ASSOCIATION OF AMERICAN RAILROADS | POLICY & ECONOMICS

Freight Rail's Role in Price Stability and Supply Chain Resilience

How America's rail network quietly buffers inflation and strengthens the economy.

DECEMBER 3, 2025

Acknowledgments

We thank Prof. Christopher P. L. Barkan (RailTEC, University of Illinois), Prof. Kenneth Boyer (Michigan State University), Prof. Gerard J. McCullough (University of Minnesota), Prof. Patrick McLaughlin (Hoover Institution, Stanford University), and Prof. Wesley Wilson (University of Oregon) for thoughtful reviews and comments on earlier drafts. The analysis and views expressed are those of the Association of American Railroads (AAR) and do not reflect those of AAR's members, the reviewers, or their institutions. Any errors are ours.

Executive Summary

The U.S. freight rail network is one of the country's most enduring competitive advantages—and one of its most under-recognized economic stabilizers. At a time when transportation costs are increasingly tied to inflation and supply chain stress, rail's efficiency, predictability, and resilience provide a quiet but powerful buffer for the broader economy.

This paper examines how freight rail contributes to price stability and supply-chain resilience, using three decades of federal data, industry performance metrics, and sector case studies. The evidence shows that rail's distinctive cost structure and operating model—capital-intensive, long-haul, and energy-efficient—make it less prone to volatility and faster to recover from shocks. In economic terms, rail functions as a built-in shock absorber within the nation's logistics system.

Rail as an Inflation Buffer

Over the past five years, global supply chains have endured an extraordinary series of disruptions: pandemic lockdowns, energy price surges, labor shortages, and unprecedented port congestion. Each wave drove up the cost of moving goods and contributed to inflationary pressure across the economy. Yet, amid these cycles, rail prices remained more stable than other freight modes.

Our analysis of more than thirty years of federal data finds a consistent pattern:

- A 10% rise in trucking cost inflation is associated with roughly a 2.3% increase in goods inflation, while a 10% rise in rail cost inflation is linked to just 0.7%.
- Trucking cost shocks reach consumer prices quickly, typically within one to two months. Rail cost changes are smaller, slower, and fade faster.

This difference—roughly a three-to-one ratio—reflects the underlying economics of each mode. Trucking dominates last-mile and retail distribution, where price movements flow directly to consumers. Rail serves primarily long-distance movements of bulk and intermediate goods, where contracts, inventories, and economies of scale absorb much of the volatility. Because rail accounts for nearly 40% of long-distance ton-miles,[1] that stability has measurable macroeconomic impact.

[1] *See Table 2, trucking accounts for about 36% of U.S. long-distance ton-miles.*

Why Resilience Matters for Inflation

Price behavior tells only part of the story. Rail's inflation advantage is reinforced by its operational resilience—its ability to maintain throughput and restore fluidity during disruptions.

During the height of the COVID-19 crisis and subsequent port congestion, the rail network absorbed extraordinary volumes while recovering faster than expected, given the extremely difficult situation. On the key Los Angeles–Chicago intermodal corridor, for example, average terminal dwell times in Chicago fell below 20 hours for 48 of 52 weeks in 2024,[2] and cross-country transit stabilized at 4–5 days. Railroads achieved this by metering flows, repositioning assets, returning stored equipment to service, adding thousands of new employees, and coordinating closely with shippers.

Each of these actions limited the need for emergency trucking, reduced detention and storage charges, and prevented localized disruptions from cascading into nationwide price spikes. In other words, resilience on the network translates directly into lower inflation pass-through—by avoiding the kinds of sudden logistics costs that quickly filter into consumer prices.

Sector Evidence: Agriculture and Energy

The stabilizing role of rail is especially clear in agriculture and energy-intensive industries.

- **Grain and food exports:** Rail moves roughly 25% of domestic grain tonnage and nearly 40% of grain exports. More than 70% of rail grain ton-miles are associated with shipments over 1,000 miles, connecting the interior to export ports. Rail programs such as forward railcar commitments and shuttle-train services allow shippers to lock in capacity and pricing ahead of harvest peaks, helping, to the extent possible, reduce demurrage, detention, and emergency trucking costs that can drive food price volatility.

- **Energy and industrial commodities:** Even as coal's share of electricity generation declines (to about 15% in 2024), rail still moves roughly three-quarters of all coal and underpins flows of chemicals, crude oil, aggregates, and other industrial inputs. Predictable long-haul rail service helps industrial producers manage energy and raw-material costs,[3] shielding downstream sectors—and ultimately consumers—from the full force of price swings.

---

[2] *As a reference point, the average rail terminal dwell time in the U.S. during the last week of 2024 was roughly 26 hours.*

[3] *Admittedly, during periods of capacity constraints or operational disruptions, this predictability can erode. While railroads work to mitigate these impacts through planning and coordination, systemic pressures can still challenge service reliability.*

Efficiency and Systemwide Benefits

Rail's inflation-buffering effect is reinforced by its energy advantage. On average, Class I railroads move a ton of freight roughly 480–500 miles per gallon of fuel, about three to four times more efficient than trucks, while representing just 0.5% of U.S. greenhouse-gas emissions. Since 2000, fuel efficiency has improved by roughly 22%, driven by investments in lighter, higher capacity railcars and distributed power, idling reduction technologies, advanced fuel-management systems, and hybrid terminal equipment.

That efficiency is not merely environmental—it is economic. Lower fuel intensity reduces exposure to oil price spikes and helps anchor long-term logistics costs. If just 20% of long-haul heavy-truck freight shifted to rail, the resulting savings could reach $13 billion in fuel and $11 billion in reduced congestion and pavement wear annually. These gains translate into lower costs for shippers, taxpayers, and ultimately consumers.

The Takeaway

Freight rail's contribution to economic stability is both measurable and structural. It moves a large share of the nation's freight at predictable cost, restores service quickly when stressed, and operates with far greater fuel efficiency than competing modes. These characteristics make it an essential partner in managing logistics costs and moderating inflation pressures.

At a time when supply-chain resilience and price stability are at the center of national economic strategy, freight rail remains one of America's quietest but most effective tools for keeping the economy moving—and prices in check.

Introduction and Research Context

Since 2020, repeated shocks—pandemic congestion, labor tightness, energy volatility—have raised logistics costs and fed goods inflation.[4] Rail stood out for scale and price stability relative to other modes.

Why this matters for prices. When transport costs move, the portion that reaches consumers depends on how those costs travel through the supply chain. Trucking sits close to retail shelves; rail concentrates upstream in long-haul movements of bulk and intermediate goods, where contracts, inventories, and planning horizons diffuse shocks. This paper measures those differences and connects them to rail's operational resilience—how quickly the network keeps or restores fluidity when stressed.

Freight rail's macroeconomic relevance stems from both scale (about 40% of long-distance U.S. ton-miles) and steadier pricing than other modes. When freight costs rise, pass-through—the share of transport cost growth reflected in prices paid by businesses and consumers—depends on how those costs ripple through the supply chain. Higher pass-through means shelf prices move quickly; lower pass-through implies buffering elsewhere. Rail's emphasis on bulk and intermediate goods over long distances, combined with a resilient operating model, dampen those ripples—making rail a strategic buffer against inflation.

We measure rail's inflation-buffering role and show how operational resilience helps prevent cost spikes from reaching consumers.

Research Hypothesis

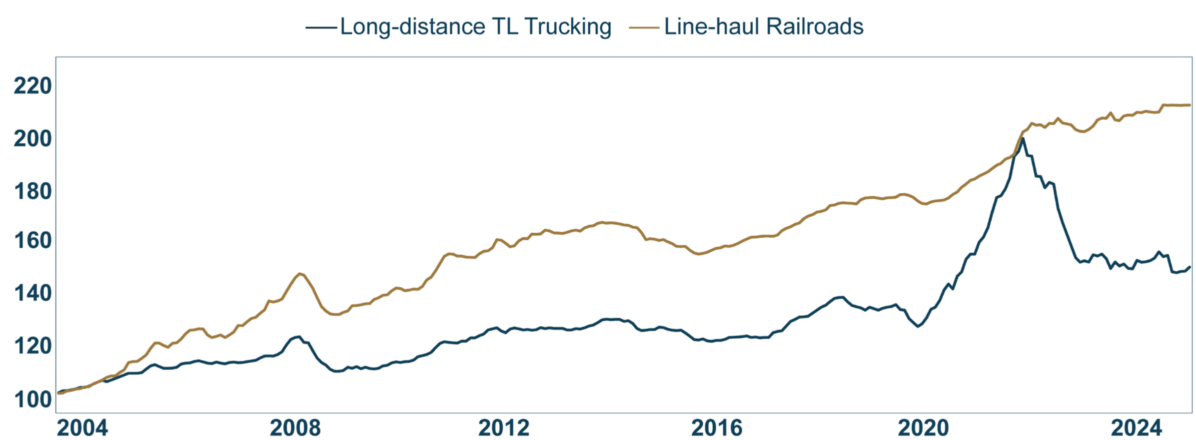
Hypothesis. Changes in rail freight costs have lower and shorter-lived pass-through to goods inflation than changes in truck freight costs. **Rationale**: trucking dominates final distribution where cost shocks are priced into shelves quickly; rail concentrates in long-haul bulk and intermediate flows where contracts, inventories, and planning horizons buffer volatility.

Testable implications. If this hypothesis holds, (i) the magnitude of pass-through from truck prices to goods inflation should exceed that from rail; and (ii) the timing should differ, with truck effects peaking faster and rail effects fading sooner.

[4] *Between January 2020 and January 2022, goods prices (cars, furniture, clothing) rose about 14%, while services prices (healthcare, education) increased by less than 6%, according to seasonally adjusted CPI data from the Bureau of Labor Statistics. The gap reflected how pandemic-era supply chain disruptions and freight costs disproportionately affected goods-producing sectors. By January 2023, goods prices were up 19% from January 2020 versus 14% for services, and the difference largely disappeared by year-end as demand for services recovered and higher wages in labor-intensive sectors fed into prices. See IMF Working Paper 2022/061 (DOI: 10.5089/9798400204685.001.A001) and FRBSF Economic Letter 2023-14 (June 20, 2023) for further analysis of global supply chain impacts on inflation.*

Empirical approach (preview). We relate monthly changes in long-distance truckload and line-haul rail price indices (PPIs) to monthly changes in goods inflation (commodity CPI), using log differences to focus on growth rather than levels. Full specifications (ARDL with lags up to 12 months), diagnostics, and sector extensions are detailed in the next section and Appendix B.[5]

***Figure 1:** Freight transportation PPIs by mode (seasonally adjusted), Jan. 2004–July 2025; monthly log differences.*[6]



Source: Bureau of Labor Statistics; seasonal adjustment performed by AAR.

