

CSCMP'S ANNUAL
STATE OF LOGISTICS REPORT

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PRESENTED BY



Rental | Leasing | Logistics

Steep Grade Ahead



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Introduction

Welcome to the 29th Annual Council of Supply Chain Management Professionals (CSCMP) State of Logistics Report. This year's report identifies an industry rapidly changing to meet growing demand and costs, a context we summarize as Steep Grade Ahead.

After declining in 2016 for the first time since 2009, United States Business Logistics Costs (USBLC) returned to higher levels with a 6.2 percent increase YoY. The pace of spending increases became pronounced especially in Q4 of 2017, with the main drivers being a robust economic climate with growing demand, strong job market, rising wages, and while nothing new to the industry, significantly intensifying driver shortages.

As e-commerce continued double digit growth it fueled parcel services and other modes, namely motor carrier, rail, air freight, pipeline, freight forwarding, and 3PL—all faced capacity issues, and shippers and carriers were forced to be more innovative. Toward the end of 2017, over the road (OTR) became so heated that a significant percent of shippers modified their approach to freight bids to reduce exposure, looking to dedicated carriage or curtailing lane bidding to secure capacity. Nonetheless, reports of 5–15 percent cost increases in 2017 OTR were widespread.

With a healthy GDP growth of 2.9 percent, USBLC as a percentage of GDP in 2017 increased 10 basis points to 7.7 percent from a revised 7.6 percent in 2016. At the midpoint of 2018, we see signs of continued capacity constraints and sustained high prices. Unemployment is expected to remain low for the remainder of 2018 and consumer confidence reached its highest level since 2004. Retailers are confident about building higher inventories to meet demand, indicated by increases in both wholesale and retail inventories. In light of these developments we expect pressures on capacity and pricing to intensify. On the regulation front, the Joint Committee on Taxation estimates that GDP will be about 0.7 percent higher over the next decade as a result of the tax changes. Another shift that will affect the logistics industry is infrastructure spending as outlined by President Trump, which if executed as planned, will reduce the cost of transportation.

Similar in structure and content to last year's report, in this 29th edition we provide a narrative on macroeconomic factors affecting logistics, insights from industry leaders, discussion of important trends, detailed analysis of each major logistics sector, and a strategic assessment of the industry. This year, we added a special section on blockchain, a leading topic at every logistics event this past year. Also unchanged is the method of calculating USBLC, co-developed by A.T. Kearney, CSCMP, and a diverse set of industry partners.

Once again, A.T. Kearney is honored to partner with CSCMP and Penske Logistics in authoring the State of Logistics Report. In compiling the report, we collaborated with a long list of contributors, including but not limited to: Marc Althen, Penske Logistics; Ravi Shanker, Morgan Stanley; Brent Hutto, Truckstop.com; Steve Owens, IHSMarkit; and Daphne Carmeli, Deliv. We thank all of them, and others too numerous to name, for sharing their time and perspectives with us.

We hope the data and analysis in this report helps you plan your business strategy for 2018 and beyond. Please contact us with any questions or comments on the issues covered in the report or to suggest improvements that could make next year's edition more useful.

Executive Summary

Carriers take the wheel in 2017

A logistics industry that entered 2017 amid widespread uncertainty emerged with clear hallmarks of a strong seller's market. Demand revved up quickly, triggering freight capacity shortages that gave carriers leverage to raise prices after years of downward rate pressure. Fueling the turnaround were healthy economic growth, low unemployment, resurgent consumer spending, and anticipated benefits from tax cuts. These forces show no signs of easing in 2018, although new tariffs and fears of trade wars cloud the outlook.

United States Business Logistics Costs (USBLC) rose 6.2 percent last year, following a rare decline in 2016. Key indicators suggest the economic momentum that lifted GDP 2.9 percent last year will continue: retail and wholesale inventories are swelling, household spending is strengthening, and economists are predicting tax reform will add 70 basis points to GDP over the next decade. Among the biggest beneficiaries of tax changes are asset-heavy companies newly incented to spend money on overdue capital improvements, including projects addressing the logistics industry's "last mile" challenge.



Key indicators suggest the economic momentum that lifted GDP 2.9 percent last year will continue.

Developments in the second half of 2017 signaled that logistics executives face continuing capacity shortages and price increases, potentially complicated by trade tensions that could disrupt global supply chains. That's why we name this year's report *Steep Grade Ahead*. For company leaders, striking the right balance between price and risk has never been more important—or more difficult. Shippers looking to control logistics costs need creative thinking and innovation, and that means opportunity for start-ups and new technologies offering novel solutions to transportation challenges.

A closer look at 2017 numbers shows rising costs across all USBLC components: transportation, inventory carrying costs and other expenses (see figure 1 on page 3). Transportation led the way with a 7 percent overall increase, with costs running well above inflation for every shipping mode except waterborne freight. Private or dedicated fleet and rail saw the biggest hikes as shippers scrambled to lock up capacity—a trend also reflected in A.T. Kearney surveys.

The 9.5 percent rise in dedicated trucking costs paced an over-the-road sector that saw some of the sharpest spending increases last year. Parcel and express deliveries—a segment closely tied to eCommerce—slipped from last year's first place finish but still recorded a 7 percent increase. Even less-than-truckload motor freight, where costs have dropped steadily in recent years, notched a 6.6 percent rise. Elsewhere, energy-sensitive pipelines and railroads saw shipping volumes and rates climb as oil prices rose from historically low levels.

Figure 1
US business logistics costs increased in 2017 after falling in 2016

US business logistics costs \$ billion	2017	YoY 17/16	5-yr CAGR
Transportation costs			
Full truckload	289.4	6.4%	4.8%
Less-than-truckload	62.4	6.6%	-2.1%
Private or dedicated	289.6	9.5%	6.8%
Motor carriers	641.4	7.8%	4.8%
Parcel	99.0	7.0%	7.9%
Carload	59.0	7.3%	-0.5%
Intermodal	21.4	10.7%	2.6%
Rail	80.5	8.2%	0.3%
Air freight (includes domestic, import, export, cargo, and express)	67.2	3.1%	1.5%
Water (includes domestic, import, and export)	41.0	1.1%	-0.4%
Pipeline	36.4	5.8%	5.8%
Subtotal	965.5	7.0%	4.2%
Inventory carrying costs			
Storage	148.0	4.2%	3.1%
Financial cost (WACC x total business inventory)	151.6	5.0%	-1.0%
Other (obsolescence, shrinkage, insurance, handling, others)	128.4	4.6%	0.9%
Subtotal	428.0	4.6%	0.9%
Other costs			
Carriers' support activities	50.5	3.9%	4.8%
Shippers' administrative costs	50.7	6.0%	4.9%
Subtotal	101.2	4.9%	4.9%
Total US business logistics costs	1,494.7	6.2%	3.2%

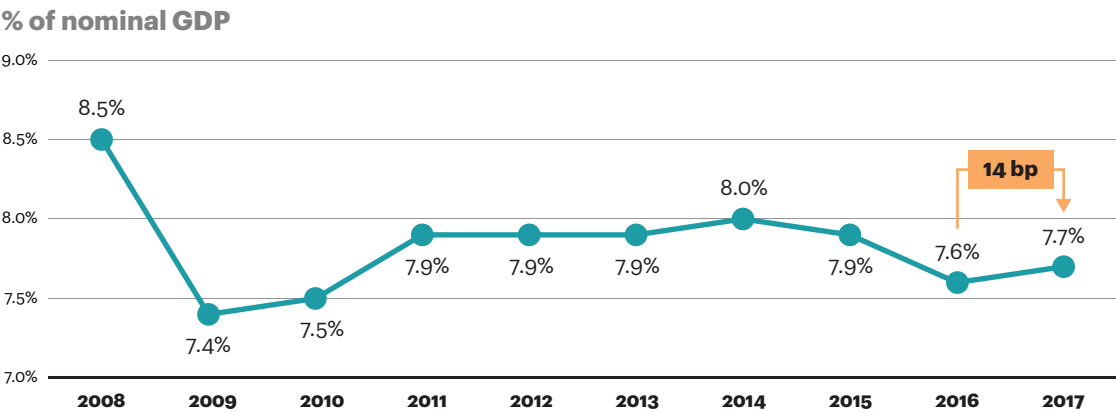
Notes: YoY is year-on-year. WACC is weighted average cost of capital.
 Sources: CSCMP's 29th Annual State of Logistics Report; A.T. Kearney analysis

Strong demand and higher interest rates also lifted the cost of carrying inventory last year. Inventory financing expenses rose 5.0 percent as average capital costs increased 6 basis points, and storage expenditures increased 4.2 percent. These figures mark a sharp acceleration from 0.7 percent inventory cost growth in 2016.

In another sign of possible overheating, logistics’ share of overall economic output increased. Total USBLC rose to 7.7 percent of GDP from 7.6 percent in 2016 (see figure 2 on page 4).

Much of the action in logistics last year revolved around e-commerce, which produced another year of double-digit volume growth and rising consumer expectations. Amazon continues to raise the bar, conditioning shoppers to expect same-day delivery while forcing rivals and logistics providers to play catch-up. As delivery windows shrink, covering the “last mile” to

Figure 2
Business logistics costs have increased to 7.7 percent of GDP



Source: A.T. Kearney analysis

customers’ homes has become a critical and costly priority. Seeking efficient solutions, shippers are testing innovations such as storage lockers, click and collect, crowdsourced delivery, and Amazon’s Pantry. But there’s no denying the need for significant investment in last-mile delivery infrastructure. Already, carriers and warehouse operators that benefit from rising e-commerce shipments are investing heavily in reconfiguring their networks to meet tighter delivery requirements. Before long, infrastructure costs may become a drag on e-commerce growth, and a potential advantage for brick-and-mortar retailers whose stores can double as delivery nodes.

Demand outpaces supply in every sector

No sector saw more change last year than motor freight, where severe capacity pressures sparked sharp rate hikes. Carriers gained pricing power as demand rose and electronic logging mandates exacerbated driver shortages. Trucking shares took off, paving the way for Schneider National’s IPO and megamergers including Knight-Swift and Heartland-Interstate. Meanwhile, new technologies such as Tesla’s electric truck concept offered hope for future efficiency gains.

Railroad rates and shipping volumes increased on the back of robust economic growth and truck capacity shortages. As cargo shifted to rail from trucks, railroads were able to raise prices sharply, reversing a 2016 decline. Productivity also improved as more Class 1 railroads embraced “precision railroading” principles.

A similar story played out in warehousing, which saw strong demand, tighter capacity, higher labor costs, and rising rates. Customers seeking cost flexibility drove demand for “pop-up” warehouses, while warehouse operators turned to automation amid tight labor markets and higher volumes. Robots and other automated systems promise to help warehouses boost productivity, meet tight e-commerce lead times, and manage growing “safety stocks” and proliferating SKUs.

Increases in time-sensitive shipments lifted air freight volumes 9 percent, while air cargo capacity rose just 3 percent. Demand pressures are driving adoption of new technologies such as electronic air waybills (e-AWBs) and real-time tracking in an industry traditionally slow to innovate. Looking forward, air freight volume growth is expected to moderate to 4-5 percent, more closely matching capacity growth.

Water shippers capitalized on lax pricing discipline among carriers to negotiate 2018 contracts at or below last year's rates. Industry fundamentals are expected to balance out this year, with higher fuel prices likely to boost shipping costs. Ultimately, capacity and pricing discipline will determine whether carriers or shippers benefit the most from strong economic growth.

In 3PL, customer-vendor relationships still focus on short term cost-cutting, rather than long-term strategic partnerships with advantages for both sides. Technologies underpinning the fourth industrial revolution may encourage such partnerships.

Freight forwarders face a choice between transformation or disintermediation. Disruptive start-ups are moving along a digital-to-physical path that's less arduous than the physical-to-digital challenge confronting established forwarders. Successful incumbents will emphasize capabilities that are not easily automated or commoditized.

In the pipeline sector, surging oil and gas production is boosting rates, pinching capacity and attracting new capital. Private equity firms are among the leading investors in new infrastructure projects.

This year's report adds a section on blockchain, the secure ledger system with potential to transform logistics. Over time, "smart contracts" enabled by blockchain could increase reliability, accelerate processes, and reduce costs across the supply chain. But first, the industry must agree on common standards, invest in the necessary technology, and demonstrate blockchain's benefits in "proof-of-concept" tests.

Investment in new logistics technologies rose last year, lifting startup activity to the highest levels in recent history. Technological advances are improving efficiency in sectors such as warehousing, parcel delivery, and motor freight. Innovation also spawned new business models throughout the industry.

2018: Five trends lead to one scenario

Looking ahead, we expect five trends to shape the future of logistics:

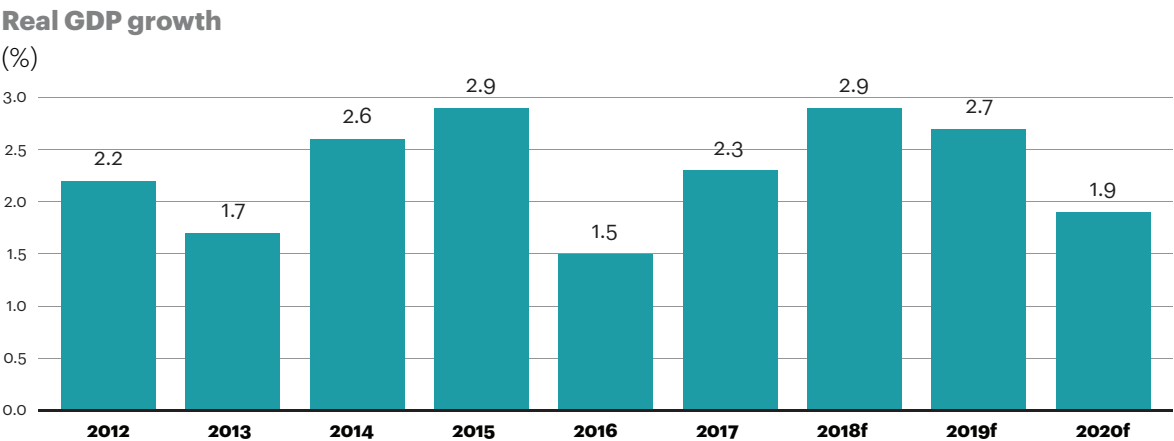
- Robust macroeconomic growth rooted in a strong labor market and recent tax cuts will boost demand for logistics.
- Rising interest rates, a tighter labor market, and higher fuel prices will raise logistics costs.
- Robust demand patterns and new competitors will challenge old business models.
- A fully digital, connected, and flexible supply chain optimized for e-commerce and last-mile, same-day delivery will become essential.
- The next-generation supply chain will improve fulfillment and drive efficiency through technologies such as big data and predictive analytics, artificial intelligence, robotics, crowdsourcing, and electric and autonomous vehicles.

A year ago, uncertainty raised four possible scenarios for logistics. This year, we foresee only one: a steep grade ahead. Carriers are in control as demand outstrips supply, while shippers try to "create capacity" by improving efficiency wherever possible. Paradoxically, rising e-commerce volumes will shift attention to the supply chain from digital initiatives. Companies that recognize and capitalize on this trend will succeed, with smart technology investments and astute strategic choices separating winners from losers.

Macroeconomics: Strong Economic Growth Lifts Demand and Costs

Last year we argued that the US logistics industry was accelerating into uncertainty, based on conflicting macroeconomic signals. On the one hand, soft economic data such as business and consumer confidence showed strength. On the other, hard data such as business inventory-to-sales ratios flashed warning signs. We now know that the soft data won out. Economic growth revved up last year, contributing to capacity shortages and price inflation. The short-term outlook looks much the same. The International Monetary Fund projects economic growth of 2.9 percent in the United States this year, up from 2.3 percent in 2017 (see figure 3).

Figure 3
US economic growth will be robust in the near term



Sources: International Monetary Fund; A.T. Kearney analysis

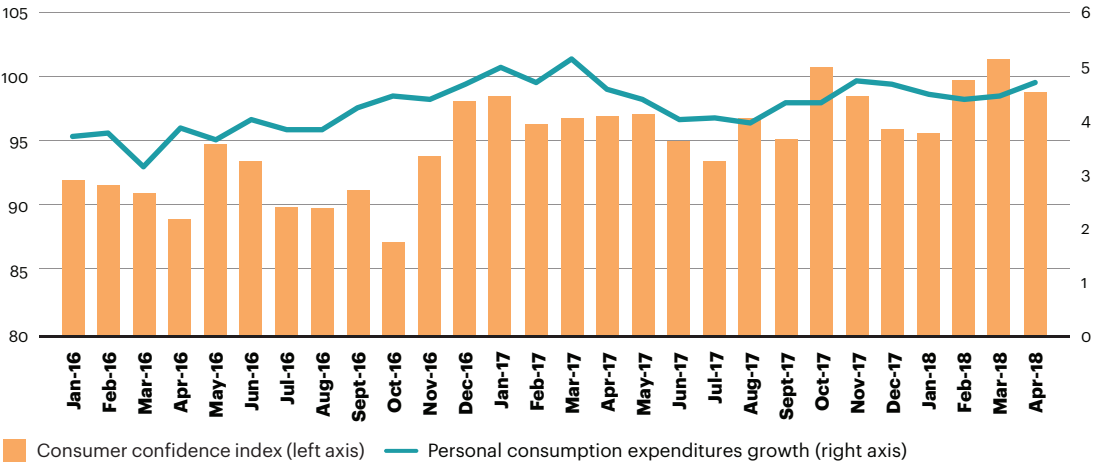
Longer-term economic prospects are harder to forecast, as government policy and market dynamics can change dramatically. For instance, equities have turned volatile after a steady nine-year rise, thanks to fears of a trade war, waning confidence in leading technology companies, and the Fed’s moves to raise interest rates. Under current policies, economic growth is expected to remain strong for the next two to three years before slowing as short-term tax breaks expire, interest rates rise, and widening deficits force government to cut spending.

Today’s robust economic climate partly reflects healthy consumer spending driven by a strong job market and modestly rising wages. US unemployment will remain low in 2018, supporting more wage growth and household spending power. In March 2018, consumer confidence reached its highest level since January 2004, according to the University of Michigan (see figure 4 on page 7). Even as consumer spending growth declined in the first quarter of 2018, businesses displayed optimism by building inventory. For instance, Best Buy recently attributed its strong first quarter performance to higher inventory levels that enabled it to better meet consumer demand. Wholesale inventories increased 1.0 percent in February—the biggest monthly increase since October 2013—while retail inventories rose 0.4 percent.

