



CSCMP's Annual State of Logistics Report®

Logistics in Transition: New Drivers at the Wheel



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Introduction

“The future is like a corridor into which we can see only by the light coming from behind.”

— **Edward Weyer Jr. (1904–1998), anthropologist**

Welcome to the 27th edition of CSCMP’s Annual State of Logistics Report®. This year’s report reflects a number of changes, or what we choose to call “New Drivers at the Wheel.”

First, the drivers of business logistics costs in the United States changed dramatically in 2015. Vigorous growth in B2C e-commerce propelled shipper spending sharply higher in parcel and express. Meanwhile, a shift away from coal and a drop in oil prices drove shipping spend down in rail and pipeline. Lower fuel prices also led to reduced fuel surcharges in motor carriers and other modes. Emerging technologies took on a large role in discussions, if not quite yet in implementation.

Second, this 27th edition reflects a change in the structure and content of the report itself, as the first step on a new path to enhance the quantitative and qualitative value of the report to the CSCMP’s members and the broader supply chain community. This report follows a new structure that includes a focused narrative on the economic environment impacting logistics; insights from interviews with industry leaders, including shippers, carriers, and analysts; a spotlight on relevant trends; and a strategic point of view on the state of the industry.

In addition, this year’s report introduces several changes to how US Business Logistics Costs (USBLC) are estimated. Key changes include the use of new sources, a new breakdown of components, and modifications to calculation methodologies and assumptions.¹ This new approach was co-developed by A.T. Kearney, CSCMP, and a diverse set of industry partners.

Finally, this edition reflects a change in authorship. A.T. Kearney is honored to partner with CSCMP and Penske Logistics in authoring the State of Logistics Report. Of course, this report would not have been possible without the collaboration of a long list of contributors, including: Marc Althen, Penske; Evan Armstrong, Armstrong & Associates; Roxanne Bullard, Truckstop.com; Clyde Crimmel and Dan Keen, Association of American Railroads; Bradley S. Jacobs, XPO Logistics; Philippe Lambotte, Mattel; John G. Larkin, STIFEL; Steve Owens and Ryan Siavelis, IHS Economics—Transportation Consulting Practice; Matt Rose, BNSF Railway Company; David Vernon, Sanford Bernstein; Rosalyn Wilson; Drewry Shipping Consultants Ltd.; and Technavio. Thanks to all of them, and to many others too numerous to name, for sharing their time and thoughts with us.

We hope you find the data and insights in this report useful as you plan your business strategy for 2016 and beyond. Please feel free to contact us to discuss any of the issues we raise—and to provide us with feedback on how we can make the 28th edition even more valuable to you.

¹ For a more detailed explanation of changes, a description of each element, and a 10-year time series, please refer to the appendix.

Executive Summary

Despite numerous challenges on the domestic and international fronts, the United States remains the world’s largest economy, and the International Monetary Fund (IMF) forecasts that annual growth will remain steady at around 2.4 percent in the coming years. While economic and carrier conditions are expected to continue favoring a “shipper’s market” over the next six months, a realignment of factors—including capacity, inventories, interest rates, and economic growth—are projected to result in moderately higher transportation rates in 2017. Similarly, oil price risk will likely contribute to upward pressure on fuel-related surcharges.

Between 2010 and 2014, USBLC grew by an average of 4.6 percent annually, fueled mainly by 5.5 percent annual growth in transportation costs (see figure 1). The upward trend in USBLC, however,

Figure 1
US business logistics costs

\$ billion	2015	YoY 15/14	5-yr. CAGR
Transportation costs			
Full truckload	278.8	3.0%	7.1%
Less-than-truckload	63.7	7.0%	3.4%
Private or dedicated	240.1	1.0%	5.3%
Motor carriers	582.6	2.6%	5.9%
Parcel	82.2	8.0%	6.7%
Carload	60.8	−12.0%	4.4%
Intermodal	19.9	2.0%	2.1%
Rail	80.7	−8.9%	3.8%
Airfreight (includes domestic, import, export, cargo, and express)	67.4	2.1%	4.6%
Water (includes domestic, import, and export)	47.6	2.1%	3.9%
Pipeline	29.5	−11.8%	2.7%
Subtotal	889.9	1.3%	5.5%
Inventory carrying costs			
Storage	141.0	2.5%	4.7%
Financial cost (WACC x Total Business Inventory)	158.1	7.4%	0.9%
Other (obsolescence, shrinkage, insurance, handling, others)	128.2	5.1%	2.6%
Subtotal	427.3	5.1%	2.6%
Other costs			
Carriers’ support activities	45.7	2.0%	6.3%
Shippers’ administrative costs	45.3	6.3%	4.8%
Subtotal	91.0	4.1%	5.5%
Total US business logistics costs	1,408.2	2.6%	4.6%

