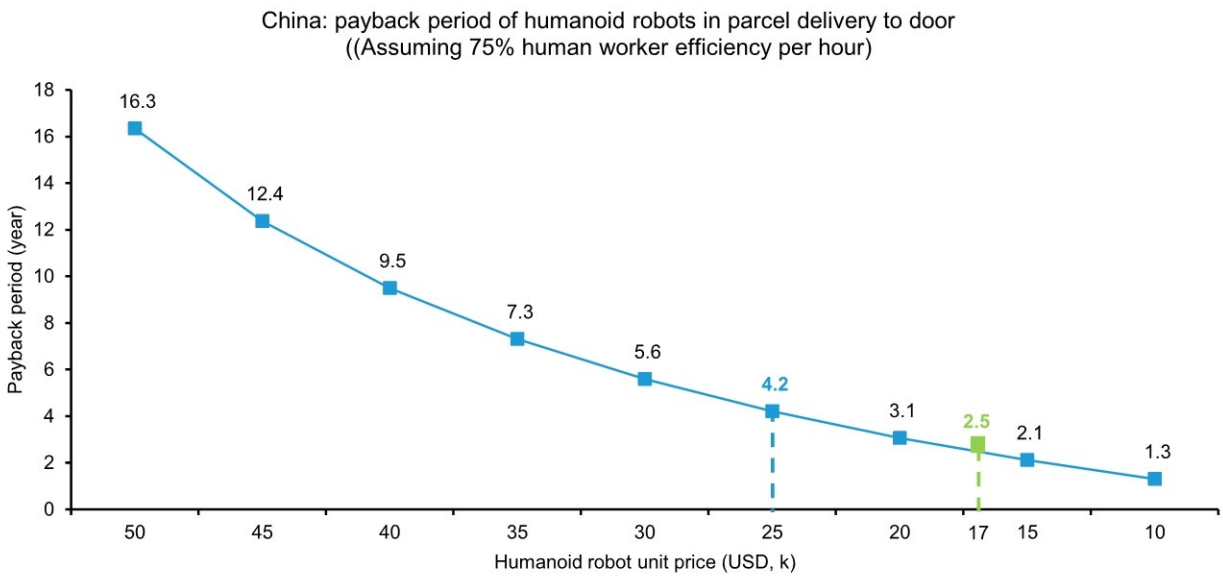
# of humanoid robots	Number of orders delivered per day	Working days per year	Per order revenue	Total revenue
2	210	312	0.29	**37,440**
Annual robot cost (% of robot price)	**Robot costs**	**No. of operators**	**Operator costs**	**Total costs**
15%	7,500	1	14,486	**21,986**

Annual net revenue (total)	**15,454**
Payback years	**4.2**

Assumptions	
Unit Labor cost (USD)	
Basic annual wage	11,143
Plus: welfare+miscellaneous (% of basic annual wage)	30%
Total annual wage	14,486
Robot cost ((USD)	
Purchase price	25,000
Integration & setup (30% of price)	7,500
Maintenance & electricity (15% of price)	3,750
Operation mode & efficiency	
Humanoid robots' working efficiency relative to human workers	75%
Human average order per hour	20
Humanoid average order per hour	15
# of humanoid robots looked after by 1 operator	2
Working time & shifts	
Working hours per day - robot (with battery swap)	14
Working days per year - robot (i.e. 52 weeks*6 working days per week)	312
Per order revenue (USD)	0.29
USD/RMB	7

