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Data in the fast lane – managing automotive logistics amid component shortages

The global semiconductor shortage seems to be the first, second, third and only issue in the auto industry right now. Maybe that's not exactly true – there are also issues related to the semiconductor shortage, such as record used vehicle prices, consumers buying early in order to get their desired vehicles, and vows to ditch just-in-time inventory management. In addition, there is investor excitement surrounding electric vehicle (EV) growth rates – and even the legacy companies are getting in on the action by dramatically ramping up their investments in EVs.

Less headline-grabbing is the blocking and tackling of efficiently managing freight spend in the context of highly global automotive supply chains.

In this report, we cover numerous datasets available through FreightWaves and the SONAR platform that can help automotive OEMs and automotive suppliers manage their transportation networks.

Those data sets and use cases include:

Freight market data to assist in negotiations with carriers. (Pages 2-4) For example, SONAR data show that the freight market for inbound Detroit loads is highly volatile based on auto production trends – inbound Detroit loads should be less expensive when OEMs are sourcing a lot of components as assembly volumes ramp up. Conversely, it is easier for auto companies to source components into Detroit at lower freight rates when production levels decline.

Detailed containerized rail data helps to determine the best freight corridors to use rail intermodal to lower freight costs. (Pages 5-6) Auto companies should focus on intermodal corridors with existing density, which includes north-south cross-border shipments in 53' containers as auto parts are taken south to the Mexican assembly plants. Meanwhile, eastbound lanes from Vancouver represent the densest international intermodal corridor for auto parts.

Contract freight rate data that is specific to the auto industry can be accessed using SONAR Supply Chain Intelligence (SCI). (Pages 7-8) SCI helps shippers to quantify the benefits of converting freight from truckload to intermodal in particular lanes. Plus, it allows shippers to see how their rates compare to the market. Knowing how rates stack up helps shippers to lower freight costs through more effective negotiation and also helps to improve carrier compliance for the most important shipments. In this report, we analyze an auto company's shipments in two lanes – one where their freight rates are below-market and one where they are above the market in a lane that is generally more challenging for shippers.

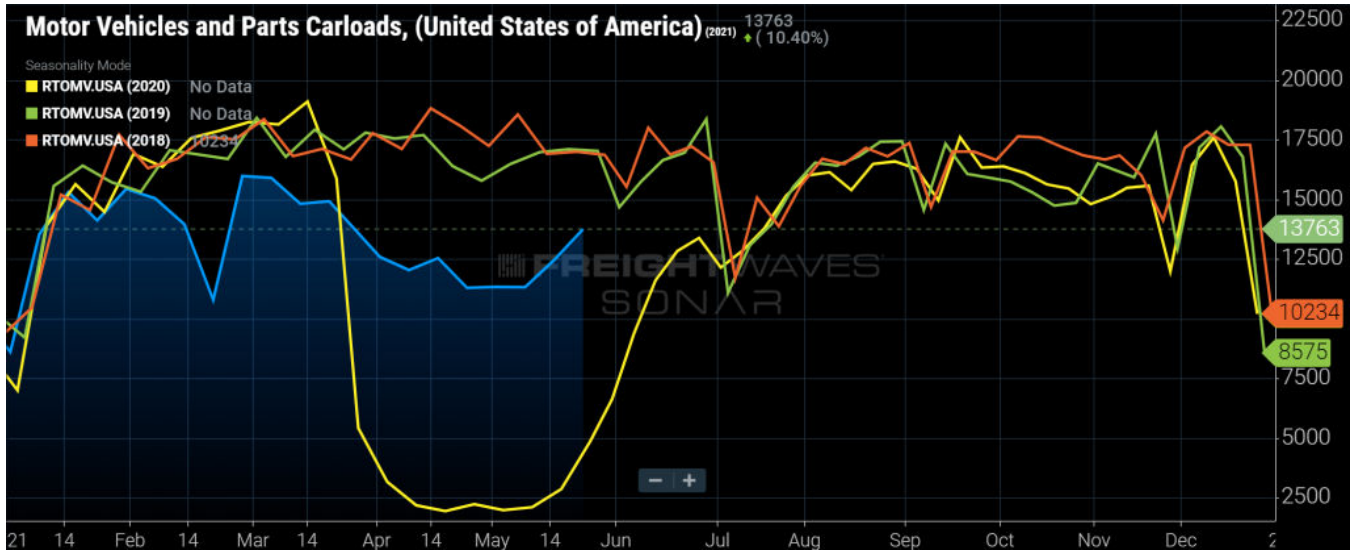
Canadian National Railway's pending acquisition of Kansas City Southern will likely improve the efficiency of auto supply chains. (Page 9) The deal would extend the combined railway's reach to additional geographies and would likely lead to additional railway investment in north-south corridors linking major automotive markets.