[5] *We document stylized facts about the long-run trajectories of rail and trucking freight rates using Producer Price Index (PPI) data: long-distance truckload and line-haul rail. We use the PPI series for line-haul railroads rather than the broader rail transportation PPI, as the latter includes passenger rail transportation and spans a slightly shorter time series. We seasonally adjust the non-SA freight PPI series (rail and truck) using the X-13ARIMA-SEATS method to align them with seasonally adjusted commodity CPI.*

[6] *As mentioned in the previous footnote, both PPI series in the chart are seasonally adjusted using the standard X-13ARIMA-SEATS methodology developed by the U.S. Census Bureau. The original PPI data are sourced from the Bureau of Labor Statistics.*

Figure 1 shows truck prices spiking in 2020–22 while rail rose more modestly—evidence of rail's steadier costs.[7] Truck price growth spiked during 2020–2022, while rail rose more moderately—consistent with rail's historically steadier cost profile.[8] That pattern motivates the core question: do changes in truck prices transmit to goods inflation more, and faster, than changes in rail prices? The next section answers this empirically and then links the statistical results to operations (how resilience limits emergency logistics costs that raise pass-through).

Notably, over 2004–mid-2025, the level paths of the truck and rail Producer Price Indexes (PPIs)[9] differ and some may argue that from 2004 to mid-2025, truck freight rates increased less than rail freight rates in absolute terms, therefore rail price increases must have a higher pass-through to goods inflation in the broader economy. This is not correct: inflation pass-through is not solely about the magnitude of price changes. It's about how those changes ripple through the economy. Trucking costs tend to hit consumers quickly. Rail costs are absorbed more gradually, making rail a buffer against inflation. Moreover, put simply, trucking cost increases tend to be passed directly onto the prices of goods. If trucking gets more expensive, one is more likely to see that reflected in store prices quickly. Freight rail, on the other hand, does not have the same effect. When rail freight rates go up by the same percentage amount, the impact on consumer prices tends to be smaller. Rail freight rates are also more stable, which could also dampen expectations-driven pass-through.

In addition, from an economic theory perspective, when inflation hits, firms with higher fixed costs (e.g., infrastructure, equipment) and lower variable costs (e.g., fuel per ton-mile) are less sensitive to inflation in input prices, because the variable portion of their cost structure—the part that actually inflates—is smaller.

The next section presents the empirical Pass-Through Analysis, followed by sections that examine how rail's operational resilience, sectoral patterns, and efficiency gains reinforce its role as an inflation buffer.

---

[7] *Railroads operate under multiple competitive constraints, including rivalry among railroads, intermodal competition (especially from trucks and barges), product and geographic competition, and ongoing technological change. See Laurits R. Christensen Associates, Inc., A Study of Competition in the U.S. Freight Railroad Industry and Analysis of Proposals That Might Enhance Competition, Vol. 3, Revised Final Report (Nov. 2009); John Frittelli, Railroad Access and Competition Issues, Congressional Research Service (May 1, 2009); and Edward L. Fitzsimmons & Douglas W. Mallenby, "Market Power in the Railroad Industry," Journal of the Transportation Research Forum, Vol. 56, No. 2 (Spring 2002), pp. 67–75. The Surface Transportation Board may also sanction railroads found to engage in anticompetitive conduct or to charge unreasonable rates.*

[8] *To assess the intrinsic volatility of each series, we first remove long-term trends to isolate short-term fluctuations. After detrending the data in Figure 1, the calculated variances for rail and truck PPIs are 54 and 127, respectively, indicating that truck prices exhibit greater volatility. This approach ensures that our comparison reflects underlying price variability rather than cumulative or structural growth over time.*

[9] *PPI measures the average change over time in the selling prices received by domestic producers for their goods and services. In the next subsection, we document stylized facts about the long-run trajectories of rail and trucking freight rates using PPI data.*

Pass-Through Analysis

When transportation prices change, only part of that change reaches consumers. Economists call this pass-through. High pass-through means cost spikes show up quickly and visibly in the prices of goods; low pass-through means the supply chain absorbs more of the shock (via contracts, inventories, or mode switching), so less reaches the shelf.

This section quantifies how rail and truck cost changes transmit to goods inflation. We then use those results to interpret what we see operationally on the network in the next section.

Approach

We use monthly federal series from 1992:06–2025:07: the line-haul rail PPI, the long-distance truckload PPI, and goods inflation (commodity CPI). To study changes rather than long-run levels, each series is converted to monthly log differences. Because companies adjust over time—contracts reset, inventories rebalance, and routing shifts—we estimate Autoregressive Distributed Lag (ARDL) models that relate current and lagged freight-price growth to current goods inflation, allowing up to 12 months of lags; model selection follows the Akaike Information Criterion (AIC). We also estimate industry models for iron & steel, chemicals, plastics, and paper, informed by Freight Analysis Framework (FAF)[10] mode shares, to see where rail costs matter most. Robustness checks include alternative rail price indices (line-haul vs. broader rail PPI), an annual rail price proxy (revenue per ton-mile), diesel and crude controls, headline/core/core-goods CPI variants, and a COVID-era subsample. Full specifications, diagnostics (unit-root tests, lag selection), and bootstrap impulse responses (1,000 reps; 95% bands) are in **Appendix B**.

Headline result. A 10% increase in truck freight-rate growth is associated with +2.3% in goods inflation, while the same change in rail is +0.7%—roughly 3:1. Timing differs as well: truck pass-through tends to peak within 1–2 months, whereas rail's effect is smaller and fades faster. In the impulse-response analysis, a one-standard-deviation truck price shock raises goods inflation by ~0.25% and persists longer; a comparable rail shock is <0.1% and dissipates more quickly. These differences are statistically significant across specifications.

Economic interpretation. Trucking dominates final distribution, so cost changes flow quickly to retail pricing. Rail concentrates on bulk and intermediate goods over long distances, where contracts, inventory buffers, and planning horizons dilute the signal and slow transmission. The sector results align with this logic: in rail-reliant supply chains (e.g., iron & steel, chemicals), sensitivity to rail costs is higher than in the aggregate; sectors closer to retail

[10] *FAF is a comprehensive database that estimates freight flows among states and major metropolitan areas across all transportation modes.*

distribution show stronger links to trucking. Railroads' use of differential pricing—reflecting service needs, volumes, and cost structures—supports efficient allocation while helping preserve stability in these chains.

Robustness and perspective. The main result holds when we (i) replace the line-haul rail PPI with the broader rail-transportation PPI, (ii) switch to annual data using revenue/RTM as a rail price proxy, (iii) include diesel and crude controls, and (iv) substitute headline, core, or core-goods CPI for commodity CPI. Importantly, during the 2020–2022 extremes, truck pass-through remained large, while rail's remained muted—consistent with rail's upstream role and its superior fuel efficiency.

Figure 2: *Estimated pass-through: effect of a 10% increase in freight rate growth on goods inflation (ARDL; short-run and long-run impacts)*

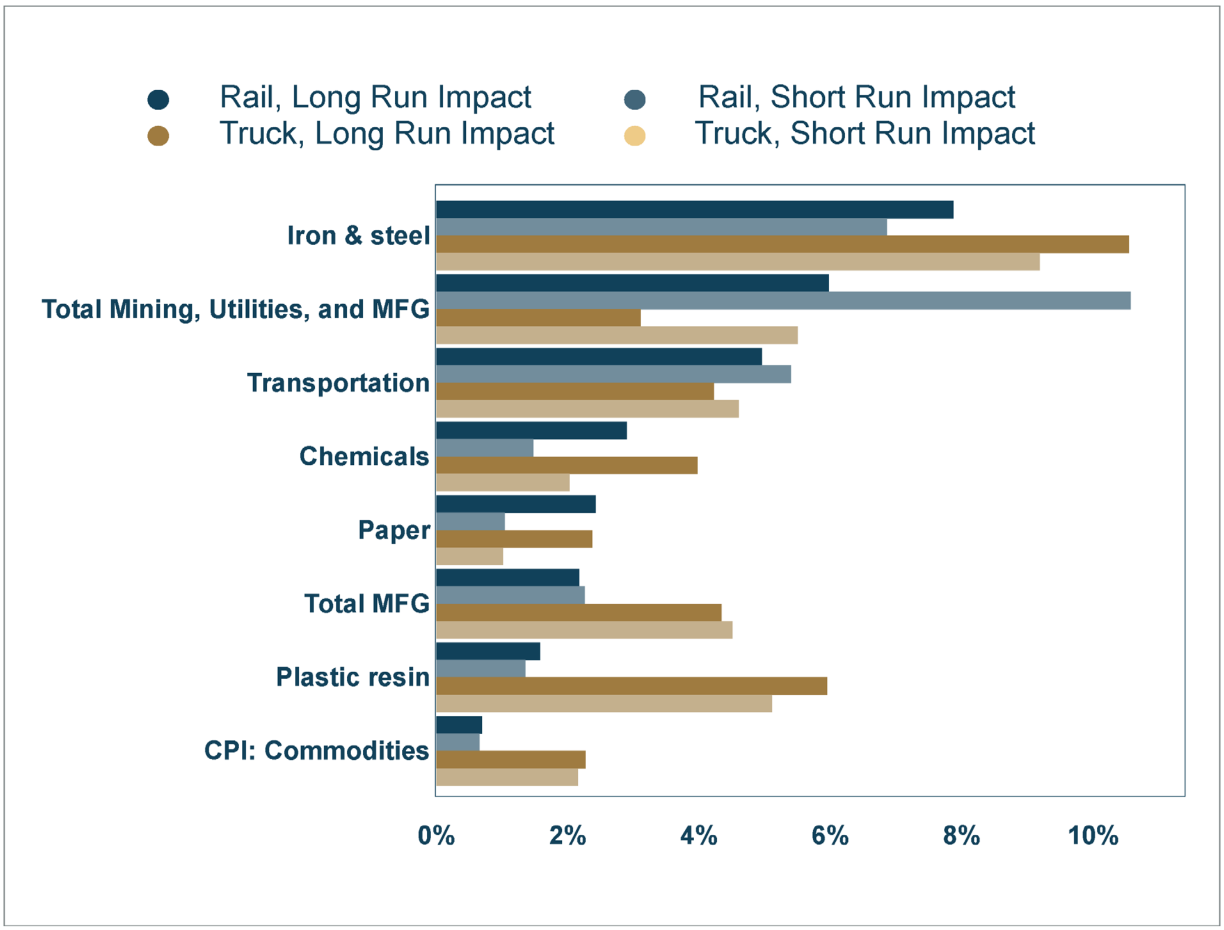


Figure 2 quantifies the effect of a 10% increase in rail or truck freight-rate inflation on the growth rate of goods prices. In other words, it maps transportation price growth to goods-price growth.[11]

The lighter bars show the short-run response—how goods prices move immediately after a 10% change in freight price growth. The darker bars show the long-run response—how prices adjust after firms and shippers have time to react (e.g., switching modes, renegotiating contracts, rebalancing inventories, or investing in alternatives). For trucking, pass-through peaks within 1–2 months, underscoring how quickly freight cost shocks can translate to shelf prices, especially in sectors with limited short-term flexibility. The rail response is smaller and fades faster.