Source: Bernstein analysis

EXHIBIT 22: **Payback sensitivity: humanoids in China's delivery to door**



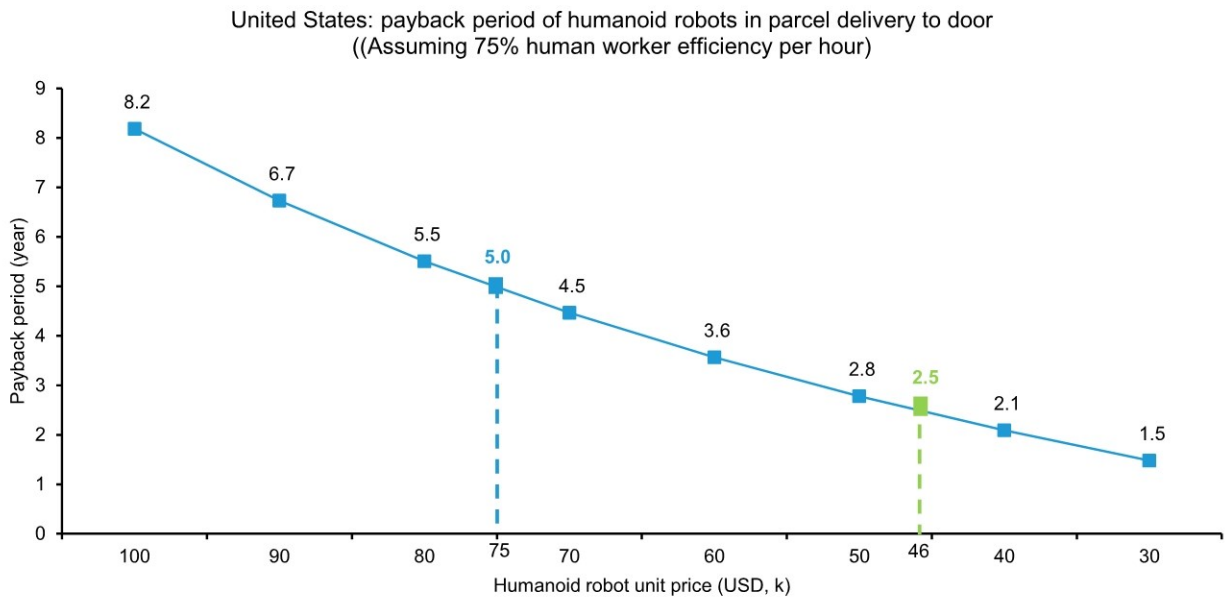
Source: Bernstein analysis

EXHIBIT 23: **Estimated payback period: humanoids in U.S. delivery to door**

Estimated payback period of humanoid robots in U.S. parcel delivery to door				
Each courier transports a humanoid robot to an area, where the courier and robot are each assigned to one building.				
Illustration of economics in one delivery station, all in USD				
Upfront investment in humanoid robot solutions				
Upfront investment	# of humanoid robots	Robot unit price	Integration cost (% of robot price)	Sub-total
Procurement and system integration of humanoids	4	75,000	30%	**390,000**
Before replacement				
Annual labor cost	# of workers	Unit labor cost		Sub-total
Couriers	10	41,184		**411,840**
After replacement (Courier + humanoid robot + robot operator)				
Annual robot maintenance, electricity, and labor cost	# of humanoid robots/workers	Annual robot cost (% of robot price)	Unit cost	Sub-total
Humanoid robots	4	15%	11,250	45,000
Couriers	5	41,184		205,920
Operators	2	41,184		82,368
				333,288
Annual cost saved				**78,552**
Payback years				**5.0**
Assumptions				
Unit Labor cost (USD)				
Basic annual wage				31,680
Plus: welfare+miscellaneous (% of basic annual wage)				30%
Total annual wage				41,184
Robot cost ((USD)				
Purchase price				75,000
Integration & setup (30% of price)				22,500
Maintenance & electricity (15% of price)				11,250
Operation mode & efficiency				
Humanoid robots' working efficiency relative to human workers				75%
# of humanoid robots looked after by 1 operator				2
Working time & shifts				
Working hours per day - human				7
Working hours per day - robot (with battery swap)				11
Working days per year - human (i.e. 52 weeks*5 working days per week)				260
Working days per year - robot (same as human)				260
Before				
Avg. daily parcel orders per courier				140
No. of couriers per station				**10**
Total orders fulfilled per year				364,000
After				
Avg. daily parcel orders per courier				140
Avg. daily parcel orders per humanoid				175
No. of couriers per station				**5**
Annual orders fulfilled by couriers				182,000
Remaining orders				182,000
No. of humanoids per station				**4**
No. of operators per station				**2**
USD/RMB				7

Source: Bernstein analysis

EXHIBIT 24: **Payback sensitivity: humanoids in U.S. delivery to door**



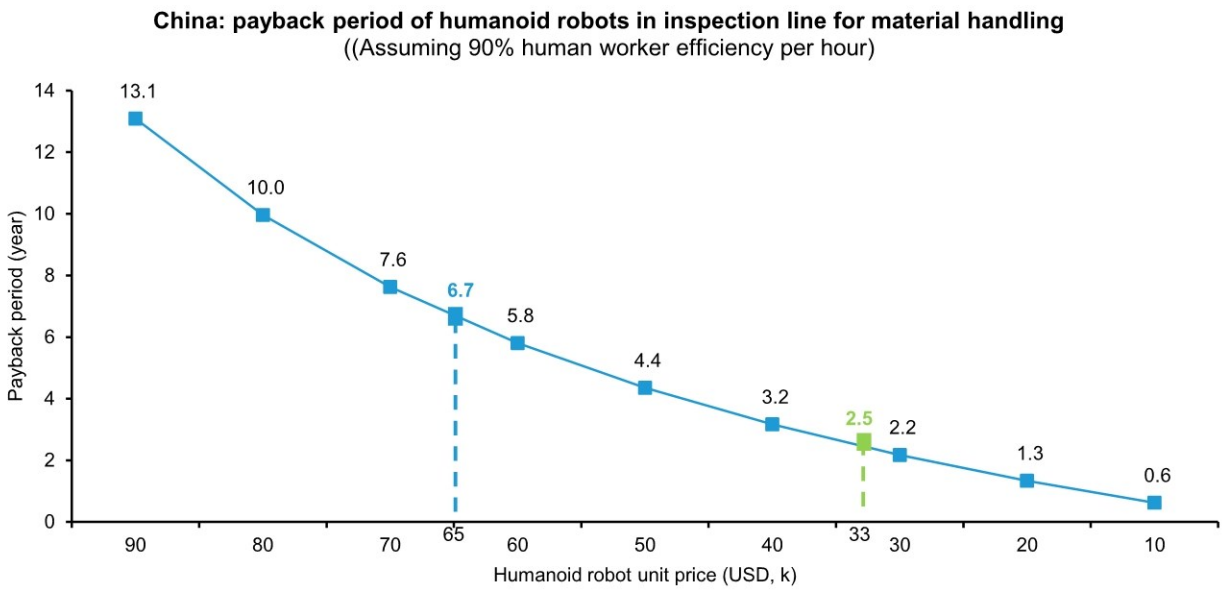
Source: Bernstein analysis

EXHIBIT 25: **Estimated payback period: humanoids in China's inspection line for material handling**

Estimated payback period of humanoid robots in China's Inspection line for material handling				
USD				
Upfront investment in humanoid robot solutions				
Upfront investment	# of humanoid robots	Robot unit price	Integration cost (% of robot price)	Sub-total
Procurement and system integration of humanoids	2	65,000	30%	**169,000**
Before replacement (only warehouse workers)				
Annual labor cost	# of workers	Unit labor cost	Implied shifts (relative to robot)	Sub-total
Factory workers	1.8	14,706	2.7	**71,269**
After replacement (humanoid robots + robot operators)				
Annual maintenance & electricity cost	# of humanoid robots	Annual robot cost (% of robot price)	Unit cost	Sub-total
Humanoid robots	2	15%	9,750	19,500
Annual labor cost	# of operators	Unit labor cost	Implied shifts (relative to robot)	Sub-total
Operators	0.7	14,706	2.7	26,396
				45,896
Annual cost saved				**25,373**
Payback years				**6.7**
Assumptions				
Unit labor cost (USD)				
Basic annual wage				11,313
Plus: welfare+miscellaneous (% of basic annual wage)				30%
Total annual wage				14,706
Robot cost (USD)				
Robot cost				
Purchase price				65,000
Integration & setup (30% of price)				19,500
Maintenance & electricity (15% of price)				9,750
Operation mode & efficiency				
Humanoid robots' working efficiency relative to human workers				90%
# of humanoid robots looked after by 1 operator				3
Working time & shifts				
Working hours per day - human				8
Working hours per day - robot (with battery swap)				16
Implied shifts per day (human relative to robot)				2.0
Working days per year - human (i.e. 52 weeks*5 working days per week)				260
Working days per year - robot (assume 15 days of maintenance per year)				350
Implied shifts per year (human relative to robot)				2.7
USD/RMB				7

Source: Bernstein analysis

EXHIBIT 26: **Payback sensitivity: humanoids in China's inspection line for material handling**



Source: Bernstein analysis

人在草木间

EXHIBIT 27: **Estimated payback period: humanoids in U.S. inspection line for material handling**

Estimated payback period of humanoid robots in US Inspection line for material handling				
USD				
Upfront investment in humanoid robot solutions				
Upfront investment	# of humanoid robots	Robot unit price	Integration cost (% of robot price)	Sub-total
Procurement and system integration of humanoid robots	2	150,000	30%	**390,000**