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Due primarily to the global semiconductor shortage, automotive production is one area of the economy that has not recovered from the COVID recession. In 2020 (yellow line below), automotive rail carloads, which primarily consist of finished vehicles, fell off a cliff in March before recovering to seasonal norms in July. 2021 volumes (blue line) remain significantly below 2018 and 2019 levels due to the ongoing semiconductor shortage. Its impact is magnified the longer the shortage persists because there is a certain amount of vehicle replacement that needs to take place each month (~1.4 million units +/-) as vehicles are taken out of service.



Motor vehicle shipments on the Class I railroads are shown for 2021, 2020, 2019 and 2018 in blue, yellow, green and orange, respectively. (Source: SONAR)

The volatility in the auto industry has wreaked havoc on the Detroit freight market.

Demand to move truckloads (which presumably includes many truckloads full of auto parts) into Detroit fell sharply in March 2020 amid plant shutdowns before an acceleration in inbound freight demand as production came back online in 3Q20.



(Source: SONAR)

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Detroit is typically a backhaul freight market, but the severity of the freight imbalance changes dramatically with market conditions. There is typically more demand for inbound truckloads into Detroit than outbound truckloads. That is due to the consumption in the area and also because a large volume of auto parts are hauled by truck into Detroit while finished vehicles typically leave in rail carloads, at least those traveling long distances.

While Detroit’s status as a backhaul market didn’t change during the COVID era, the magnitude of its freight imbalance changed dramatically. When auto plants shut down in late March 2020, Detroit’s freight market became balanced with roughly an equal volume of inbound and outbound freight tenders (a measure of freight demand), simply because the region wasn’t demanding as many inbound auto parts as it typically does. That’s important information for shippers that are moving goods that terminate in Detroit because it means that they have more negotiating leverage with carriers (since carriers can get re-loaded in Detroit more easily).

Of course, the auto plant shutdowns last year didn’t last long and the region became a severe backhaul market by July and August as OEMs demanded large volumes of inbound components and production schedules attempted to make up for lost time. During periods with those characteristics, shippers often struggle to secure capacity and it is often a good idea for shippers to make sure routing guides are in order and to extend lead times to help secure capacity.