In rail-reliant supply chains (e.g., iron & steel, chemicals), sensitivity to rail costs is naturally higher than in the aggregate. That reflects actual usage patterns and the role of differential pricing, which matches prices to service needs, volume, and cost structure while maintaining network efficiency. Keeping rail efficient in these sectors directly supports price stability. (Figure 2 illustrates these sector-specific impact).[12]

Some may argue that the passthrough is too high from rail freight rate increases to the growth rates of these industry PPIs. While rail freight rate increases may affect input costs in these industries, transportation typically represents a fraction of total production costs, and pricing decisions are influenced by a range of factors including global demand, energy prices, and labor costs. It is important to note that though the inflation pass-through of rail freight rate increases to the growth rates of these industry PPIs are higher than the average inflation passthrough of rail freight rate increases to the overall goods inflation, a lot of times this pass-through is still lower than the passthrough of truck freight rate increases to the growth rates of these industry PPIs, and that railroads continue to offer competitive rates compared to trucking, especially over long distances and for bulk commodities.

To assess how sudden changes in freight prices might affect goods inflation over time, we compute bootstrap impulse responses (1,000 simulations) and plot 95% confidence bands (Figure 3).[13]

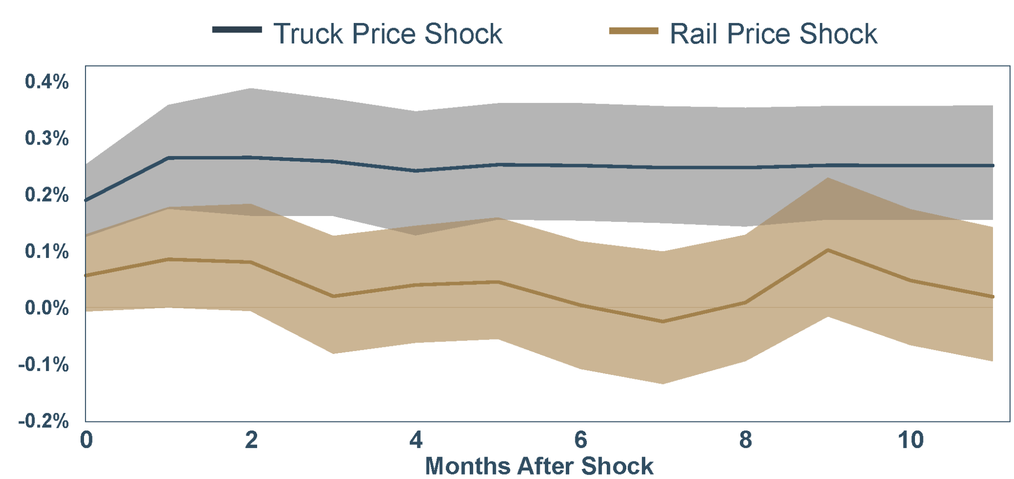
By aggregating the results across all simulations, we can estimate the average response of goods inflation to a one-standard-deviation shock in rail or truck freight rate growth, with 95% confidence intervals around that response. The shaded bands in Figure 3 show the range of uncertainty. The results provide a clear picture of how inflation evolves after sudden cost

[11] *We measure impacts on inflation rates (growth), not on price levels.*
[12] *For truck dominated industries, e.g., wood, cement and concrete manufacturing, as well as machinery and furniture manufacturing, we do see that trucking have even more inflation passthrough compared to freight rail.*
[13] *In technical terms, we use bootstrapped residuals data.*

increases: a sharp rise in truck freight rates leads to a larger and longer-lasting impact on goods inflation—about 0.25%—whereas an equivalent increase in rail rates produces a smaller and shorter-lived effect (< 0.1%).[14] These differences are statistically significant and robust across model specifications.

Taken together, the statistical evidence and sector results point to a consistent conclusion: truck cost shocks transmit to goods inflation more quickly and more strongly than rail cost shocks. Whether those shocks ultimately reach consumers depends on operations. When networks congest, shippers resort to emergency logistics—spot trucking, expediting, detention, and storage—which amplifies pass-through. When networks remain fluid or recover quickly, those costs are contained. The next section examines resilience—terminal dwell, corridor transit times, and corridor management—to show how operational performance prevents short-term disruptions from becoming broader price increases.

***Figure 3**: Impulse responses of goods inflation to a one-standard-deviation shock in truck vs. rail rate growth (bootstrap, 1,000 reps; 95% bands)*



Note: This chart shows what happens to commodity prices over the next year when shipping costs go up (specifically, following a one standard deviation increase in freight rail or long-distance truckload inflation at time t=0). The dark blue line tracks the impact of higher truck inflation, and the gold line shows the effect of higher rail inflation. The shaded areas show the range of uncertainty (95 percent confidence band). Overall, rising truck prices tend to push commodity prices up more than rising rail prices.

[14] *In technical terms, figure 3 presents the impulse response functions. An impulse response function shows how a shock to one variable affects other variables in an economic system over time, providing insight into the dynamic interdependencies within the system.*

Supply Chain Resilience (Rail Network Performance During Disruptions)

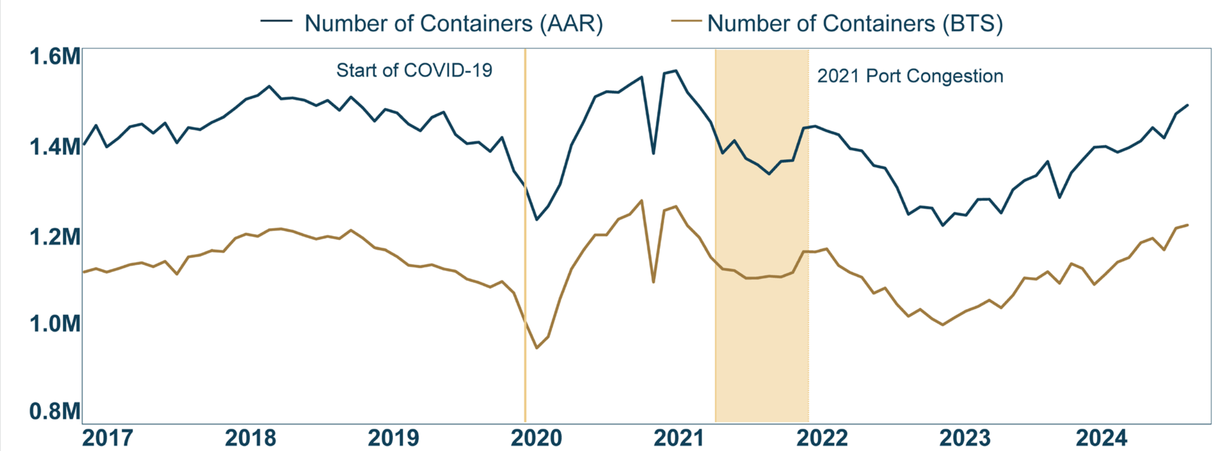
The pass-through analysis above suggests that rail freight rates contribute less to consumer price inflation than trucking freight rates. This inflation advantage comes not just from rail's pricing patterns, but also from its operational strength during disruption. A central factor is resilience: the ability of the rail network to maintain throughput, restore fluidity, and limit costly spillovers during shocks. We can explore rail intermodal[15] volume by performing a variance decomposition[16] using origin, destination, route, month, and year. This decomposition estimates that over 90% of the total variation in intermodal trips is attributable to route-level heterogeneity (most of the differences seen in intermodal trips come from the specific routes taken rather than time). This pattern is consistent with route-level demand drivers—such as commodity flows and network constraints—being the dominant source of variation in rail intermodal volumes.

One way rail mitigates cost spikes is through intermodal service, which combines rail and truck strengths. This flexibility is especially valuable in crises for avoiding expensive last-minute shipping alternatives that drive up prices. Intermodal transportation is the cleanest illustration of this resilience. By combining rail's efficiency for long-haul movement with trucking's flexibility at the first and last mile, intermodal services provide shippers with the ability to reallocate flows quickly and maintain continuity of supply. This design is particularly valuable in periods of stress, when avoiding costly substitutions or emergency shipments is critical to keeping prices stable. Figure 4 presents two consistent series of seasonally adjusted intermodal traffic—one from the Bureau of Transportation Statistics (BTS), covering the major U.S. Class I railroads,[17] and one from AAR that also includes all Canadian and Mexican carriers operating in the United States.[18]

---

[15] *Rail intermodal combines shipping containers and truck trailers transported by rail, often with truck or water transport at either end. It efficiently moves various goods, including retail products, industrial items like auto parts, and agricultural goods such as grain. For more details see: https://www.aar.org/issue/freight-rail-intermodal/*
[16] *A variance decomposition separates total variance into multiple parts to allow researchers to understand the importance of different components.*
[17] *(BNSF, CSX, NS, and UP). CN, CPKC, and GMXT operate in the U.S., but they do not report their U.S.-specific intermodal volumes separately and thus are excluded from the BTS data.*
[18] *Although they differ in levels, the series move almost identically, with a 96% correlation, and together they capture how the network absorbed shocks between 2017 and 2024.*

***Figure 4**: Seasonally Adjusted Freight Rail Intermodal Traffic, 2017-2024*



Source: AAR, BTS.

The trajectory over this period illustrates both volatility and adaptability. In 2019, volumes softened as trade tensions and slower industrial activity weighed on demand. In early 2020, the onset of the pandemic produced a sharp contraction, followed within months by a dramatic rebound as consumer spending shifted from services to goods. By late 2020 and early 2021, intermodal traffic reached record highs. The subsequent period, however, was marked by widespread congestion in 2021 and 2022, driven by port backlogs, warehouse shortages, chassis and drayage constraints, labor scarcity, and extreme weather. These bottlenecks raised operational metrics (such as dwell time and transit time) and risked costly mode shifts, amplifying inflationary pressures across the logistics system. By 2023 and 2024, as inventories normalized and capacity constraints eased, volumes returned to a more sustainable range and railroads reduced terminal dwell, restoring a more balanced and resilient operating environment.[19]

At the height of port congestion, more than 100 vessels were queued outside Los Angeles and Long Beach, with inland networks facing severe strain. Railroads responded with a range of measures designed to restore velocity. They metered flows into congested hubs (such as Chicago) to allow clearance, offered incentives for balanced container moves, returned stored equipment to service, coordinated closely with shippers on car supply, deployed new visibility tools, and accelerated workforce recruitment. These actions were not about eliminating disruption altogether—no mode could do that—but about preventing temporary bottlenecks

[19] A two-step regression using the variance composition supports the trends seen in the raw data, as well as an estimation of the coefficient of variation (CV). In our data, the CV went from 1-2% in 2018-19 (pre-pandemic), to 6-7% in 2020-21 (during the COVID-19 pandemic), and then returned to a lower, stable CV of 3-4% in 2022-23. CV is a statistical measure that indicates how variable or unstable the data are relative to the mean. A larger CV indicates more variability.

from cascading into system failures. In this way, railroads helped manage the instability and kept it from driving up shipping costs or causing broader system failures.