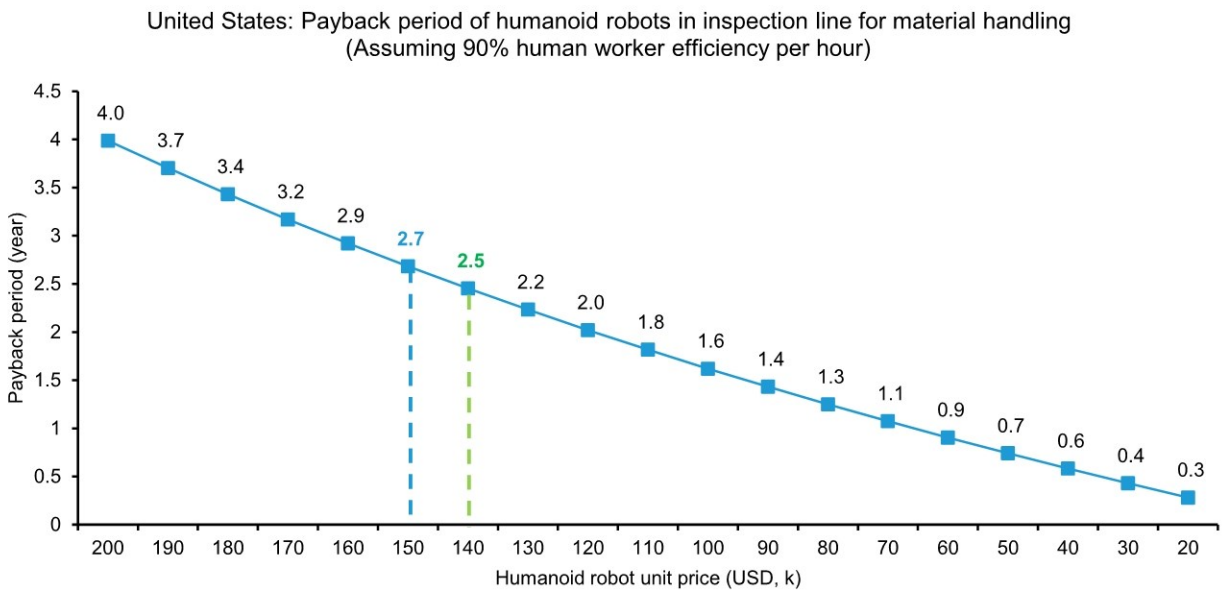
Before replacement				
Annual labor cost	# of workers	Unit labor cost	Implied shifts (relative to robot)	Sub-total
Factory workers	1.8	62,400	2.7	**302,400**

After replacement (humanoid robots + robot operators)				
Annual robot maintenance & electricity cost	# of humanoid robots	Annual robot cost (% of robot price)	Unit cost	Sub-total
Humanoid robots	2	15%	22,500	45,000
Annual labor cost	# of operators	Unit labor cost	Implied shifts (relative to robot)	Sub-total
Operators	0.7	62,400	2.7	112,000
				157,000
Annual cost saved (excl. upfront humanoid robot investment)				**145,400**
Payback years				**2.7**

Assumptions	
Unit labor cost (USD)	
Basic annual wage	48,000
Plus: welfare+miscellaneous (% of basic annual wage)	30%
Total annual wage	62,400
Robot cost (USD)	
Robot cost	
Purchase price	150,000
Integration & setup (30% of price)	45,000
Maintenance & electricity (15% of price)	22,500
Operation mode & efficiency	
Humanoid robots' working efficiency relative to human workers	90%
# of humanoid robots looked after by 1 operator	3
Working time & shifts	
Working hours per day - human	8
Working hours per day - robot (with battery swap)	16
Implied shifts per day (human relative to robot)	2.0
Working days per year - human (i.e. 52 weeks*5 working days per week)	260
Working days per year - robot (assume 15 days of maintenance per year)	350
Implied shifts per year (human relative to robot)	2.7
USD/RMB	7

Source: Bernstein analysis

EXHIBIT 28: **Payback sensitivity: humanoids in U.S. inspection line for material handling**



Source: Bernstein analysis

INVESTMENT IMPLICATIONS

We rate Hesai, Tuopu, Shuanghuan, Inovance, Harmonic Drive, JD, Xiaomi, BYD, Amazon Outperform; Sanhua, Estun, XPeng Market-Perform; Leader Drive, Coupang Underperform.

BERNSTEIN TICKER TABLE

			21 Aug 2026 Closing		TTM	Reported EPS				Reported P/E (x)		
Ticker	Rating	Cur	Price	Price Target	Rel. Perf.	Cur	2025A	2026E	2027E	2025A	2026E	2027E
HSAI (Hesai)	O	USD	19.10	29.00	(49.8)%	CNY	2.91	3.18	5.26	44.1	40.4	24.4
2525.HK (Hesai)	O	HKD	18.00	29.00	NA	CNY	0.36	0.40	0.66	42.4	38.8	23.5
688017.CH (Leader Drive)	U	CNY	295.15	115.00	64.9%	CNY	0.69	0.83	0.96	426.3	353.8	307.0
601689.CH (Tuopu)	O	CNY	46.30	75.00	(53.1)%	CNY	1.61	1.81	2.36	28.8	25.6	19.7
2050.HK (Sanhua)	M	HKD	26.40	27.00	(43.3)%	CNY	1.03	0.97	1.11	22.0	23.3	20.5
002050.CH (Sanhua)	M	CNY	35.71	39.00	(16.2)%	CNY	1.03	0.97	1.11	34.7	36.7	32.3
002472.CH (Shuanghuan)	O	CNY	35.23	60.00	(39.1)%	CNY	1.50	1.70	2.00	23.5	20.7	17.6
300124.CH (Inovance)	O	CNY	58.30	82.00	(48.2)%	CNY	1.87	2.19	2.65	31.2	26.6	22.0
6324.JP (HDSI)	O	JPY	5,680.00	7,800.00	90.6%	JPY	16.99	57.37	79.51	334.3	99.0	71.4
002747.CH (Estun)	M	CNY	30.82	26.00	(4.3)%	CNY	0.05	0.31	0.32	616.4	100.3	95.3
2715.HK (Estun)	M	HKD	16.80	17.26	NA	CNY	0.05	0.31	0.32	336.0	54.7	51.9
9618.HK (JD)	O	HKD	113.30	155.00	(38.6)%	HKD	10.46	14.84	16.70	10.8	7.6	6.8
JD (JD)	O	USD	29.37	40.00	(28.3)%	CNY	18.15	25.76	28.99	10.9	7.7	6.8
CPNG (Coupang)	U	USD	16.45	12.00	(63.3)%	USD	0.11	(0.54)	0.21	146.0	(30.2)	79.9
1810.HK (Xiaomi)	O	HKD	27.82	35.00	(67.5)%	CNY	1.62	0.89	1.29	14.7	26.9	18.5
XPEV (XPeng)	M	USD	12.19	20.00	(69.1)%	CNY	(1.20)	(2.03)	0.45	(68.5)	(40.3)	181.4
9868.HK (XPeng)	M	HKD	47.68	78.00	(80.0)%	CNY	(0.60)	(1.02)	0.23	(68.3)	(40.2)	181.0
1211.HK (BYD)	O	HKD	92.80	130.00	(50.7)%	CNY	3.58	4.15	5.57	22.2	19.2	14.3
002594.CH (BYD)	O	CNY	90.66	114.00	(50.0)%	CNY	3.58	4.15	5.57	25.3	21.8	16.3
AMZN (Amazon)	O	USD	258.63	320.00	(7.5)%	USD	7.17	12.65	12.13	36.1	20.4	21.3
ASIAX			1,976.42									
JPL			2,642.77									
SPX			7,674.37									

