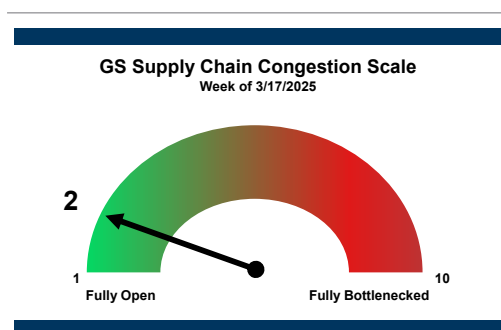


Tracking U.S. Supply Chain Congestion

GS Supply Chain Congestion Scale: Mar 17th; Weekly Scale Unchanged at '2'



Scale is based solely off weekly metrics to give more granularity on high frequency data indications; see Appendix for scale that combines weekly and monthly metrics

Source: Goldman Sachs Global Investment Research

Our weekly bottleneck scale remained at '2' this week as the absolute level of the congestion index was largely unchanged on a sequential basis (index -0.9% w/w; Exhibit 2). For this week's scale and index, the number of container ships waiting to dock and unload goods along the West Coast increased from 0 to 1, while backlogs along the East Coast increased from 10 to 11 (Exhibit 6).

West Coast rail intermodal traffic

growth decelerated on average versus last week (up ~9% YoY; Exhibit 7), but rail service metrics were broadly improved. Chassis dwell times were mixed on average at US ports this week (Exhibit 9), while ocean container shipping rates (China to US West Coast) stood at -39% YoY versus last week's -29% level (Exhibit 10).

Net/net, this week's index was largely unchanged as slightly higher container ship backlogs and decelerated intermodal traffic growth was offset by improved rail service and decelerated ocean container rates.

Jordan Alliger

+1(212)357-4913 | jordan.alliger@gs.com
Goldman Sachs & Co. LLC

Andrzej Tomczyk, CFA

+1(212)357-4445 | andrzej.tomczyk@gs.com
Goldman Sachs & Co. LLC

Paul Stoddard

+1(801)744-3761 | paul.x.stoddard@gs.com
Goldman Sachs & Co. LLC

Goldman Sachs does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision. For Reg AC certification and other important disclosures, see the Disclosure Appendix, or go to www.gs.com/research/hedge.html. Analysts employed by non-US affiliates are not registered/qualified as research analysts with FINRA in the U.S.

Exhibit 1: Our weekly composite index largely unchanged in the most recent week (-0.9% w/w), and the bottleneck scale remained at '2'; overall bottleneck levels remain well below peak congestion levels when scale was at '10'

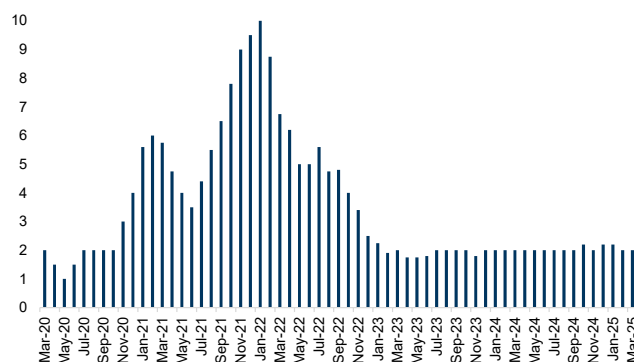
GS Weekly Bottleneck Index, Feb 2020 - Mar 2025



Source: Goldman Sachs Global Investment Research

Exhibit 2: Our average weekly bottleneck score in March is '2.0'; this result is down significantly from the Dec21/Jan22 peak of congestion

GS Weekly Congestion Scale, Scored by Month*



*Numbers reflect the average weekly score seen in each respective month

Source: Goldman Sachs Global Investment Research

As a reminder (and to help reiterate why and how we construct the index), please refer to the Appendix following [Exhibit 17](#). Additionally, for further clarity on tracked congestion metrics, please refer to the glossary following [Exhibit 19](#).

Transport Subsectors to Watch as Congestion Eases

The key question remains whether the last stumbling blocks around congestion ease in the US - notably the improving inventory situation as well as moderating East Coast port backlogs, and of course any potential strike-related work stoppages around US East/Gulf-Coast ports - as well as any potential demand pull forward related to potential tariffs. Should supply chain pressures broadly continue to mitigate, then it is conceivable we could see the index being back to a '1' in 2025. As we highlighted what could happen [when we first introduced the index](#), labor and equipment availability is improving alongside demand moderation, both helping the fall in the index. **With the dramatic easing that already took place over 2023/2024, we think from a transport subsector perspective we would look to the US Rails (NSC, UNP, CSX) and intermodal marketing companies (SNDR, JBHT) as being the prime beneficiaries** should congestion stay easier, as these networks were amongst the most adversely impacted by supply-chain problems – both from operational constraints and underperformance on volumes due to an inability to translate high consumer demand into actual throughput.

Indicator Updates

Of the metrics we track ([Exhibit 3](#)), we provide updates for the weekly and monthly variables below ([Exhibit 4](#) - [Exhibit 5](#)).

Exhibit 3: Tracked Congestion Metrics

Tracked Metrics	
Weekly Variables	Monthly Variables
Container Ships Waiting to Dock at LA/LB	Container Weighted Average Dwell (San Pedro's Bay)
Container Ships Waiting Along to U.S. Gulf/East Coast	Containers Dwelling > 5 days (San Pedro's Bay)
UNP Intermodal Traffic	PMI Manufacturing Supplier Delivery Time
UNP Intermodal Velocity	Big Three' West Coast Ports' Inbound Loaded Containers
UNP Intermodal Dwell	LMI Transportation Capacity
BNSF Intermodal Traffic	LMI Warehousing Capacity
BNSF Intermodal Velocity	LMI Warehousing Utilization
BNSF Intermodal Dwell	Door to Door Shipping Days, China to US
Ocean Shipping Rates, East Asia to U.S. West Coast	Class 8 Trucking Driver Count Growth
Chassis Street Dwell, 20ft Containers	Rail Container Dwell (San Pedro's Bay)
Chassis Street Dwell, 40/45ft Containers	
Chassis Terminal Dwell Time, 20ft Containers	
Chassis Terminal Dwell Time, 40/45ft Containers	