Households are not the only source of growth. As free-spending consumers drove demand for imports, the depreciating US dollar boosted exports. The Economist Intelligence Unit forecasts

Figure 4
Household spending trends are relatively strong

Consumer confidence and personal consumption expenditures growth
(Index value, year-over-year %)



Sources: University of Michigan, US Federal Reserve; A.T. Kearney analysis

the second straight year of 3 percent US export growth. Investment, already strengthening, could grow even faster with the recently introduced business tax cuts. Most economists predict GDP gains from tax reform will occur in the first five years or so, with benefits fading (or even reversing) after 2025. Economists differ about how much the tax cuts will stimulate the economy, but the Joint Committee on Taxation (the official tax legislation analyst for Congress) estimates that GDP will be about 0.7 percent higher over the next decade as a result of the tax changes.

Business investment is one of the areas where economists expect the biggest boost from tax reform. The new tax law allows businesses to deduct the full price of new equipment (up to \$1 million) and write off 100 percent of the depreciation of new and used equipment. This will enable logistics firms to upgrade and expand their capital stock more cheaply than in the past. Asset-heavy businesses such as railroads and trucking companies stand to reap significant benefits from these provisions. For example, UPS announced plans to invest \$7 billion in capital projects, such as its fleet, facilities, and IT, over the next three years as a result of the tax code changes.

The new tax law also may prompt some logistics firms to reconsider their choice of business entity. One of the sectors likely to see changes is trucking, where many firms are currently structured as S corporations (pass-through businesses). The tax legislation changes the calculation of S corporation deductions while cutting the C corporation tax rate to 21 percent from 35 percent. Some trucking companies may be able to reduce their tax bills by switching to C status.

Another potential policy shift that would directly affect the logistics industry is greater infrastructure spending. The American Society of Civil Engineers estimates that the United States needs to invest \$4.6 trillion in roads, bridges, ports, and other transportation infrastructure by 2025. President Trump outlined a \$1.5 trillion 10-year infrastructure plan during his 2018 State of the Union Address—\$500 billion more than had ever been discussed publicly. The plan calls for \$200 billion in federal funding, with the remaining \$1.3 trillion to come from private investors (including from foreign entities), states, and localities. However, some economists and policy-makers doubt \$200 billion in federal money would leverage \$1.5 trillion in total investment.

Political obstacles also stand in the way, with several Republican leaders in Congress openly questioning whether there will be time to advance comprehensive infrastructure legislation in 2018. At best, large-scale infrastructure funding isn't likely to arrive until late 2019.

Despite the dim prospects for a major infrastructure bill in the near term, investment will increase this year. The omnibus spending bill for the federal government through September 2018 includes new infrastructure spending, and the Department of Transportation's discretionary budget has increased by \$8.7 billion to \$27.3 billion. Programs in line for additional dollars include TIGER grants for infrastructure projects, FAST Act federal/state partnership repair grants, and the Airport Improvement Program for smaller airports. The Department of Transportation also said it will shift \$211 million in TIGER grant funding to rural infrastructure projects.

In the short term, then, logistics providers should not expect a sweeping modernization of US infrastructure. Therefore, the United States' score of 5.9 on overall infrastructure quality in the World Economic Forum's Global Competitiveness Report—behind the Netherlands at 6.2, but ahead of Spain at 5.5—is likely to persist. Modest upgrades in road, rail, and airport infrastructure are likely in the near to medium term. As improvement projects move forward, logistics providers would face delays on affected routes. Once the new infrastructure is online, however, travel time and costs related to wear and tear should decline. But without broader infrastructure investments, such expenses will burden logistics firms for the foreseeable future.



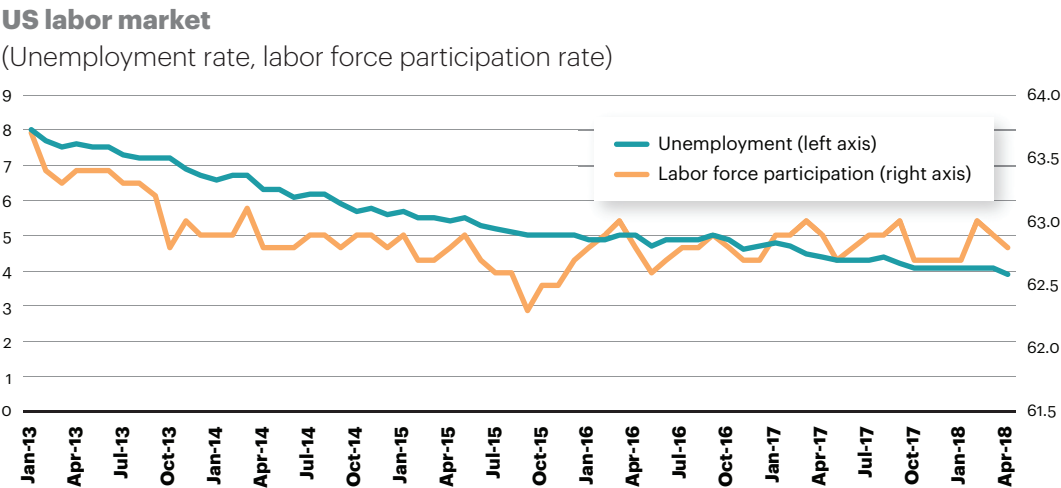
Under current policies, economic growth is likely to remain strong for the next two to three years.

Monetary policy is another short-term variable facing logistics firms. Inflation hit the US Federal Reserve's 2 percent target in March for the first time in more than a year and remained at that level in April, leading to a broad consensus that the Fed will continue hiking interest rates. Chairman Jay Powell indicated as much in the Federal Open Markets Committee (FOMC) meeting in mid-June. Announcing another 0.25 basis point increase, he indicated that more rate increases are likely in 2018 because "the economy is doing very well." Such gradual tightening should support continued economic expansion while minimizing the risk of over-correcting for historically low interest rates.

Higher interest rates mean higher capital costs for logistics firms. Aswath Damodaran, professor of finance at New York University's Stern School of Business, calculates that US transportation firms were paying an average of 3.9 percent to borrow money in January 2018, up from 3.5 percent a year earlier. Over the same period, however, transportation companies saw the cost of equity financing drop to 7.2 percent from 8.2 percent. (These figures compare to a 3.9 percent cost of debt and 7.5 percent cost of equity for all companies in January 2018.) As interest rates rise, debt and equity costs likely will continue converging, necessitating more careful consideration of capital-raising options. Borrowing costs will rise for companies looking to finance equipment purchases or refinance debt, and those with variable-rate credit lines. Carriers could also see the cost of asset ownership increase as higher rates drive up debt service expense and operating lease payments. Shippers will feel similar effects: inventory costs will rise with interest rates, prompting shippers to hold less inventory as they try to minimize working capital costs.

Economic growth is driving up labor costs, too. Although this challenge is nothing new for logistics providers, it has become more acute. After hovering just below 5 percent for the past few years, US unemployment sank to an 18-year low of 3.9 percent in April 2018 (see figure 5). As a result, trucking companies have raised driver salaries by 15–18 percent since 2013, according to the American Trucking Association. Still, carriers struggle to attract recruits—particularly among younger workers. Other logistics firms face similar challenges, intensified recently by increased competition with construction firms offering workers higher pay. Automation and other productivity-enhancing technologies may provide some relief, but the time frame for adoption varies across logistics providers. While automation is already in place in many warehouses, for instance, it will likely be years before autonomous trucks reduce demand for drivers.

Figure 5
The US labor market continues to tighten



Sources: US Bureau of Labor Statistics; A.T. Kearney analysis

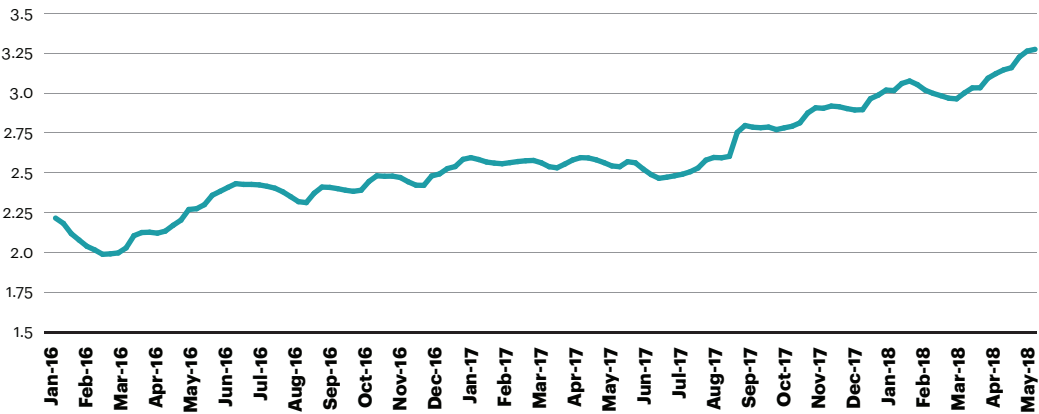
Another rising cost is fuel, as global oil prices climb steadily on robust economic activity and stronger demand. While increasing output at US shale producers and others reduces the risk of a dramatic surge, higher prices are rippling through to diesel fuel. Retail prices rose from an average of \$2.30 per gallon in 2016 to \$2.65 in 2017 and \$3.08 in the first five months of 2018 (see figure 6 on page 10).

Of course, the global economic upswing also brings good news for logistics firms. International trade accounts for about 27 percent of US GDP, with about \$1.6 trillion in exports and \$2.4 trillion in imports in 2017. Rising demand usually lifts import and export volumes at US ports. The pattern seems to be holding, with export growth accelerating each month this year, hitting 9.9 percent in April, and import growth averaging 8.7 percent during the first four months of the year. Higher trade volumes in turn raise demand for logistics providers that transport goods to and from ports, including intermodal, road, and rail carriers.

But it's far from certain that strong global trade flows will continue. US trade policy has become less predictable, as the current administration threatens established trade relationships in an effort to promote “reciprocal” trade with better terms for US companies. The pursuit of this goal has included renegotiating trade agreements and imposing broad tariffs on imported steel and aluminum in the name of national security. Higher demand for domestically produced metals

Figure 6
Rising global oil prices are pushing up the cost of fuel

US No. 2 diesel retail prices
(US \$)



Sources: US Energy Information Agency; A.T. Kearney analysis

could strain freight capacity and drive up shipping rates. As capacity becomes scarcer, shippers will seek to lock in rates and improve end-to-end visibility into their supply chains. Substantial changes in trade policy also could dampen demand for industrial real estate near seaports and intermodal hubs, particularly inland logistics centers. More broadly, continued uncertainties in the trade environment will likely affect pricing and the availability of containers, and trigger counter tariffs and import/export restrictions. The industry should prepare risk mitigation plans and consider raising rates or other strategies to protect profit margins as declining international shipments reduce revenue.

As interest rates rise, debt and equity costs likely will continue converging, necessitating more careful consideration of capital-raising options.

A major worry for logistics firms is the possibility of a US-China trade war, or with US trading partners more broadly. Tit-for-tat actions began with the United States announcing \$50 billion in tariffs on Chinese exports in March. China responded in early April that it could impose tariffs of up to 25 percent on 128 US products. There have been many twists and turns since then, including the Trump Administration striking a deal in early June to enable Chinese telecommunications company ZTE to continue to operate in the United States. Yet an all-out trade war between the world's two biggest economies is still a possibility. A rupture in the world's third-largest trading relationship would dampen both bilateral trade and overall global economic activity, hurting demand for logistics providers. Ocean shipments would be hit first, with tariffs imperiling up to 7 percent of Asia-to-US shipping and 1 percent of worldwide shipping. The early June US imposition

of steel and aluminum tariffs on the EU, Canada, and Mexico will likely have a similar dampening effect on demand for trade logistics, particularly as these partners retaliate with new tariffs on US exports. These are fast-moving, ongoing developments, though, and there is the potential that policies could quickly reverse course.

The renegotiation of the North American Free Trade Agreement (NAFTA) creates more uncertainty for the logistics industry. Since NAFTA took effect in the 1990s, trucking companies and shippers have seen cross-border trade within North America increase 400 percent. But negotiations have been bumpy thus far, casting doubt on the North American market. The effect of any renegotiation (or termination) of NAFTA on logistics firms will depend on the shape of the final agreement. Some items under discussion would boost demand for logistics firms, while others could push in the opposite direction.

Perhaps the greatest potential benefits would flow from updating NAFTA to reflect the rising importance of e-commerce, which would stimulate cross-border e-commerce trade and raise demand for logistics services. Negotiators have considered proposals to allow commingled shipments of small parcels across borders, ease cross-border shipping through better coordination on border security, and—perhaps most importantly—standardize the minimum value of items subject to customs duties. The last measure would allow greater numbers of low-value items to cross borders free of any duties. It would also harmonize the cost of exporting those items to any NAFTA market, reducing regulatory complexity for shippers and carriers.

A breakdown in negotiations resulting in the termination of NAFTA would be the worst outcome for logistics firms. In the [2018 A.T. Kearney Foreign Direct Investment \(FDI\) Confidence Index](#), 60 percent of global investors said their company's operating costs would increase if NAFTA were terminated. Higher costs would affect logistics providers both directly and indirectly as shrinking North American trade flows reduce demand from shippers.

The Logistics Industry in 2017

Motor carriers: 2017 upheaval

A vital but low-profile cog in the global economy, motor freight typically garners few headlines. That changed in 2017, as upheaval in the industry reverberated across supply chains everywhere. Surging demand and limited capacity sent shipping rates soaring. Investors bid up trucking shares, helping Schneider National complete a successful IPO. Consolidation continued apace with such megamergers as Knight-Swift and Heartland-Interstate. On the regulatory front, implementation of the long-delayed electronic log requirement exacerbated capacity shortages. New technologies moved closer to reality, as Tesla debuted a concept electric semi-truck.

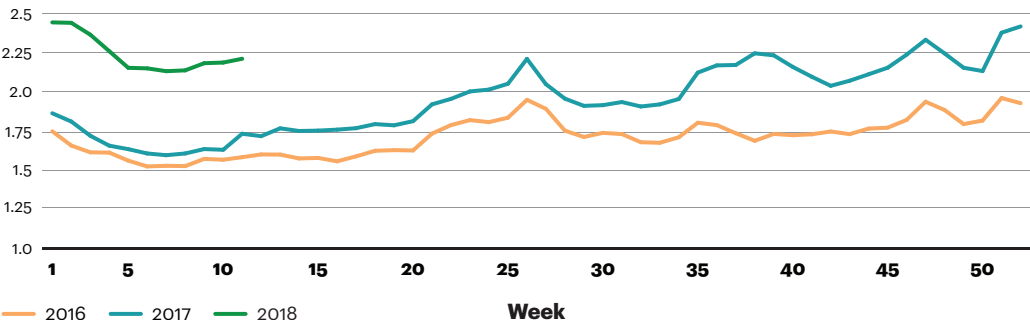
By far the most significant development of the year was a surge in rates fueled by accelerating economic growth that drove demand for freight capacity. Spot rates leapt by 20–30 percent, while contract prices climbed 5–15 percent (see figure 7). New capacity that might have moderated rate hikes never materialized, as carriers confronted driver shortages, electronic log requirements, and lingering pain from overcapacity in 2015–2016.

Figure 7
Dry van spot rates increased 28% in 2017 and are expected to continue to rise in 2018

Dry van spot rates

(2016–2018 week 11)

Weekly spot rate



Sources: Truckstop.com; A.T. Kearney analysis

In response, shippers are making adjustments to reduce their exposure to spot market premiums and secure capacity by becoming favored “shippers of choice” for carriers. For their part, carriers are starting to order more assets, investing in M&A, and enjoying a return to normal profitability after years of subpar returns.

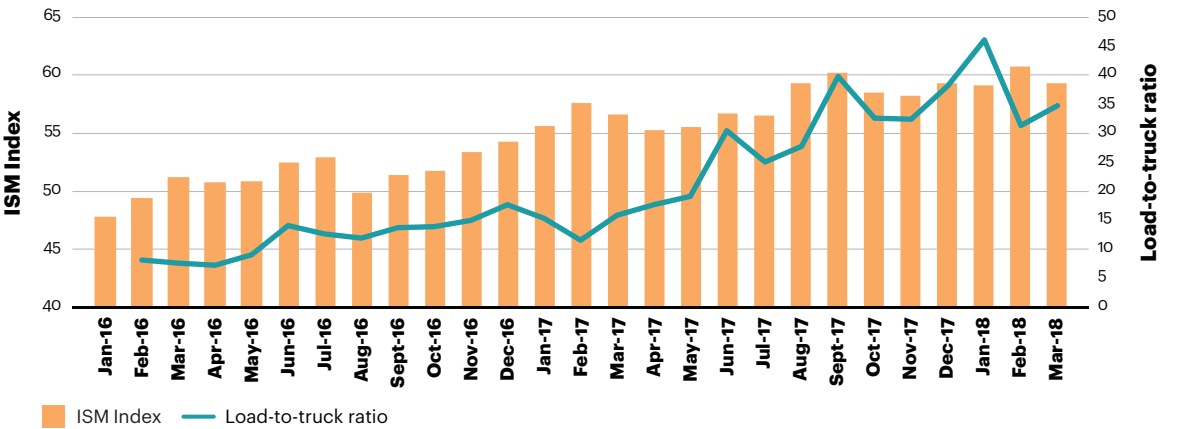
Impact on prices and capacity

As the US economy approaches a record 10th consecutive year of growth, motor freight markets are experiencing a rare combination of strong demand and stagnant capacity. The ISM manufacturing index, a key indicator of shipping demand, rose 4 percent last year, while the load-to-truck ratio, a measure of motor freight capacity, hit an all-time high (see figure 8 on page 13).