O - Outperform, M - Market-Perform, U - Underperform, NR - Not Rated, CS - Coverage Suspended

9618.HK, JD, CPNG estimate is Adjusted EPS; 9618.HK, JD, CPNG valuation is Adjusted P/E (x);

Source: Bloomberg, Bernstein estimates and analysis.

I. REQUIRED DISCLOSURES

References to "Bernstein" or the “Firm” in these disclosures relate to the following entities: Bernstein Institutional Services LLC (April 1, 2024 onwards), Sanford C. Bernstein & Co., LLC (pre April 1, 2024), Bernstein Autonomous LLP, BSG France S.A. (April 1, 2024 onwards), Sanford C. Bernstein (Hong Kong) Limited 盛博香港有限公司, Sanford C. Bernstein (Canada) Limited, Sanford C. Bernstein (India) Private Limited (SEBI registration no. INH000006378), Sanford C. Bernstein (Singapore) Private Limited, Sanford C. Bernstein Japan KK（サンフォード・C・バーンスタイン株式会社）and analysts employed by Société Générale Africa Technologies & Services to produce Bernstein research under a Global Services Agreement in place between Bernstein and Société Générale.

Bernstein is part of a joint venture between Société Générale (SG) and AllianceBernstein, L.P. (AB). Unless specifically noted otherwise, for purposes of these disclosures, references to Bernstein’s “affiliates” relate to both SG and AB and their respective affiliates.

VALUATION METHODOLOGY

This research publication covers six or more companies. For valuation methodology and other company disclosures:
Please visit: https://bernstein-autonomous.bluematrix.com/sellside/Disclosures.action.
Or, you can also write to the Director of Compliance, Bernstein Institutional Services LLC, 245 Park Avenue, New York, NY 10167.

RISKS

This research publication covers six or more companies. For risks and other company disclosures:
Please visit: https://bernstein-autonomous.bluematrix.com/sellside/Disclosures.action.
Or, you can also write to the Director of Compliance, Bernstein Institutional Services LLC, 245 Park Avenue, New York, NY 10167.

An associate contributing to this report has a financial interest in the equity or debt securities of Amazon.Com Inc.

RATINGS DEFINITIONS, BENCHMARKS AND DISTRIBUTION

EQUITY RATINGS DEFINITIONS

Bernstein brand

The Bernstein brand rates stocks based on forecasts of relative performance for the next 12 months versus the S&P 500 for stocks listed on the U.S. and Canadian exchanges, versus the Bloomberg Europe Developed Markets Large and Mid Cap Price Return Index EUR (EDME) for stocks listed on the European exchanges and emerging markets exchanges outside of the Asia Pacific region, versus the Bloomberg Japan Large and Mid Cap Price Return Index USD (JPL) for stocks listed on the Japanese exchanges, and versus the Bloomberg Asia ex-Japan Large and Mid Cap Price Return Index (ASIAX) for stocks listed on the Asian (ex-Japan) exchanges -unless otherwise specified.

The Bernstein brand has three categories of ratings:

- Outperform: Stock will outpace the market index by more than 15 pp
- Market-Perform: Stock will perform in line with the market index to within +/-15 pp
- Underperform: Stock will trail the performance of the market index by more than 15 pp

Coverage Suspended: Coverage of a company under the Bernstein research brand has been suspended. Ratings and price targets are suspended temporarily, are no longer current, and should therefore not be relied upon.

Not Rated: A rating assigned when the stock cannot be accurately valued, or the performance of the company accurately predicted, at the present time. The covering analyst may continue to publish research reports on the company to update investors on events and developments.

Not Covered (NC) denotes companies that are not under coverage.

Bernstein brand stock ratings are based on a 12-month time horizon.

Autonomous brand – common stocks

The Autonomous brand rates common stocks as indicated below. As our benchmarks we use the Bloomberg Europe 600 Financials Price Return Index (E600BK) and Bloomberg Europe Dev Mkt Financials Large and Mid Cap Price Ret Index EUR (EDMFI) index for developed European banks and Payments, the Bloomberg Europe 600 Insurance Price Return Index (E600IN) for European insurers, the S&P 500 and S&P Financials for US banks and Payments coverage, S5LIFE for US Insurance, the S&P Insurance Select Industry (SPSIINS) for US Non-Life Insurers coverage, the Bloomberg Emerging Markets Financials Large, Mid and Small Cap Price Return Index (EMLSF) for emerging market banks and insurers and Payments, and the Bloomberg Japan Financials Large & Mid Cap Price Return Index (JPFILM) for Japanese Financials. Ratings are stated relative to the sector (not the market).

The Autonomous brand has three categories of common stock ratings:

- Outperform (OP): Stock will outpace the relevant index by more than 10 pp
- Neutral (N): Stock will perform in line with the market index to within +/-10 pp
- Underperform (UP): Stock will trail the performance of the relevant index by more than 10 pp

Coverage Suspended: Coverage of a company under the Autonomous research brand has been suspended. Ratings and price targets are suspended temporarily, are no longer current, and should therefore not be relied upon.

Not Rated: A rating assigned when the stock cannot be accurately valued, or the performance of the company accurately predicted, at the present time. The covering analyst may continue to publish research reports on the company to update investors on events and developments.