Source: Goldman Sachs Global Investment Research

Exhibit 4: Bottleneck metrics indicated mixed results this week

	Dec 16 - Dec 22	Dec 23 - Dec 29	Dec 30 - Jan 5	Jan 6 - Jan 12	Jan 13 - Jan 19	Jan 20 - Jan 26	Jan 27 - Feb 2	Feb 3 - Feb 9	Feb 10 - Feb 16	Feb 17 - Feb 23	Feb 24 - Mar 2	Mar 3 - Mar 9
Container Ships Waiting to Dock at LA/LB	1	2	1	2	2	3	2	2	0	3	0	1
Container Ship Backlog (East and Gulf Coast)*	6	24	31	26	16	22	27	11	25	17	10	11
UNP Intermodal Traffic (YoY Growth)	23.5%	9.2%	17.3%	21.4%	36.1%	17.9%	16.4%	16.8%	12.7%	9.4%	14.7%	12.8%
UNP Intermodal Velocity (YoY Growth)	-1.9%	-4.8%	-6.3%	-2.7%	-3.0%	1.0%	-2.8%	-2.2%	0.3%	-1.6%	-1.6%	2.0%
UNP System Dwell (Hours)	21.0	21.5	24.8	20.9	20.4	21.1	23.3	21.6	21.9	22.7	23.2	22.3
BNSF Intermodal Traffic (YoY Growth)	15.0%	14.1%	8.2%	13.7%	29.5%	6.9%	10.7%	10.7%	8.8%	4.6%	9.1%	5.0%
BNSF Intermodal Velocity (YoY Growth)	-5.4%	-3.1%	1.1%	-4.0%	-2.3%	-1.8%	-9.5%	-7.7%	-0.6%	0.6%	0.3%	6.6%
BNSF System Dwell (Hours)	21.6	22.5	25.4	23.4	22.8	23.2	23.9	22.0	22.3	23.0	24.0	23.2
Ocean Shipping Rates, East Asia to U.S. West Coast (YoY Growth)	168.4%	206.2%	118.5%	128.9%	79.4%	19.2%	16.3%	0.9%	-2.6%	-9.3%	-25.2%	-39.1%
Chassis Street Dwell, 20ft Containers (Days)	4.6	6.6	7.0	5.2	5.0	4.9	5.6	5.9	6.5	6.3	5.6	4.9
Chassis Street Dwell, 40/45ft Containers (Days)	6.8	9.2	9.0	6.5	6.2	6.4	6.9	7.3	7.3	7.3	6.9	7.2
Chassis Terminal Dwell Time, 20ft Containers (Days)	6.6	9.3	8.8	5.8	5.8	5.9	7.1	8.0	9.1	8.4	8.7	7.5
Chassis Terminal Dwell Time, 40/45ft Containers (Days)	5.9	8.2	7.5	5.0	4.7	5.0	5.6	6.7	7.1	7.0	6.6	7.0

As of 3/28/22, we added and backdated our estimates for the East and Gulf Coast container ship backlog

Source: Marine Exchange of Southern California, AAR, STB, Freightos, Pool of Pools, Pacific Merchant Shipping Association, Port of Long Beach, Port of Oakland, Port of Los Angeles, LMI, US Bureau of Labor Statistics, IHS Markit, Refinitiv Eikon, compiled by Goldman Sachs Global Investment Research

Exhibit 5: Monthly bottleneck metrics for January indicated mixed results vs December

Monthly Variables	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	Jan-25
Container Weighted Average Dwell (Days)	2.7	2.9	2.8	2.6	2.5	2.5	2.7	2.8	3.0	3.2	3.2	3.1	3.1	3.3
% of Containers Dwelling > 5 days	7%	5%	6%	6%	4%	4%	5%	6%	8%	8%	8%	8%	8%	8%
Rail Container Dwell (Days)	5.0	4.7	6.3	7.0	4.6	6.4	4.7	5.7	8.2	9.3	9.9	7.7	6.5	6.2
Big Three Inbound Loaded Containers (YoY)	18.2%	19.5%	45.0%	16.1%	17.8%	-3.1%	20.2%	42.5%	26.3%	13.8%	27.5%	19.8%	23.8%	23.6%
LMI Transportation Capacity	63.3	54.5	60.9	59.6	61.4	57.3	50	50.9	56.7	50	50.8	52.6	53.2	52.6
LMI Warehousing Capacity	55.1	54.1	52.8	44.6	54.0	55.6	52.6	54.5	59.5	55.9	55.8	56.7	56.9	51.7
LMI Warehousing Utilization	60.2	58.7	66.3	63.6	55.1	64.0	52.6	57.9	57.6	60.9	62.9	58.9	61.7	68.3
Door to Door Shipping Days, China to US	49	56	53	52	53	48	48	49	49	49	52	53	51	50
Class 8 Driver Count	1534.6	1531.9	1530.5	1531.0	1528.5	1521.6	1518.2	1516.6	1516.4	1515.8	1514.5	1517.8	1518.1	1521.9
PMI Manufacturing Supplier Delivery Time (YoY)	-4.5	3.0	-1.6	8.4	10.7	14.2	6.5	7.8	2.0	1.5	3.9	4.2	7.0	0.8

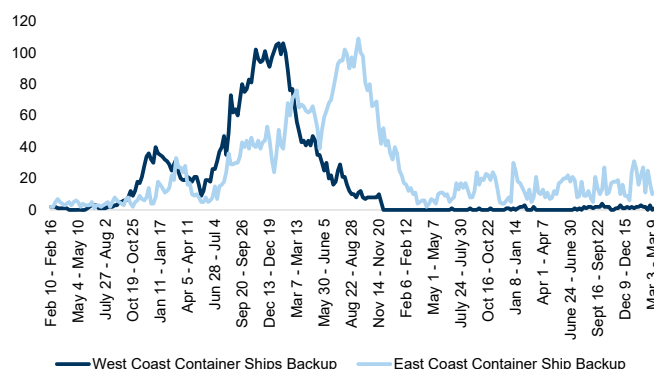
Source: Marine Exchange of Southern California, AAR, STB, Freightos, Pool of Pools, Pacific Merchant Shipping Association, Port of Long Beach, Port of Oakland, Port of Los Angeles, LMI, US Bureau of Labor Statistics, IHS Markit, compiled by Goldman Sachs Global Investment Research

Weekly Indicator Update**Anchored Container Ships**

- **West Coast container ship backlogs increased from 0 to 1 in the most recent week, while East Coast backlogs increased from 10 to 11.**

Exhibit 6: 11/1* container ships backed up this week on the East/West Coast

West vs. East Coast Container Ship Backlog, Weekly Average, Feb 2020 - Mar 2025



*East Coast is estimated via satellite data - includes container ships sitting for more than 3 days within 140 miles of US ports to the right of longitude 100 (i.e., Gulf and East Coast)

Source: Marine Exchange of Southern California, Refinitiv Eikon, Goldman Sachs Global Investment Research

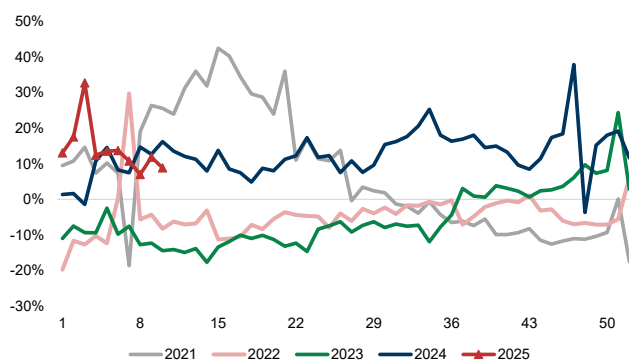
Rail Intermodal Trends

■ West Coast Class 1 Rails' (Union Pacific and Burlington Northern Santa Fe) average intermodal traffic growth decelerated in reporting week 9 of 2025 (average up ~9% YoY).