Figure 8

Carriers saw a large increase in freight volume in 2017 as manufacturing activity and consumer spending peaked

Manufacturing activity vs. dry van load-to-truck ratio



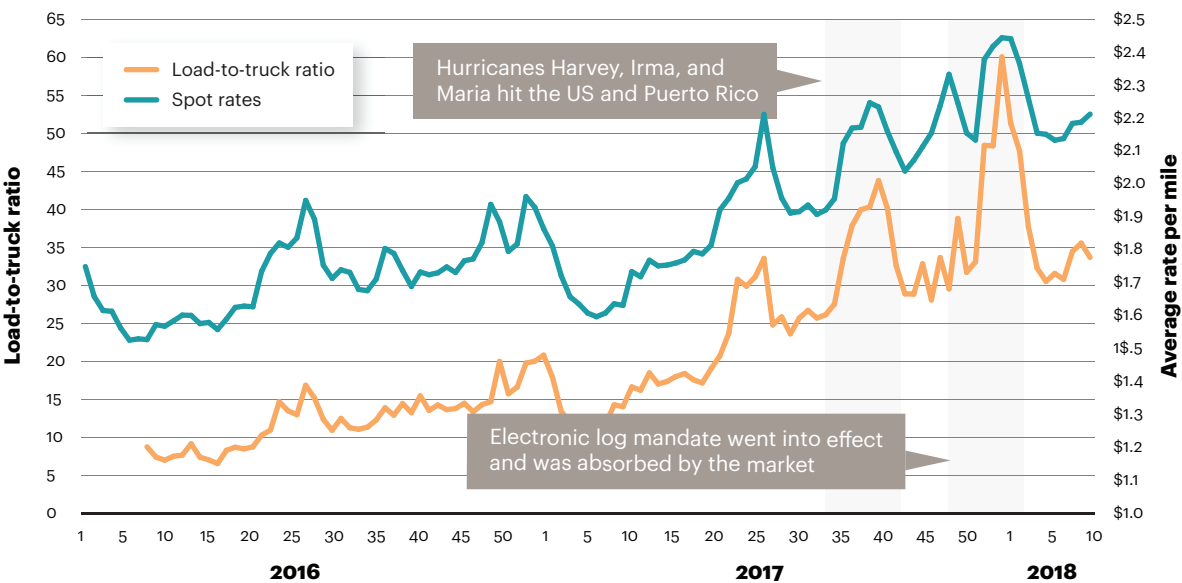
Sources: Truckstop.com; A.T. Kearney analysis

A range of short-term factors contributed to the capacity crunch last year. Hurricanes in Texas and Puerto Rico delivered a one-two punch, triggering massive demand for capacity to deliver relief supplies and submerging the crucial Houston freight hub. The US government’s electronic logging device (ELD) mandate took effect in December 2017, affecting more than 3 million drivers who hadn’t yet implemented the new tracking system (see figure 9). ELD technology

Figure 9

Spot rates increased drastically in the second half of 2017 in response to tightened capacity

Dry van demand vs. spot rates



Sources: Truckstop.com; A.T. Kearney analysis

exacerbates capacity pressures by ensuring that carriers adhere closely to rules limiting drivers’ time behind the wheel. Stricter enforcement of time limits means carriers need more drivers to move the same amount of cargo—at a time when drivers are in short supply. While tightening appears to be most pronounced in the 500- to 600-mile band at the edge of a full day’s driving range, shipments traveling 1,000–1,200 miles also have been affected. We expect the impact to increase this year, as full ELD enforcement began in April 2018. Looking ahead, carriers can expect further regulatory constraints on driver availability by 2020, when all trucking companies must comply with the FMCSA’s (Federal Motor Carrier Safety Administration) online database of failed driver drug tests.

These short-term capacity pressures compound the impact of a years-long decline in the number of truck drivers. ATA figures indicate the trucking industry was short 50,000 drivers at the end of 2017, a record shortfall that forces carriers to keep raising wages. While the ATA estimates that average driver pay rose 15–18 percent between 2013 and 2017, firms have merely rectified years of stagnant salary growth for drivers. According to BLS statistics, nominal transportation and material mover wages have increased by 16.1 percent from 2008–2018, barely exceeding the 15.9 percent CPI Inflation Index over the same period. In real terms, driver salaries today feel larger, but the average earning power of the profession has yet to see meaningful growth since 2008.

Rising volumes, along with rate increases imposed later in the year, helped carriers across the industry ease the impact of wage hikes. For example, several large LTL shippers announced 2017 general rate increases (GRIs) of nearly 6 percent. Some LTL carriers also reported favorable mix changes—heavier shipments, more density—a development reflecting robust economic activity and demand from shippers forced into the LTL market by shortages of FTL capacity.

But as carriers posted mid- to high-single-digit revenue growth, their operating ratios showed less improvement (see figure 10). We attribute the gap to two factors. First, volume growth drove most of the 2017 revenue gains, as most price hikes didn’t take effect until late in the year. Second, operating costs rose throughout the year as carriers offered higher wages to attract scarce drivers and build capacity. First-quarter 2018 earnings reports will be the strongest sign of carriers’ success in converting price hikes into profit growth, and the accuracy of Wall Street’s consensus view that it would be difficult for carriers not to make money in this market.

Figure 10
Motor carrier revenues rose in 2017, but operational costs are also increasing

	Revenue ¹			Operating ratio		
	FY17	FY16	Δ	FY17	FY16	Δ ²
J.B. Hunt	\$7,190	\$6,555	9.7%	91.3%	89.0%	2.3%
Schneider	\$4,384	\$4,046	8.4%	93.6%	92.8%	0.8%
Werner Enterprises	\$2,117	\$2,009	5.4%	93.2%	93.7%	–0.5%
Marten Transport	\$698	\$671	4.0%	91.9%	91.3%	0.6%
Heartland Express	\$607	\$613	–0.9%	89.5%	86.0%	3.5%

¹ Revenue shown in millions
² Operating ratio is operating costs / operating revenue; lower is more favorable.
 Sources: Carrier 10k filings; A.T. Kearney analysis

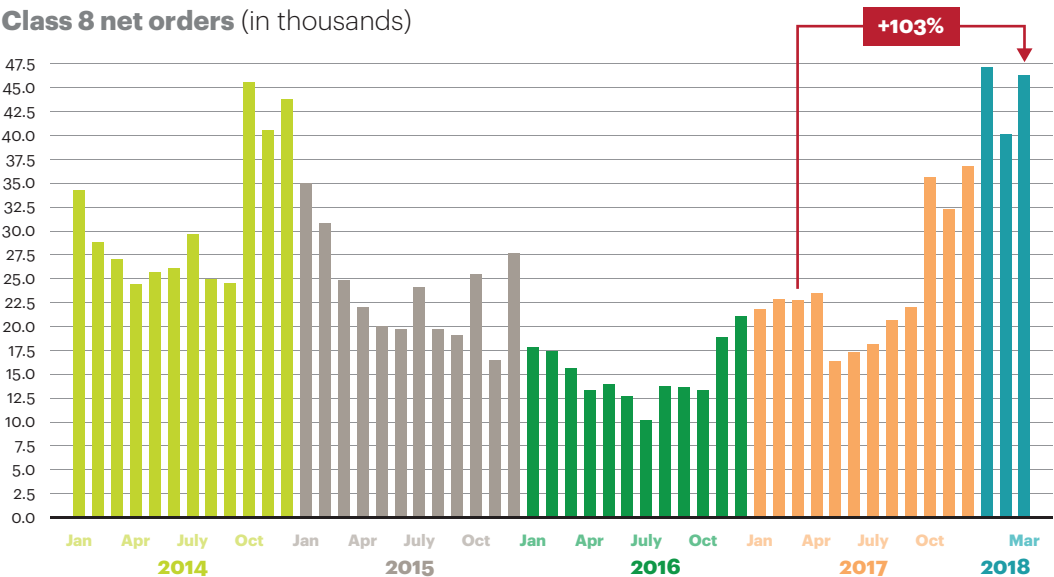
Response from carriers

Major carriers are capitalizing on the capacity shortage in several ways. Using data analytics, they assess the profitability of every route, and shift assets to lanes that generate higher returns. On low-density routes, they’re serving fewer customers and rejecting more loads. Aided by new technologies that track how much time trucks spend at each stop, carriers are identifying and purging sluggish shippers that take up too much driver time while generating too little profit. At the same time, they’re reallocating capacity from long-term contracts to the more-lucrative spot market. Shippers, however, are feeling squeezed as carriers maximize profits. Load rejections are rising to record levels and shippers are hearing that their lanes are no longer a “good fit” for their longtime carriers.

Aided by new technologies, carriers are identifying and purging sluggish shippers that take up too much driver time while generating too little profit.

Advantageous market conditions have spurred carriers to invest in new assets and pursue acquisitions. North American Class 8 truck orders reached a record high in the first quarter of 2018, as carriers seek to lure drivers with shiny new trucks and save money with fuel-efficient new technology (see figure 11). Trucking-industry M&A jumped 30 percent in the first three quarters of 2017, a sign that many carriers see acquisitions as the surest, quickest way to get the drivers they need.

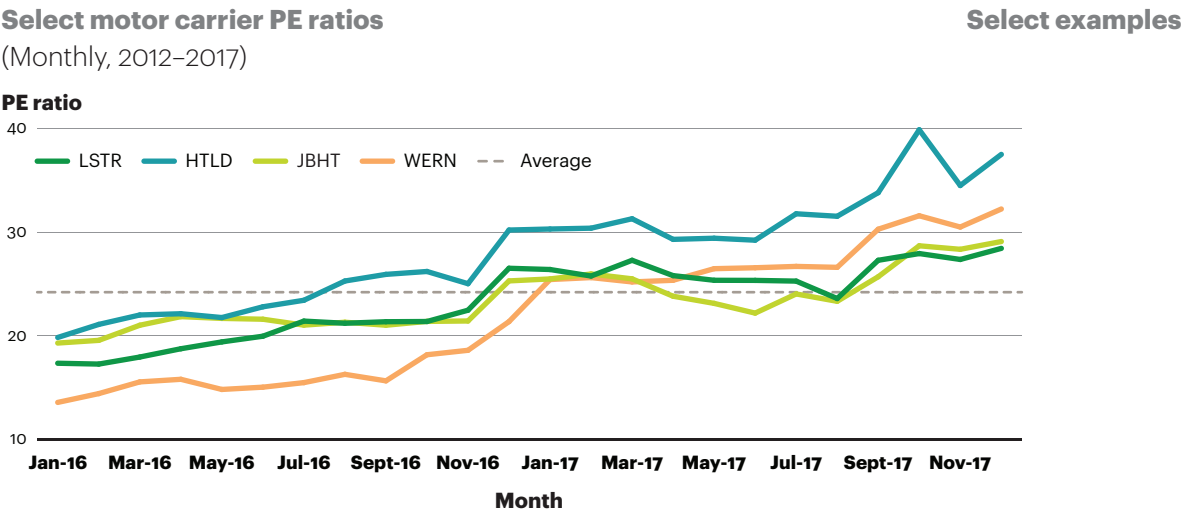
Figure 11
North American Class 8 orders for Q1 2018 were the largest totals for any quarter in history



Sources: FTR Associates via Bloomberg, North American monthly Class 8 net orders; A.T. Kearney analysis

Rising stock market valuations haven't slowed consolidation among carriers. Price-earnings multiples for major trucking stocks climbed well above their five-year average of 24.2 (see figure 12).

Figure 12
Favorable freight prices in 2017 drove motor carrier valuations above their multiyear averages



Notes: PE ratio is price-earnings ratio. LSTR is Landstar System. JBHT is J.B. Hunt. HTLD is Heartland Express. WERN is Werner.
Sources: Truckstop.com spot rates, WolframAlpha analysis of Morningstar and Xignite data; A.T. Kearney analysis

We expect more consolidation in an industry where cost pressures and capital requirements leave some smaller companies with little choice but to seek a buyer. Often these companies lack the resources to meet rising driver wage expectations and invest in new technologies such as automated driving that are likely to reshape the industry in coming years. Even if complex megamergers such as Knight-Swift happen less often, smaller “bolt-on” deals are likely to continue.

Call to action for shippers

At many shippers, the unlikely convergence of strong demand and tight freight capacity has elevated trucking from a logistics and procurement topic to a C-suite hot button. CEOs realize that trucking industry conditions threaten to snarl supply chains and stunt margins. Fortune 500 companies such as Hershey, Mondelez, Mattel, and Michelin highlighted the issue in recent earnings reports.

Shippers are using multiple short-term tactics to secure more capacity and take the edge off price hikes. The capacity scramble leads many to dig deeper into their routing guides and increase their reliance on brokers. Brokerage volumes rose 40 percent in January 2018 according to DAT. Some pricing tactics worked better than others. Shippers that hoped to avoid high prices by forgoing RFPs found themselves facing load rejections that sparked havoc in their operations. More successful were shippers who used RFP processes to reset rates, absorbing painful increases but preserving service levels and avoiding disruption for themselves and their customers.

Top-tier shippers augment short-term strategies with strategic changes geared to shifting industry economics. In a recent A.T. Kearney shipper survey, several shippers noted that they have re-evaluated the economics of dedicated fleet models to lock in capacity and have had success boosting service levels in addition to lowering their costs. Other shippers are pursuing different routes to lower their costs, reducing or delaying internal moves and consolidating more shipments. More strategically, mature firms are pursuing operational efficiencies in hopes of winning favor with carriers. Such “shipper of choice” initiatives often include reducing driver wait times by speeding turnarounds at slow-moving pickup points; some shippers use carriers’ ELD data to identify these bottlenecks. Shippers also work with their own customers to streamline freight patterns by smoothing order flows, improving forecasting of capacity requirements, and unloading freight faster. Finally, shippers are testing online logistics-matching platforms such as Uber Freight or Convoy to secure last-minute capacity on hard-to-cover lanes. Tight capacity markets could be the spark that accelerates adoption of these technologies.

What does the future hold?

Barring a sharp, sudden economic slowdown, carriers will hold the upper hand over shippers for at least the next few years. The trucking capacity crunch is unlikely to ease soon, as driver shortages continue to block industry expansion. Drivers are aging, and replenishing their ranks gets harder every day in a full-employment economy that offers young people many opportunities they consider more attractive than truck driving. Against that backdrop, we expect carriers’ operating ratios to improve markedly in 2018, potentially driving up company valuations as well.



The trucking capacity crunch is unlikely to ease soon, as driver shortages continue to block industry expansion.

For both shippers and carriers, the ultimate question is whether current conditions will cause sustained changes in industry structures. Will the full truckload market look more like the less-than-truckload market, with high infrastructure requirements and robust networks creating barriers to entry? Will shippers and carriers collaborate to reduce costs and grow capacity? Will autonomous technology—whether it’s driver assistance technology that improves safety and lowers insurance costs, truck platooning on highways, or fully autonomous trucks—cut costs for all shippers and relieve the driver shortage? Answers are still unclear, but we expect efforts and investments in all these areas to accelerate.

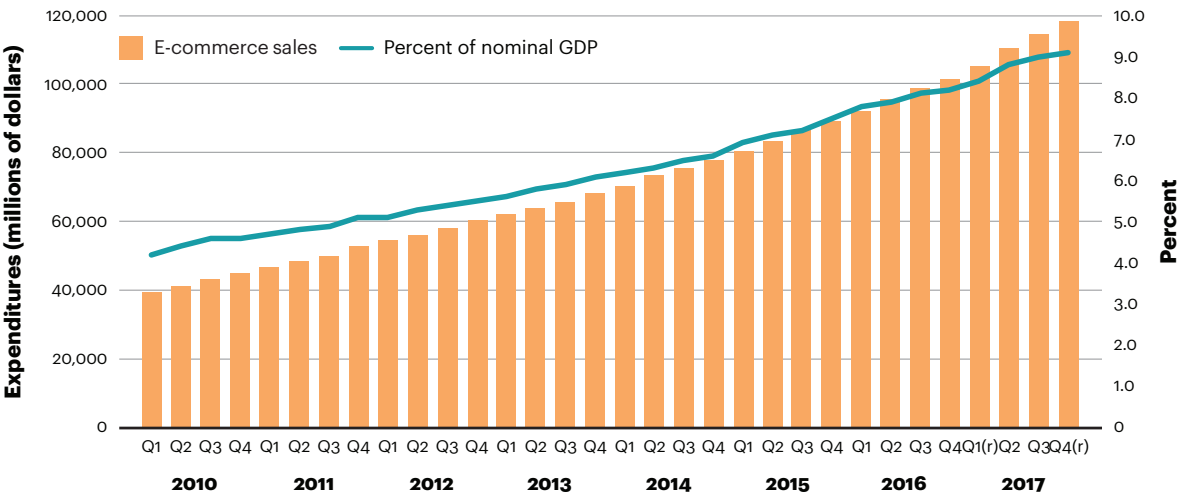
Parcel: e-commerce growth hits cost headwinds

Surging e-commerce shipments continue to fuel demand for parcel delivery, lifting rates and highlighting the need for more-efficient ways to cover the “last mile” between shippers and consumers. A range of last-mile delivery innovations have emerged, including click-and-collect, crowdsourcing, lockers, Amazon’s pantry concept, and new carriers specializing in oversized items. As the industry works to solve the last-mile riddle, it’s clear that major supply chain

adjustments are needed to move warehouses closer to customers and add more delivery capacity. This will require more capital investment and increased labor spending at a time when wages are rising across the economy. How these costs will be allocated between shippers and carriers remains to be seen. In any case, improving last-mile capabilities will take time, potentially creating headwinds for e-commerce growth.

According to the US Census Bureau, on an adjusted basis, the estimate of 2017 US total retail sales was \$5.1 trillion, of which \$448.3 billion was e-commerce (see figure 13). This represents a 15.5 percent year-over-year growth for e-commerce while the retail industry grew by 4.9 percent. The holiday season, Q4 of 2017, experienced a record-high 16.6 percent growth.

Figure 13
E-commerce sales and e-commerce as a % of total retail



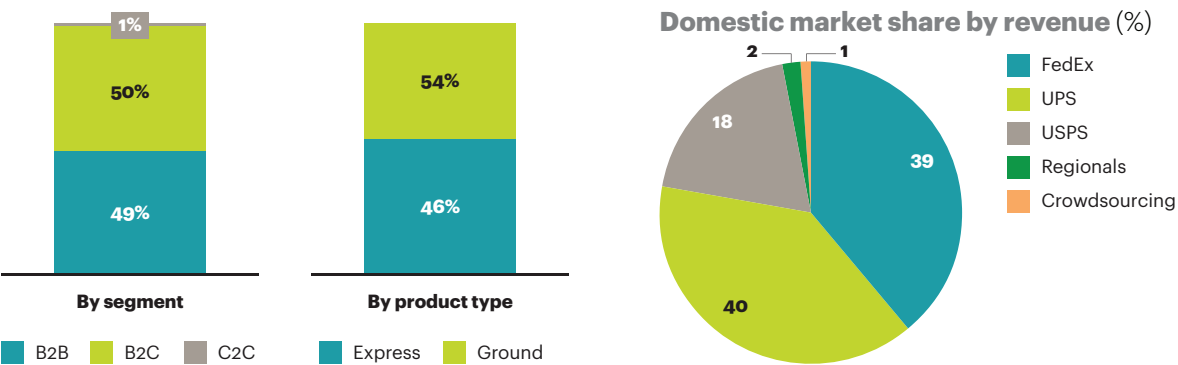
Source: Census.gov Quarterly E-Commerce Report

Parcel volumes jumped again in 2017, with remarkable price hikes in niche areas. Parcel expenditures increased 7 percent to \$99 billion in 2017 (includes Fedex, UPS, messenger, courier, USPS). Once again, e-commerce drove demand as consumers shifted more spending online. Forecasters expect the same factors to lift parcel volumes in 2018.