Those denoted as 'Feature' (e.g., Feature Outperform FOP, Feature Under Outperform FUP) are our core ideas.

Not Covered (NC) denotes companies that are not under coverage.

Autonomous brand common stock ratings are based on a 12-month time horizon.

Autonomous brand – preferred stocks

The Autonomous brand has three categories of preferred stock ratings:

- Outperform (OP): The total return of the preferred instrument is expected to outperform preferred securities of other issuers operating in similar sectors or rating categories over the next six months.
- Neutral (N): The total return of the preferred instrument is expected to perform in line with preferred securities of other issuers operating in similar sectors or rating categories over the next six months.
- Underperform (UP): The total return of the preferred instrument is expected to underperform preferred securities of other issuers operating in similar sectors or rating categories over the next six months.

Autonomous preferred stock ratings are based on a 6-month time horizon.

AUTONOMOUS CREDIT RESEARCH

Where this report contains investment recommendations for credit instruments, as defined in article 3(1)(35) of the Market Abuse Regulation, the information below is presented to comply with its disclosure requirements.

The report may also include reference(s) to published opinions by other Autonomous or Bernstein analysts covering the equity securities of the issuer(s) referenced herein. Please note an investment recommendation for credit instruments published by the author(s) of this report may differ from the published view of the analyst covering equity securities for the issuer(s) contained in this report and vice versa.

CREDIT RATINGS DEFINITIONS

The Autonomous brand has three categories of credit ratings:

- Credit Outperform (C-OP): The total return of the Reference Credit Instrument is expected to outperform the credit spread of bonds of other issuers operating in similar sectors or rating categories over the next six months.
- Credit Neutral (C-N): The total return of the Reference Credit Instrument is expected to perform in line with the credit spread of bonds of other issuers operating in similar sectors or rating categories over the next six months.
- Credit Underperform (C-UP): The total return of the Reference Credit Instrument is expected to underperform the credit spread of bonds of other issuers operating in similar sectors or rating categories over the next six months.

Autonomous credit ratings are based on a 6-month time horizon.

A list of all investment recommendations produced by the author(s) of this report alongside credit ratings history are available upon request.

It is at the sole discretion of the Firm as to when to initiate, update and cease research coverage. The Firm has established, maintains and relies on information barriers to control the flow of information contained in one or more areas (i.e. the private side) within the Firm, and into other areas, units, groups or affiliates (i.e. public side) of the Firm

DISTRIBUTION OF EQUITY RATINGS/INVESTMENT BANKING SERVICES

Equity Rating	Market Abuse Regulation (MAR) and FINRA Rating Category	Global Rating Distribution	Investment Banking Relationships*
Outperform	BUY	51.2%	15.3%
Market-Perform (Bernstein Brand) Neutral (Autonomous Brand)	HOLD	35.8%	16.2%
Underperform	SELL	13.1%	13.6%

* These figures represent the percentage of companies within each equity rating category for which affiliates of Bernstein have provided investment banking services within the previous 12 months.
As of June 30, 2026. All figures are updated quarterly.

Prior to April 1, 2024, Sanford C. Bernstein & Co., LLC. issued the ratings and price target information in the graph(s) below for the following companies: Amazon.Com Inc.

PRICE CHARTS/ RATINGS AND PRICE TARGET HISTORY

This research publication covers six or more companies. For price chart and other company disclosures, please visit https://bernstein-autonomous.bluematrix.com/sellside/Disclosures.action or you can write to the Director of Compliance, Bernstein Institutional Services LLC, 245 Park Avenue, New York, NY 10167.

CONFLICTS OF INTEREST

Bernstein and/or affiliates have received compensation for investment banking services in the past twelve months from Amazon.Com Inc.

Bernstein and/or affiliates have received compensation for non-investment banking securities-related products or services in the previous twelve months from the following clients: JD.com Inc, BYD Co Ltd and Amazon.Com Inc.

Bernstein and/or affiliates expect to receive or intend to seek compensation for investment banking services in the next three months from Amazon.Com Inc.

Certain affiliates of Bernstein act as market maker or liquidity provider in the debt securities of: Amazon.Com Inc.

Affiliates of Bernstein managed or co-managed in the past twelve months a public offering of securities of Amazon.Com Inc.

Bernstein and/or affiliates had an investment banking client relationship during the past twelve months with Amazon.Com Inc.

Certain affiliates of Bernstein act as market maker or liquidity provider in the equities securities of: Amazon.Com Inc.

OTHER MATTERS

The legal entity(ies) employing the analyst(s) listed in this report, and their location, can be determined by the country code of their phone number, as follows:

+1 Bernstein Institutional Services LLC; New York, New York, USA

+44 Bernstein Autonomous LLP; London UK

+212 Société Générale Africa Technologies & Services; Casablanca, Morocco

+33 BSG France S.A.; Paris, France

+34 BSG France S.A.; Madrid, Spain

+41 Bernstein Autonomous LLP; Geneva, Switzerland

+49 BSG France S.A.; Frankfurt, Germany

+91 Sanford C. Bernstein (India) Private Limited; Mumbai, India

+852 Sanford C. Bernstein (Hong Kong) Limited 盛博香港有限公司; Hong Kong, China

+65 Sanford C. Bernstein (Singapore) Private Limited; Singapore

+81 Sanford C. Bernstein Japan KK; Tokyo, Japan

Where this report has been prepared by research analyst(s) employed by a non-US affiliate, such analyst(s), is/are (unless otherwise expressly noted below) not registered as associated persons of Bernstein Institutional Services LLC or any other SEC-registered broker-dealer and are not licensed or qualified as research analysts with FINRA. Accordingly, such analyst(s) may not be subject to FINRA's restrictions regarding (among other things) communications by research analysts with a subject company, interactions between research analysts and investment banking personnel, participation by research analysts in solicitation and marketing activities relating to investment banking transactions, public appearances by research analysts, and trading securities held by a research analyst account.

Where this report has been prepared by research analyst(s) employed by Société Générale Africa Technologies & Services (part of the Société Générale group of companies), it has been prepared on behalf of a Bernstein company under a Global Services Agreement in place between Bernstein and Société Générale.

CERTIFICATION

Each research analyst listed in this report, who is primarily responsible for the preparation of the content of this report, certifies that all of the views expressed in this publication accurately reflect that analyst's personal views about any and all of the subject securities or issuers and that no part of that analyst's compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views in this publication.