- BNSF intermodal traffic at +5% YoY this week vs. +9% YoY last week; UNP intermodal traffic at +13% YoY vs. +15% YoY last week.
- Note that intermodal volume declines first moderated to flat YoY growth in September 2023 before inflecting more positively in October and remaining positive through year-end 2023 into 2024 ([Exhibit 8](#)); so we started to lap tougher YoY growth comparables as of September 2024.

Exhibit 7: West Coast Class 1 Rails' Intermodal Volume Growth, Week 1 - Week 52

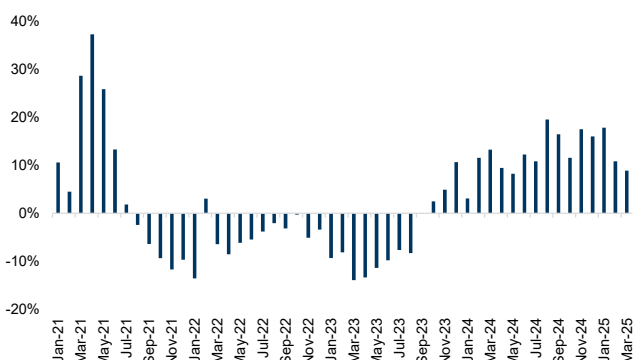
YoY % growth



Source: AAR, Data compiled by Goldman Sachs Global Investment Research

Exhibit 8: Intermodal volume declines (UNP and BNSF) moderated to flat YoY growth in September 2023 and have now remained positive for >1 year

West Coast Class 1 Rail Intermodal Traffic YoY % Growth



Source: AAR, Data compiled by Goldman Sachs Global Investment Research

■ West Coast Class 1 Rail intermodal train speed and terminal dwell

performance were broadly improved in the most recent week.

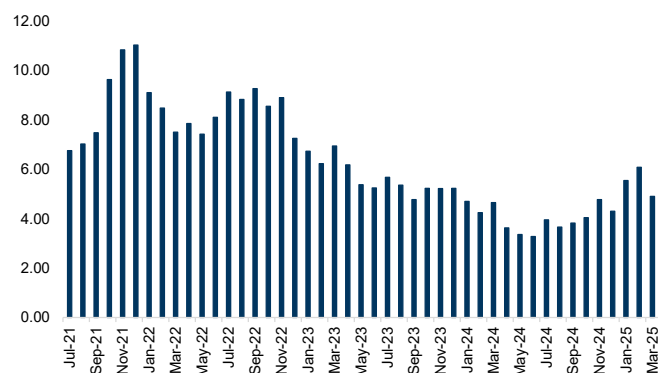
- UNP terminal dwell decreased from 23.2 hours to 22.3 hours last week; BNSF dwell decreased from 24.0 hours to 23.2.
- On intermodal train speed, BNSF was at +6.6% YoY vs. +0.3% YoY last week; UNP was at +2.0% YoY vs. -1.6% last week.

Chassis Dwell Time

■ **Chassis dwell is down significantly when comparing March to peak congestion levels – as per Exhibit 9; dwell data for the most recent week implied mixed results on average vs last week.**

- Average street dwell time for 20ft shipping container chassis was at 4.9 days for week 10 of 2025, down slightly versus 5.6 days in week 9.
- Street dwell for 40/45ft container chassis was 7.2 days in week 10, up versus 6.9 days in week 9.
- Chassis terminal dwell time for 20/40ft containers was at 7.5/7.0 days in week 10 versus 8.7/6.6 days in week 9.

Exhibit 9: Dwell for the more typical 20ft container chassis is well off peak congestion levels, but up MoM into January
Chassis Street Dwell Time (20ft Containers)



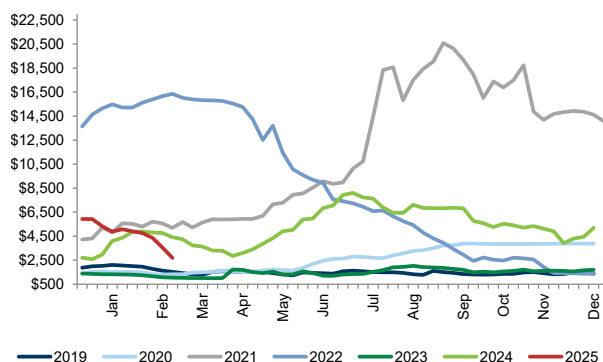
Dwell time shown in days

Source: Pool of Pools

Ocean Shipping Rates

- Week 10 saw ocean container rates at ~\$2.69k (-39% YoY) vs ~\$3.56k last week (-25% YoY).

Exhibit 10: Ocean Container Shipping Rates, China/East Asia to North America West Coast

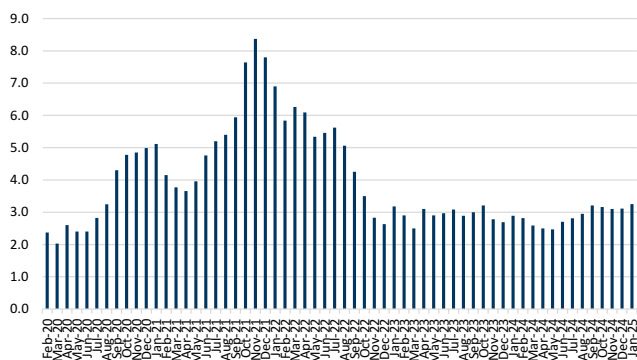


Lagged Monthly Indicators (January Data)

San Pedro's Bay Container Dwell

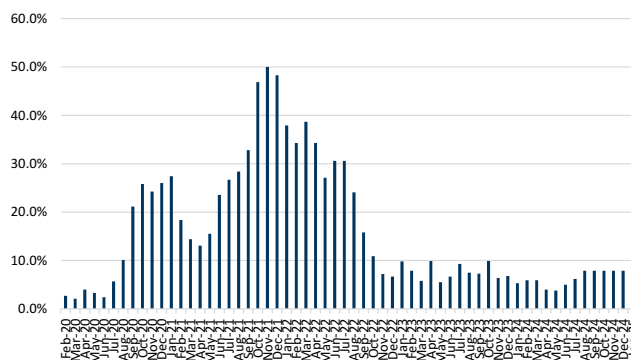
- Container weighted average dwell time remained largely unchanged at 3.3 days in January.
- ~8% of the San Pedro's Bay containers were dwelling for more than 5 days in January – this is down from ~50% at peak congestion level.
- Rail container dwell decreased to 6.2 days in January from 6.5 days in December; this result for dwell remains far below 2022's peak rail container dwell of ~16 days.