Prices rose with volumes last year as carriers capitalized on surging demand. UPS and FedEx announced average general rate increases of 4.9 percent, and the US Postal Service raised prices 5 percent on standard and flat-rate Priority Mail. UPS also levied “peak time” surcharges to defray the additional costs of handling seasonal surges in parcel shipments. During the 2017 holiday season, UPS tacked on \$0.27 for domestic residential ground packages, \$0.81 for next-day air shipments, and \$0.97 for two-day or three-day delivery. FedEx hasn’t indicated whether it will mimic UPS and implement a peak surcharge for residential deliveries in 2018. As for market share, UPS, FedEx, and USPS took 39 percent, 39 percent, and 19 percent, respectively, while regional carriers and crowdsourcing platforms accounted for less than 3 percent (see figure 14 on page 19).

FedEx and UPS continue to emphasize efficient use of space, reducing dimensional divisors to penalize customers that use unnecessarily large boxes—known in the industry as “shipping

Figure 14
UPS and FedEx continue to dominate the carrier market



Financial reports from UPS, FedEx, USPS, regional carriers; A.T. Kearney analysis

air.” Both carriers cut their dimensional divisor to 139 for all packages in 2018, a steep drop from 166 in 2017 and 194 five years ago.

UPS also boosted surcharges for oversized packages, the fastest-growing market segment last year. Its additional handling fee for packages weighing more than 70 pounds rose to \$19 (58 percent higher than FedEx) and its large package surcharge increased to \$90 (12.5 percent above FedEx).

Shippers and carriers must meet a widening array of delivery standards, from next-day to same-day and even shorter windows.

Rising shipments of oversized items present special challenges. Appliances, for example, due to their non-conveyable nature, cost more to store and pick up in warehouses and take up more space in trucks, cutting into carriers’ revenues per mile. For shippers, last-mile delivery options are limited. Only a few carriers specialize in the costly, labor-intensive process of delivering large consumer products to residences. Innovative last-mile solutions such as Amazon lockers or store pickups are designed for smaller packages. With few alternatives, limited competition, and no short-term hope for labor-saving autonomous delivery technology, carriers have leeway to raise prices further. Indeed, more hikes seem likely as carriers seek to recover the high costs of delivering bulky merchandise.

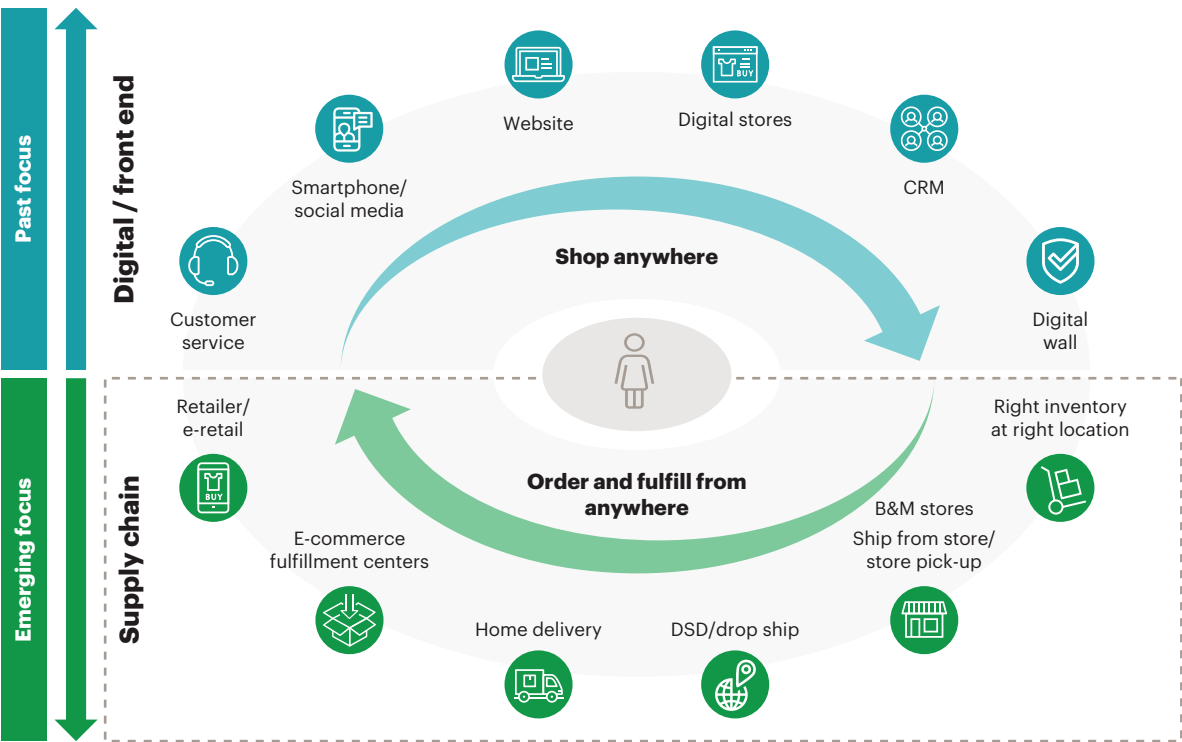
Recent months brought a reminder that the parcel delivery industry isn’t immune to politics. President Trump blasted Amazon’s contract with USPS, claiming the agency loses money providing last-mile delivery service to the online retail behemoth. Amazon could face difficult choices if USPS yields to presidential pressure and raises rates. So far, the company has focused supply chain investments on upstream assets, counting on USPS to cover the last mile. A significant rate hike by the postal service could squeeze Amazon’s profits, possibly

prompting the company to reallocate some capital to its own last-mile capabilities. And if last-mile rates for residential service rise, UPS and FedEx might reconsider their recent shift to higher-margin business-to-business deliveries.

Cutting out middlemen: D2C on the rise, shifting focus to supply chain and logistics

Large e-commerce companies that have focused on generating demand through their websites are now fulfilling their own orders, taking on supply chain and logistics functions previously outsourced to third parties (see figure 15). According to A.T. Kearney, about one-third of companies are actively pursuing this direct-to-consumer (D2C) strategy, another one-third are considering it, and the rest have decided to wait. D2C economics can be attractive; selling direct to consumers eliminates wholesale discounts, yielding higher prices and boosting margins. Sellers also get more customer data, which improves their targeting.

Figure 15
The focus in e-commerce is shifting to supply chain



Notes: CRM is customer relationship management. DSD is direct store delivery.
Source: A.T. Kearney analysis

Rising customer expectations increase costs and drive structural change

As the focus of e-commerce shifts to supply chain logistics, the industry confronts a fundamental challenge: rising service expectations from consumers expecting ever-faster delivery. Until recently, carriers have met these expectations by adding more trucks and hiring more drivers. Such linear responses are starting to fall short as demand grows in both magnitude and complexity. Shippers and carriers must meet a widening array of delivery standards, from next-day to same-day and even shorter windows. This requires structural changes in supply

chains, most notably the repositioning of distribution centers closer to customers. Such shifts entail significant capital investments, while the resulting fragmentation of inventory, delivery assets, and driver pools drives up operating costs.

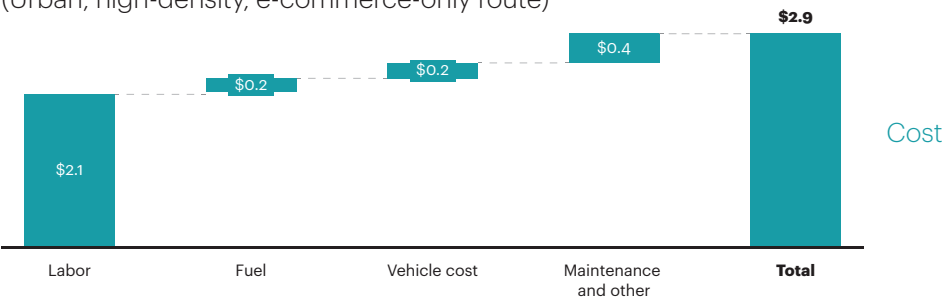
As fragmentation undermines economies of scale, shippers and carriers looking to restore operational efficiencies will explore new technologies and pursue creative new supplier relationships. M&A also is likely to increase as industry players combine to gain scale, and larger companies acquire start-ups with promising innovations.

Rising labor costs are another headwind for shippers and carriers (see figure 16). Delivery labor, the primary driver of last-mile cost, increased 9 percent last year amid low unemployment, higher minimum wages, and intense competition for drivers among traditional carriers, last-mile specialists, crowdsourcing platforms, and shippers building their own delivery capabilities.

Figure 16
Parcel cost headwinds will also have a large impact on the e-commerce landscape

Estimated last mile cost per package, \$

(Urban, high-density, e-commerce-only route)



With labor constituting 75% of cost of last mile, a 9% inflationary labor environment means 7-8% YoY increases in cost of last mile

Note: YoY is year-on-year.
Sources: Bernstein; A.T. Kearney analysis

The impact of industry changes will vary across the e-commerce sector. Some shippers are better positioned than others to meet rising customer expectations and absorb higher supply chain costs. For example, retailers with brick-and-mortar chains have an edge over online-only rivals when it comes to same-day delivery. Physical stores located close to customers can double as fulfillment centers for online orders. Retailers will have to reconfigure stores for this purpose, an investment that’s likely to pay off as more SKUs are ordered for same-day and even “same-day a.m.” delivery. Similarly, rising costs won’t affect all e-commerce players equally. We segment e-commerce into three tiers of vulnerability to higher supply chain costs:

Cost-insensitive: In high-margin businesses such as footwear and beauty, where fulfillment costs represent a small fraction of product prices, shippers can afford to add e-commerce warehouses, push fast-moving inventory closer to population centers, and build select “experience hubs.”

Cost-sensitive: Fulfillment eats up a larger share of price for shippers of consumable products. To reduce costs, they might bypass parcel carriers with multi-echelon store-based fulfillment networks.

Cost-challenged: Low-margin retailers such as grocery chains won't invest in supply chain enhancements, relying instead on store-based inventory for fulfillment.

More than 60 percent of e-commerce shippers are cost-sensitive or cost-challenged. That figure is a red flag for parcel carriers—well over half the market is concentrated in segments with little additional money to spend on delivery.

Same-day trend may favor brick-and-mortars

If the outcome of the increase in D2C is geared toward same-day, the advantage may shift to companies with a retail footprint (for example, WMT). However, the problem associated with using stores as forward deployment is that they were not designed as such; therefore they will also need some infrastructure changes before they can be efficiently used for this purpose. It is also unclear that the speed of delivery expectation by the customer will continue to rise at the same pace (for example, same-day to same-day a.m.), however we expect more SKUs to shift to same-day.

More than 60 percent of e-commerce shippers are cost-sensitive or cost-challenged. That figure is a red flag for parcel carriers—well over half the market is concentrated in segments with little additional money to spend on delivery.

Looking forward

Parcel shipping volumes and customer delivery expectations continue to rise, triggering price increases and driving fundamental shifts in the industry. Amid surging e-commerce demand, shippers are embracing direct-to-consumer sales as carriers rearrange assets to meet last-mile delivery challenges. These changes require significant capital expenditures at a time of intense competition and rising labor costs. Until markets determine how to allocate the expanding financial burden among various industry players, carriers will have an opportunity to push through more price hikes, especially in market niches such as oversized package delivery.

Three trends to watch

- **Trend 1:** Rising volumes and customer expectations force a capital-intensive “re-think” of last mile supply chain to be capex intensive
- **Trend 2:** Carriers have room to raise prices while markets are figuring out who will bear investment burdens
- **Trend 3:** Parcel cost headwinds may impede e-commerce strategies, particularly in cost-sensitive segments

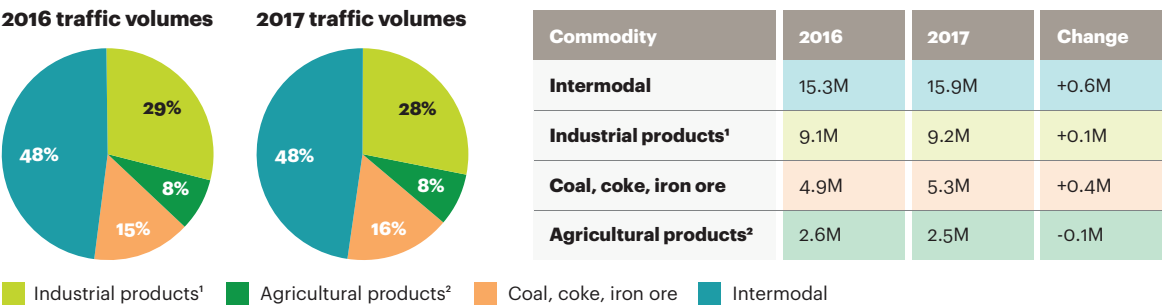
Rail: winners in the short term

Railroads enjoyed a strong year as favorable factors converged to boost shipping volumes and rates. Economic growth accelerated, while shrinking truck capacity shifted more cargo to rail and allowed railroads to raise prices sharply—reversing prior-year trends. At the same time, a transformational leader sparked an industrywide emphasis on productivity at US Class I railroads.

In 2017, total carloads rose 3 percent to 3.09 million. Much of the gain came early in the year, on strong intermodal traffic. Price hikes across nearly all commercial franchises drove railroad revenue higher, with impressive per-unit increases in intermodal, coal, and chemicals (see figure 17).

Figure 17
Railroads experienced volume gains across all major commodity types, apart from agricultural products

Rail shipment mix by commodity type (by number of carloads)



¹ Includes metals, automotive, paper and forest products, chemicals, and petroleum products.

² Includes grains, sweeteners, oils, and food and farm products.

Sources: Weekly traffic statistics, railroad websites; A.T. Kearney analysis

Along with rising volumes and revenues, railroads grew more productive last year, improving returns for investors. Operating ratios—a key productivity indicator that measures expenses against revenues—continued to decline as railroads cut headcount, optimized asset utilization and rolling stock inventory, and increased train speeds and lengths.

A key source of demand—coal shipments for domestic utilities—stabilized after years of considerable declines. The US Department of Energy reports that coal’s share of total generating capacity has settled at approximately 30 percent. Strengthening coal exports provided another boost to railroad profitability. Still, the long-term future of coal is uncertain amid pressure from cheaper natural gas and subsidized renewable energy. Around the country, coal-fired power plants are closing, and bankruptcy threatens large buyers of coal.

As railroads reap short-term gains, they face a looming challenge from technology-enabled over-the-road alternatives. With an eye on railroads’ growing intermodal market, trucking companies are pumping investment into electric powertrains, telematics-enabled safety systems, and fully and semi-autonomous vehicles. These technologies promise to make trucking more efficient, potentially erasing the economic advantages of rail shipping.

Precision railroading, productivity gains, and service disruptions

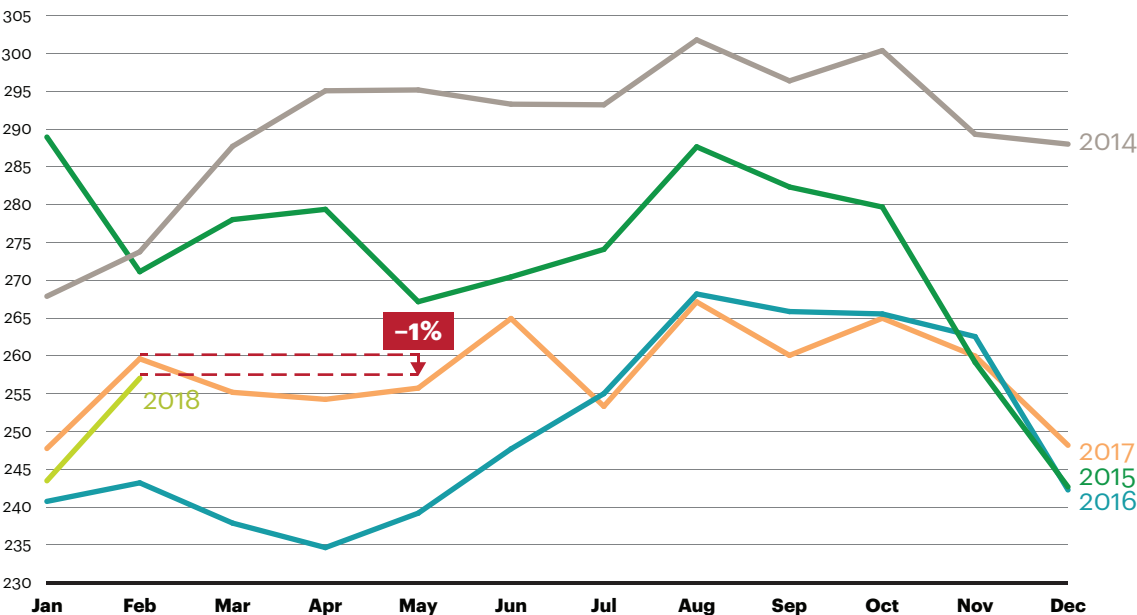
We cannot talk about productivity gains in 2017 without first addressing the passing of Hunter Harrison, who left an indelible mark on the North American railroad industry. As CEO of three different railroads, the precision railroading champion set new standards for productivity. His influence will continue for years to come: Harrison disciples lead three of the six US and Canadian Class I railroads (James Foote at CSX, Jean-Jacques Ruest at Canadian National, and Keith Creel at Canadian Pacific).

Before Harrison’s death last December, CSX made considerable strides in implementing precision railroading. In one of the biggest moves, CSX closed several major classification yards that use “humps” and gravity to sort railcars. The company also started taking locomotives offline, optimizing operations, and divesting non-core assets. Headcount declined about 19 percent. Efficiency gains at CSX prompted other railroads to cut costs: CSX’s rival NS shed 11 percent of its workforce (see figure 18).