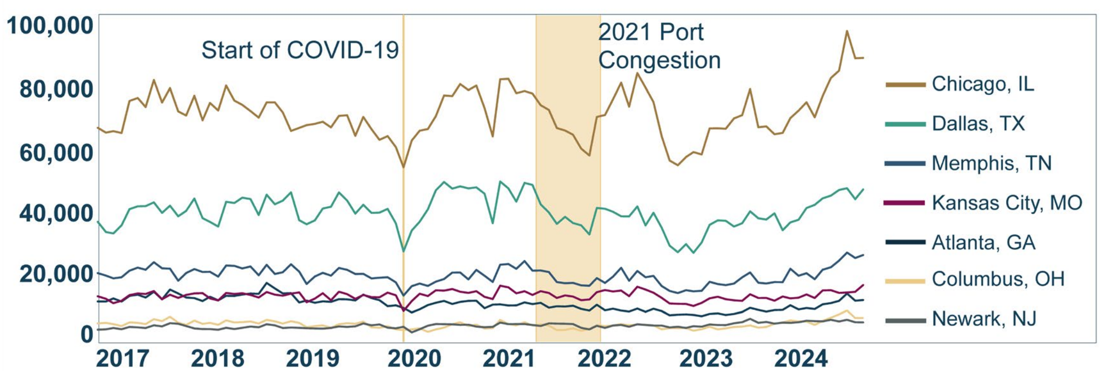
These patterns suggest that resilience at the network level becomes an inflation-relevant mechanism. In summary, railroads maintain throughput or quickly restore service, which blunts the impact of freight cost shocks. Fewer delays mean shippers don't incur extra costs (like re-routing to trucks or holding inventory), so there's less pressure to pass costs on as higher prices. This operational dimension reinforces the econometric evidence: rail contributes less to consumer price inflation not only because its rates are less volatile, but also because its network structure and resilience dampen the translation of shocks into final prices.

Freight rail's ability to restore throughput and maintain velocity during crises is not just operational—it's macroeconomic. By preventing bottlenecks from cascading into systemic cost increases, rail helps contain inflationary spillovers and stabilize supply chains.

Case Study: Los Angeles—Chicago Intermodal Corridor[20]

The Los Angeles–Chicago corridor links the largest West Coast gateways to the nation's largest inland hub. When this corridor slows, costs ripple nationwide. In other words, its stability is a key factor in whether West Coast delays spill over into higher costs for shippers and consumers in the interior. Figure 5 is consistent with the view that Los Angeles—Chicago's intermodal volume is outsized compared to other routes, underscoring that if this corridor clogs, the cost impacts will be far more widespread.

Figure 5*: Intermodal Movements originating in Los Angeles, top inland markets, 2017-2024*



Source: AAR.

[20] *For simplicity, Los Angeles refers to terminals in Los Angeles, Long Beach, San Bernardino, and City of Industry, CA.*

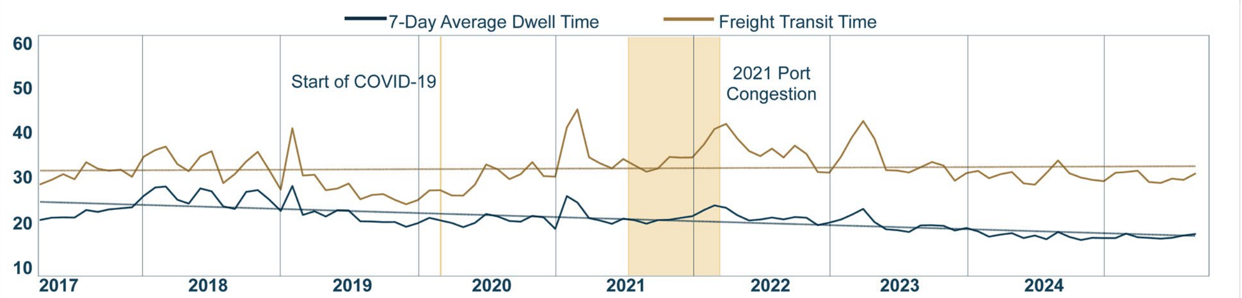
Table 1 summarizes key efficiency metrics—Chicago rail terminal dwell time (how long cars sit) and LA-Chicago intermodal rail transit time (how fast intermodal cars move)—by year. These indicators serve as proxies for logistical efficiency: when they rise, asset utilization worsens, prompting substitution to trucking and driving up costs; when they fall, cost pressures ease. In this way, these indicators link operational performance directly to broader cost pressures that can influence inflation through the costs that shippers eventually pass on to consumers. Lower is better.

Table 1: *Summary Statistics*[21]

	2019	2020	2021	2022	2023	2024
Median 7-Day Dwell Chicago (hours)	22.2	21.5	21.8	22.4	20.7	18.3
Average 7-Day Dwell Chicago (hours)	22.8	21.6	22.2	22.5	20.8	18.5
(standard deviation[22])	(2.4)	(1.1)	(2.2)	(1.3)	(2.1)	(1.4)
Median Transit LA to Chicago (Days)	4.3	4.2	6.1	6.6	4.2	4.6
Avg Transit LA to Chicago (Days)	4.4	4.2	6.1	6.1	4.2	4.6
(standard deviation)	(0.6)	(0.3)	(1.2)	(1.2)	(0.1)	(0.1)

The Surface Transportation Board (STB) tracks average weekly yard dwell time and freight transit hours by Class I railroad and specifically for the Chicago gateway, highlighting the importance of Chicago as a critical rail hub.[23] Figure 6 presents the 7-day average yard dwell and the 7-day average freight transit time for the Chicago gateway since mid-2017 reported by the STB.

Figure 6: *Chicago gateway: 7-Day Average yard Dwell (hours) and Freight Transit Time (hours), Apr. 2017 – July 2025*



Source: AAR analysis of STB data. Average 7-day dwell is weighted by volume at the terminals covered. Straight lines present linear trend lines of data.

[21] *Statistics are calculated using weighted terminal values (based on car inventories per terminal for the Chicago terminals covered).*
[22] *Standard deviation is a statistical measure that indicates the spread of the data–how far individual observations are from the average.*
[23] *https://www.stb.gov/reports-data/rail-service-data/*

Average transit time is helpful but less precise than dwell time because it does not normalize for origin/destination mix.

Dwell time, by contrast, offers a more consistent measure of terminal and operational performance. As shown in Figure 6, average dwell times at Chicago terminals, despite spikes in 2020 and 2021, trended downward since mid-2017 and remained below 20 hours for almost every week of 2024. This long-run improvement suggests that continual infrastructure and operational investments help prevent congestion shocks from persistently spilling into consumer prices. More recently, the data suggest continued improvement: The 7-day average dwell time at Chicago terminals was under 20 hours for 48 of the 52 weeks in 2024, with the most recent week over 20 hours being in April 2024. This reduction in dwell time occurred even with high volumes—a clear improvement in efficiency compared to the disruptions of 2020-21.[24]

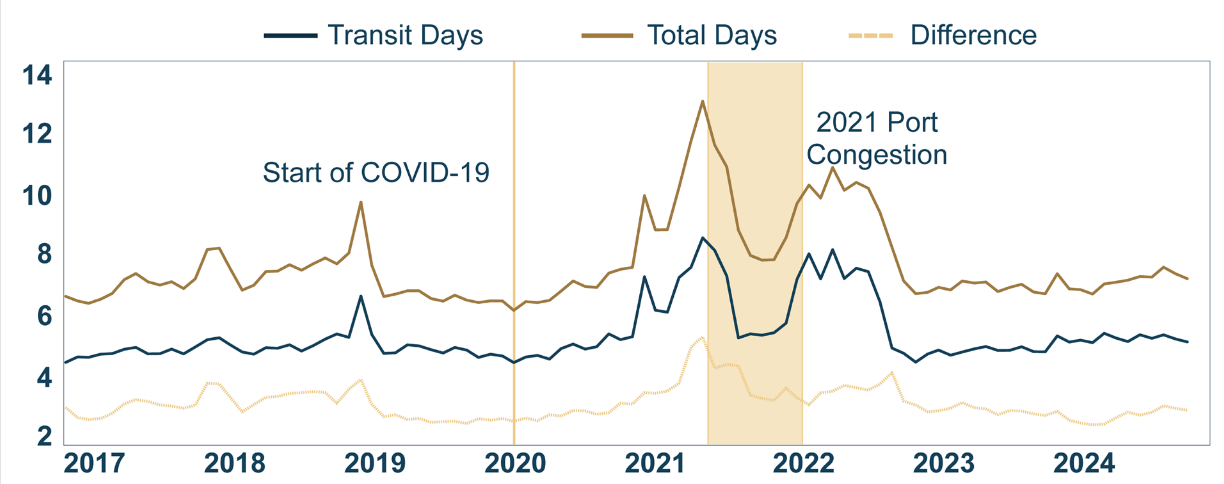
This is a critical metric: lower dwell enables faster asset turns, reduces the need for costly trucking substitutes and additional rail assets, while limiting detention and storage fees—all of which restrain cost pass-through. In short, keeping dwell times low helps prevent costly backlogs and mode shifts, which in turn reduces pushing those costs onto shippers and consumers.

Another useful indicator of efficiency is the average time it takes a container to travel from Los Angeles to Chicago. Even at the peak, intermodal rail transit time briefly rose to ~6 days in 2021 before returning to 4–5 days. That stability limited cost spillovers inland. Figure 7 shows three measures: the total intermodal trip duration from the moment the customer releases the shipment to the railroad until final delivery to the consignee; the transit time, which captures only the active intermodal rail movement, excluding time spent at origin and destination terminals; and the difference between the two measures. Total door-to-door intermodal trip time held around six to seven days except for similar spikes as seen by intermodal transit days during Covid-19 and port congestion.[25] Seeing that cross-country container transit time was kept near normal is suggestive of railroads attempting to limit the pass-through of West Coast bottlenecks into inland freight costs.

[24] *As a rough point of reference, the average rail terminal dwell time in the U.S. during the last week of 2024 was roughly 26 hours. The 7-day average yard dwell time during the same week in Chicago was 18.5 hours.*

[25] *Typically, it takes around 4-5 days of actual travel (6-7 days including terminal time) to move a container from Los Angelese to Chicago via rail. These times remained relatively steady, showing that the corridor continued to function reliably.*

Figure 7: *Los- Angeles – Chicago: average door-to-door intermodal trip duration vs. transit (days), 2017-2024*[26]



Source: AAR.