II. ADDITIONAL GLOBAL CONFLICT DISCLOSURES

It is at the sole discretion of the Firm as to when to initiate, update and cease research coverage. The Firm has established, maintains and relies on information barriers to control the flow of information contained in one or more areas (i.e., the private side) within the Firm, and into other areas, units, groups or affiliates (i.e., public side) of the Firm.

III. OTHER IMPORTANT INFORMATION AND DISCLOSURES

Separate branding is maintained for "Bernstein" and "Autonomous" research products.

- Bernstein produces a number of different types of research products including, among others, fundamental analysis and quantitative analysis under both the "Autonomous" and "Bernstein" brands. Recommendations contained within one type of research product may differ from recommendations contained within other types of research products, whether as a result of

differing time horizons, methodologies or otherwise. Furthermore, views or recommendations within a research product issued under one brand may differ from views or recommendations under the same type of research product issued under the other brand. The Research Ratings System for the two brands and other information related to those Rating Systems are included in the previous section.

- Autonomous operates as a separate business unit within the following entities: Bernstein Institutional Services LLC, Bernstein Autonomous LLP, Sanford C. Bernstein (Hong Kong) Limited 盛博香港有限公司 and Sanford C. Bernstein (India) Private Limited. For information relating to "Autonomous" branded products (including certain Sales materials) please visit: www.autonomous.com. For information relating to Bernstein branded products please visit: www.bernsteinresearch.com.

Analysts are compensated based on aggregate contributions to the research franchise as measured by account penetration, productivity and proactivity of investment ideas. No analysts are compensated based on performance in, or contributions to, generating investment banking revenues.

This report has been produced by an independent analyst as defined in Article 3 (1)(34)(i) of EU 596/2014 Market Abuse Regulation ("MAR") and the same article of MAR as it forms part of United Kingdom domestic law by virtue of the European Union (Withdrawal) Act 2018.

To our readers in the United States: Bernstein Institutional Services LLC, a broker-dealer registered with the U.S. Securities and Exchange Commission ("SEC") and a member of the U.S. Financial Industry Regulatory Authority, Inc. ("FINRA") is distributing this publication in the United States and accepts responsibility for its contents. Where this material contains an analysis of debt product(s), such material is intended only for institutional investors and is not subject to the US independence and disclosure standards applicable to debt research prepared for retail investors.

Bernstein Institutional Services LLC may act as principal for its own account or as agent for another person (including an affiliate) in sales or purchases of any security which is a subject of this report. This report does not purport to meet the objectives or needs of any specific individuals, entities or accounts.

To our readers in Canada: If this publication pertains to a Canadian domiciled company, it is being distributed in Canada by Sanford C. Bernstein (Canada) Limited, which is licensed and regulated by the Canadian Investment Regulatory Organization. If the publication pertains to a non-Canadian domiciled company, it is being distributed by Bernstein Institutional Services LLC, which is licensed and regulated by both the SEC and FINRA, into Canada under the International Dealers Exemption.

This document may not be passed onto any person in Canada unless that person qualifies as "permitted client" as defined in Section 1.1 of NI 31-103.

To our readers in Brazil: This report has been prepared by Bernstein Institutional Services LLC, and Banco BTG Pactual S.A. ("BTG") is responsible for the distribution of this report in Brazil.

To readers in the United Kingdom: This publication has been issued or approved for issue in the United Kingdom by Bernstein Autonomous LLP, authorised and regulated by the Financial Conduct Authority and located at 60 London Wall, London EC2M 5SH, +44 (0)20-7170-5000. Registered in England & Wales No OC343985.

This document is for distribution only to persons who (i) have professional experience in matters relating to investments falling within Article 19(5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (as amended, the "Financial Promotion Order"), (ii) are persons falling within Article 49(2)(a) to (d) ("high net worth companies, unincorporated associations, etc.") of the Financial Promotion Order, (iii) are outside the United Kingdom, or (iv) are persons to whom an invitation or inducement to engage in investment activity (within the meaning of section 21 of the FSMA) in connection with the issue or sale of any securities may otherwise lawfully be communicated or caused to be communicated (all such persons together being referred to as "relevant persons"). This document is directed only at relevant persons and must not be acted on or relied on by persons who are not relevant persons. Any investment or investment activity to which this document relates is available only to relevant persons and will be engaged in only with relevant persons.

To our readers in the member states of the EEA: This publication is being distributed by BSG France SA, which is authorised and regulated by the Autorité de Contrôle Prudentiel et de Résolution (ACPR) and Autorité des Marchés Financiers (AMF).

To our readers in Hong Kong: This publication is being distributed in Hong Kong by Sanford C. Bernstein (Hong Kong) Limited 盛博香港有限公司, which is licensed and regulated by the Hong Kong Securities and Futures Commission (Central Entity No. AXC846) to carry out Type 4 (Advising on Securities) regulated activities and subject to the licensing conditions mentioned in the SFC Public Register (https://www.sfc.hk/publicregWeb/corp/AXC846/details)). This publication is solely for professional investors, as defined in the Securities and Futures Ordinance (Cap. 571). The purpose of this report is solely to provide an analysis

of the issuers referred to in this report and is not intended for any purpose contrary to the laws of Hong Kong.

To our readers in Singapore: This publication is being distributed in Singapore by Sanford C. Bernstein (Singapore) Private Limited, only to accredited investors or institutional investors, as defined in the Securities and Futures Act 2001 of Singapore ("SFA"). Recipients in Singapore should contact Sanford C. Bernstein (Singapore) Private Limited in respect of matters arising from, or in connection with, this publication. Sanford C. Bernstein (Singapore) Private Limited is regulated by the Monetary Authority of Singapore and licensed under the SFA as a capital markets services licence holder for dealing in capital markets products that are securities and collective investment schemes and an exempt financial adviser for advising on, issuing and promulgating analyses and reports on securities. Sanford C. Bernstein (Singapore) Private Limited is registered in Singapore with Company Registration No. 20213710W and located at 8 Marina Boulevard, #12-01, Marina Bay Financial Centre, Singapore 018981, +65-6326-7000.

To our readers in the People's Republic of China: The securities referred to in this document are not being offered or sold and may not be offered or sold, directly or indirectly, in the People's Republic of China (for such purposes, not including the Hong Kong and Macau Special Administrative Regions or Taiwan, the "PRC") in contravention of any applicable laws of the PRC.

This document does not constitute an offer to sell or the solicitation of an offer to buy any securities in the PRC to any person to whom it is unlawful to make the offer or solicitation in the PRC.