Figure 18
For the first half of 2017, carloads trended higher than 2016; 2018 is following a similar trend

US railroad traffic¹

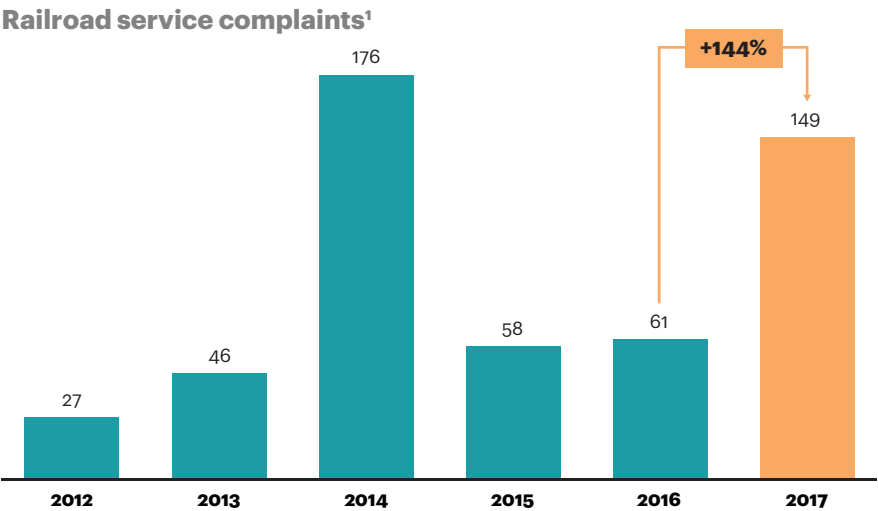
(Thousand carloads)



¹ Historical data for the United States has been restated to remove FEC.
Sources: Association of American Railroads; A.T. Kearney analysis

Yet service deteriorated as CSX implemented precision railroading, angering major rail shippers. Customers reported increased transit times, missed pickups, limited equipment availability, and misrouted cars (see figure 19 on page 24). Chemicals, automotive, and agriculture shippers were among the most vocal—several submitted public testimony describing the pain caused by CSX’s service disruptions. Shippers’ complaints spurred action by the US Surface Transportation Board (STB), which required CSX to submit weekly performance reports and status updates.

Figure 19
Poor service led to a 144% increase in railroad service issue complaints during 2017 compared to 2016



¹ Includes only complaints designated as “Railroad Service Level” in the STB’s RCPA report.
Sources: Surface Transportation Board Full Year RCPA Case by Category; A.T. Kearney analysis

Disruptions increased sharply across the industry in the first quarter of 2018, with all Class I railroads reporting slower train speeds and longer transit times. Analysts blame service woes on railroad efficiency initiatives such as crew downsizing and equipment idling. These measures limit the railroads’ ability to adjust capacity as conditions require. When irregular operations occur—hurricanes or winter storms, for example—railroad recovery times are impacted and service tends to decline throughout the network.

Beyond complaining to the STB, shippers reacted to poor service by shifting industrial products volumes to alternative transit modes or better-performing railroads where possible. Rail executives have responded by visiting key customers and promising better service.

As we noted in the 2017 State of Logistics report, the operational characteristics of US rail networks—particularly along the East Coast—pose unique challenges for precision railroading. Last years’ experience confirms that cost-cutting measures can make railroads less resilient and slower to resolve service breakdowns.

Looking ahead

Railroads look like big winners in the short term. Strong demand gives Class I operators more pricing power (particularly in intermodal), while corporate tax cuts boost cash flows, rising fuel prices drive incremental fuel surcharge revenues, and improved productivity increases profit margins.

In the longer term, however, headwinds are gathering force. New technologies will reduce the marginal costs of trucking and put competitive pressure on railroads. An A.T. Kearney analysis indicates that platooning and autonomous technology could be widely available to shippers over the next three to seven years, while innovation among key railroad suppliers lags. Additionally, railroads are still figuring out how to manage and leverage significant investments in positive train control assets.

Water: rising tides?

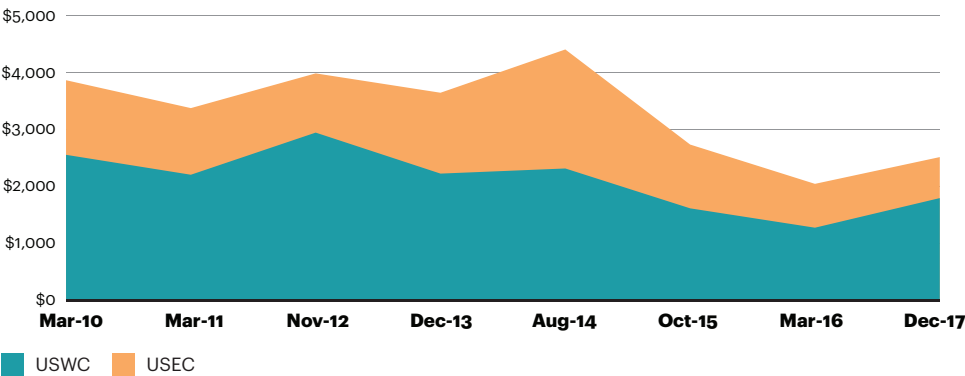
Last year we predicted that consolidation, capacity issues, and carrier finances would continue to shape ocean shipping markets in 2017, with structural overcapacity and lax pricing discipline keeping rates at historic lows. While these issues persist given the inertia of the industry, the story has been far from gloomy. Carriers’ fortunes improved as rates bounced back—the Shanghai Containerized Freight Index rose 27 percent on average in 2017. Higher rates flowed to the bottom line, with ocean liners booking total profits of \$7 billion last year after posting combined losses of \$3.5 billion in 2016.

With the global economy steaming ahead, demand rose by an estimated 5 percent. Consequently, US ports registered 6 percent import growth, handling a record 23 million containers despite several hurricanes. On the supply side, a 3.9 percent capacity increase came in below demand growth, reducing idle fleet capacity to 2 percent from 7 percent in 2016. At the lane level, unbalanced fundamentals and seasonal trends rocked the market, but carriers encouraged by strong demand canceled fewer scheduled sailings.

Deal making remained strong—COSCO acquired OOCL and the three largest Japanese carriers merged to form Ocean Network Express (ONE). In April, all three new alliances commenced operations and Maersk and Hapag-Lloyd completed their respective acquisitions of Hamburg Sud and UASC. The top five carriers now control about 64 percent of the market, up from 46 percent a decade ago. Yet the industry remains competitive, scoring 1,000 on the Herfindahl-Hirschman Index, a widely used measure of market concentration, well below the 10,000 reading that indicates monopoly. However, recent mergers have lifted concentration to higher levels on some lanes, such as Europe to South America.

Carriers took advantage of the wider Panama Canal last year, sailing mega vessels to upgraded East and Gulf Coast ports, where volume growth of 7.9 percent outstripped a 1.3 percent rise on the West Coast. This triggered a price war, not only among carriers but between routings. The traditional \$1,000 per FEU spread between transpacific rates to the West and East Coast fell by half, creating an incentive to ship goods to major interior markets via East Coast ports and intermodal rail. Infrastructure improvements such as the raising of the Bayonne Bridge in New York—which enables bigger vessels to call at the largest Eastern port—are encouraging liners to ship even more cargo to the East (see figure 20).

Figure 20
The spread between East and West Coast rates has been declining



Notes: USEC is United States East Coast. USWC is United States West Coast.
Source: SCFI

Capacity pressures lifted rates in the cold chain last year amid tightness in reefer box supply that appears likely to persist in 2018. Meanwhile, volume migration from specialized reefer ships to container lines accelerated and is expected to reach 85 percent of the total reefer market by 2021.

Coal fell out of favor in domestic markets but found safe harbor overseas. A 117 percent rise in thermal coal exports boosted inland barge operations to the US Gulf. Dry bulk shipping generally enjoyed a strong year, with the Baltic Dry Index up 70 percent on the back of strong Chinese demand for iron ore transported on giant bulkers. Ore shipments spilled over into smaller grain-carrying vessels, reducing capacity and driving up rates for US farmers and traders in an already weak agricultural market.

Carriers hoping to maintain profit margins will have to step back from price wars and deliver greater value by integrating customer needs into their operating models through cost efficiency and new technology.

OPEC production cuts and a global glut of crude led to the worst showing in decades for the liquid bulk sector; even an early winter in the Northern Hemisphere could not perk up rates during the seasonally strong cold months. One bright spot is the growing export of American crude to Asia, driving up ton-mile demand and spurring infrastructure construction in the Gulf of Mexico to enable direct loading of supertankers that dominate the crude trade.

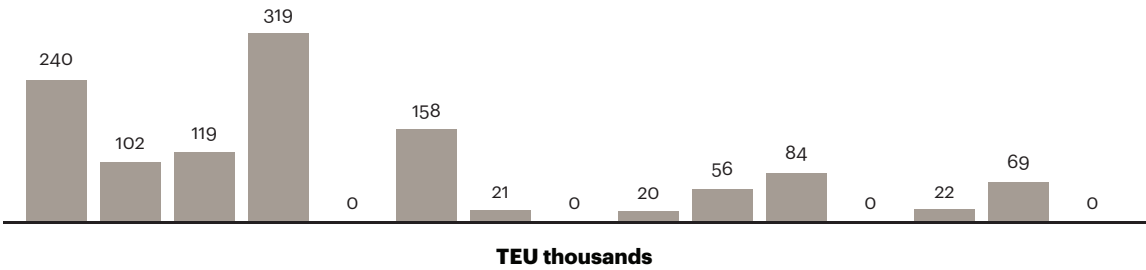
On the horizon: all aboard or man overboard?

While 2017 was not a bad year for carriers, it could have been much better based on strong fundamentals. Economics 101 suggests consolidation should lead to oligopoly, allowing dominant carriers to set prices in non-collusive collaboration. However, carriers are still locked in price-based competition as they battle for market share and scramble to curb post-merger customer defections. Collectively, carriers in the Transpacific Stabilization Agreement announced no less than 18 general rate increases last year but nearly all failed to stick. Shippers took advantage of lax pricing discipline to negotiate 2018 contracts at or below last year's rates. Carriers hoping to maintain profit margins will have to step back from price wars and deliver greater value by integrating customer needs into their operating models through cost efficiency and new technology.

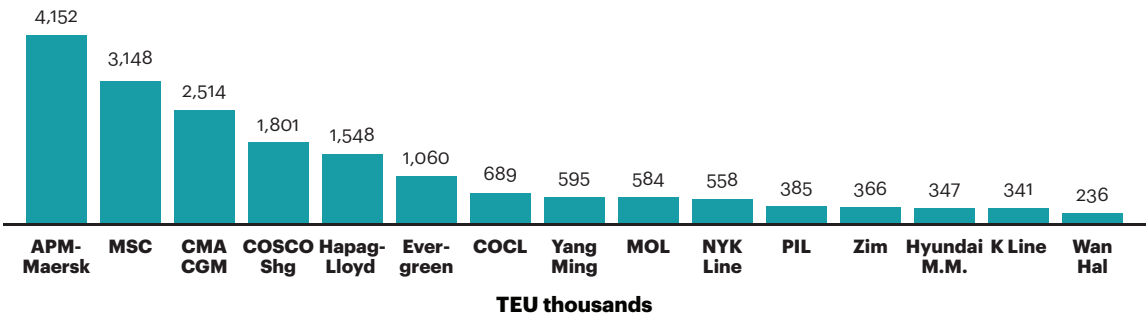
We do not anticipate further consolidation in the industry this year. The recent wave of deals left few attractive targets, and acquirers are focused on complex merger integration challenges. Any deals in 2018 likely will target niche players. But as carriers absorb acquired companies into their operations, consolidation and alliance realignment will reward them with greater market power (see figure 21 on page 28).

Figure 21
New capacity in 2018 is concentrated within a few big carriers

Deliveries due in 2018



Fleet as of January 2018



Source: Alphaliner

Alphaliner predicts ocean shipping demand will rise 5.1 percent this year. So far, the seasonally weak first quarter saw a 4.7 percent increase. Supply is expected to increase 5.3 percent, slightly outpacing demand. More than 70 percent of new capacity will hit the seas during the first half, in time for peak season. As carriers chase the cost advantages of scale, roughly 30 percent of new capacity will be on ultra-large vessels of 18,000 to 25,000 TEU. They'll need all the cost advantages they can get. Bunker fuel costs are expected to rise 25 percent this year, tracking crude oil price increases. Meanwhile, the sulfur emissions cap will drop to 0.5 percent from 3.5 percent by 2020, potentially spurring further increases in low-sulfur fuel prices that already cost about 50 percent more. Strong industry fundamentals will likely allow carriers to pass along higher fuel costs to shippers.

We think 2018 will hinge on a single behavior: discipline. Capacity and pricing discipline will determine whether carriers or shippers benefit more from the strong global economy. Nevertheless, tempests await as geopolitical shocks including possible trade wars and growing state involvement in the industry threaten carrier discipline.

Air freight: need for speed

Air freight volumes rose 9 percent in 2017, outpacing global trade growth on surging demand for ultrafast shipments. Traditional air shippers in the semiconductor, pharmaceutical, and electronics industries powered growth, challenging carriers to meet demand for cargo space on planes.

Last year, airlines including American and Delta added or expanded cargo facilities handling pharmaceutical shipments. But they also need to accommodate rising volumes from fast-growing e-commerce shippers and others looking to speed up supply chains. Online retailers compete on both price and service levels, striving to meet customer expectations for

ever-shorter delivery windows. Retailers and their suppliers increasingly turn to air shipping as they reduce consolidated full container loads in favor of more frequent deliveries to distribution and fulfillment centers. Other shippers, particularly manufacturers relying on steel mills, resort to air cargo when lean inventory practices cause supply chain bottlenecks.

Air freight volume growth slowed in the first quarter of 2018, slipping to a still-strong 5.4 percent increase from the year-earlier period. IATA forecasts a decline to average annual growth of 4.9 percent for the 2018–2022 period. Future air cargo volumes will depend on the overall level of global trade amid tit-for-tat tariff threats and other protectionist measures.

Creative solutions required

Airline cargo capacity lagged growth in air freight demand last year, even as rising passenger traffic put more planes in the air. IATA estimates that available capacity grew at only one-third the rate of demand growth. The gap narrowed dramatically in the first quarter of 2018, when a 5.3 percent rise in capacity nearly matched volume growth.

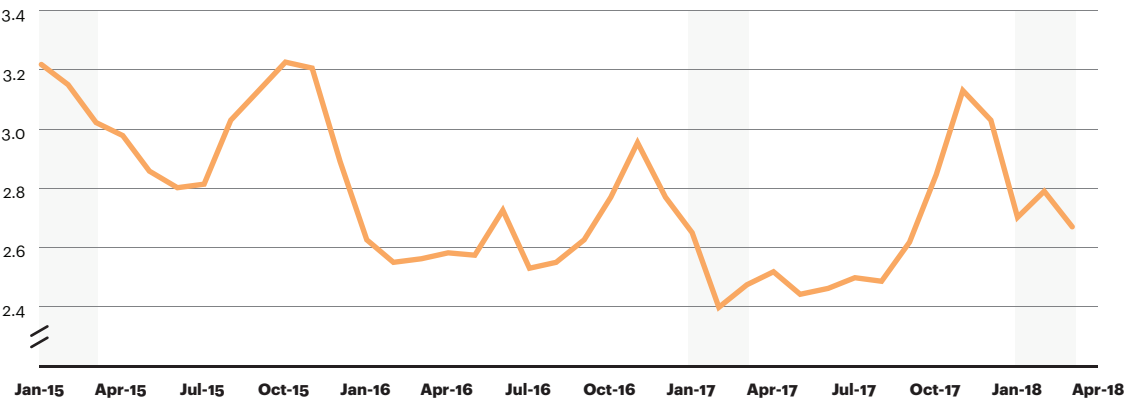
The cargo capacity shortage is causing backups at major airports. Some forwarders are responding by routing shipments through smaller cargo airports such as Charlotte Douglas, where freight volume soared 28 percent in 2017. Online retail giant Amazon is going even further, building its own air cargo facility at Cincinnati/Northern Kentucky airport and launching a fleet of 30 Air Amazon jets.

Airlines are forming partnerships to expand coordination on cargo capacity and share the costs of warehousing. During 2017, Delta expanded partnerships with Air France-KLM, Aeromexico, and Korean Air, while United Airlines expanded its partnership with Lufthansa and Air Nippon Airways.

Less empty space in cargo holds means higher load factors and yields for airlines. Air freight prices rose 4 percent last year, helping airlines absorb rising jet fuel prices, their biggest cost driver. With jet fuel pricing now trading over 50 percent above last year’s levels, and airline CEOs determined to maintain yields, air shippers shouldn’t expect rate relief in 2018 (see figure 22).

Figure 22
Air freight prices jumped 4 percent in 2017

Drewry East-West Air Freight average rate
(\$ per kilo)



Note: Weighted average of all-in air freight buy rates paid by forwarders to airlines for standard deferred airport-to-airport air freight services on 21 major East-West routes. Rates are expressed in \$/kg and include three components: the base rate, the fuel surcharge, and the security surcharge.
Source: Drewry

Is modernization and digitization finally reaching air freight?

In a development with potentially far-reaching implications, IATA members last year called for accelerated modernization of their industry, which has been slow to embrace new technologies. First on the digitization agenda is increasing adoption of e-AWBs and e-freight. E-AWB penetration climbed three percentage points to 53 percent last year. Other projects announced include digital and interactive cargo capabilities to address the long-standing request from shippers for real-time tracking of shipments.

Digitization also enables airlines to offer premium services. Delta is expanding its GPS-enabled cargo services both domestically and internationally while implementing real-time tracking of ULDs through Bluetooth technology. American Airlines is modernizing cargo management with a multiyear implementation of iCargo. And Lufthansa Cargo recently acquired Fleet, a Portland, Oregon-based start-up offering a global distribution system for logistics.

Although we expect the pace of modernization and digitization to accelerate, we don't foresee short-term digital disruption. More likely is gradual technological transformation over the medium-to-long term.