Notes: YoY is year-on-year. WACC is weighted average cost of capital.
Source: CSCMP’s 27th Annual State of Logistics Report (see report appendix)

slowed considerably to just 2.6 percent between 2014 and 2015. Significantly, transportation costs—the largest single component of USBLC—grew by only 1.3 percent in 2015. One reason for this slower growth is that the drop in energy prices lowered fuel surcharges, affecting nearly all freight modes. In addition, overcapacity in full truckload (FTL) drove down rates in this important submarket, where revenue growth was limited to 3.0 percent. However, energy markets may correct, truck overcapacity could level off, and other constraints—such as driver shortages—could push FTL rates up in the not too distant future.

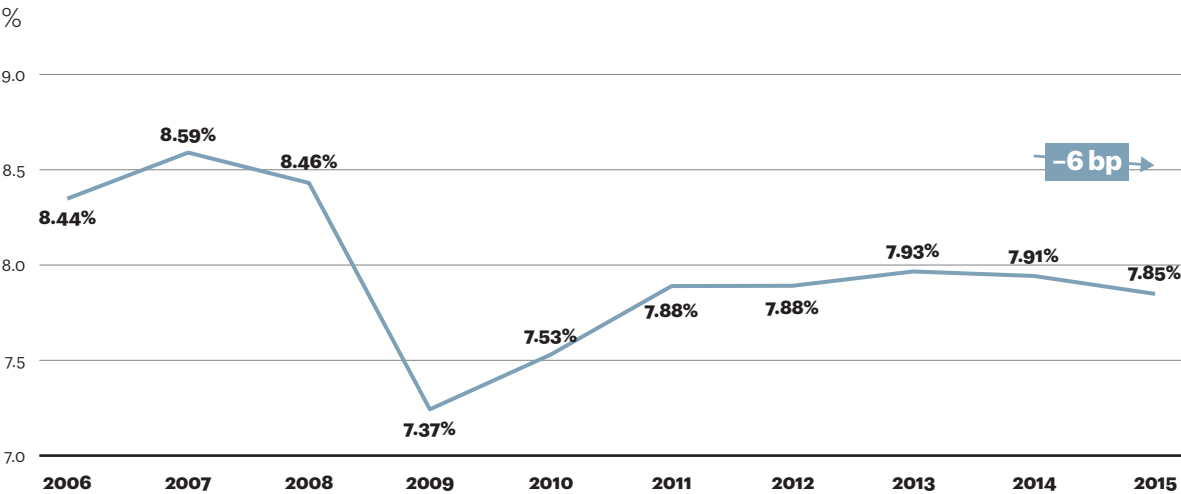
A closer look at the transportation cost numbers, though, suggests that 2015 may mark a turning point in the US transportation bill: energy-sensitive transportation modes such as rail and pipeline saw decreased revenue, even as consumer-centric modes such as parcel and express and less-than-truckload (LTL) accelerated their growth. The 8.9 percent decline in rail revenues can be mainly attributed to a steep reduction in coal traffic, while pipeline’s 11.8 percent drop was largely driven by the fact that low oil prices depressed domestic crude oil and natural gas production. In contrast to the decline in rail and pipeline, parcel and express and the LTL segment of motor carriers grew 8.0 percent and 7.0 percent respectively, propelled by the continued acceleration of e-commerce in the retail sector. So perhaps consumers are now at the wheel of US transportation costs, potentially having displaced energy for good.

Changes in inventory carrying costs may also herald another shift in direction, as the financial cost of inventory begins to rise following the end of a nearly decade-long period of falling interest rates. US business inventories, which had grown steadily at approximately 5 percent per year between 2009 and 2014, flattened out in 2015. This stagnation in inventory growth, however, was countered by a rise of 42 basis points in the weighted average cost of capital (WACC), resulting in a 5.1 percent overall increase in inventory carrying costs.

On balance, US business logistics achieved a modest efficiency gain in 2015 compared to 2014, with USBLC declining by 6 basis points as a percentage of nominal GDP (see figure 2).

Figure 2
Business logistics costs are hovering at around 7.9 percent of GDP...for now

US business logistics costs as a share of nominal GDP



Note: bp is basis points.

Source: CSCMP's 27th Annual State of Logistics Report (see report appendix)

Today, the logistics system is sound. Desired services and features are generally available, and a system designed for cost efficiency is delivering pricing favorable to shippers. However, gaps in infrastructure and accelerating trends for speed will increasingly pressure a system that was not designed for e-commerce-driven “last mile, last minute.”