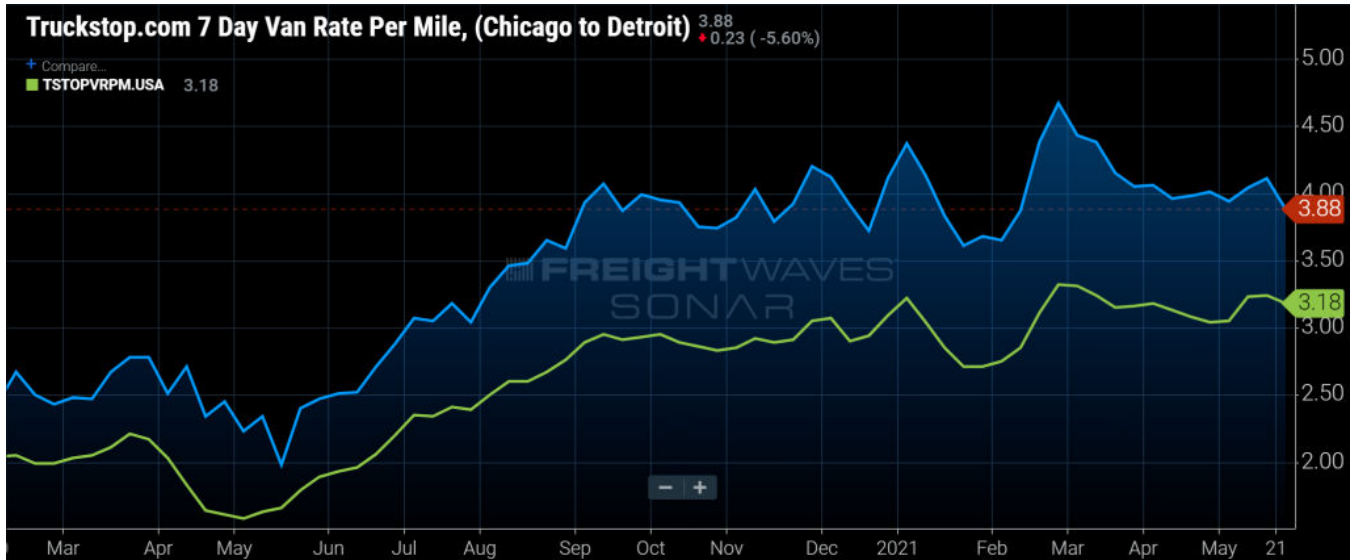
Detroit briefly became a balanced market in April 2020 (Detroit Headhaul Index near zero) before returning to its typical backhaul status.



An indicator of balance (or imbalance) in freight demand, the Detroit Headhaul Index subtracts inbound demand from outbound demand. Deeply negative numbers indicate that there is greater inbound truckload demand than outbound truckload demand. (Source: SONAR)

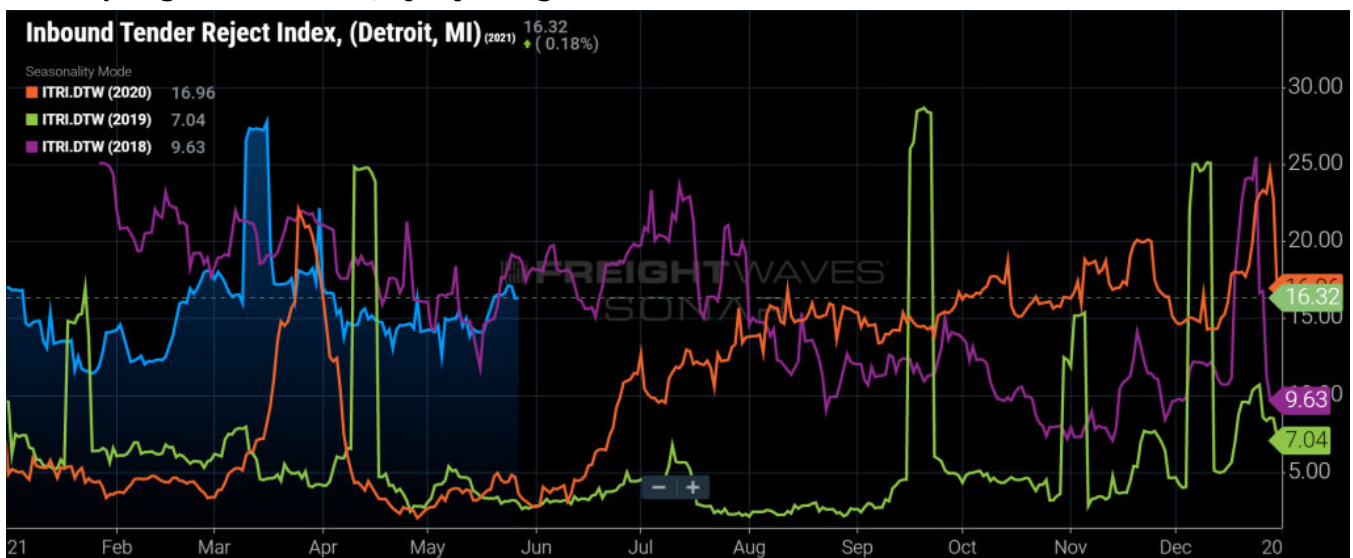
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Carriers' reluctance to head to Detroit (a backhaul market) explains why rates on loads inbound to Detroit are typically priced at a premium to most other lanes. The chart immediately below compares spot rates from Chicago to Detroit (\$3.88/mile, including fuel surcharges) to the nationwide rate of \$3.18/mile, which also includes fuel surcharges. While tender rejection rates (second chart below) show carriers' reaction to the market conditions and the chance that shippers' tenders are accepted, spot rates, such as those shown below, help shippers quantify the magnitude of risk in the event that loads fall through the routing guide.