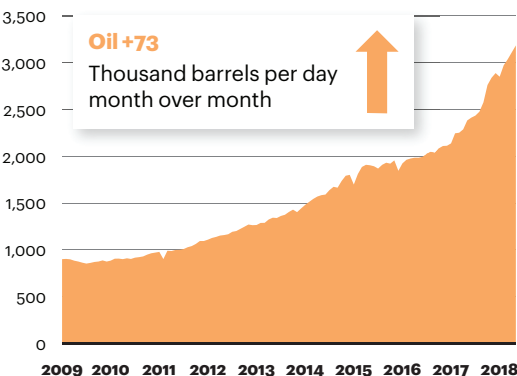
Pipeline: capacity shortages attract new players

Oil prices stabilized at higher levels last year, driving up production and squeezing pipeline capacity. With crude fetching \$45 to \$60 per barrel, US production peaked above 10 million barrels per day (bpd) and average annual daily production rose nearly 6 percent to 9.3 million barrels. Surging output quickly filled pipelines, boosting revenues by 15 percent for midstream operators while overwhelming existing transport infrastructure. Demand got another jolt when the lifting of a four-decade-old crude oil export ban increased the need for pipelines to move oil to Gulf Coast terminals. Pipeline shortages were most acute in the Permian Basin of Texas and southeastern New Mexico, which accounted for more than 80 percent of the production increase (see figure 23). By the first quarter of 2018, Permian bottlenecks had produced the biggest price differential between Permian and Cushing (WTI) prices since 2014.

Figure 23
The Permian Region oil production accounted for more than 80% of production increases in 2017

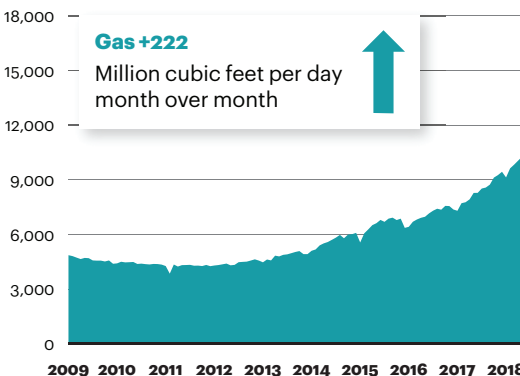
Permian Region oil production

Thousand barrels per day



Permian Region natural gas production

Million cubic feet per day



Source: A.T. Kearney analysis

Strong demand and capacity shortages attracted new capital into the pipeline sector. Private equity firms are among the leading investors in new infrastructure projects. In one major financing, Howard Energy Partners (HEP), a venture backed by private equity and a sovereign wealth fund, joined forces with WPX to build oil and natural gas gathering and processing facilities.

New capital is upending traditional financial arrangements. Some midstream companies seeking a bigger share of rising production are ditching conservative “take or pay” agreements with producers in favor of more-aggressive “pay to play” deals. In the HEP-WPX deal, HEP agreed to pay WPX \$300 million up front and fund the first \$263 million in capital expenditures, in exchange for WPX’s promise to transport and process production from 50,000 acres in the Permian over 20 years. Such agreements shift more risk to pipeline operators, which can be a challenge for typical midstream companies, especially master limited partnerships (MLPs) focused on delivering steady dividend payments to investors.

FERC changes pricing rules for MLP-owned pipelines

In March 2018, the Federal Energy Regulatory Commission disallowed recovery of income taxes from cost-based tariff rates for MLP-owned interstate pipelines. The agency will enforce its decision through an adjustment of the Oil Pipeline Rate Index in 2020. Initially, the ruling will affect only pipelines that set rates through cost-based tariffs. Over time, however, it’s expected to push down rates throughout the sector as shippers leverage the FERC decision with MLPs that set rates through private negotiations or market prices.

Marcellus and exports drive natural gas boom

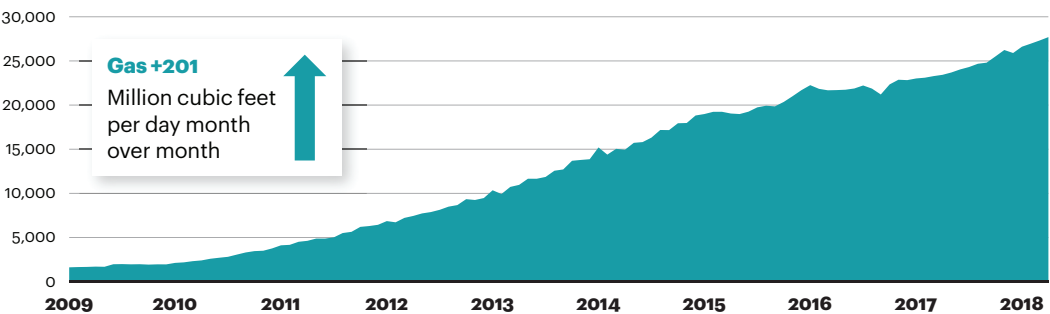
Natural gas production has become increasingly concentrated in the Marcellus shale region, located mainly in Pennsylvania and West Virginia (see figure 24). Marcellus production growth outpaced the nationwide increase last year, as production fell in Texas, Arkansas, the Rockies, and offshore fields. Louisiana also saw a significant increase, breaking a five-year decline.

The rise of Marcellus is reconfiguring the natural gas pipeline landscape. In 2017, approximately eight of the 37 pipeline projects completed in the US reversed existing flows to bring gas from the Marcellus to the Gulf Coast for LNG exports. Another 10 reversal projects are being

Figure 24
Natural gas production in the Marcellus Region outpaced the nationwide increase in 2017

Marcellus Region natural gas production

Million cubic feet per day



Source: A.T. Kearney analysis

considered or have been approved in the East and South. At the same time, new pipelines and expansions are under construction across the country, including three that will cross the Texas border into Mexico. Altogether, approximately 50 projects, large and small, are slated to be completed by 2019.

Natural gas demand continues to grow at home and abroad, signaling good times ahead for pipeline operators. Exports represent the largest share of growth, with new pipelines carrying gas to Mexico, and US companies tapping LNG markets around the world. The addition of four more LNG terminals by 2021 will bring total Gulf Coast export capacity to 9.2 Bcf/d.

Freight forwarding: in choppy waters

Last year we projected that the logistics industry would enter a period of uncertainty largely due to rising protectionist sentiment and an uncertain recovery from economic crises around the world. Instead, 2017 saw a resurgence in the global economy with international trade growing an estimated 4.3 percent according to the World Bank, ahead of the 3 percent growth in global economic output and 3 points higher than 2016's trade growth. This was good news for freight forwarders, many of whom saw their net revenues grow by double digits, with an average volume growth of 10 percent in air freight, 6 percent in ocean liftings, and 4 percent in road.

2017 saw a resurgence in the global economy with international trade growing an estimated 4.3 percent according to the World Bank. This was good news for freight forwarders, many of whom saw their net revenues grow by double digits.

These same economic tailwinds boosted underlying demand for ocean and air freight resulting in rising freight rates that served as a headwind for forwarders, pressuring yields that declined an average 6 percent on ocean moves and 8 percent on air freight. Some forwarders, such as Panalpina, were more affected than others depending on exposure and their ability to pass on higher rates by bundling value-added services.

M&A remained low in 2017 with Geodis' bid for CEVA Logistics falling through due to a reorganization at Geodis' state-owned parent SNCF. Acquisitions were mainly of niche players such as perishable or regional forwarders. That could change in 2018 with players such as DSV with strong balance sheets and more appetite for big acquisitions. Maersk's strategy to transform itself to an integrated supply chain partner might spur it to bolster via M&A the capabilities of its DAMCO forwarding unit. XPO Logistics could also be busy, having earmarked \$8 billion for deals on both sides of the Atlantic. With the top 10 players controlling just 43.5 percent of the market there is certainly room for consolidation.

Technology: disruption unfolding

Rising freight costs could be the least of the concerns for freight forwarders given the onslaught of start-ups venturing onto their turf. Flexport, the most famous of the lot, is closing in on a \$1 billion valuation as investors throw their weight behind the digitization of freight. The start-up tripled its ocean volume (though still much lower than traditional forwarders), and in a more direct threat opened warehouses and cross-dock facilities at key international gateways.

Disruption through disintermediation of middlemen is all the rage in Silicon Valley with start-ups in many legacy industries building business models around it. Ventures such as the New York Shipping Exchange and Uber Freight see an alternate path to disruption in a collaboration model with freight forwarders. They are building digital marketplaces in which freight forwarders can participate, to procure capacity and enforce compliance with ocean carriers in the case of the former, and to secure hinterland trucking capacity on demand in the case of the latter. Not all start-ups are attempting to disrupt incumbents; for instance, Stargo is creating solutions to aid forwarders in their digital transformation.

Not to be left behind, carriers, forwarders, and tech giants are collaborating to more immediately address impactful operational issues such as the paper trail associated with moving cargo internationally. To solve this unwieldy problem, blockchain technology is being collaboratively developed and piloted by shippers such as AB InBev, carriers such as APL and Maersk, forwarders such as Agility and Kuehne + Nagel, technology giants such as IBM, and customs agencies. The blockchain can speed up document flow and reduce data entry by up to 80 percent while providing immutable, secure, and instantaneous visibility into the supply chain to all parties involved.

Forwarders are also developing their own digital capabilities attempting to become transparent and reliable control towers for logistics. Last year DAMCO, Geodis, and Kuehne + Nagel all launched digital services aimed at online booking, pricing, and planning.

Outlook: multifaceted challenges

Despite positive forecasts of economic output for 2018, the outlook for international trade that freight forwarders are dependent on may not be as rosy, in part due to the increasing threat of tariffs and other trade barriers. Rising wages in developing nations coupled with increasingly capable automation in developed nations may accelerate reshoring trends, casting away the global value chains that have fueled international trade for the past few decades.

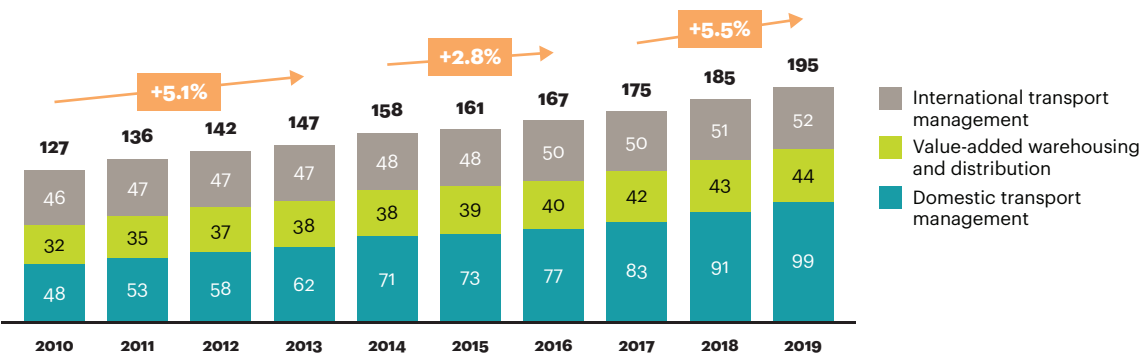
Strategically, forwarders need to transform or be disintermediated not just by the multitude of start-ups but also by air and ocean carriers who are making it easier for smaller shippers to access their capacity. The digital-to-physical path that start-ups are embarking on might prove to be lower resistance than the physical-to-digital transformation that forwarders are faced with. Then there are wildcards such as Amazon that have tremendous market power and do not shy away from taking on big challenges such as starting their own forwarding and carrier operations. Notwithstanding these challenges, forwarders can fight back by focusing on what makes them a successful cog in the global supply chain—their ability to manage the customer experience through nurtured relationships with shippers, carriers, and intermediaries such as port and customs agents, an aspect that does not lend itself to automation and commoditization.

Third-party logistics: capacity pressures intensify

Growth and change

US 3PLs are poised for growth after several major players spent much of last year integrating acquisitions from 2015 and 2016. Between 2017 and 2019, the market is expected to grow at a 5.5 percent rate to \$195 billion (see figure 25). Forecasters predict 19 percent growth in domestic transportation over the two-year period, as tight capacity drives up rates. Warehousing is expected to see 7 percent growth by 2019, largely on rising demand for value-added services. Shipper–3PL interactions continue to focus on short-term cost-cutting, while mutual mistrust prevents them from forging long-term strategic partnerships that would unlock greater growth for 3PLs.

Figure 25
The US 3PL market is projected to grow by 5.5% between 2017 and 2019



Note: Numbers may not resolve due to rounding.
Sources: Global and Regional Infrastructure, Logistics Costs, and Third-Party Logistics Market Trends and Analysis, October '17, Armstrong & Associates; A.T. Kearney analysis

Changes in infrastructure, talent pool, and regulations challenge shippers

US shippers that use 3PLs opportunistically and transactionally face steeper challenges in 2018 as capacity pressures in value-added warehousing intensify. A recent JLL report predicted 30 consecutive quarters of positive net absorption and the lowest availability rates since 2001. Compounding space shortages is the scarcity of warehouse workers with the skills to handle surging e-commerce shipments and use new technologies such as automation and the Internet of Things. Workers with those skills command ever-higher wages, adding to 3PL costs. At the same time, Amazon continues flexing its muscles. The online retail giant had about 160 million square feet of warehouse space by fall 2017, second only to DHL. Amazon’s expansion squeezes talent availability and helps fuel rental rates, which have risen for six straight years.

Domestic transportation is dealing with three challenges. First, shrinking capacity has stretched out lead times for putting orders on the road. Second, carriers that invest in new trucks struggle to find drivers at a time when higher-paying jobs in other sectors are plentiful. Finally, new regulations such as ELD and CDL drug and alcohol clearance mean carriers will need more drivers to run the same number of trucks. On the bright side, these conditions make shippers more receptive to closer partnerships with 3PLs. Innovative 3PLs that can help shippers improve supply chain efficiency and reduce total cost of ownership stand to benefit from the tight domestic market.

Strategic partnerships hindered by cost focus and trust issues

While small (<\$30 million in logistics spending) and large (>\$300 million in logistics spending) shippers are still interested in outsourcing logistics, many are dissatisfied with the “one-stop” solutions offered by most 3PLs. There’s blame on both sides. Shippers often expect 3PLs to meet unrealistic implementation time lines and performance standards. 3PLs, for their part, avoid the risks of exploring truly innovative and customized solutions lest they lose a cost-sensitive shipper and wonder why large shippers regularly reexamine what logistics activities to bring back in-house.

While both sides acknowledge that quick, accurate, and consistent information forms the foundation of any strategic partnership, they can’t agree on the exact roles and ownership structures for such collaborations. One way to mitigate these mutual concerns could be a gainsharing model that increases “skin in the game.” Another route to seamless collaboration would replace emails and offline reporting with a more-conversational and frequent exchange of information.

3PLs and shippers can’t afford to give up on collaboration. Today’s consumers are always connected, and their delivery expectations continue to rise. 3PLs and shippers won’t gain the speed and agility to meet those expectations until they form long-term, open, and mutually beneficial partnerships.

Digital technologies disrupt the sector but also enable efficiency and collaboration

Higher levels of data connectivity and demands for greater transparency make business more volatile, which in turn forces shippers to seek greater agility, visibility, and flexibility in logistics. Several emerging technologies help 3PLs fill this need. Blockchain, for example, increases the speed and efficiency of logistics transactions by enabling a 3PL to report and document every stage of a shipment in a secure, digital format. Already, the Blockchain in Transportation Alliance (BiTA) has attracted more than 750 companies, including the largest US 3PLs. In inventory management, IoT applications such as embedded sensors and RFID enable real-time data gathering and improve forecasting accuracy. Some 3PLs use drones to count and track assets and expedite last-mile deliveries, improving inventory control across multiple nodes and helping 3PLs win more omnichannel fulfillment work. However, these technological advances also open the door to new competition for traditional 3PLs. Online marketplaces such as Flexport, OpenPort, and Blockarray offer a range of services, from LTL for smaller shippers to warehouses for cross-docking, supply chain financing, and even air cargo, all with competitive prices and complete shipment visibility. Amid these opportunities and threats, one thing is clear: technologies underpinning the Fourth Industrial Revolution (from blockchain and IoT to 3D printing and quantum computing) also hold the key to strategic collaboration between shippers and 3PLs in the coming decade.

Warehousing: innovate or die

The crucial role of warehousing as a supply chain staging ground has become even more important amid rising economic growth and surging online commerce. As myriad changes reshape logistics, four major trends will drive the evolution of warehousing over the next five years: labor cost inflation (in both trucking and warehousing), e-commerce growth, the dominance of larger players such as Amazon, and warehouse automation.

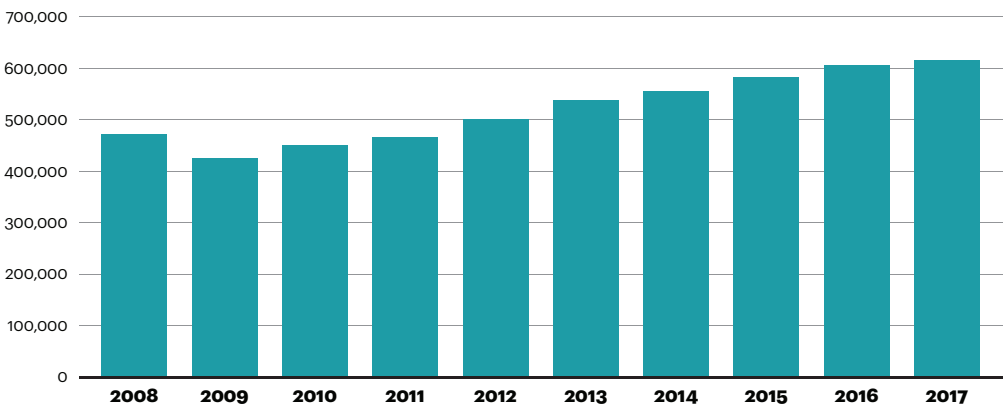
Tight capacity and driver shortages squeeze shippers

Forecasters expect storage rates to keep rising on strong demand and tight capacity. CBRE’s recently published Global Prime Logistics Rents Report predicts double-digit rent increases in

many markets this year. Worldwide, six of the 10 markets with the sharpest increases last year were in the US, including the top three: Oakland, New Jersey, and the inland Los Angeles area.

As warehouse rates rise, the ranks of truck drivers are dwindling. To reduce order delays and stock shortages, many shippers are moving goods closer to end customers, adding overflow capacity, increasing inventory levels, and adding safety stocks. These measures further reduce warehouse capacity, driving rates even higher. As safety stocks increase and SKUs proliferate, warehouse efficiency becomes paramount for companies striving to meet ever-shrinking e-commerce delivery lead times, the requirements of just-in-time manufacturing, and the demands of retailers trying to keep shelves full and store inventories lean. “Assumptions have changed a lot in terms of volume and service levels required,” says Chris Caton, senior vice president and global head of research for logistics real estate developer Prologis (see figure 26).