Exhibit 11: Container Weighted Average Dwell Time at San Pedro's Bay, Days



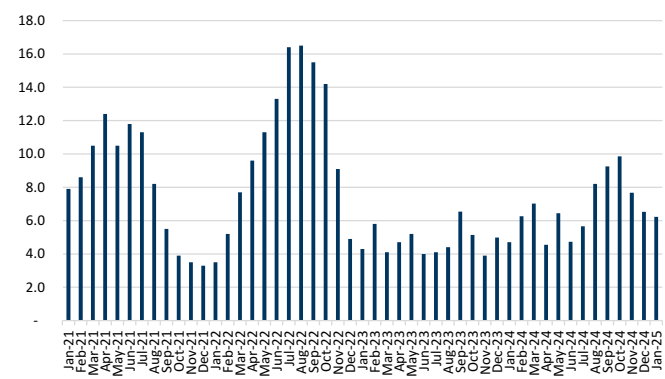
Source: Pacific Merchant Shipping Association

Exhibit 12: % of Containers Dwelling More than 5 Days



Source: Pacific Merchant Shipping Association

Exhibit 13: Rail Container Dwell Time, Days

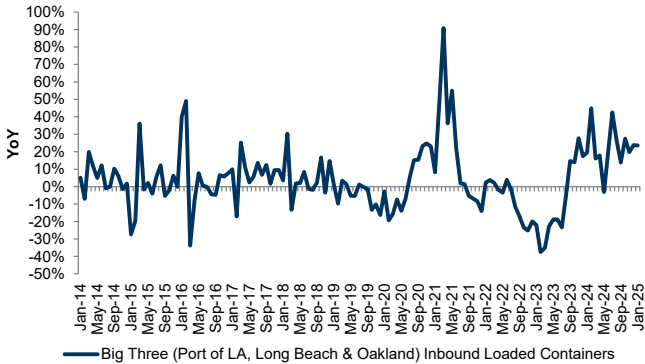


Source: Pacific Merchant Shipping Association

“Big Three” West Coast Ports’ Inbound Loaded Containers

- Total inbound containers for the Ports of LA, Long Beach, and Oakland +24% YoY in December.

Exhibit 14: West Coast Ports’ Inbound Loaded Containers +24% YoY in January

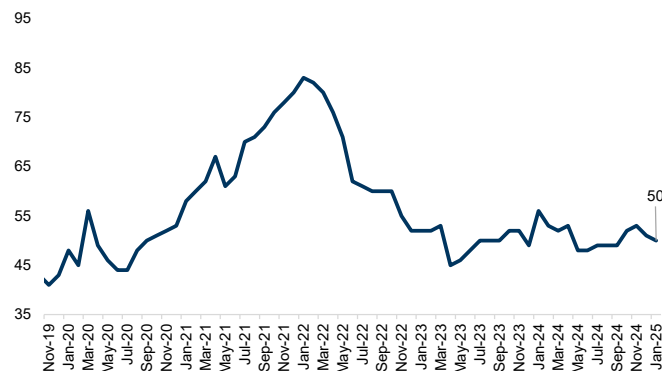


Source: Port of Long Beach, Port of Los Angeles, Port of Oakland

Door to Door Shipping, China to US

- It was taking an average of 50 days to ship (door-to-door) from China to the US in January, much closer to average pre-pandemic transit times when compared to peak congestion at 80+ days, and down slightly MoM.

Exhibit 15: Door to Door Shipping Days, China to US

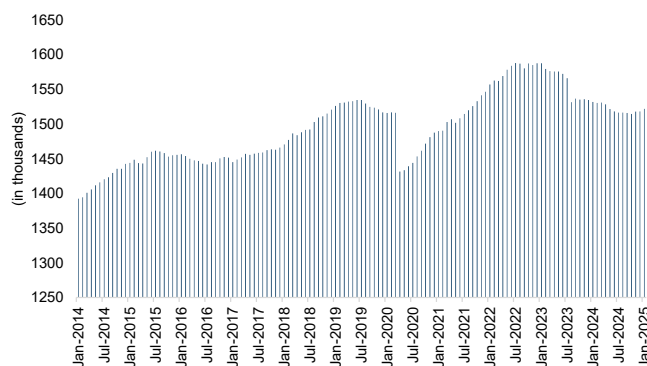


Source: Freightos

Trucking Employee Count

- Truck transportation employee count was implied to be below pre-pandemic highs in January (-0.8% below pre-Covid) as YoY growth has averaged -1.1% over the past six months. January's employee count was +0.3% sequentially.

Exhibit 16: Total Truck Transportation Employee Count, Seasonally Adjusted



Source: US Bureau of Labor Statistics

LMI Capacity and Utilization

■ LMI Transportation Capacity Index

- Transportation capacity expanded slightly in January given the 52.6 reading, but the rate of expansion fell slightly relative to December's 53.2 reading.

■ LMI Warehouse Capacity Index

- Warehouse capacity remained expansionary in January, but the 51.7 reading indicated a slower rate of expansion versus December's reading of 56.9.

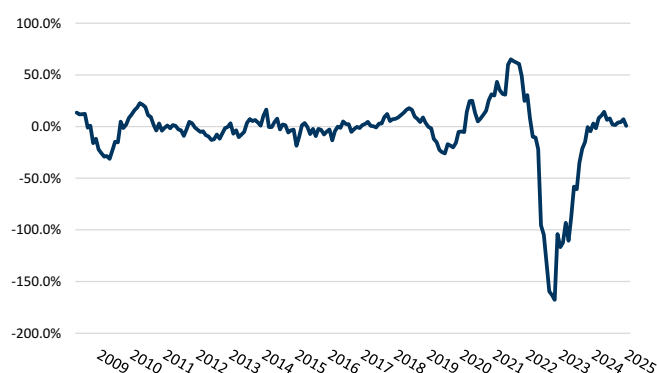
■ LMI Warehouse Utilization Index

- Warehouse utilization expanded at a faster pace in January with a 68.3 reading compared to 61.7 in December.

PMI Supplier Delivery Times

- Delivery times were largely unchanged on an absolute basis albeit expanding slightly (i.e., below 50 indicates expanding delivery times) in January given the 48.3 reading. Delivery time contraction first began to occur sustainably as of January 2023, so we were beginning to normalize delivery times on a YoY basis as of 1Q24; January supplier delivery PMI index was +1 % YoY.