(Source: SONAR)

Carriers are responding to the freight market for inbound Detroit loads, similar to the way they did in spring/summer 2018, by rejecting about 16% of tendered loads.



(Source: SONAR)

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Containerized rail data show the flow of auto parts to the North American assembly plants.

Auto manufacturing has very long supply chains. Vehicles that are assembled in North America contain parts from around the globe. Many of those parts come to North America through the Port of Vancouver and many auto parts that are manufactured in the U.S. are taken south across the U.S./Mexico border in intermodal containers to Mexican assembly plants. Then, the finished vehicles return north along the same rail tracks, largely for U.S. consumption.

Auto parts traveling in international intermodal containers (primarily 40') mainly travel from the West Coast ports to the Midwest auto plants. Vancouver to Detroit is the densest lane.

	origin_location_area	destination_location_area	product_short_desc	container_size	frequency_count
1.	VANCOUVER	DETROIT	AUTO PARTS	40	10,955
2.	LOS ANGELES/LONG BEACH/SAN BER	CHICAGO	AUTO PARTS MXD	40	7,034
3.	VANCOUVER	TORONTO	AUTO PARTS	40	4,079
4.	VANCOUVER	DETROIT	AUTO PARTS	20	3,540
5.	COLUMBUS	LOS ANGELES/LONG BEACH/SAN BER	AUTO PARTS MXD	40	2,759
6.	SEATTLE/TACOMA	COLUMBUS	AUTO PARTS MXD	40	2,576
7.	LOS ANGELES/LONG BEACH/SAN BER	COLUMBUS	AUTO PARTS MXD	40	2,202
8.	CINCINNATI	SAVANNAH	AUTO PARTS MXD	40	2,022
9.	SEATTLE/TACOMA	LOUISVILLE	AUTO PARTS MXD	40	1,707
10.	DETROIT	VANCOUVER	AUTO PARTS MXD	40	1,571

The densest 10 North American international intermodal lanes, filtered to include only those containing auto parts, are shown above. (Source: FreightWaves)

FreightWaves' intermodal data is able to be filtered by a short description of the container contents, which provides insight into the flow of auto parts. Understanding the trade flow of the automotive supply chain can help auto OEMs and suppliers know where they can save on freight costs by converting truckloads into intermodal units – an action that typically saves 10%-15% off the freight bill while also cutting fuel surcharges in half. But, intermodal traffic flows need density in order for the service to be economically viable, so we suggest that auto OEMs/suppliers begin by overlaying their highway traffic flows on top of intermodal density tables and maps to determine where there is an opportunity for conversion to intermodal.