We do not represent that this document may be lawfully distributed, or that any securities may be lawfully offered, in compliance with any applicable registration or other requirements in the PRC, or pursuant to an exemption available thereunder, or assume any responsibility for facilitating any such distribution or offering. In particular, no action has been taken by us which would permit a public offering of any securities or distribution of this document in the PRC. Accordingly, the securities are not being offered or sold within the PRC by means of this document or any other document. Neither this document nor any advertisement or other offering material may be distributed or published in the PRC, except under circumstances that will result in compliance with any applicable laws and regulations.

To our readers in Japan: This publication is being distributed in Japan by Sanford C. Bernstein Japan KK (サンフォード・C・バーンスタイン株式会社), which is registered in Japan as a Financial Instruments Business Operator with the Kanto Local Finance Bureau (registration number: The Director-General of Kanto Local Finance Bureau (FIBO) No.3387) and regulated by the Financial Services Agency. It is also a member of Investment Management Association of Japan. This publication is solely for qualified institutional investors in Japan only, as defined in Article 2, paragraph (3), items (i) of the Financial Instruments and Exchange Act.

For the institutional client readers in Japan who have been granted access to the Bernstein website by Daiwa Securities Group Inc. ("Daiwa"), your access to this document should not be construed as meaning that Bernstein is providing you with investment advice for any purposes. Whilst Bernstein has prepared this document, your relationship is, and will remain with, Daiwa, and Bernstein has neither any contractual relationship with you nor any obligations towards you.

To our readers in Australia: Sanford C. Bernstein (Hong Kong) Limited 盛博香港有限公司 is responsible for distributing research in Australia. It is regulated by the Securities and Exchange Commission under U.S. laws, by the Financial Conduct Authority under U.K. laws, which differs from Australian laws. Sanford C. Bernstein (Hong Kong) Limited 盛博香港有限公司 is exempt from the requirement to hold an Australian financial services license under the Corporations Act 2001 in respect of the provision of the following financial services to wholesale clients:

- providing financial product advice;
- dealing in a financial product;
- making a market for a financial product; and
- providing a custodial or depository service.

To our readers in India: This publication is being distributed in India by Sanford C. Bernstein (India) Private Limited (SCB India) which is licensed and regulated by Securities and Exchange Board of India ("SEBI") as a research analyst entity under the SEBI (Research Analyst) Regulations, 2014, having registration no. INH000006378 and as a stock broker having registration no. INZ000213537. SCB India is currently engaged in the business of providing research and stock broking services. Please refer to www.bernsteinresearch.in for more information.

- SCB India is a Private limited company incorporated under the Companies Act, 2013, on April 12, 2017 bearing corporate identification number U65999MH2017FTC293762, and registered office at Level 3A, 4th Floor, First International Financial Centre, Plot Nos C-54 and C-55, G Block, Near CBI Office, Bandra Kurla Complex, Bandra (East), Mumbai 400098,

Maharashtra, India (Phone No: +91-22-68421401).

- For details of Associates (i.e., affiliates/group companies) of SCB India, kindly email MUM-BERNSTEIN-InCompliance@bernsteinsg.com.
- SCB India does not have any disciplinary history as on the date of this report.
- Except as noted above, SCB India and/or its Associates (i.e., affiliates/group companies), the Research Analysts authoring this report, and their relatives
  - do not have any financial interest in the subject company
  - do not have actual/beneficial ownership of one percent or more in securities of the subject company;
  - is not engaged in any investment banking activities for Indian companies, as such;
  - have not managed or co-managed a public offering in the past twelve months for any Indian companies;
  - have not received any compensation for investment banking services or merchant banking services from the subject company in the past 12 months;
  - have not received compensation for brokerage services from the subject company in the past twelve months;
  - have not received any compensation or other benefits from the subject company or third party related to the specific recommendations or views in this report; and
  - do not currently, but may in the future, act as a market maker in the financial instruments of the companies covered in the report.
  - do not have any conflict of interest in the subject company as of the date of this report.
- Except as noted above, the subject company has not been a client of SCB India during twelve months preceding the date of distribution of this research report. Neither SCB India nor its Associates (i.e., affiliates/group companies) have received compensation for products or services other than investment banking, merchant banking or brokerage services from the subject company in the past twelve months.
- The principal research analyst(s) who prepared this report, members of the analysts' team, and members of their households are not an officer, director, employee or advisory board member of the companies covered in the report.
- Our Compliance officer / Grievance officer is Ms. Rupal Talati, who can be reached at +91-22-68421451, or MUM-BERNSTEIN-InCompliance@bernsteinsg.com / Scbin-investorgrievance@bernsteinsg.com
- The Research investor charter and Terms & Conditions of SCB India are available on its website and may be accessed at Sanford C. Bernstein (India) Private Limited (https://bernsteinresearch.in/) for your reference.
- Disclaimer: Registration granted by SEBI, and certification from NISM, is in no way a guarantee of performance of the intermediary or provide any assurance of returns to investors. Investments in securities market are subject to market risks. Read all the related documents carefully before investing.

To our readers in Switzerland: This document is provided in Switzerland by or through Bernstein Autonomous LLP, and is provided only to qualified investors as defined in article 10 of the Swiss Collective Investment Scheme Act ("CISA") and related provisions of the Collective Investment Scheme Ordinance and in strict compliance with applicable Swiss law and regulations. The products mentioned in this document may not be suitable for all types of investors. This document is based on the Directives on the Independence of Financial Research issued by the Swiss Bankers Association (SBA) in January 2008.

To our readers in the Middle East: Bernstein Autonomous LLP, DIFC branch has its principal office at Gate Village 06, DIFC, Dubai, UAE. Bernstein Autonomous LLP, DIFC branch is regulated by the Dubai Financial Services Authority (DFSA) with the registration number CL10040 and is provisioned for Arranging Deals in Investments and Advising on Financial Products. All communications and services are directed at Professional Clients and Market Counterparties only (as defined in the DFSA rulebook). Persons other than Professional Clients and Market Counterparties, such as Retail Clients, are not the intended

recipients of our communications or services.

LEGAL

All research publications are disseminated to our clients through posting on the firm's password protected websites, bernsteinresearch.com and autonomous.com. Certain, but not all, research publications are also made available to clients through third-party vendors or redistributed to clients through alternate electronic means as a convenience.

This publication has been published and distributed in accordance with the Firm's policy for management of conflicts of interest in investment research, a copy of which is available from Bernstein Institutional Services LLC, Director of Compliance, 245 Park Avenue, New York, NY 10167. Additional disclosures and information regarding Bernstein's business are available on our website www.bernsteinresearch.com.