Figure 26
Estimated end-of-year inventories of US retail firms



Notes: Estimates are shown in millions of dollars and are based on data from the Annual Retail Trade Survey. Estimates have been adjusted using final results of the 2012 Economic Census. Estimated measures of sample variability can be found at http://www2.census.gov/programs-surveys/retail/tables/2016/arts/reliability_tables.xls. Retail total and other subsector totals may include data for kinds of business not shown. Estimates have not been adjusted for price changes. Additional information on confidentiality protection, sampling error, nonsampling error, sample design, and definitions can be found at <http://www.census.gov/programs-surveys/arts/technical-documentation/methodology.html>.
Source: US Census Bureau

Warehouses battle turnover and worker shortages

With unemployment at a 10-year low, finding skilled workers has become a top priority and a major challenge for warehouses. Warehouse wages rose 6 percent last year to a range of \$12 to \$15 per hour, according to the US Bureau of Labor Statistics. As warehouse operators’ largest single expense was rising, worker productivity stagnated, delivering a one-two punch to operational efficiency and profit margins. These pressures intensified during the peak holiday shipping season when major e-commerce players such as Amazon and Walmart recruited additional part-time workers.

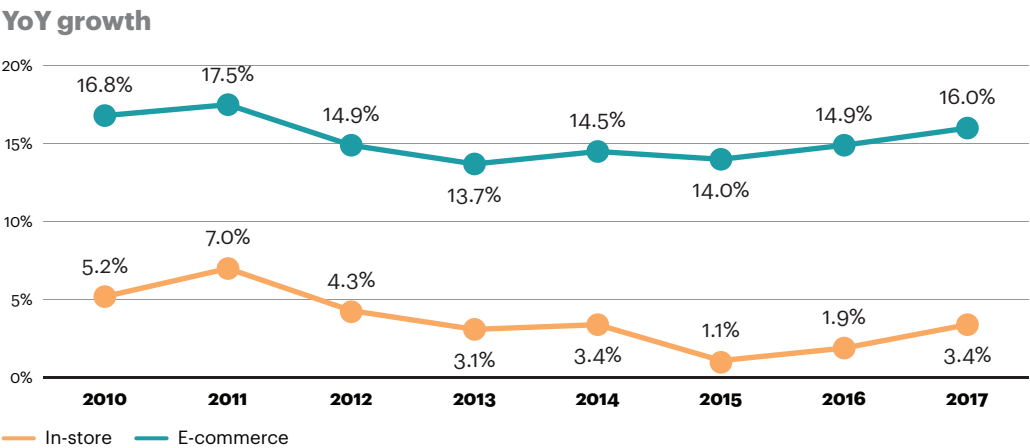
Labor shortages and high turnover make it harder for warehouse managers hoping to control costs and boost productivity by improving workforce capabilities through training programs. As a result, more companies are seeking technological solutions to cost and productivity challenges. A December 2017 survey by DC Velocity found that more than half of warehouse operators were investing large sums in handheld technologies and mobile platforms.

Rising customer expectations and changing market dynamics—what e-commerce growth means for warehousing

Retailers rode an accelerating economy to 4.1 percent growth in 2017. E-commerce retailers set the pace again, posting a 16 percent sales increase while traditional store sales rose 3.4 percent (see figure 27). The ensuing pressure on warehouse capacity reduced space availability and lifted rents. Space availability tumbled to a historic low of 7.3 percent in the first quarter of 2018, according to the CBRE Industrial and Logistics Report. Rental rates rose 5.9 percent last year as retailers and 3PLs jockeyed for shrinking amounts of warehouse space (see figure 28). Warehouse operators reaped the benefit of rising rates, while retailers and 3PLs tried to protect their profit margins by improving warehouse efficiency.

To find those efficiencies, some retailers and consumer packaged goods companies are teaming up with 3PLs specializing in e-commerce shipments, a segment that grew 15.7 percent last year, well above overall 3PL market growth of 6 percent. Focused on technology-enabled integrated

Figure 27
E-commerce retailers recorded a 16% sales increase in 2017



Note: YoY is year-on-year.
Sources: eMarketer, US Census Bureau, CBRE Research; A.T. Kearney analysis

Figure 28
Rental rates rose 5.9% in 2017



Sources: Cushman and Wakefield, MARKETBEAT U.S. Industrial Q1 2017, MARKETBEAT U.S. Industrial Q1; A.T. Kearney analysis

solutions, 3PLs such as Radial and Saddle Creek Logistics Services are creating fulfillment centers that generate scale economies by combining multiple shippers under one roof.

As the dominant e-commerce player, Amazon is forcing online rivals and brick-and-mortar retailers to match its increasingly aggressive delivery promises. Free two-day shipping has become a baseline expectation, compelling shippers across the spectrum to reconfigure supply chains and create omnichannel capabilities. Delivery options such as ship-from-store or in-store pickup of online orders require investments in warehouse automation and network alterations, including forward inventory deployment and mini warehouse operations in large cities. As supply chains become more complex, companies need new systems and processes, such as technology that provides a real-time view of inventory available for sale.

As myriad changes reshape logistics, four major trends will drive the evolution of warehousing over the next five years: labor cost inflation, e-commerce growth, the dominance of larger players such as Amazon, and warehouse automation.

Amazon also uses big data to optimize warehouse operations, capitalizing on its proximity to final customers and its ability to collect and analyze large amounts of data. For example, more-accurate inventory allocation allows Amazon to ship faster at lower cost while selling more products at full price than retailers forced to discount excess inventory. Better data also enables real-time performance tracking, increasing the productivity of Amazon's workers and warehouse equipment while accelerating fulfillment. Amazon recently patented a wristband that tracks warehouse workers' movements, using the haptic feedback to improve efficiency. Amazon's dominance leaves other retailers with two choices: fight or join forces with the Internet giant. Those that choose to sell directly through their own e-commerce channel are investing in warehouse automation or forming partnerships with e-commerce-focused 3PLs. Retailers that opt to sell through Amazon save money on warehouse investments, but contribute to Amazon's density, the source of its power in logistics.

Shippers are experimenting with new formats, especially during the holiday season, when online sales surge and a flood of returns follows. "Pop-up warehouses" operated by Stord, Flexe, and others offer temporary storage and returns-handling capabilities for these peak demand periods. Pop-up warehouses cost more than traditional distribution centers, and shippers incur additional costs shifting inventory to temporary storage facilities. Still, the flexibility of buying warehouse capacity on an as-needed basis supports demand for pop-ups.

Rising demand for same-day delivery is driving an increase in forward warehouse deployment. Same-day delivery is most popular in urban locations, where warehouse space is limited and rents are higher than suburban areas. As a result, shippers are squeezing into warehouses as small as 200,000 square feet (a typical warehouse spans 500,000 square feet) and sometimes even sharing space with rivals to save on rent.

Turning to technology

In an era of razor-thin margins and rising labor costs, warehouse operators hoping to stay competitive and increase profits must keep pace with technological advancements. Along with these financial pressures, two recent developments increase the likelihood that the industry will overcome its longstanding reluctance to invest heavily in new technologies.

First, the new tax law opens a five-year window during which businesses can accelerate the write-off of the cost of new equipment and buildings. Thus, businesses get immediate tax benefits and a bonus depreciation on equipment, powerful incentives for technology investments in the short term.

Second, warehouse managers have a much wider array of technologies to choose from as they seek new tools to reduce costs, improve efficiency, and streamline operations. The proliferation of choices at various price points means more warehouse operators will find technologies suited to their needs and budgets. Among the wide variety of technological enhancements, four major categories hold great promise:

Robots. Autonomous mobile robots (AMRs) and automated guided vehicles (AGVs) aren't new, but rising pressure to improve worker productivity is spurring adoption of robotic-centric solutions at pick-pack-and-ship warehouses. Innovative systems such as Kiva use movable storage shelves that can be lifted by small, autonomous robots. Robots that bring items to workers increase productivity by a factor of two or more, while enhancing accountability and flexibility. However, AMRs are supplanting AGVs in busy warehouses seeking greater flexibility, efficiency, and speed. Unlike AGVs, AMRs don't have to follow fixed routes. They're also easier to set up and use, faster, smarter, cheaper, and more efficient than AGVs.

Drones. Aerial drones help organizations improve warehouse efficiency and inventory accuracy. Coupled with advanced optical technology, RFID, and bar coding sensors, drones deliver significant gains in labor productivity and inventory cycle count efficiency. Major retailers are testing drone systems from companies such as PINC, in hopes of driving major improvements in inventory identification and the overall inventory-checking process.

Wearables. Wearable technologies enhance the operational benefits of connected networks that are improving process transparency and enabling analytics in many warehouses. Technology vendors say wearable voice command tools increase warehouse efficiency by as much as 30 percent. Adoption of wearables is likely to accelerate as more companies discover their potential to improve communication, productivity, and safety. For example, line workers wearing "smart glasses" receive visual step-by-step instructions. Two-way audio headsets allow managers to communicate with workers spread across a warehouse in real time. Other wearables monitor employees' health and stress levels, while GPS and beacon technology tracks worker movements and warns them away from dangerous areas.

Chip/sensor technology. Advances in chip and sensor technology, which translate data from the automated movement of physical goods, can be especially powerful in expediting payments and delivery of goods and services. Sophisticated WMS chip technology, meanwhile, cuts operating costs while increasing the speed and accuracy of warehouse operations.

Racing to the bleeding edge

Warehousing faces an "innovate or die" challenge as costs, competition, and consumer expectations escalate. In their urgent quest to accelerate faster, operators are taking greater risks and looking into such "bleeding-edge" technologies as exoskeletons. Many

of the roughly 36 exoskeleton suppliers, including Ekso Bionics and SuitX, now offer lightweight passive designs with metal and carbon-fiber frames that attach to workers' bodies or exterior scaffolding. Warehouse operators' willingness to try such futuristic systems underscores a growing awareness that technology may be the best hope for survival in a rapidly evolving industry.

Blockchain: from buzzword to reality

Little more than a cryptocurrency buzzword a few years ago, blockchain now attracts big money from companies around the world. Market researchers at International Data Corporation predict global spending on blockchain will double to \$2.1 billion in 2018. Financial sector companies will invest the most—a projected \$754 million—followed closely by distribution and logistics at \$510 million.

In the fragmented global logistics industry, most cargo passes through many hands and the industry lacks standardized transaction and tracking processes. The resulting complexities have spawned an expensive and inefficient supply chain notably lacking in trust and accountability. Enter blockchain, an instantaneous, immutable, fully transparent transaction ledger seemingly tailor-made for global logistics. Blockchain has applications in three key supply chain areas: 1) simplifying payments and cross-border transactions; 2) tracking goods as they move through the supply chain; and 3) establishing the provenance and integrity of goods.

Several logistics players are betting on blockchain, with shipping giant Maersk leading the pack. Maersk and IBM are developing a global blockchain-based system to digitize shipment tracking. IBM estimates that a shipment from East Africa to Europe currently requires approvals from as many as 30 different parties. By the time it reaches its destination, up to 200 different interactions may have occurred. The IBM-Maersk blockchain system maintains a tamper-proof, digital record of these interactions, allowing a shipment to be tracked with accuracy while in transit. Digital records offer the added benefit of drastically reducing paperwork expenses that often equal the cost of physically moving goods around the world.

Industry ready for adoption?

Despite growing enthusiasm over blockchain's potential to transform logistics, widespread adoption will take time. We expect steady but gradual uptake as industry players define a set of common standards, revamp logistics technology for blockchain, and win buy-in through successful pilot programs.

Common standards are the key to industrywide adoption. Systemic inefficiencies will persist unless shippers, 3PLs, carriers, brokers, and governments agree on a common framework for transacting and tracking through blockchain. The industry needs standards for smart contracts, freight payments, asset maintenance and ownership history, chains of custody, and data, among other areas. Industry organizations such as BiTA (Blockchain in Transportation Alliance) are leading the conversation around common frameworks. However, BiTA Managing Director Craig Fuller says progress has been slowed by the diversity of players involved and the early stage evidence of commercial outcomes of blockchain applications. Among these potential standards, perhaps the most important is a set of protocols for data characterization—such as a universal driver ID. The industry's inability to settle on a global standard for EDI suggests the pace of blockchain adoption will depend on how quickly negotiators agree on data characterization standards.

Another challenge is the existing technology infrastructure of logistics. There's a need for standardization and stricter implementation of existing technology before blockchain solutions

can be built on top. For example, blockchain can potentially be used to enforce penalties for late delivery and track detention pay in trucking. However, for a blockchain solution to be effective, you must trust the integrity of the underlying ELD system—if the geolocation and HOS tracking of the ELD are unreliable, a blockchain-based smart contract will add little value. Furthermore, blockchain requires other technology upgrades. For example, participants will need to digitize their transactions and interactions so data can be uploaded in real time to the blockchain ledger. The faster logistics players adopt these standards and technology, the sooner blockchain can roll out across the industry.

Widespread industry support will also be necessary for successful adoption. For blockchain to work, all participants must believe in the validity of the information exchanged across the chain. For example, manufacturers need to trust that their carriers have the necessary insurance and other qualifications to handle their freight. An effective global blockchain network also requires participation by all stakeholders. Interactions happen not only between shippers and carriers, but also regulators, retailers, wholesalers, and customers. If any party refuses or fails to participate, the value of blockchain will be greatly diminished. Thus, the more exposure the players in the industry have to successful proof-of-concept use cases, the more likely they are to buy into blockchain and accelerate its adoption.

Potential for market consolidation?

Currently, large logistics companies with the resources to conduct pilot programs and collaborate with other industry leaders are driving the blockchain agenda. This will give them a first-mover's advantage in dictating standards that enable blockchain. These standards will provide the initial framework for how blockchain could ultimately be implemented in the industry—from what the data should look like to how information should be captured and logged digitally into the blockchain.

However, given the fragmented nature of the logistics industry and the importance of mass participation, smaller companies will have the ability to help shape blockchain standards and implementation. The smaller players have much to gain from blockchain, which likely will level the industry playing field. They will benefit as blockchain increases transparency and improves inventory and capacity management—potentially saving the industry billions of dollars. These savings could ultimately be the difference between success or failure for small logistics companies. In that sense, successful blockchain adoption would help small players more than large ones. Therefore, blockchain adoption appears unlikely to increase industry consolidation. That said, the impact of blockchain on any participant will vary depending on where the participant falls on the chain. Asset-based 3PLs such as truck carriers will likely benefit more from blockchain than asset-light 3PLs who provide matching services or documentation support. It will be interesting to see how various market players adopt and adjust to blockchain over the next few years.

Logistics Trends and Outlook: Shifting Currents

Rising demand and tight capacity put carriers in the driver's seat

Logistics providers are on a roll after years of battling excess capacity that squeezed margins and pushed many carriers to the brink. An accelerating economy is spurring demand across the industry. As warehouses, truck trailers, rail cars, and cargo holds fill up, providers are regaining pricing power and raising rates. Conditions were particularly strong for providers last year as economic growth picked up, e-commerce shipments surged, and rebuilding efforts following natural disasters around the US added a temporary jolt of demand.

On the supply side, shortages of operators and equipment continue to squeeze capacity. Trucking, which transports more than 70 percent of consumer goods in the US, faces acute driver shortages as older workers retire and young people opt for other opportunities in a strong job market. Carriers face similar trouble getting new equipment, as truck manufacturers struggle to keep pace with orders. Truck order backlogs more than doubled since last September, reaching 205,000 units at the end of April. However, equipment shortages aren't likely to ease until late this year.

Carriers and shippers are scrambling to adjust to market dynamics that haven't been seen for years. Demand has outpaced supply for six straight months, giving carriers leverage to choose which shippers will get capacity. Carriers are allocating capacity to preferred customers, and even "firing" inefficient shippers in extreme cases. Shippers, for their part, are trying to become more attractive to carriers. They're seeking favored status under carriers' "shipper of choice" programs and eking out capacity through technologies such as appointment window scheduling.

Fundamental forces reshape logistics

Looking beyond short-term supply and demand fluctuations, we see five fundamental factors driving logistics: consumer demand, technology, infrastructure, and global trade tensions.

1. The human element. E-commerce is the driving force in consumer markets, creating new customer expectations that stretch supply chain capabilities. Amazon has set a standard of two-day delivery for online retailing, with significant implications for logistics. Warehouses are getting smaller and moving closer to population hubs as retailers retool their networks for faster delivery.

While consumers benefit from faster shipping, logistics workers enjoy unprecedented competition for their services. Talent is scarce across various occupations and filling vacancies is difficult in a booming economy that offers workers more options. Logistics companies raising wages for traditional industry jobs also need to recruit workers with the skills to operate new technologies that are spreading through the industry.

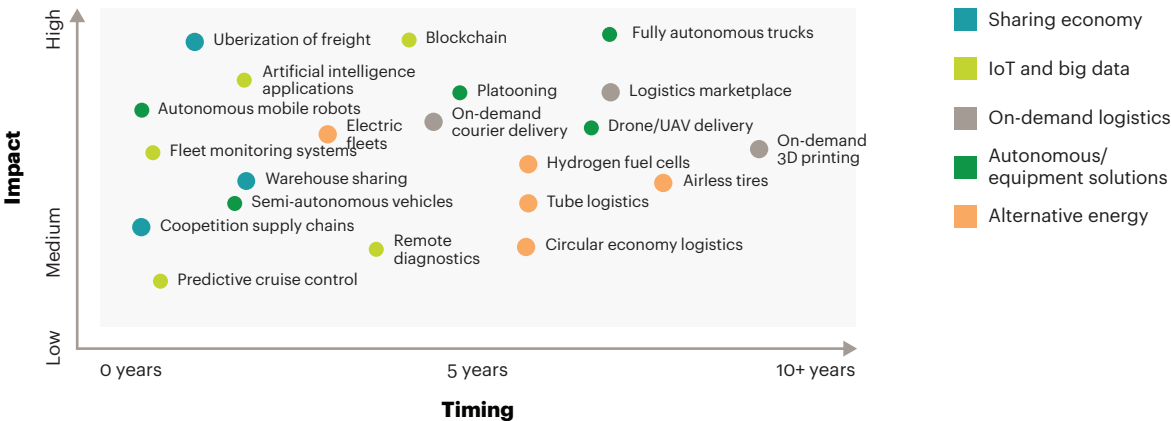
2. Technological disruption. Logistics is in the early stages of an evolutionary leap driven by technological change. We expect four key technologies to have a significant impact on the industry over the next 10 years (see figure 29 on page 43).