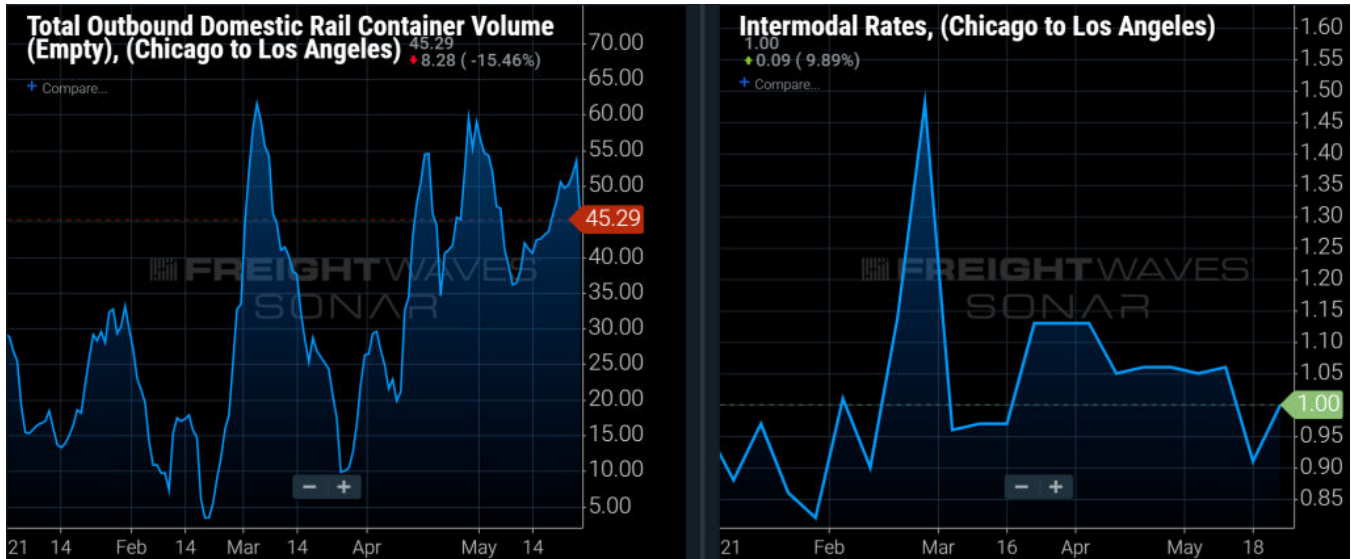
Auto parts traveling in domestic intermodal containers (primarily 53') mainly travel north-south in many cross-border routes. Canadian National Railway's potential acquisition of Kansas City Southern may improve the rail capacity and density of many of those north-south intermodal lanes.

	origin_location_area	destination_location_area	product_short_desc	container_size	frequency_count
1.	SAN ANTONIO	LOS ANGELES/LONG BEACH/SAN BER	AUTO PARTS	53	73,236
2.	CHICAGO	LOS ANGELES/LONG BEACH/SAN BER	AUTO PARTS	53	50,529
3.	CHICAGO	ROJAS	AUTO PARTS	53	46,021
4.	DETROIT	ROJAS	AUTO PARTS	53	40,395
5.	EL PASO	CHICAGO	AUTO PARTS MXD	53	32,227
6.	EL PASO	CHICAGO	AUTO PARTS	53	32,106
7.	LAREDO	DETROIT	AUTO PARTS	53	31,868
8.	SAN ANTONIO	CHICAGO	AUTO PARTS	53	29,618
9.	CHICAGO	OAKLAND	AUTO PARTS	53	28,871
10.	MEMPHIS	LOS ANGELES/LONG BEACH/SAN BER	AUTO PARTS	53	28,657
11.	LOS ANGELES/LONG BEACH/SAN BER	CHICAGO	AUTO PARTS	53	21,490
12.	CHICAGO	DALLAS	AUTO PARTS	53	21,272
13.	LAREDO	DETROIT	AUTO PARTS MXD	53	20,378
14.	DETROIT	ROJAS	AUTO PARTS MXD	53	19,095
15.	CHICAGO	CIUDAD	AUTO PARTS	53	18,428

The densest 10 North American domestic intermodal lanes (primarily 53' containers), filtered to include only those containing auto parts, are shown above. (Source: FreightWaves)

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Reflecting imbalances in international trade, SONAR data show that there is ample domestic intermodal capacity in the second-densest domestic intermodal lane for auto parts (i.e., Chicago to Los Angeles). Evidence of excess domestic intermodal capacity include 45 empty domestic containers moving daily in the lane, on average, in the past week (headhaul lanes typically show no empty containers). In addition, intermodal spot rates to move 53' containers in the Chicago to Los Angeles lane, including fuel surcharges, are depressed at only \$1.00/mile.