The securities described herein may not be eligible for sale in all jurisdictions or to certain categories of investors where that permission profile is not consistent with the licenses held by the entities noted herein. This document is for distribution only as may be permitted by law. This publication is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of, or located in any locality, state, country or other jurisdiction where such distribution, publication, availability or use would be contrary to law or regulation or which would subject any of the entities referenced herein or any of their subsidiaries or affiliates to any registration or licensing requirement within such jurisdiction. This publication is based upon public sources we believe to be reliable, but no representation is made by us that the publication is accurate or complete. We do not undertake to advise you of any change in the reported information or in the opinions herein. This publication was prepared and issued by entity referred to herein for distribution to eligible counterparties or professional clients. This publication is not an offer to buy or sell any security, and it does not constitute investment, legal or tax advice. The investments referred to herein may not be suitable for you. Investors must make their own investment decisions in consultation with their professional advisors in light of their specific circumstances. The value of investments may fluctuate, and investments that are denominated in foreign currencies may fluctuate in value as a result of exposure to exchange rate movements. Information about past performance of an investment is not necessarily a guide to, indicator of, or assurance of, future performance.

This report is directed to and intended only for our clients who are “eligible counterparties”, “professional clients”, “institutional investors” and/or “professional investors” as defined by the aforementioned regulators, and must not be redistributed to retail clients as defined by the aforementioned regulators. Retail clients who receive this report should note that the services of the entities noted herein are not available to them and should not rely on the material herein to make an investment decision. The result of such act will not hold the entities noted herein liable for any loss thus incurred as the entities noted herein are not registered/ authorised/ licensed to deal with retail clients and will not enter into any contractual agreement/arrangement with retail clients. This report is provided subject to the terms and conditions of any agreement that the clients may have entered into with the entities noted herein. All research reports are disseminated on a simultaneous basis to eligible clients through electronic publication to our client portal.

The information in this report was prepared by Bernstein solely for the internal business use of our clients. Clients may store, display, analyze, reformat and print the information in this report for this limited use only. Clients may not copy, alter, create derivative works, resell, reverse engineer, commercially exploit, share or distribute any part of the information contained herein for any purpose without Bernstein’s express written consent. These restrictions include extracting data or using the content to develop indices or other products. Further, you may not use this report, or any portion of this report, to train or finetune any third-party machine learning or artificial intelligence system, or as a prompt or input into any such system. You also may not, without Bernstein’s express written consent, do any of the foregoing in connection with your own internal machine learning or artificial intelligence system.

Bernstein may use artificial intelligence tools in the preparation of its materials. Any such materials are reviewed by Bernstein’s research analysts prior to publication.

This report has been prepared for information purposes only and is based on current public information that we consider reliable, but the entities noted herein do not warrant or represent (express or implied) as to the sources of information or data contained herein are accurate, complete, not misleading or as to its fitness for the purpose intended even though the entities noted herein rely on reputable or trustworthy data providers, it should not be relied upon as such. Opinions expressed are the author(s)’ current opinions as of the date appearing on the material only and we do not undertake to advise you of any change in the reported information or in the opinions herein.

Any references to Societe Generale herein are purely factual, based upon publicly available information, and included for comparative purposes only. They do not constitute an opinion or recommendation with respect to the securities of Societe Generale.

This publication was prepared and issued by the entity referred to herein for distribution to eligible counterparties or professional clients. The information in this report is intended for general circulation and does not constitute an offer to buy or sell any security,

investment, legal or tax advice nor a personal recommendation, as defined by any of the aforementioned regulators. It does not take into account the particular investment objectives, financial situations, or needs of individual investors. The report has not been reviewed by any of the aforementioned regulators and does not represent any official recommendation from the aforementioned regulators. The investments referred to herein may not be suitable for you. Investors must make their own investment decisions in consultation with advice sought from a financial adviser regarding the suitability of the investment product, taking into account the specific investment objectives, financial situation or particular needs of any recipient of the recommendation, before the recipient makes a commitment to purchase the investment product.

The analysis contained herein is based on numerous assumptions. Different assumptions could result in materially different results. The information in this report does not constitute, or form part of, any offer to sell or issue, or any offer to purchase or subscribe for shares, or to induce engagement in any other investment activity. The value of any securities or financial instruments mentioned in this report may fluctuate subject to market conditions. Information about past performance of an investment is not necessarily a guide to, indicative of, or assurance of future performance. Estimates of future performance mentioned by the research analyst in this report are based on assumptions that may not be realized due to unforeseen factors like market volatility/fluctuation. In relation to securities or financial instruments denominated in a foreign currency other than the clients' home currency, movements in exchange rates will have an effect on the value, either favorable or unfavorable. Before acting on any recommendations in this report, recipients should consider the appropriateness of investing in the subject securities or financial instruments mentioned in this report and, if necessary, seek independent professional advice.

The securities described herein may not be eligible for sale in all jurisdictions or to certain categories of investors where that permission profile is not consistent with the licenses held by the entities noted herein. This document is for distribution only as may be permitted by law. It is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction where such distribution, publication, availability or use would be contrary to law or regulation or would subject the entities noted herein to any regulation or licensing requirement within such jurisdiction.

Source: Bloomberg Index Services Limited. BLOOMBERG® is a trademark and service mark of Bloomberg Finance L.P. and its affiliates (collectively "Bloomberg"). Bloomberg or Bloomberg's licensors own all proprietary rights in the Bloomberg Indices. Neither Bloomberg nor Bloomberg's licensors approves or endorses this material, or guarantees the accuracy or completeness of any information herein, or makes any warranty, express or implied, as to the results to be obtained therefrom and, to the maximum extent allowed by law, neither shall have any liability or responsibility for injury or damages arising in connection therewith.

No part of this material may be reproduced, distributed or transmitted or otherwise made available without prior consent of the entities noted herein. Copyright Bernstein Institutional Services LLC Bernstein Autonomous LLP, BSG France S.A., Sanford C. Bernstein (Hong Kong) Limited 盛博香港有限公司, Sanford C. Bernstein (Canada) Limited, Sanford C. Bernstein (India) Private Limited (SEBI registration no. INH000006378), Sanford C. Bernstein (Singapore) Private Limited and Sanford C. Bernstein Japan KK (サンフォード・C・バーンスタイン株式会社). All rights reserved. The trademarks and service marks contained herein are the property of their respective owners. Any unauthorized use or disclosure is strictly prohibited. The entities noted herein may pursue legal action if the unauthorized use results in any defamation and/or reputational risk to the entities noted herein and research published under the Bernstein and Autonomous brands.