3. Infrastructure, a very nervous system. With more than four million miles of roads ranging from 15-lane interstates to residential streets, US infrastructure currently ranks 12th among 138 countries on the World Economic Forum's rankings for overall infrastructure quality.

Figure 29

A range of new technological innovations is expected to impact the overall transportation industry over the next 10 years

Innovation grid: a 10-year outlook



Source: A.T. Kearney analysis

Yet most US infrastructure is more than 50 years old and badly in need of improvement. A high rate of traffic fatalities knocked the US down to 60th place for highway safety. The American Society of Civil Engineers gave US infrastructure a D+ on the last two report cards and recommended more than \$2 trillion in upgrades over 10 years to modernize transportation and boost economic growth.

Resilience is a growing concern, as shown by the slow recoveries from three major hurricanes that battered some US transportation systems last year, causing an estimated \$265 billion in damage. The US also ranks low for sustainability, with average CO₂ emissions double the rate of any other industrialized nation. US emission levels reflect higher automobile use compared with other countries that rely more heavily on public transit.

Despite the pressing need, progress on transportation improvements has been slow. Since President Trump unveiled his \$1.5 trillion infrastructure plan, Congress has allocated just \$21 billion, or 2 percent of the funding target.

- 4. Regulatory ripples.** The largest impact on regulation of logistics is expected to be due to the full enforcement of the Electronic Logging Mandate in April. For large fleets, the impact is expected to have normalized as alternatives of electronic logging devices (ELDs) have long been in use. Even as of May 2017, 81 percent of large fleets (more than 250 trucks) had already implemented ELD (some large providers such as Schneider since 2010). Small to medium-size fleets are experiencing disruptions in carrier productivity in select lanes—specifically any lanes in the 450- to 600-mile distance segment, where the abuse of hours of service would be expected to exist. Small trucking companies that have recently implemented ELD are reporting a 12–15 percent reduction in miles per day. Shippers are hearing about the impact of ELD enforcement on select parts of their network that are being serviced by small niche carriers that delayed implementing ELD. Most issues are expected to normalize by year end as compliance increases; however, it is clear that the ELD mandate is exacerbating already tough capacity conditions.
- 5. Rumors of trade war.** Heated trade rhetoric between the US and China has been running hot and cold, with threats of tariffs on more than \$150 billion in goods. Although it is too early to

evaluate the impact on logistics and global supply chains, the effect on global supply chains could be highly disruptive, forcing companies to find new suppliers, potentially at higher costs that would be passed onto consumers. At this point, it's not clear if hostilities will escalate into all-out trade war or recede as both parties ponder the potential damage. Import tariffs would fuel inflation in the US, driving up costs for businesses and consumers. For China, losing access to the US consumer market would be catastrophic. While the ultimate outcome remains in doubt, we can safely predict that a trade war would produce plenty of losers.

Overall outlook

We expect strong demand, capacity constraints, and new technologies to shape short-term conditions in logistics (see figure 30). Capacity is likely to stay tight this year, allowing providers to push through more rate hikes. More companies will turn to technologies such as Uberized

Figure 30
Four key disruptive technologies

Autonomous Mobile Robots	
Description and implications <ul style="list-style-type: none">Autonomous mobile robots (AMR) move in warehouses with a high degree of autonomy to perform tasks such as picking up, moving, and placing crates while having the ability to stop for or maneuver around objects and humans.Interest in AMRs picked up six years ago, when Amazon bought Kiva systems. Since then, AMRs have begun moving into the mainstream as technology improved and more AMR vendors entered the market.Today, AMRs use mapping programs to identify the most efficient routes through warehouses rather than following predetermined paths. And with cloud-based software, operators can control AMRs from remote locations. Increasingly, warehouse operators see robots as key elements of technologically advanced facilities equipped to handle higher volumes, faster delivery expectations, and rising operational complexity.	Progress to date <ul style="list-style-type: none">Autonomous mobile robotics in the warehouse is a high-growth and theoretically transformative logistics technology. There are more than 50 existing and emerging firms vying for customers within this space: the prominent candidates are Fetch Robotics, Via Robotics, and Vecna Robotics, which currently offer AMR solutions to meet the challenges presented by the high-volume, high-labor requirements of e-commerce fulfillment.A recent, highly publicized example is at FedEx, where Vecna AMRs are used to convey and sort oversized packages at ground distribution hubs.
2020 outlook <ul style="list-style-type: none">A recent report by Tractica Research estimates that the worldwide sales of warehousing and logistics robots will reach \$22.4 billion by the end of 2021, with robot unit shipments reaching 620,000 units per year by 2021.Mobile robotics in material handling and logistics will become a \$75 billion market by 2027 and then more than double in size by 2038.The increase of e-commerce, omnichannel retailing, and customer demand for faster and inexpensive delivery is pressuring logistics players to ease the delivery value chain and look for automation.	
Artificial Intelligence	
Description and implications <ul style="list-style-type: none">Artificial intelligence applications are outputs of computer systems that enable or are able to autonomously perform tasks such as visual perception, speech recognition, decision-making, and translation between languages.Gartner analyst Noha Tohamy breaks out the application of AI into two categories, augmentation and automation.Augmentation is where AI assists humans in eliminating manual processes. Immediate applications in the supply chain space can be seen in reporting, route planning, and allocations.Automation refers to the completion of tasks without the need for any human intervention.	Progress to date <ul style="list-style-type: none">AI continues to increase its applicability in logistics by becoming more readily accessible and affordable. The network-based nature of the industry provides a natural framework for implementing and scaling AI.The impact of data-driven and autonomous supply chains provides an opportunity for formerly inconceivable levels of optimization in manufacturing, logistics, warehousing, and last-mile delivery.
2020 outlook <ul style="list-style-type: none">By 2020 it is expected that AI in logistics will include back office automation, predictive operations, intelligent logistics assets, and new customer experience models.AI will continue making strides in adoption in consumer and enterprise domains.Further, physical and digital logistics networks will drive new levels of value creation that augment human know-how through self-learning.	

“Uberization” for freight	
Description and implications <ul style="list-style-type: none">• Technology applications enable efficient matching of supply and demand.• These applications enable increased transparency and streamlined communication, bypassing significant manual or personal intervention.• There is a need to increase development of standards for communication of requirements (on behalf of shippers) and capabilities (by carriers).	Progress to date <ul style="list-style-type: none">• Multiple start-ups—including Uber Freight, Cargomatic, Convoy, Cargo Chief, Transfix, and Trucker Path—have entered the space, successfully raised millions in funding, and piloted the concept at smaller scales, in select regions.• Uber has launched several versions of Uber Freight for long-haul trucking, including a perks program called Uber Freight Plus that offers truckers discounts on trucks, fuel, maintenance parts, and other common needs.
2020 outlook <ul style="list-style-type: none">• Uber Freight will gain traction in the next few years as shippers and carriers transition from legacy manual/personal practices to a digital platform.	
Blockchain	
Description and implications <ul style="list-style-type: none">• Blockchain is a secure, tamper-resistant ledger that can track shipments, documentation, and payment transactions across the supply chain. Many users can view and enter data, but nobody can alter previous entries.	Progress to date <ul style="list-style-type: none">• Experts predict blockchain will increase global trade by nearly 15% and reduce documentation costs representing an estimated 20% of global trade expenses.• In a sign of widespread interest, more than 750 companies, including the largest US 3PLs, have joined the Blockchain in Transportation Alliance (BiTA).• Some companies are starting to use the technology—earlier this year, Maersk and IBM launched a blockchain venture to improve efficiency and security in global trade.• Two of Europe’s largest shipping ports, Rotterdam and Antwerp, have begun work on blockchain projects to streamline interaction with port customers.
2020 outlook <ul style="list-style-type: none">• Recording values on blocks, the results of processes can be seen at all ends at the same time, which makes most steps of the shipping process very fast. Secondly, it will strengthen traceability and help identify fake products. Blockchain technology will bring additional unforeseen benefits to the shipping and logistics industry.	

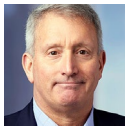
Source: A.T. Kearney analysis

applications and AMRs to find capacity and boost efficiency. Shippers that source goods from countries subject to new trade restrictions should start looking for alternative vendors now, before they lose access to current suppliers. All shippers should continue improving efficiency in their supply chains so they can secure carrier capacity at the lowest possible cost. Carriers, meanwhile, should maximize capacity utilization by cultivating a strong customer base that will improve network density.

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Appendix

Estimating USBLC

The CSCMP and A.T. Kearney strive to maintain maximum transparency and consistency. The assessment of assumptions, data sources, and methodologies that was made last year resulted in a robust research procedure that can be replicated for consecutive years. Because the structure of the supply chain did not significantly change compared to last year, it was deemed appropriate to keep the approach to estimate the USBLC unchanged.

Historical comparability has been preserved and the three main categories of the past have been retained: transportation costs, inventory carrying costs, and other costs (see figure A on page 47).

BEA uses the widest variety of available source data as input to the industry accounts. It incorporates domestic and import–export revenues where applicable. In other words, it includes any spend attributable to an establishment within the US.

Transportation costs

Transportation costs are based on Bureau of Economic Analysis (BEA) industry output. BEA US input–output accounts are a primary component of national income and product accounts and GDP. BEA uses the widest variety of available source data as input to the industry accounts. It incorporates domestic and import–export revenues where applicable. In other words, it includes any spend attributable to an establishment within the United States. It is rebalanced every five years against US Business Census data.

Our data partner IHS Markit used detailed BEA data, its proprietary databases IHS Markit Transearch™ and IHS Markit Business Market Index, and public company information to categorize subsegments in a way that better reflects how transportation and logistics is purchased and used. Data was thoroughly reviewed to avoid double counting between segments.

No changes were made to last year’s segmentation and definitions:

- Motor carriers are segmented into full truckload, less-than-truckload, and private or dedicated carriers.
- Parcel includes U.S.-based couriers and messengers and the USPS parcel segment, net of purchased transformation. The numbers are based on BEA output, modified to remove duplicate transportation from other modes (arising from, for example, intramode purchases).

Figure A

Three cost categories are used to determine USBLC

Data element	Sub-elements	Source
Transportation costs		
Motor carriers	<ul style="list-style-type: none"> Full truckload Less-than-truckload Private or dedicated 	<ul style="list-style-type: none"> BEA input-output accounts, annual, production of commodities by industry IHS Markit Transearch™
Parcel	<ul style="list-style-type: none"> Courier and messenger USPS parcel segment 	<ul style="list-style-type: none"> BEA input-output accounts, annual, production of commodities by industry, gross value IHS Markit FedEx and UPS financial statements US Bureau of Transportation, Form 41 Air Carrier Reports USPS financial statements USPS Cost Segment and Components Report
Rail	<ul style="list-style-type: none"> Carload Intermodal 	<ul style="list-style-type: none"> BEA input-output accounts, annual, production of commodities by industry IHS Markit Association of American Railroads
Air freight	<ul style="list-style-type: none"> Domestic and import-export cargo and express 	<ul style="list-style-type: none"> BEA input-output accounts, annual, production of commodities by industry US Bureau of Transportation, Form 41 Air Carrier Reports IHS Markit
Water	<ul style="list-style-type: none"> Inland Coastal and Great Lakes Deep sea: domestic, import-export 	<ul style="list-style-type: none"> BEA input-output accounts, annual, production of commodities by industry IHS Markit
Pipeline	<ul style="list-style-type: none"> Crude oil Natural gas Other products 	<ul style="list-style-type: none"> BEA input-output accounts, annual, production of commodities by industry IHS Markit
Inventory carrying costs		
Storage		<ul style="list-style-type: none"> BEA input-output accounts, annual, production of commodities by industry Armstrong & Associates, total US warehouse market
Weighted average cost of capital	<ul style="list-style-type: none"> Cost of equity, debt, and taxes 	<ul style="list-style-type: none"> Aswath Damodaran, New York University Stern School of Business
Total business inventory		<ul style="list-style-type: none"> Federal Reserve Bank of St. Louis, Series ID A371RC1Q027SBEA: private inventories, quarterly, seasonally adjusted (from BEA). Private inventories includes manufacturing, retail, and wholesale and represents end-of-month stock and goods available for sale on the last day of the reporting period.
Other (obsolescence, shrinkage, insurance, handling, others)	<ul style="list-style-type: none"> Shippers' administrative costs 	<ul style="list-style-type: none"> A.T. Kearney estimate based on various internal and external studies Gartner
Other costs		
Carriers' support activities	<ul style="list-style-type: none"> Freight transportation arrangement Packing and crating Marine cargo, port, and other shipping-related services All other support services to transportation 	<ul style="list-style-type: none"> BEA input-output accounts, annual, production of commodities by industry Public company financial statements IHS Markit Business Market Index
Weighted average cost of capital	<ul style="list-style-type: none"> Wages Benefits IT costs 	<ul style="list-style-type: none"> BLS, occupational employment statistics, occupation by industry sector BLS, employer costs for employee compensation, private workers

Sources: US Census Bureau, CBRE Research, eMarketer, S&P CapIQ, UPS Investor Relations, FedEx, Investor Relations, Bernstein, International Monetary Fund, Economist Intelligence Unit, University of Michigan, US Federal Reserve, Joint Committee on Taxation, American Society of Civil Engineers, World Economic Forum, New York University Stern School of Business, US Bureau of Labor Statistics, American Trucking Association, US Energy Information Agency, US Census, A.T. Kearney Foreign Direct Investment Confidence Index, Wall Street Journal, Financial Times, The New York Times, Logistics Management, The Washington Post, Politico, Heritage Foundation, Tax Policy Center, White House, Freight Waves, Bloomberg, The Hill, IATA, delta.com, aa.com, united.com, lufthansa.com

- Air freight includes both cargo and air express. Consistent with BEA definitions, it incorporates both domestic and import–export revenues.
- Water includes coastal and Great Lakes, inland waterways, and deep sea. It incorporates domestic and import–export revenues.
- Pipeline reflects all commodity products.
- Freight forwarder is included, net of purchased transportation cost estimates, under carriers’ support activities in the “Other costs” category.

Inventory carrying costs

Inventory carrying costs are calculated from the bottom up using the sum of their three subcomponents: storage, financial costs, and other. Financial costs estimates the weighted average cost of capital for all US public companies and multiplies it by the value of total business inventory. The value for “other” is calculated as a proportion of the overall inventory carrying cost. This proportion is smaller than the other two subsegments and is based on consensus estimates from various sources.

Financial costs estimates the weighted average cost of capital for all US public companies and multiplies it by the value of total business inventory. The value for “other” is calculated as a proportion of the overall inventory carrying cost.

Other costs

We use the same definitions as last year.

Carriers’ support activities reflect a broad range of services that support shipping. Examples include freight transportation arrangement (freight forwarders and brokers), customs services, packing or crating, port handling, and other freight yard management, container leasing, navigation services, and a number of other related activities. In the case of freight transportation arrangement (forwarders and brokers), purchased transportation has been estimated and removed to eliminate duplicate counting of freight.

Shippers’ administrative costs are built on two specific cost areas: labor and logistics IT. Labor costs are calculated using a weighted average of mean annual wages for manufacturing, retail, and wholesale industries for logistics-related occupations plus the estimated value of total benefits paid to employees in addition to wages. Logistics IT spend is based on industry reports of the supply chain management software market for the United States.

Historical comparisons

To facilitate comparisons with the historical series, the USBLC table has been recalculated back to 2008 using current sources and methodologies (see figure B). In some cases, government data has been revised or updated, so some figures such as GDP and inventory may differ from previous reports.

Figure B
Ten-year summary of USBLC

Metric	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Nominal GDP	\$ billion	14,718.6	14,418.7	14,964.4	15,517.9	16,155.3	16,691.5	17,427.6	18,120.7	18,624.5	19,390.6
Total business inventory	\$ billion	2,195.5	1,933.4	2,031.5	2,271.0	2,343.8	2,413.3	2,536.7	2,505.8	2,511.5	2,608.7
Inventory carrying rate	%	18.1%	19.2%	18.5%	17.6%	17.5%	17.7%	16.1%	17.0%	16.3%	16.4%
Transportation costs	\$ billion	774.3	622.7	681.9	749.3	785.8	809.9	903.4	907.0	902.2	965.5
Inventory carrying costs (ICC)	\$ billion	397.3	372.1	375.5	400.1	409.5	427.9	409.0	426.4	409.2	428.0
Other costs	\$ billion	74.4	68.7	70.2	74.8	79.7	82.6	89.9	95.3	96.4	101.2
Total USBLC	\$ billion	1,246.0	1,063.5	1,127.5	1,224.2	1,275.0	1,320.4	1,402.3	1,428.7	1,407.8	1,494.7
Total USBLC as % of GDP	%	8.5%	7.4%	7.5%	7.9%	7.9%	7.9%	8.0%	7.9%	7.6%	7.7%
Total business inventory as % of GDP	%	2.7%	2.6%	2.5%	2.6%	2.5%	2.6%	2.3%	2.4%	2.2%	2.2%
Transportation as % of GDP	%	5.3%	4.3%	4.6%	4.8%	4.9%	4.9%	5.2%	5.0%	4.8%	5.0%
ICC as % of GDP	%	2.7%	2.6%	2.5%	2.6%	2.5%	2.6%	2.3%	2.4%	2.2%	2.2%
Total business inventory as % of GDP (2010=100)	base 100	104.7	100.1	97.3	100.0	98.3	99.4	91.0	91.3	85.2	85.6
Transportation as % of GDP (2010 = 100)	base 100	109.0	89.4	94.4	100.0	100.7	100.5	107.4	103.7	100.3	103.1
ICC as % of GDP (2010 = 100)	base 100	104.7	100.1	97.3	100.0	98.3	99.4	91.0	91.3	85.2	85.6
Total USBLC as % of GDP (2010 = 100)	base 100	107.3	93.5	95.5	100.0	100.0	100.3	102.0	99.9	95.8	97.7

Sources: IHS Markit; A.T. Kearney analysis

CSCMP'S ANNUAL STATE OF LOGISTICS REPORT®

AUTHORED BY **ATKearney**



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Since 1963, the Council of Supply Chain Management Professionals (CSCMP) has been the leading worldwide professional association dedicated to education, research, and the advancement of the supply chain management profession.

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