The LA-Chicago corridor illustrates how, even under stress, rail operations prevent short-term volatility from becoming systemic inflation by supporting improved efficiency and adaptation. This corridor functions as a shock absorber, underscoring why investments in rail capacity and terminal efficiency have macroeconomic payoffs.

Sector Insights (Agriculture, Energy/Industrial)

Beyond economy-wide trends, rail's cost stability and operational resilience show up clearly in specific supply chains. Two illustrative examples follow.

Agriculture (Grain, Food Exports)

The grain supply chain depends critically on long-haul rail. USDA data show rail carries roughly 25% of domestic grain tonnage and ~ 40 percent of grain exports.[27] Rail's strength is distance: more than 70 percent of rail grain ton-miles come from shipments exceeding 1,000 miles, and more than 95% from shipments exceeding 500 miles.[28] That long-haul efficiency is essential during peak harvest months, when demand surges and cost volatility risks rise.

[26] *Averages are at the month level (average number of days a trip took that ended in Chicago in February, for example).*
[27] *See Table 2 in the following USDA report https://www.ams.usda.gov/sites/default/files/media/TransportationofUSGrainsModalShare1984_2022.pdf*
[28] *See https://www.stb.gov/reports-data/reports-studies/*

Several features make planning and pricing challenging, and explain why rail programs that increase predictability matter:

- **High uncertainty:** Crop size varies by region and year; reliable estimates arrive late in the season, complicating forward planning.

- **Geographic dispersion**: Rail-served elevators and end markets are spread nationwide and overseas, increasing routing complexity.

- **Market timing**: Farmers and elevators dynamically choose between selling now vs. storing for later; synchronized moves can trigger sharp, simultaneous transportation demand.

- **Export-led swings**: Month-to-month changes in rail carloads of grain closely track export activity (see Figure 8).

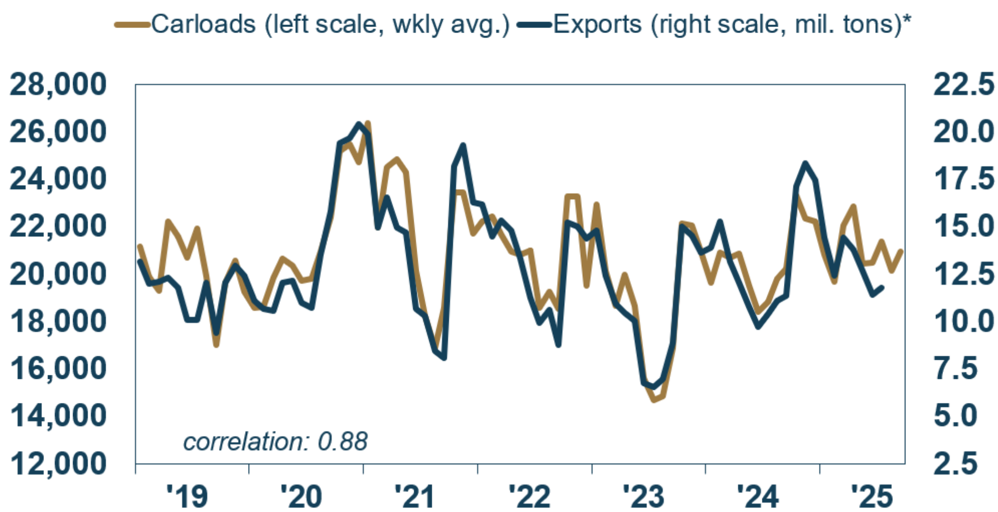
- **Seasonality:** Movements typically peak Sep-Jan and again in March, then drop back (see Figure 9).

Why rail programs matter. To absorb peaks without cascading costs, carriers use commercial tools that convert uncertainty into plan-able capacity:

- **Forward railcar commitments / car-supply auctions**: Shippers lock in cars for defined windows, aligning procurement, sales, and vessel schedules; this reduces demurrage, detention, and emergency trucking.

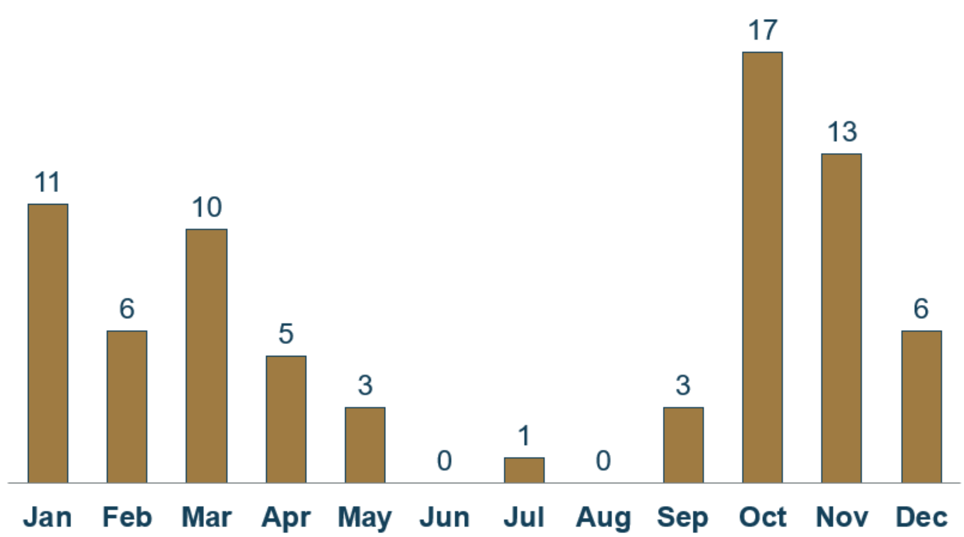
- **Shuttle train service:** Purpose-built origin/destination facilities enable rapid turns at lower unit costs and higher reliability, which creates economies of density that translate into steadier rates.

Figure 8: *U.S. Rail Carloads of Grain vs. U.S. Grain Exports: Jan. 2019 – Sept. 2025*



**Sum of barley, corn, oats, rice, rye, sorghum, soybeans, and wheat. Exports are through July 2025. Source: AAR, USDA*

Figure 9: *Number of Times a Month Has Been a Top-Three Month in a Given Year between 2000 and 2024 for Rail Grain Originations*



Note: Rail traffic figures on which this chart is based do not include the U.S. operations of Canadian and Mexican railroads.
Source: AAR.

Energy & Industrial Commodities (Coal)

Over the past two decades, the U.S. energy mix has shifted markedly. In 2024, U.S. coal production was 512 million tons—down 56 percent from the 2008 peak—and coal consumption fell to 411 million tons, its lowest level since 1962. This decline is due to a sharp reduction in coal's share of U.S. electricity generation, which fell from 52 percent in the 1990s to just 15 percent in 2024. Natural gas and renewables gained share at coal's expense.

Even so, coal remains critical in regions where alternative sources remain less accessible or where legacy infrastructure continues to rely on coal-fired generation. Railroads make this possible, serving as the vital link between concentrated coal production regions and the widespread areas where coal is consumed. In 2024, 73% of coal shipments reached their destination by rail, followed by barge (10%), conveyor (9%), and truck (8%).[29] Rail also accounts for the overwhelming majority of export coal movements.

Rail coal volumes have fallen sharply in line with demand. Class I railroads originated 2.97 million coal carloads in 2024, down 61% from their 2008 peak. Still, coal remains the largest single carload rail commodity, accounting for approximately 26% of non-intermodal U.S. rail volume in 2024. As is the case with grain, rail coal movements are largely long distance. In 2022, movements of at least 1,000 miles accounted for 66% of U.S. rail ton-miles; movements of at least 500 miles accounted for 89%.[30]

Coal's trajectory will continue to be shaped by market trends, regulation, and global demand. But even as its role in power generation shrinks, railroads maintain close communication with coal producers and utilities to match assets to customers' needs. Through technological advances, innovative service, competitive rates, and sustained reinvestment, railroads provide predictable delivery at scale—limiting emergency trucking, smoothing input costs, and buffering inflation across energy-intensive supply chains (including chemicals and other upstream industrial inputs).

---

[29] *Energy Information Administration, Annual Coal Distribution Report, available at https://www.eia.gov/coal/distribution/annual/.*
[30] *See https://www.stb.gov/reports-data/reports-studies/*

Fuel Efficiency and External Cost Savings

On average, Class I railroads move a ton of freight ~480-500 miles per gallon of fuel, roughly 3-4x the fuel efficiency of typical truck moves (Table 2), and a single train can replace several hundred trucks on U.S. highways.[31] This efficiency translates directly into lower fuel consumption, reducing exposure to oil price shocks and limiting inflationary spillovers.

Table 2 compares average fuel efficiency for freight rail and trucking. By this measure, rail is far ahead: it accounts for nearly 40 percent of U.S. long-distance ton-miles while being at least 4 times more fuel-efficient than trucking.

Table 2: *Freight Rail vs. Trucking Fuel Consumption*

	Freight Rail	Trucks
Mode share of ton-miles (% of U.S. long-distance freight)*	39%	36%
Fuel efficiency (revenue ton-miles per gallon of fuel)**	480-500	110-130

* Shipments >= 500 miles. Assumes 75% of "multi-modal" is rail and 25% is truck. Data from 2023.
** For rail, Class I average 2023; for truck, assumes 18 tons per truck and 6.61 miles per gallon.