Exhibit 17: PMI: Manufacturing Suppliers' Delivery Times, YoY, Seasonally Adjusted



Source: IHS Markit

Appendix

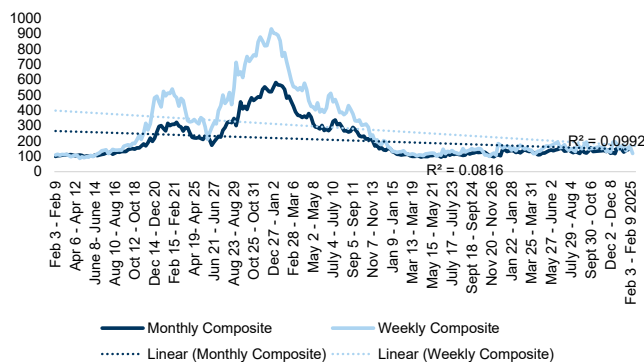
Given the importance supply chain fluidity has on retailers, consumer goods companies, inflationary pricing, etc., we think this scale's importance is tied most directly to the pace at which supply chain congestion is on the mend. To this end, we look at a variety of variables that we think tie directly, or in some cases indirectly, to overall congestion; including ships at anchor, days to deliver, various dwell times, intermodal volume and velocity statistics amongst others. Aggregating this data, we create the Supply Chain Congestion Scale – an attempt to quantify the balance between supply chains being “Fully Bottlenecked” and “Fully Open,” relative to the pre-pandemic benchmark we chose as Feb 3rd, 2020. Basically, how fluid is the overall transport logistics network.

To determine the position of the Legacy Congestion Scale (1-10), we calculate growth or decline in each category (monthly and weekly variables) relative to pre-congestion levels, overweighting certain categories we deem most directly tied to supply chain bottlenecks (i.e., ships anchored off the ports of LA and Long Beach, shipping container and chassis street dwell times, door-to-door shipping days from China to US), and scale it based on our Composite Scale ([Exhibit 19](#)).

We publish the weekly scale on Monday PM/Tuesday AM to relay leading edge data that

will inform the roughly one month lagged composite (i.e., we will update the weekly scale every week and the legacy scale will be updated monthly). Looking at the two charts, it is generally clear that the weekly composite should have good predictive ability as to the eventual direction of the monthly composite (which includes more encompassing variables than pure weekly ones to provide strong confirmation on congestion direction), and this is confirmed by the similarly high R^2 values seen in Exhibit 18.

Exhibit 18: The weekly composite index (light blue) leads the monthly (dark blue); expect future monthly updates to confirm recent weekly trends



Source: Goldman Sachs Global Investment Research

Exhibit 20: GS Legacy Supply Chain Congestion Scale (incorporates monthly and weekly data)

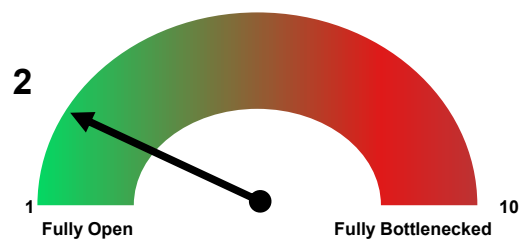
Composite Scale	Fluidity Scale
<101	1
101-153	2
154-206	3
207-259	4
260-313	5
314-366	6
367-419	7
420-472	8
473-526	9
>526	10

Source: Goldman Sachs Global Investment Research

Exhibit 19: Our combined scale averaged '142' in January, indicating a bottleneck score of '2' when looking at all metrics (weekly and monthly combined)

Weekly + Monthly Combined Congestion Scale*

GS Legacy Supply Chain Congestion Scale
Monthly Data Updated Through January



*We rescaled our index on 3/28/2022 to account for higher-than-anticipated peak bottleneck levels

Source: Goldman Sachs Global Investment Research

Exhibit 21: GS Weekly Supply Chain Congestion Scale (High-Frequency Data)

Composite Scale	Fluidity Scale
<101	1
101-192	2
193-284	3
285-376	4
377-468	5
469-560	6
561-652	7
653-745	8
746-837	9
>838	10

Source: Goldman Sachs Global Investment Research

Glossary:

- West Coast container ship backlog:** tracks the number of container ships waiting to dock at the ports of LA and Long Beach; we add the number of ships anchored within 40 miles of the coast to the number of ships slow-steaming to port (AKA: ships loitering farther offshore) to get a better depiction of the true container ship backlog.

2. **East Coast container ship backlog:** estimates the number of container ships waiting to dock at the East and Gulf Coast ports in the US; based on satellite image data technology (Eikon), we add the number of container ships sitting for at least three days within 140 miles of a US port (accounts for ships to the right of 100 degrees of longitude to account for East Coast).
3. **Intermodal traffic:** tracks Y/Y intermodal carload volume growth for West Coast Class 1 Rails (BNSF and UNP). Accelerating volumes would indicate a more fluid supply chain for our purposes as more goods get moved through the system.
4. **Intermodal velocity:** tracks the average speed of the intermodal railcars (BNSF and UNP).
5. **Intermodal dwell:** tracks the average number of hours an intermodal railcar is idle (i.e., how long the car spends waiting at a terminal).
6. **Chassis dwell:** refers to the average time for chassis waiting on-terminal and on-street.
7. **Rail container dwell:** refers to the number of days a container waits to depart from a rail facility after being unloaded from an ocean carrier.
8. **Container weighted average dwell:** refers to the number of days a container stays at a marine terminal after being unloaded from an ocean carrier and taken off the premises by a truck.
9. **Ocean shipping rates:** refers to the average cost of shipping a container by ocean; we specifically track the cost of shipping from East Asia to the US West Coast via the FBX01 index from Freightos.
10. **Big Three West Coast Ports' inbound loaded containers:** refers to the Y/Y growth that the Big Three West Coast ports (LA, Long Beach, and Oakland) see in inbound loaded containers (i.e., how many more goods are moving through the port versus the same period last year).
11. **PMI manufacturing supplier delivery time index:** readings of 50 indicate no change in delivery times versus the prior month; readings above 50 indicate delivery times improved (faster supply chain) and readings below 50 indicated delivery times deteriorated sequentially (more delayed supply chain). The index is a result of IHS Markit's PMI business survey which asks purchasing managers, "Are your suppliers' delivery times slower, faster or unchanged on average than one month ago?"
12. **China-to-US door-to-door shipping transit time:** sourced from Freightos, this metric tracks the number of days it takes for a good to reach final destination (on average) once an order is placed and accepted (i.e., door-to-door shipping is not necessarily port-to-port as it also captures delivery times from port to final destination).

GS Data Works leverages alternative data sources and advanced analysis techniques to create unique data-driven insights across Global Investment Research. GS Data Works analysis (East Coast container ship backlog estimates) provided by Dan Duggan, Ph.D., Aditi Singh, and Parag Agrawal.