The volume of empty domestic containers moving from Chicago to L.A. shown as a 7-day moving average during the past week (left) and domestic intermodal door-to-door spot rates, including fuel surcharges from Chicago to L.A. (right).

(Source: SONAR)

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Contracted freight rate data show that automotive shippers often pay a significant premium to use highway carriers, in comparison to domestic rail intermodal. The implication is that there are significant freight savings opportunities through better management of supply chains. In addition, with near-zero interest rates reducing the costs of holding inventory, auto OEMs and suppliers may opt to have more components in inventory throughout the supply chain as just-in-time inventory management falls out of favor. That should reduce the time-sensitivity of many freight shipments and allow for consolidation of less-than-truckload (LTL) shipments into truckload and conversion of truckload into intermodal units.

Example 1: Romulus, MI to Claycomo, MO:

In 2020, Shipper X's contract rates for dry van truckload movements were 23% higher than intermodal movements in the same lane, when fuel and accessorials are included. Intermodal proves viable in this lane with the intermodal routing only including 5 miles out of route. In this case, the intermodal rate was \$1.56/mile with five miles out of route versus a \$1.94/mile rate for truckload.

ship_da...	shi...	transportation_m...	origin_city	origin_st...	origin_zi...	dest_city	dest_state	dest_zip3	base_rate	amount_...	distance_...	Shipment...
2020	0249	INTERMODAL	ROMULUS	MI	481	CLAYCOMO	MO	641	1,033.85	1,159.24	739.54	1,999
2020	0249	TRUCKLOAD (DRY VAN)	ROMULUS	MI	481	CLAYCOMO	MO	641	1,237.17	1,426.21	734.56	1,032

(Source: FreightWaves)

The SONAR SCI app analyzes how Shipper X's truckload rates from Romulus, Michigan to Claycomo, Missouri compared to the overall truckload market and its peer group, defined as others in the auto industry, which includes both auto OEMs and auto suppliers. In this lane, Shippers X's \$1.94/mile is \$0.67/mile below the average market rate and is \$0.82/mile below its peer group.

That data tells Shipper X that the company is effectively managing costs, but also may be at risk of facing carrier compliance issues if the truckload market were to tighten. Another factor to consider is that Shipper X moved over 1,000 truckloads in this lane in 2020. That volume gives it more negotiating power than most smaller shippers, so a discount to the market should be expected.

In addition, the Romulus to Claycomo lane receives a Lane Score of 57, which indicates that the balance of negotiating power between most carriers and shippers is fairly even in the lane. The higher the number, the easier the lane is for shippers to manage.



(Source: SONAR SCI)

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Example 2: Compton, CA to Romulus, MI:

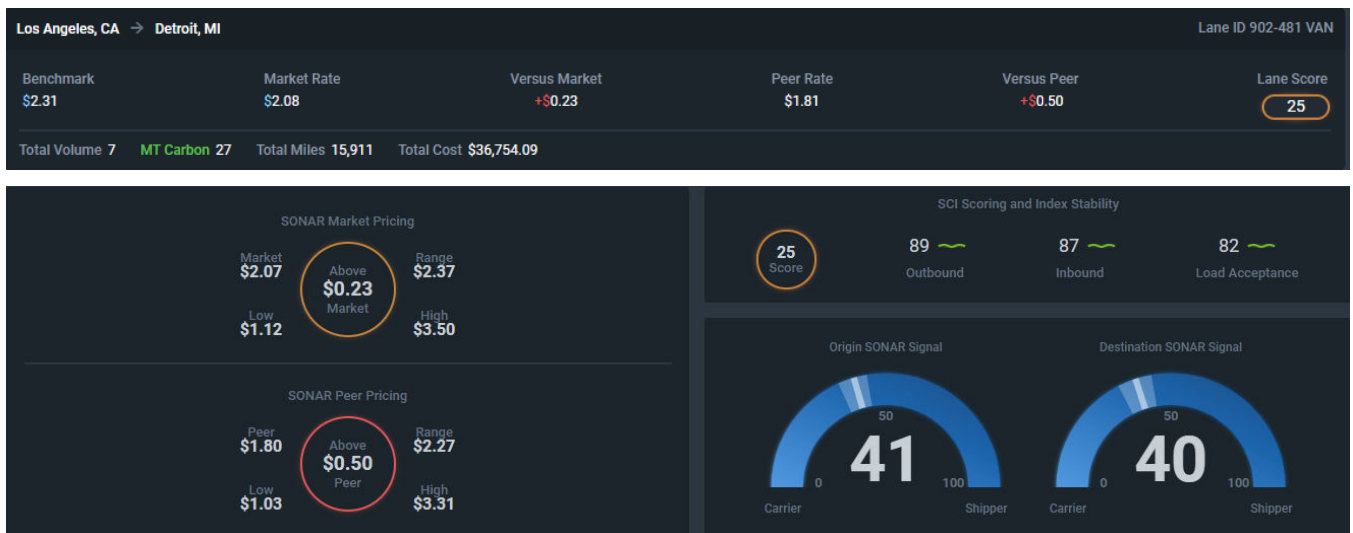
In 2020, Shipper X moved intermodal units and truckloads from Compton, California to Romulus, Michigan with an average savings of 27.8% associated with moving via rail intermodal, compared to truckload. While this route involved 15 out-of-route miles rather than 5 miles in Example 1, intermodal savings increase as lengths of haul increase since the lower per-mile costs on the railroad are spread out over a greater number of miles.

ship_da...	shl...	transportation_m...	origin_city	origin_st...	origin_zl...	dest_city	dest_state	dest_zlp3	base_rate	amount_...	distance_...	Shipment...
2020	0249	INTERMODAL	COMPTON	CA	902	ROMULUS	MI	481	3,497.5	4,106.27	2,287.7	23
2020	0249	TRUCKLOAD (DRY VAN)	COMPTON	CA	902	ROMULUS	MI	481	4,771.29	5,247.93	2,272.98	7

(Source: FreightWaves)

The SONAR SCI app shows that this eastbound lane from the West Coast is more difficult for shippers to manage, which is reflected in a below-average Lane Score of 25. The difference is that Southern California is one of the biggest headhaul markets in the U.S. so carriers have numerous options when looking for loads. In addition, as highlighted above, the Detroit area is a fairly undesirable destination for carriers since it may be difficult to get re-loaded and carriers may have to accept a low-rated brokered load to get out of Detroit.

In the Compton to Romulus lane, the truckload contract rate that Shipper X is paying of \$2.31/mile is \$0.23/mile above the average market rate and is \$0.50/mile above its peer group. That may mean that Shipper X is paying too much and needs to focus on lowering its contracted rates in that lane during the next round of negotiations. Alternatively, the premium could be by design because routing guide compliance may be of high importance when sourcing imported auto components that are vital to keep automotive production lines running. Another factor to consider is that Shipper X only moved 7 truckloads in that lane in 2020 compared to 23 intermodal units. Therefore, the 7 truckloads may have been expedited shipments, which is consistent with paying relatively high freight rates on a per-mile basis.



(Source: FreightWaves)

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Canadian National Railway’s pending acquisition of Kansas City Southern Railway could improve the transportation efficiency of auto parts and finished motor vehicles.

After much drama regarding which railroad will acquire Kansas City Southern, it’s clear now that Kansas City Southern shareholders prefer Canadian National’s larger, and recently sweetened, offer. The transaction is not a done deal because it still needs approval from the both Kansas City Southern shareholders (which shouldn’t be an issue) and the U.S. Surface Transportation Board (which may be an issue, or result in significant mitigation measures).