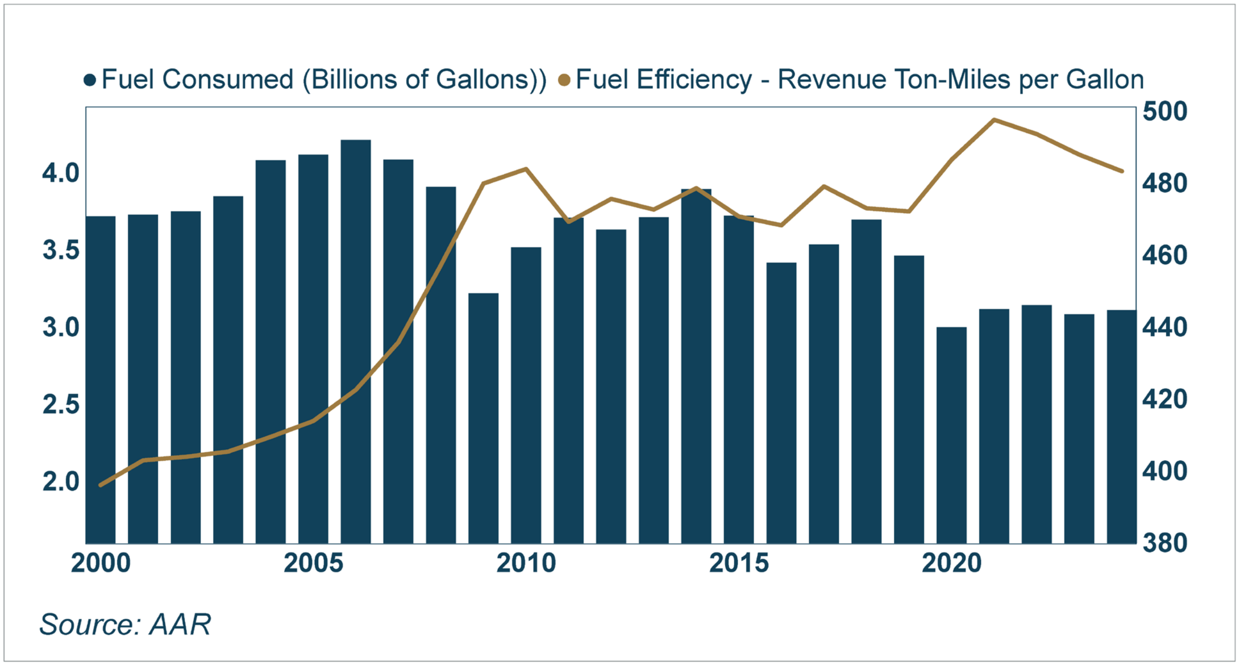
Source: BTS Freight Analysis Framework, American Transportation Research Institute

Figure 10 shows a 22 percent improvement in rail fuel efficiency between 2000 and 2024, underscoring how efficiency gains decoupled freight growth from fuel use. Each increment of improvement reduces exposure to oil price shocks, which are a common driver of consumer inflation. In this sense, freight rail's lower fuel intensity helps contain costs by anchoring logistics expenses and insulating supply chains from volatility.

---

[31] *For example, see:*
Herr, P., White, J. (2011). SURFACE FREIGHT TRANSPORTATION A Comparison of the Costs of Road, Rail, and Waterways Freight Shipments That Are Not Passed on to Consumers (GAO-11-134). Government Accountability Office.
Austin, D. (2015, March). Pricing freight transport to account for external costs.
EPA (2024) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022. U.S. Environmental Protection Agency, EPA 430-R-24-004. https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-andsinks-1990-2022.

Figure 10: *Rail Fuel Efficiency trend (revenue ton-miles per gallon) and total Fuel use, 2000 - 2024*



Railroads have achieved these gains through strategic investments in technologies and refined operating practices designed to improve fuel and operational efficiency, including:

- Deploying advanced fuel management systems that calculate optimal speeds for fuel savings; using distributed power to reduce horsepower needs; expanding idling-reduction technologies such as stop-start systems.

- Upgrading thousands of locomotives to improve operational and fuel efficiency; introducing lighter, higher capacity railcars; electrifying intermodal cranes and yard equipment to improve operational efficiency and reduce terminal operating costs.

- Conducting R&D on batteries, hydrogen, natural gas, and higher biofuel blends; testing hybrid locomotives and zero-emission technologies.

These initiatives yield economic co-benefits: improved fuel efficiency and smoother operations lower costs, enhance network fluidity, and reinforce rail's role in keeping freight costs—and therefore consumer prices—in check. They also reduce external costs such as congestion and pavement damage, which amount to billions.

In short, freight rail's fuel efficiency is central to its role as a macro stabilizer, strengthening the economy's resilience to shocks and helping to moderate inflationary pressures.

Hypothetical Modal Shift

To illustrate the potential economic gains from greater rail utilization, we modeled a 20% modal shift from truck to rail.[32] The results show substantial fuel, infrastructure, and inflation-related savings.

According to the Federal Highway Administration's 2023 Highway Statistics, combination trucks traveled about 196 billion miles that year.[33] Assume ~ 16.3% of those truck vehicle miles travelled were empty[34] and an 18-ton average payload per truck, this would mean shifting approximately 590 billion ton-miles from highways to railroads.

The impact would be substantial:

- ***Fuel Savings****:* About 3.54 billion gallons, translating to nearly $13 billion in cost savings—enough to power 5 million U.S. homes for a full year.[35]

- ***External Benefits***[36]*:* Extrapolating from standard CBO methods,[37] such a shift materially reduces pavement damage and congestion, yielding benefits worth $11 billion (2024 dollars). That's $11 billion in reduced public costs (road repairs, traffic delays)—effectively a significant economic boost just by optimizing mode choice.

In addition, shippers would likely see significant cost savings. According to data compiled by Wolfe Research, rail is typically 12%-14% cheaper than comparable truck movements.[38] Other sources estimate an even larger price advantage for rail.

---

[32] *This primarily involves Class 7 and Class 8 trucks, commonly referred to as heavy-duty trucks, as they represent the heaviest and most road-impacting vehicles in the commercial fleet. While most combination trucks fall under Class 8, some Class 7 vehicles may also qualify. To ensure inclusivity and consistency, we based our data collection and analysis on the "combination truck" classification rather than strict vehicle class.*

[33] *See Table VM-1 from https://www.fhwa.dot.gov/policyinformation/statistics/2023/*

[34] *See https://truckingresearch.org/2024/06/an-analysis-of-the-operational-costs-of-trucking-2024-update/, p. 38*

[35] *Based on the 2023 industry average and adjusting for a 15% reduction to account for circuity and drayage, railroads achieved an average of 414.8 ton-miles per gallon. Whereas trucks got 6.61 miles per gallon on average (see https://truckingresearch.org/2024/06/an-analysis-of-the-operational-costs-of-trucking-2024-update/, p. 39).*

[36] *As noted in Figure 11, benefits are defined as the cost savings from reduced pavement damage and traffic congestion. Accordingly, our estimate should be interpreted as a lower bound.*

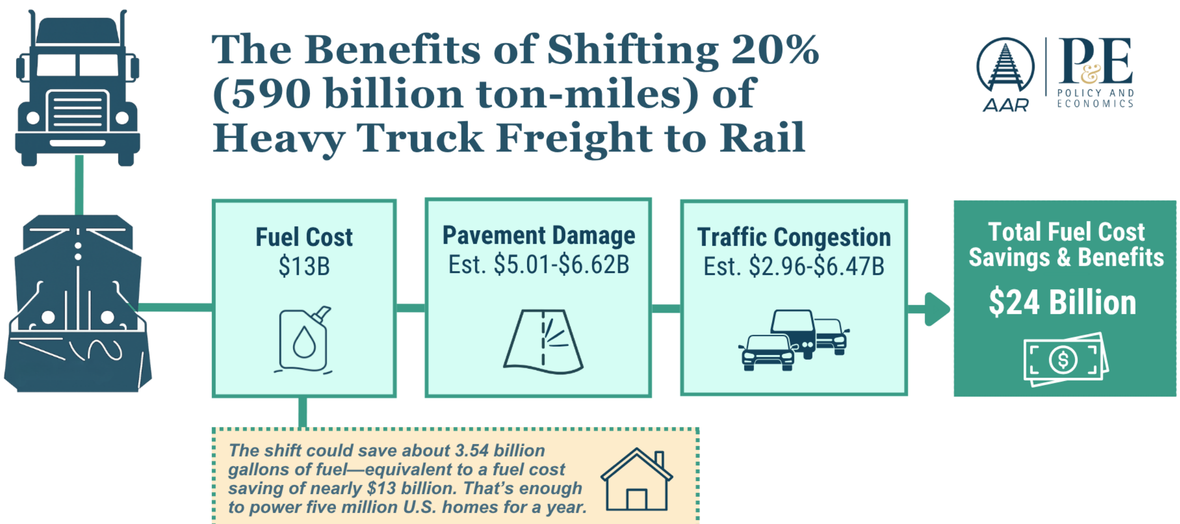
[37] *Austin, D. (2015, March). Pricing freight transport to account for external costs.*

[38] *Wolfe Research, The State of the Freight: 1Q Shipper Survey*, January 22, 2025. This is the most recent of periodic *surveys conducted by Wolfe Research of traffic managers at some of the largest shippers in the country regarding their pricing and volume expectations across all modes of freight.*

In short, even a modest diversion of freight to rail would yield multi-billion-dollar savings in fuel and infrastructure costs and noticeably lower shipping expenses—savings that ultimately translate into less inflationary pressure on goods.

These figures illustrate the magnitude of rail's potential as a cost stabilizer and efficiency driver in the freight system. Analysis shows that railroads can offer notable advantages in economic resilience, fuel savings, and infrastructure preservation. Their role in reducing inflation is just the beginning—expanded use of rail could deliver broad economic benefits.

Figure 11: *Illustrative 20% truck-to-rail modal shift: fuel saved and external costs avoided (2024 dollars)*



Note: In this analysis, benefits are defined as the cost savings from reduced pavement damage and traffic congestion. Since these are only two components of the broader set of external costs, readers should interpret the benefits presented here as a lower bound. Source: Estimates for pavement damage and traffic congestion are based on AAR calculation and the estimates in the 2015 March CBO study by Austin, David "Pricing freight transport to account for external costs." Fuel cost estimates are based on AAR calculation, American Transportation Research Institute "An Analysis of the operational costs of trucking" in 2024, as well as the motor fuel prices from the Bureau of Transportation Statistics. All dollar values are in 2024 dollars.

Conclusion

Freight rail is more than infrastructure—it's a strategic lever for cost control, inflation mitigation, and supply chain resilience. Its efficiency and reliability make it indispensable for U.S. competitiveness. The evidence is clear. On average, when trucking freight rates grow 10% faster, goods inflation tends to increase by 2.3%. In comparison, when rail freight rates grow 10% faster, goods inflation tends to rise by only 0.7%, on average. During the COVID-19 period, trucking costs fed directly into consumer prices, while rail costs did not. This statistical result is reinforced by operational evidence: rail networks, particularly intermodal corridors, maintained service continuity and restored throughput under stress, limiting the extent to which disruptions are translated into higher costs for shippers and households.

Freight rail's advantages extend beyond price stability. Railroads are three to four times more fuel-efficient than trucks, have steadily improved efficiency over the past two decades despite carrying a large share of freight. A 20% shift of long-haul heavy truck freight to rail would generate nearly $13 billion in annual fuel savings and about $11 billion in avoided congestion and pavement costs. These are not marginal savings—they are structural benefits that compound year after year.

The mechanisms are straightforward. Freight rail's fixed infrastructure and economies of scale make it inherently more cost-efficient, while its focus on bulk and intermediate goods insulates consumer prices from immediate shocks. By contrast, trucking's central role in last-mile and retail distribution means cost increases are passed through quickly and visibly to consumers. Together, these structural factors explain why greater use of rail acts as an inflation buffer.

The policy implications are direct. Preserving incentives for private rail investment is essential to moderate price pressures as freight demand grows. Targeted public investment in first- and last-mile connectors can ensure rail's resilience translates into benefits for shippers and consumers. Aligning infrastructure costs with actual usage would correct distortions that favor trucking and ensure freight moves on the most efficient mode. Streamlining permitting and adopting performance-based safety standards would accelerate capacity improvements and technology adoption without sacrificing safeguards.