Disclosure Appendix

Reg AC

We, Jordan Alliger, Andrzej Tomczyk, CFA and Paul Stoddard, hereby certify that all of the views expressed in this report accurately reflect our personal views about the subject company or companies and its or their securities. We also certify that no part of our compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

GS Factor Profile

The Goldman Sachs Factor Profile provides investment context for a stock by comparing key attributes to the market (i.e. our universe of rated stocks) and its sector peers. The four key attributes depicted are: Growth, Financial Returns, Multiple (e.g. valuation) and Integrated (a composite of Growth, Financial Returns and Multiple). Growth, Financial Returns and Multiple are calculated by using normalized ranks for specific metrics for each stock. The normalized ranks for the metrics are then averaged and converted into percentiles for the relevant attribute. The precise calculation of each metric may vary depending on the fiscal year, industry and region, but the standard approach is as follows:

Growth is based on a stock's forward-looking sales growth, EBITDA growth and EPS growth (for financial stocks, only EPS and sales growth), with a higher percentile indicating a higher growth company. **Financial Returns** is based on a stock's forward-looking ROE, ROCE and CROCI (for financial stocks, only ROE), with a higher percentile indicating a company with higher financial returns. **Multiple** is based on a stock's forward-looking P/E, P/B, price/dividend (P/D), EV/EBITDA, EV/FCF and EV/Debt Adjusted Cash Flow (DACF) (for financial stocks, only P/E, P/B and P/D), with a higher percentile indicating a stock trading at a higher multiple. The **Integrated** percentile is calculated as the average of the Growth percentile, Financial Returns percentile and (100% - Multiple percentile).

Financial Returns and Multiple use the Goldman Sachs analyst forecasts at the fiscal year-end at least three quarters in the future. Growth uses inputs for the fiscal year at least seven quarters in the future compared with the year at least three quarters in the future (on a per-share basis for all metrics).

For a more detailed description of how we calculate the GS Factor Profile, please contact your GS representative.

M&A Rank

Across our global coverage, we examine stocks using an M&A framework, considering both qualitative factors and quantitative factors (which may vary across sectors and regions) to incorporate the potential that certain companies could be acquired. We then assign a M&A rank as a means of scoring companies under our rated coverage from 1 to 3, with 1 representing high (30%-50%) probability of the company becoming an acquisition target, 2 representing medium (15%-30%) probability and 3 representing low (0%-15%) probability. For companies ranked 1 or 2, in line with our standard departmental guidelines we incorporate an M&A component into our target price. M&A rank of 3 is considered immaterial and therefore does not factor into our price target, and may or may not be discussed in research.

Quantum

Quantum is Goldman Sachs' proprietary database providing access to detailed financial statement histories, forecasts and ratios. It can be used for in-depth analysis of a single company, or to make comparisons between companies in different sectors and markets.

Disclosures

Distribution of ratings/investment banking relationships

Goldman Sachs Investment Research global Equity coverage universe

	Rating Distribution				Investment Banking Relationships		
	Buy	Hold	Sell		Buy	Hold	Sell
Global	48%	34%	18%		64%	57%	43%

As of January 1, 2025, Goldman Sachs Global Investment Research had investment ratings on 3,021 equity securities. Goldman Sachs assigns stocks as Buys and Sells on various regional Investment Lists; stocks not so assigned are deemed Neutral. Such assignments equate to Buy, Hold and Sell for the purposes of the above disclosure required by the FINRA Rules. See 'Ratings, Coverage universe and related definitions' below. The Investment Banking Relationships chart reflects the percentage of subject companies within each rating category for whom Goldman Sachs has provided investment banking services within the previous twelve months.

Regulatory disclosures

Disclosures required by United States laws and regulations

See company-specific regulatory disclosures above for any of the following disclosures required as to companies referred to in this report: manager or co-manager in a pending transaction; 1% or other ownership; compensation for certain services; types of client relationships; managed/co-managed public offerings in prior periods; directorships; for equity securities, market making and/or specialist role. Goldman Sachs trades or may trade as a principal in debt securities (or in related derivatives) of issuers discussed in this report.

The following are additional required disclosures: **Ownership and material conflicts of interest:** Goldman Sachs policy prohibits its analysts, professionals reporting to analysts and members of their households from owning securities of any company in the analyst's area of coverage.

Analyst compensation: Analysts are paid in part based on the profitability of Goldman Sachs, which includes investment banking revenues. **Analyst as officer or director:** Goldman Sachs policy generally prohibits its analysts, persons reporting to analysts or members of their households from serving as an officer, director or advisor of any company in the analyst's area of coverage. **Non-U.S. Analysts:** Non-U.S. analysts may not be associated persons of Goldman Sachs & Co. LLC and therefore may not be subject to FINRA Rule 2241 or FINRA Rule 2242 restrictions on communications with subject company, public appearances and trading securities held by the analysts.

Distribution of ratings: See the distribution of ratings disclosure above. **Price chart:** See the price chart, with changes of ratings and price targets in prior periods, above, or, if electronic format or if with respect to multiple companies which are the subject of this report, on the Goldman Sachs website at <https://www.gs.com/research/hedge.html>.

Additional disclosures required under the laws and regulations of jurisdictions other than the United States