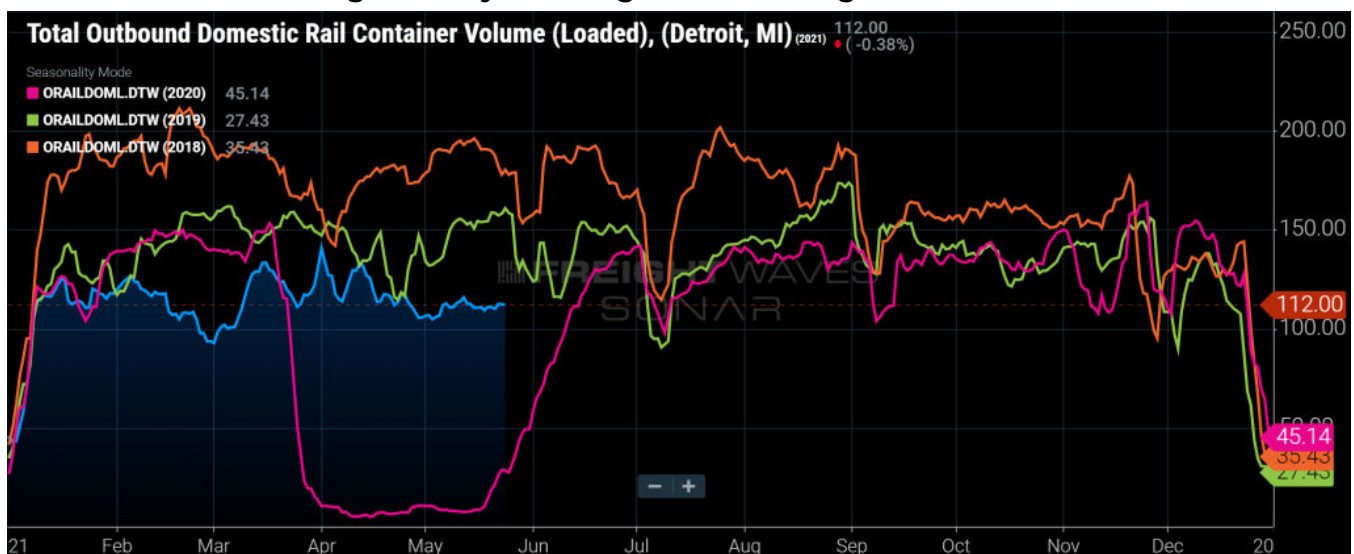
In addition to trucks, auto components are moved to automotive assembly plants in rail intermodal containers and in boxcars. As highlighted above, east-west intermodal services to/from the Port of Vancouver and north-south intermodal services across the U.S./Mexico border are both heavy corridors for auto parts. For example, auto parts are moved in heavy volumes southbound in containers from the U.S. to Mexican auto assembly plants and finished vehicles are moved northbound in bi-level and tri-level automotive railcars.

Assuming the Canadian National acquisition of Kansas City Southern occurs, the combined company should improve the efficiency of moving motor vehicles and components by rail while also extending auto companies’ reach on the railways. The deal would improve efficiency by eliminating railway interchanges that are currently necessary in the central U.S. for certain longer-haul routes.

Here are a few potential automotive railroad routes that may make more economic sense following the acquisition:

- Moving auto parts from Detroit (or other locations east of the Mississippi River) to the Mexican auto assembly plants.
- Moving finished vehicles from Mexican auto plants to a wider range of U.S. and Canadian consumption centers as well as port cities in the U.S., eastern Canada and western Canada.
- Moving auto parts from Vancouver to a wider range of North American assembly plants.

Detroit outbound domestic intermodal volume typically averages 100-200 units/day; that volume could increase significantly following a CN/KCS merger.



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Loaded domestic containerized intermodal volume outbound from Detroit is shown for 2021, 2020, 2019 and 2018 in blue, pink, green and orange, respectively. (Source: SONAR)

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