In short, freight rail is a strategic national asset. It absorbs shocks, dampens inflation, and delivers long-term efficiency gains. Strengthening rail capacity and investment is not a niche concern—it is central to America's economic resilience, household price stability, and global competitiveness.

Appendix A: Background

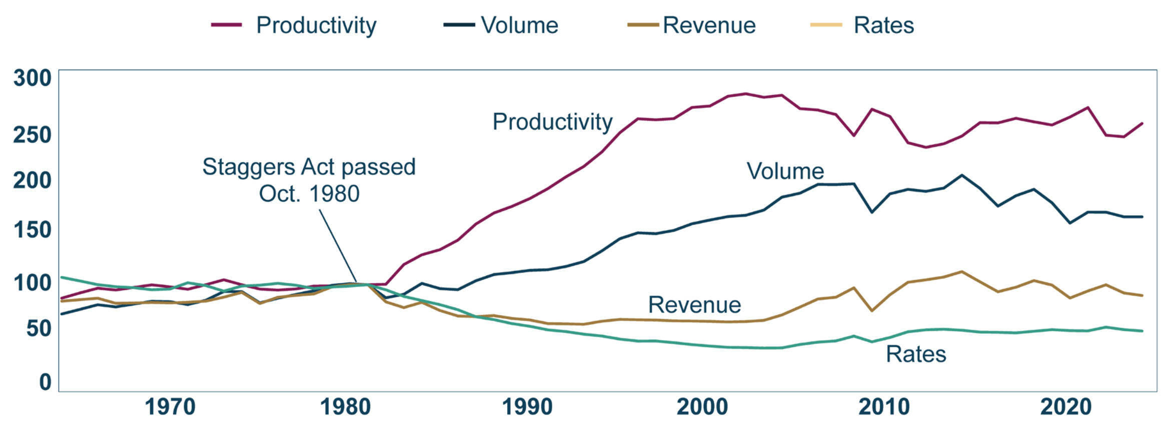
Staggers Act Deregulation and Freight Rail Performance

In the aftermath of the Staggers Act deregulation (1980), inflation-adjusted rail rates (as measured by revenue per ton-mile) roughly halved, even as freight volumes grew (Figure A1). During the same time, freight rail productivity surged, enabling railroads to reduce rates while improving service quality, safety, and profitability. These efficiency gains allowed rail carriers to pass savings on to customers, making rail a more cost-effective option over time.[39] In addition, from 1980 through 2024, U.S. freight railroads reinvested approximately $840 billion—around $1.4 trillion in today's dollars—of their own funds, on capital expenditures and maintenance expenses related to locomotives, freight cars, tracks, bridges, tunnels, and other infrastructure and equipment. Importantly, in contrast to freight railroads, trucks, airlines, and barges operate on highways, airways, and waterways that are overwhelmingly publicly funded. These sustained investments are crucial to maintaining a healthy and resilient freight rail network. As a result of these investments, the industry also saw substantial safety gains since 1980.

---

[39] There is a rich body of literature documenting freight rail's productivity gains, reduced rates, and improved service quality in the years immediately following the Staggers Act deregulation. Selected publications include:
Caves, D. W., Christensen, L. R., & Swanson, J. A. (2010). The Staggers Act, 30 years later: the authors of a 1981 article on railroad deregulation review their observations. Regulation, 33, 28.
Eakin, B. K., Bozzo, A. T., Meitzen, M. E., & Schoech, P. E. (2010). Railroad performance under the Staggers Act: deregulation revived the rail freight industry, with most of the gains going to shippers. Regulation, 33, 32.
Winston, C. (2005). The success of the Staggers rail act of 1980 (pp. 05-24). Washington, DC: AEI-Brookings Joint Center for Regulatory Studies.
Ellig, J. (2002). Railroad deregulation and consumer welfare. Journal of Regulatory Economics, 21(2), 143-167.
Surface Transportation Board, Office of Economics, Environmental Analysis, and Administration, Rail Rates Continue Multi-Year Decline (December 2000, 22 pages).
Larson, P. D., & Spraggins, H. B. (2000). The American railroad industry: Twenty years after staggers. Transportation Quarterly, 54(2).
Winston, C. (1998). US industry adjustment to economic deregulation. Journal of Economic Perspectives, 12(3), 89-110.
Wilson, W. W. (1997). Cost savings and productivity in the railroad industry. Journal of Regulatory Economics, 11(1), 21-40.
U.S. General Accounting Office, Railroad Regulation: Economic and Financial Impacts of the Staggers Rail Act of 1980. (GAO, May 1990, 72 pages).
For recent articles, see [Forty Years After Surface Freight Deregulation | The Regulatory Review]
Scribner, Marc. (2022). Freight Rail Deregulation: Past Experience and Future Reforms. Reasons Foundation.
Stout, K. (2025). Common Carrier Reforms to Promote a Healthy Market in the Rail Industry. International Center for Law and Economics, Issue Brief 2025-04-08.

Figure A1: *U.S. Freight Rail Performance from 1964 to 2024 (1981 = 100)*



Source: AAR. "Rates" is inflation-adjusted revenue per ton-mile. "Volume" is ton-miles. "Productivity" is revenue ton-miles per constant dollar operating expense. "Revenue" is operating Revenue in 2024, in U.S. dollars.

Appendix B: Data, Methodology, Transformations and Statistical Tests

Data and Methodology

We use a standard time-series approach to see how monthly changes in rail and truck costs relate to monthly changes in goods inflation. To quantify rail's inflation-buffering role, we conducted a rigorous econometric analysis using Autoregressive Distributed Lag (ARDL) models.[40] This approach allows us to isolate how freight cost shocks translate into consumer price inflation across modes.

We use monthly data (1992:06-2025:07) on PPI: line-haul rail and long-distance truckload trucking, our two primary variables of interest in the pass-through model,[41] to track inflation in freight transportation services. To examine how freight cost shocks may transmit to consumer prices, we incorporate seasonally adjusted commodity Consumer Price Index (CPI) data—that is, measures of goods inflation. Although services account for roughly three-fourths of the U.S.

---

[40] ARDL model is useful in this context because it can handle different types of data and lets us look at how price changes unfold over time. In technical terms, the ARDL model accommodates variables with mixed orders of integration, allows for dynamic lag structures, and provide robust estimates of both short-run dynamics and long-run equilibrium relationships. Admittedly, while the ARDL framework is commonly used in economic studies to explore impact and dynamic relationships, we acknowledge that it does not, on its own, establish causality. A more rigorous identification strategy—such as exploiting exogenous shocks to rail operating costs (e.g., regulatory changes)—would be required to make causal claims.

[41] A passthrough model measures how much an increase in one cost, such as freight costs, translates into higher prices for goods and services. In this paper, we focus on estimating how much rising freight costs contribute to increases in goods prices.

economy, we focus on commodity CPI because spending on goods is more relevant to the transportation sector than spending on services.[42]

We further utilize industry-level PPI data for sectors such as iron and steel, plastic resin, manufacturing, mining, and chemicals. Like the freight transportation PPI series, these industry-level PPIs are not seasonally adjusted. Therefore, we seasonally adjusted the PPI series using the standard X-13ARIMA-SEATS methodology developed by the U.S. Census Bureau. This adjustment helps isolate underlying trends by removing predictable seasonal effects, improving the interpretability of month-to-month changes in rail price dynamics.

Lastly, we use FAF data to understand mode shares by commodity. FAF ton-miles indicate how much freight is moved and how far, a good proxy for how much each mode is used in a sector.[43]

As mentioned above, our analysis uses monthly data from June 1992 to July 2025.[44] This time frame is chosen because it's the period when all the necessary data—rail and truck freight prices and goods inflation—are available.[45] For the industry-specific results, we use the longest period where both freight price data and the relevant industry price data are consistently reported.

Before running the model, we check the data for trends that could distort the results. Since the price series show long-term trends (non-stationarity[46]), we convert them into percentage changes from month to month (log-differences). This step helps ensure the model produces reliable and meaningful estimates.[47]

We estimate goods inflation as a function of current and past changes in rail and truck price indices.

---

[42] *Consistent with the inflation pass-through literature, we use the Commodity CPI to measure goods inflation rather than the PCE goods index for two reasons. First, PCE includes all personal consumption expenditures—both direct household spending and expenditures made on behalf of households by governments or nonprofits—while CPI reflects only out-of-pocket spending by urban consumers, aligning more closely with the consumer experience of inflation. Second, PCE's chain-weighted methodology adjusts expenditure weights monthly to account for substitution toward lower-priced goods, which can dampen measured inflation in categories with sharp price increases (such as transportation inputs). By contrast, CPI's fixed basket more fully captures these inflationary pressures.*
[43] *For this analysis, we used the most current version available at the time—FAF5.7.1. For more details, see https://www.bts.gov/faf.*
[44] *Please note that the BLS periodically revises its PPI series. The sample period used in this analysis spans from June 1992 to July 2025, and the data reflect values as of August 26, 2025.*
[45] *For example, the line-haul railroads PPI starts in January 1969, whereas the long-distance truckload freight PPI series starts in June 1992. Therefore, our baseline sample starts in June 1992.*
[46] *In technical terms, we conduct the unit root test, which is a statistical test used to check whether a time series is stationary or not, that is, whether its average and variance remain stable over time.*
[47] *In technical terms, we perform the unit root tests which indicate non-stationarity in the PPI level series; therefore, the data were log-differenced to ensure stationarity before estimating the ARDL model.*

Our empirical regression is specified as follows:

$$\boldsymbol{\pi_t = \alpha + \sum_{i=1}^{l} \gamma_i \cdot \pi_{t-i} + \sum_{i=0}^{l} \beta_i^{Rail} \cdot \omega_{t-i}^{Rail} + \sum_{i=0}^{l} \beta_i^{Truck} \cdot \omega_{t-i}^{Truck} + \varepsilon_t} \quad (1)$$

- $\boldsymbol{\pi_t}$ is the month-over-month log change in domestic goods prices, calculated as the difference in the natural logarithm of the commodity CPI between periods *t* and *t−1*.
- $\boldsymbol{\omega_t^{Rail}}$ and $\boldsymbol{\omega_t^{Truck}}$ represent the month-over-month log changes in the PPIs for line-haul railroads and long-distance truckload services, respectively.
- $\boldsymbol{\gamma_i}$ captures the persistence of goods inflation through its own lags.
- $\boldsymbol{\beta_i^{Rail}}$ and $\boldsymbol{\beta_i^{Truck}}$ measure the impact of rail and truck freight price inflation on goods inflation.
- $\boldsymbol{\alpha}$ is the constant term, representing the expected value of π_t when all explanatory variables and their lags are zero.
- $\boldsymbol{\varepsilon_t}$ is the error term.