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. **Australia:** Goldman Sachs Australia Pty Ltd and its affiliates are not authorised deposit-taking institutions (as that term is defined in the Banking Act 1959 (Cth)) in Australia and do not provide banking services, nor carry on a banking business, in Australia. This research, and any access to it, is intended only for “wholesale clients” within the meaning of the Australian Corporations Act, unless otherwise agreed by Goldman Sachs. In producing research reports, members of Global Investment Research of Goldman Sachs Australia may attend site visits and other meetings hosted by the companies and other entities which are the subject of its research reports. In some instances the costs of such site visits or meetings may be met in part or in whole by the issuers concerned if Goldman Sachs Australia considers it is appropriate and reasonable in the specific circumstances relating to the site visit or meeting. To the extent that the contents of this document contains any financial product advice, it is general advice only and has been prepared by Goldman Sachs without taking into account a client’s objectives, financial situation or needs. A client should, before acting on any such advice, consider the appropriateness of the advice having regard to the client’s own objectives, financial situation and needs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests and a copy of Goldman Sachs’ Australian Sell-Side Research Independence Policy Statement are available at: <https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html>. **Brazil:** Disclosure information in relation to CVM Resolution n. 20 is available at <https://www.gs.com/worldwide/brazil/area/gir/index.html>. Where applicable, the Brazil-registered analyst primarily responsible for the content of this research report, as defined in Article 20 of CVM Resolution n. 20, is the first author named at the beginning of this report, unless indicated otherwise at the end of the text. **Canada:** This information is being provided to you for information purposes only and is not, and under no circumstances should be construed as, an advertisement, offering or solicitation by Goldman Sachs & Co. LLC for purchasers of securities in Canada to trade in any Canadian security. Goldman Sachs & Co. LLC is not registered as a dealer in any jurisdiction in Canada under applicable Canadian securities laws and generally is not permitted to trade in Canadian securities and may be prohibited from selling certain securities and products in certain jurisdictions in Canada. If you wish to trade in any Canadian securities or other products in Canada please contact Goldman Sachs Canada Inc., an affiliate of The Goldman Sachs Group Inc., or another registered Canadian dealer. **Hong Kong:** Further information on the securities of covered companies referred to in this research may be obtained on request from Goldman Sachs (Asia) L.L.C. **India:** Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (India) Securities Private Limited, Research Analyst - SEBI Registration Number INH000001493, 951-A, Rational House, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400 025, India, Corporate Identity Number U7140MH2006FTC160634, Phone +91 22 6616 9000, Fax +91 22 6616 9001. Goldman Sachs may beneficially own 1% or more of the securities (as such term is defined in clause 2 (h) the Indian Securities Contracts (Regulation) Act, 1956) of the subject company or companies referred to in this research report. Investment in securities market are subject to market risks. Read all the related documents carefully before investing. Registration granted by SEBI and certification from NISM in no way guarantee performance of the intermediary or provide any assurance of returns to investors. Goldman Sachs (India) Securities Private Limited compliance officer and investor grievance contact details can be found at this link: <https://publishing.gs.com/disclosures/hedge.html> - /general/equity. **Japan:** See below. **Korea:** This research, and any access to it, is intended only for “professional investors” within the meaning of the Financial Services and Capital Markets Act, unless otherwise agreed by Goldman Sachs. Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (Asia) L.L.C., Seoul Branch. **New Zealand:** Goldman Sachs New Zealand Limited and its affiliates are neither “registered banks” nor “deposit takers” (as defined in the Reserve Bank of New Zealand Act 1989) in New Zealand. This research, and any access to it, is intended for “wholesale clients” (as defined in the Financial Advisers Act 2008) unless otherwise agreed by Goldman Sachs. A copy of certain Goldman Sachs Australia and New Zealand disclosure of interests is available at: <https://www.goldmansachs.com/disclosures/australia-new-zealand/index.html>. **Russia:** Research reports distributed in the Russian Federation are not advertising as defined in the Russian legislation, but are information and analysis not having product promotion as their main purpose and do not provide appraisal within the meaning of the Russian legislation on appraisal activity. Research reports do not constitute a personalized investment recommendation as defined in Russian laws and regulations, are not addressed to a specific client, and are prepared without analyzing the financial circumstances, investment profiles or risk profiles of clients. Goldman Sachs assumes no responsibility for any investment decisions that may be taken by a client or any other person based on this research report. **Singapore:** Goldman Sachs (Singapore) Pte. (Company Number: 198602165W), which is regulated by the Monetary Authority of Singapore, accepts legal responsibility for this research, and should be contacted with respect to any matters arising from, or in connection with, this research. **Taiwan:** This material is for reference only and must not be reprinted without permission. Investors should carefully consider their own investment risk. Investment results are the responsibility of the individual investor. **United Kingdom:** Persons who would be categorized as retail clients in the United Kingdom, as such term is defined in the rules of the Financial Conduct Authority, should read this research in conjunction with prior Goldman Sachs research on the covered companies referred to herein and should refer to the risk warnings that have been sent to them by Goldman Sachs International. A copy of these risks warnings, and a glossary of certain financial terms used in this report, are available from Goldman Sachs International on request.

European Union and United Kingdom: Disclosure information in relation to Article 6 (2) of the European Commission Delegated Regulation (EU) (2016/958) supplementing Regulation (EU) No 596/2014 of the European Parliament and of the Council (including as that Delegated Regulation is implemented into United Kingdom domestic law and regulation following the United Kingdom’s departure from the European Union and the European Economic Area) with regard to regulatory technical standards for the technical arrangements for objective presentation of investment recommendations or other information recommending or suggesting an investment strategy and for disclosure of particular interests or indications of conflicts of interest is available at <https://www.gs.com/disclosures/europeanpolicy.html> which states the European Policy for Managing Conflicts of Interest in Connection with Investment Research.

Japan: Goldman Sachs Japan Co., Ltd. is a Financial Instrument Dealer registered with the Kanto Financial Bureau under registration number Kinsho 69, and a member of Japan Securities Dealers Association, Financial Futures Association of Japan Type II Financial Instruments Firms Association, The Investment Trusts Association, Japan, and Japan Investment Advisers Association. Sales and purchase of equities are subject to commission pre-determined with clients plus consumption tax. See company-specific disclosures as to any applicable disclosures required by Japanese stock exchanges, the Japanese Securities Dealers Association or the Japanese Securities Finance Company.

Ratings, coverage universe and related definitions

Buy (B), Neutral (N), Sell (S) Analysts recommend stocks as Buys or Sells for inclusion on various regional Investment Lists. Being assigned a Buy or Sell on an Investment List is determined by a stock’s total return potential relative to its coverage universe. Any stock not assigned as a Buy or a Sell on an Investment List with an active rating (i.e., a stock that is not Rating Suspended, Not Rated, Early-Stage Biotech, Coverage Suspended or Not Covered), is deemed Neutral. Each region manages Regional Conviction Lists, which are selected from Buy rated stocks on the respective region’s Investment Lists and represent investment recommendations focused on the size of the total return potential and/or the likelihood of the realization of the return across their respective areas of coverage. The addition or removal of stocks from such Conviction Lists are managed by the Investment Review Committee or other designated committee in each respective region and do not represent a change in the analysts’ investment rating for such stocks.

Total return potential represents the upside or downside differential between the current share price and the price target, including all paid or anticipated dividends, expected during the time horizon associated with the price target. Price targets are required for all covered stocks. The total return potential, price target and associated time horizon are stated in each report adding or reiterating an Investment List membership.

Coverage Universe: A list of all stocks in each coverage universe is available by primary analyst, stock and coverage universe at <https://www.gs.com/research/hedge.html>.

Not Rated (NR). The investment rating, target price and earnings estimates (where relevant) are removed pursuant to Goldman Sachs policy when

Goldman Sachs is acting in an advisory capacity in a merger or in a strategic transaction involving this company, when there are legal, regulatory or policy constraints due to Goldman Sachs' involvement in a transaction, and in certain other circumstances. **Early-Stage Biotech (ES).** An investment rating and a target price are not assigned pursuant to Goldman Sachs policy when this company neither has a drug, treatment or medical device that has passed a Phase II clinical trial nor a license to distribute a post-Phase II drug, treatment or medical device. **Rating Suspended (RS).** Goldman Sachs Research has suspended the investment rating and price target for this stock, because there is not a sufficient fundamental basis for determining an investment rating or target price. The previous investment rating and target price, if any, are no longer in effect for this stock and should not be relied upon. **Coverage Suspended (CS).** Goldman Sachs has suspended coverage of this company. **Not Covered (NC).** Goldman Sachs does not cover this company.