Commodity CPI is a composite index that includes a broad array of goods, some of which are more rail-reliant than others. To explore this variation, we examine selected industries—such as iron and steel, plastic resins, chemicals, and paper—that are traditionally understood to be rail-reliant. We also consult FAF data to inform this selection. While the FAF data can be nuanced, it provides for each transportation mode ton-mile estimates, which measure the physical movement of goods—that is, how much weight is moved and how far. This offers a direct proxy for transportation service usage.[48]

We also run the same exercise for rail-reliant industries (iron & steel, chemicals, plastics, paper) to see where transport costs matter most. We estimate the following regression for each industry:

$$\boldsymbol{\omega_t^{(Industry\ k)} = \alpha + \sum_{i=0}^{l} \beta_i^{Rail} \cdot \omega_{t-i}^{Rail} + \sum_{i=0}^{l} \beta_i^{Truck} \cdot \omega_{t-i}^{Truck} + \varepsilon_t} \quad (2)$$

For each industry, we estimate a model that explains monthly changes in producer prices using rail and truck freight rate inflation, including their past values. We test different time lags to find the best fit and then report how sensitive prices are to transportation costs in both the short term and long term.

[48] In contrast, input-output (I-O) tables measure dollar flows, capturing how much industries spend on transportation services. While useful for economic impact analysis, I-O tables can mispresent modal dependence, especially for high-value, low-weight goods like electronics, which may appear more "dependent" simply due to their high shipping costs, not actual volume or modal usage. Therefore, the ton-mile estimates in the FAF data better reflect the physical reliance of industries on freight modes such as rail and truck, making it a more appropriate choice for analyzing modal dependence in the context of supply chain infrastructure.

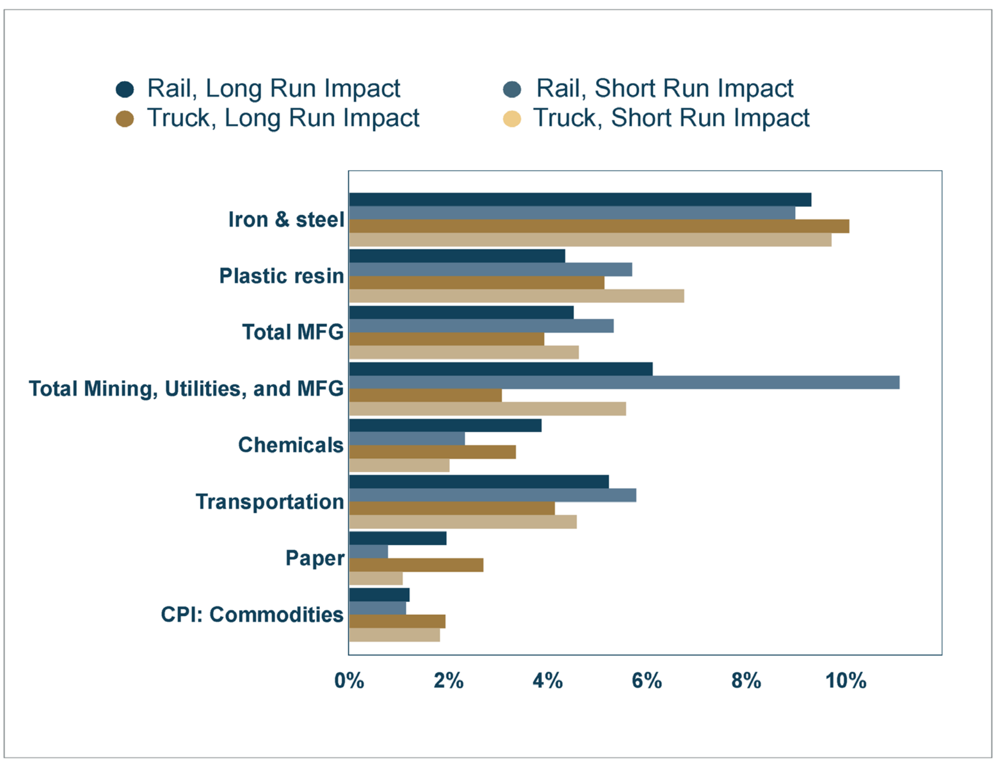
Robustness checks

To ensure the reliability of our findings, we tested multiple model specifications and alternative data sources. Those robustness checks support the view that rail's lower inflation pass-through is consistent across methodologies and timeframes.

In summary, results are robust to (i) alternative rail price indexes, (ii) annual frequency using revenue/RTM as a rail price proxy, (iii) controls for diesel and crude oil prices, and (iv) alternative CPI measures (headline, core, and core goods).

- *Alternative Rail Price Index:*
  - We replace the line-haul railroads PPI with the broader rail transportation PPI (which includes short line railroads and passenger transportation). We find virtually unchanged results (Figure B1), reinforcing that the lower pass-through of rail costs is not an artifact of the index we chose.

Figure B1: *Robustness Check Using Broader Rail Transportation PPI - Estimated pass-through: effect of a 10% increase in rail transportation rate growth on goods inflation (ARDL; short-run and long-run impacts)*



- We use annualized data instead of monthly PPI and CPI data, and proxy rail price inflation using annual rail revenue per ton-mile data tracked by AAR.[49] Alongside the annualized long-distance truckload PPI and goods inflation data from 1992 to 2024, we find consistent evidence that rail freight rate growth contributes to goods inflation—but to a significantly lesser extent than truck freight rate growth.

- *Pandemic-Era Analysis:* We isolate the COVID-19 pandemic period to examine whether the relationship between freight price inflation and goods inflation behaves differently under extreme supply chain disruptions. Notably, even amid extreme supply-chain disruptions in 2020–2022, higher rail price growth did not translate into higher consumer prices, whereas higher trucking freight rate growth clearly did.

  Some may argue that this finding is not surprising at all as surging truck rates during COVID-19 naturally contributed to inflation. However, as mentioned in the introduction, a rise in transportation costs alone doesn't automatically translate into inflation passthrough. It depends on how those costs ripple through the economy.

  If trucking gets more expensive, consumers will likely see that reflected in store prices quickly. Rail, on the other hand, often hauls bulk goods and intermediate inputs over long distances. A rise in rail rates tends not to show up as directly or immediately in retail prices. Trucking is more immediate and ubiquitous in final distribution, so its cost changes ripple through the economy faster and more visibly. Rail's stable long-haul role introduces less volatility into final consumer prices. These findings align with our earlier explanation: rail's efficiency and its focus on bulk inputs make it more resistant to turning cost increases into broad price hikes, whereas trucking has a larger footprint in CPI-sensitive retail distribution.

- *Alternative CPI Series:*
  - We test the model using headline and core CPI in place of commodity CPI.[50] Since services account for roughly three-fourths of the U.S. economy, and rail transportation is more closely tied to goods rather than services, we do not expect rail costs to significantly influence headline or core CPI. As expected, the results

---

[49] *It is worth noting that annualization significantly reduces our sample size and weakens statistical inference. Nevertheless, we perform a robustness check since rail revenue per ton-mile data is available annually.*

[50] *Some may argue that the CPI measures the overall price increase for final consumer goods and that given freight rail's heavily concentration in bulk and intermediate goods, the low elasticity of freight rail rate growth to goods inflation merely reflects a composition of goods that reach the CPI basket, not a structural inflation-taming role of freight rail in supply chain. However, we know that food (agricultural commodities), energy commodities, new and used vehicles, and durable goods consumption are all carried by freight rail (for example, as mentioned in the sector insights section, based on USDA data, freight rail accounts for nearly 25% of all grain shipments by tonnage and close to 40 percent of grain exports by tonnage). These categories are the main subcomponents of goods inflation (see CPI Inflation Contributions from Goods and Services - San Francisco Fed for more details).*

show that rail freight rate changes do not contribute meaningfully to either headline or core CPI.

- We test the model using core goods inflation, which excludes food and energy prices.[51] It shows a strong link to the growth rate of truck PPI than rail PPI, likely due to rail's relative energy efficiency. Results are robust when using commodity CPI, with controls for diesel and crude prices.[52]

Table B1: *Data Series Reference Table*

Category	Description	Series ID
Consumer Price Index (CPI)	Goods	CUSR0000SAC
	Goods excl. Food & Energy	CUSR0000SACL1E
	Headline	CPIAUCSL
	Core	CPILFESL
Producer Price Index (PPI)	Rail Transportation (All)	PCU482482
	Rail Transportation (Line-haul)	PCU482111482111
	Trucking (Long-distance Truckload)	PCU4841214841212
	Iron & Steel Industry	PCU331110331110
	Plastic Resin Industry	PCU325211325211
	Chemical Manufacturing Industry	PCU325325
	Paper Manufacturing Industry	PCU322322
	Total Manufacturing Industries	PCUOMFGOMFG
	Transportation Industries	PCUATRANSATRANS
	Total Mining, Utilities, and Manufacturing Industries	PCUAMUMAMUM
Fuel Price	Crude Oil (WTI)	WTISPLC
	Diesel	WPU057303

[51] *Food and energy prices can swing wildly due to bad weather, oil shocks, geopolitical events, or other events. Therefore, core goods inflation is thought to reflect the steadier, longer-term movement in prices more accurately than overall inflation.*
[52] *Some may note that while energy and food commodities are major users of rail transportation services, excluding these categories may allow us to better isolate the impact of freight costs on core goods inflation. However, part of rail's inflation advantage comes from using less fuel; if you mathematically filter out energy costs, you also filter out one reason rail is cheaper.*

Transformations and Tests

1. **Data Transformations**
   All series used in the model are seasonally adjusted. Most are pre-adjusted by the Bureau of Labor Statistics (BLS). For those not seasonally adjusted, we apply the standard X-13ARIMA-SEATS methodology developed by the U.S. Census Bureau to seasonally adjust them prior to modeling.

2. **Unit Root Tests**
   To assess stationarity, we conduct both the Augmented Dickey-Fuller (ADF) test and the Zivot-Andrews test at the 5% significance level. For series found to be non-stationary, we apply log-differencing and re-test to ensure all data used in the model are stationary.

3. **ARDL Lag Order Selection**
   Following standard practice in the economic literature, we use the Akaike Information Criterion (AIC) to determine the optimal lag length, considering up to 12 lags. In simpler terms, we use AIC to choose the best-fitting model while balancing the model fit and model complexity.

4. **Bootstrap Procedure**
   We implement a residual-based bootstrap approach, simulating the model 1,000 times to estimate the impulse response functions. Confidence intervals are reported at the 95% level. Specifically, we take the estimated ARDL model and obtain its residuals, resample the residuals with replacement to create synthetic error terms and generate synthetic time series by recursively applying the ARDL model using the bootstrapped residuals and re-estimate the IRFs for each bootstrap sample. Finally, we construct confidence intervals at 95% level from the distribution of bootstrapped IRFs.