Global product; distributing entities

Goldman Sachs Global Investment Research produces and distributes research products for clients of Goldman Sachs on a global basis. Analysts based in Goldman Sachs offices around the world produce research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy. This research is disseminated in Australia by Goldman Sachs Australia Pty Ltd (ABN 21 006 797 897); in Brazil by Goldman Sachs do Brasil Corretora de Títulos e Valores Mobiliários S.A.; Public Communication Channel Goldman Sachs Brasil: 0800 727 5764 and / or contatogoldmanbrasil@gs.com. Available Weekdays (except holidays), from 9am to 6pm. Canal de Comunicação com o Público Goldman Sachs Brasil: 0800 727 5764 e/ou contatogoldmanbrasil@gs.com. Horário de funcionamento: segunda-feira à sexta-feira (exceto feriados), das 9h às 18h; in Canada by Goldman Sachs & Co. LLC; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs New Zealand Limited; in Russia by OOO Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman Sachs & Co. LLC. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom.

Goldman Sachs International ("GSI"), authorised by the Prudential Regulation Authority ("PRA") and regulated by the Financial Conduct Authority ("FCA") and the PRA, has approved this research in connection with its distribution in the United Kingdom.

European Economic Area: GSI, authorised by the PRA and regulated by the FCA and the PRA, disseminates research in the following jurisdictions within the European Economic Area: the Grand Duchy of Luxembourg, Italy, the Kingdom of Belgium, the Kingdom of Denmark, the Kingdom of Norway, the Republic of Finland and the Republic of Ireland; GSI - Succursale de Paris (Paris branch) which is authorised by the French Autorité de contrôle prudentiel et de résolution ("ACPR") and regulated by the Autorité de contrôle prudentiel et de résolution and the Autorité des marchés financiers ("AMF") disseminates research in France; GSI - Sucursal en España (Madrid branch) authorized in Spain by the Comisión Nacional del Mercado de Valores disseminates research in the Kingdom of Spain; GSI - Sweden Bankfilial (Stockholm branch) is authorized by the SFSA as a "third country branch" in accordance with Chapter 4, Section 4 of the Swedish Securities and Market Act (Sv. lag (2007:528) om värdepappersmarknaden) disseminates research in the Kingdom of Sweden; Goldman Sachs Bank Europe SE ("GSBE") is a credit institution incorporated in Germany and, within the Single Supervisory Mechanism, subject to direct prudential supervision by the European Central Bank and in other respects supervised by German Federal Financial Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin) and Deutsche Bundesbank and disseminates research in the Federal Republic of Germany and those jurisdictions within the European Economic Area where GSI is not authorised to disseminate research and additionally, GSBE, Copenhagen Branch filial af GSBE, Tyskland, supervised by the Danish Financial Authority disseminates research in the Kingdom of Denmark; GSBE - Sucursal en España (Madrid branch) subject (to a limited extent) to local supervision by the Bank of Spain disseminates research in the Kingdom of Spain; GSBE - Succursale Italia (Milan branch) to the relevant applicable extent, subject to local supervision by the Bank of Italy (Banca d'Italia) and the Italian Companies and Exchange Commission (Commissione Nazionale per le Società e la Borsa "Consob") disseminates research in Italy; GSBE - Succursale de Paris (Paris branch), supervised by the AMF and by the ACPR disseminates research in France; and GSBE - Sweden Bankfilial (Stockholm branch), to a limited extent, subject to local supervision by the Swedish Financial Supervisory Authority (Finansinspektionen) disseminates research in the Kingdom of Sweden.

General disclosures

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. The information, opinions, estimates and forecasts contained herein are as of the date hereof and are subject to change without prior notification. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by Global Investment Research. Goldman Sachs & Co. LLC, the United States broker dealer, is a member of SIPC (<https://www.sipc.org>).

Our salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients and principal trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, principal trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

The analysts named in this report may have from time to time discussed with our clients, including Goldman Sachs salespersons and traders, or may discuss in this report, trading strategies that reference catalysts or events that may have a near-term impact on the market price of the equity securities discussed in this report, which impact may be directionally counter to the analyst's published price target expectations for such stocks. Any such trading strategies are distinct from and do not affect the analyst's fundamental equity rating for such stocks, which rating reflects a stock's return potential relative to its coverage universe as described herein.

We and our affiliates, officers, directors, and employees will from time to time have long or short positions in, act as principal in, and buy or sell, the securities or derivatives, if any, referred to in this research, unless otherwise prohibited by regulation or Goldman Sachs policy.

The views attributed to third party presenters at Goldman Sachs arranged conferences, including individuals from other parts of Goldman Sachs, do not necessarily reflect those of Global Investment Research and are not an official view of Goldman Sachs.

Any third party referenced herein, including any salespeople, traders and other professionals or members of their household, may have positions in the products mentioned that are inconsistent with the views expressed by analysts named in this report.

This research is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Clients should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The price and value of investments referred to in this research and the income from them may fluctuate. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors.

Investors should review current options and futures disclosure documents which are available from Goldman Sachs sales representatives or at <https://www.theocc.com/about/publications/character-risks.jsp> and https://www.fiadocumentation.org/fia/regulatory-disclosures_1/fia-uniform-futures-and-options-on-futures-risk-disclosures-booklet-pdf-version-2018. Transaction costs may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

Differing Levels of Service provided by Global Investment Research: The level and types of services provided to you by Goldman Sachs Global Investment Research may vary as compared to that provided to internal and other external clients of GS, depending on various factors including your individual preferences as to the frequency and manner of receiving communication, your risk profile and investment focus and perspective (e.g., marketwide, sector specific, long term, short term), the size and scope of your overall client relationship with GS, and legal and regulatory constraints. As an example, certain clients may request to receive notifications when research on specific securities is published, and certain clients may request that specific data underlying analysts' fundamental analysis available on our internal client websites be delivered to them electronically through data feeds or otherwise. No change to an analyst's fundamental research views (e.g., ratings, price targets, or material changes to earnings estimates for equity securities), will be communicated to any client prior to inclusion of such information in a research report broadly disseminated through electronic publication to our internal client websites or through other means, as necessary, to all clients who are entitled to receive such reports.

All research reports are disseminated and available to all clients simultaneously through electronic publication to our internal client websites. Not all research content is redistributed to our clients or available to third-party aggregators, nor is Goldman Sachs responsible for the redistribution of our research by third party aggregators. For research, models or other data related to one or more securities, markets or asset classes (including related services) that may be available to you, please contact your GS representative or go to <https://research.gs.com>.

Disclosure information is also available at <https://www.gs.com/research/hedge.html> or from Research Compliance, 200 West Street, New York, NY 10282.

© 2025 Goldman Sachs.

You are permitted to store, display, analyze, modify, reformat, and print the information made available to you via this service only for your own use. You may not resell or reverse engineer this information to calculate or develop any index for disclosure and/or marketing or create any other derivative works or commercial product(s), data or offering(s) without the express written consent of Goldman Sachs. You are not permitted to publish, transmit, or otherwise reproduce this information, in whole or in part, in any format to any third party without the express written consent of Goldman Sachs. This foregoing restriction includes, without limitation, using, extracting, downloading or retrieving this information, in whole or in part, to train or finetune a machine learning or artificial intelligence system, or to provide or reproduce this information, in whole or in part, as a prompt or input to any such system.