In the near term, addressing the state of US infrastructure will be critical to a productive logistic sector (as reported by the American Society of Civil Engineers in *Failure to Act: Closing the Infrastructure Investment Gap for America’s Economic Future*). The December 2015 Fixing America’s Surface Transportation (FAST) Act holds the promise of speeding the flow of logistics by investing in badly needed repairs and expanding infrastructure capacity at critical choke points. The FAST Act provides \$305 billion in funding for surface transportation through 2020, of which \$226 billion will go to the Federal Highway Administration and 10 percent will be dedicated to rail, port, and intermodal projects. However, the FAST Act includes just \$900 million per year to fund large, nationally significant freight projects. The FAST Act is undoubtedly a major step forward, but it falls well short of the more than \$2 trillion that ASCE believes must be invested in surface transportation between now and 2025.

“Consumer expectations are changing. They want their products delivered fast, and they don’t want to pay a lot of money for delivery. Shippers are struggling to meet the challenges these expectations create, and many are turning to outside logistics companies for expertise and support.”

— **Marc Althen, president, Penske Logistics**



Over the next decade, the logistics industry will enter into a new era. Disruptive forces such as technology (including, for example, the Internet of Things, analytics, robotics, and 3D printing) and operational constraints (such as regulations, driver shortages, and infrastructure bottlenecks) will evolve at breakneck speed and threaten to fundamentally change the rules of the game. During the interim, those companies that build the skills to adapt to these disruptions will likely come out ahead.

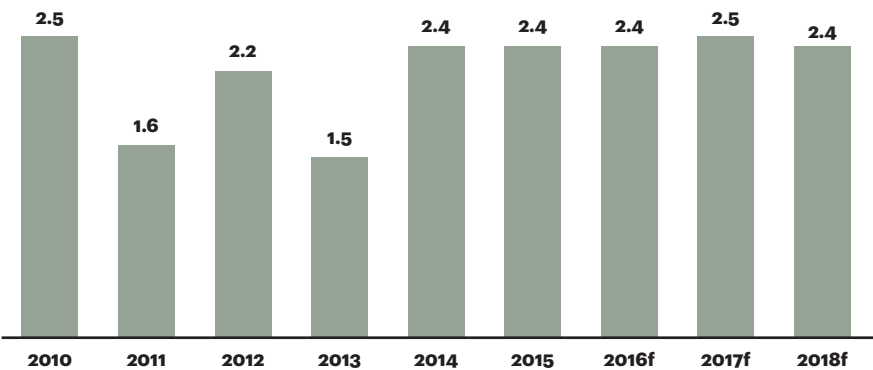
Macroeconomics: A Tenuous Recovery

The global economy continues to register modest growth. The IMF reported in April 2016 that the world economy grew by 2.8 percent in the second half of 2015 and experienced a considerable slowdown in the last quarter of the year. Although China and much of emerging Asia posted high growth rates, commodity exporters such as Brazil and Russia were a drag on world economic growth. Meanwhile, economic activity across most advanced economies remained generally weak in historic terms.

Against this backdrop, the US economy grew 2.4 percent in 2015, and the IMF forecasts that annual growth in 2016 and 2017 will be 2.4 and 2.5 percent respectively (see figure 3). Although these numbers fall slightly short of the US economy’s long-term average of 2.6 percent annual growth since 1980, they seem to indicate a degree of post-recession stability.

Figure 3
US economic growth rates appear to have stabilized

Real US GDP growth
%



Source: International Monetary Fund World Economic Outlook, April 2016

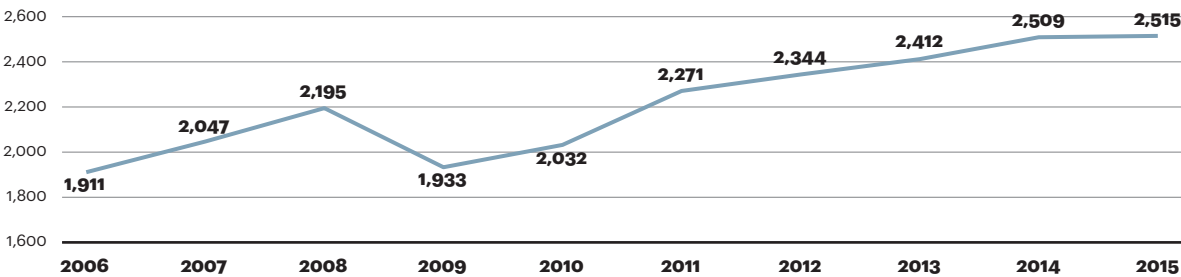
Consumer spending typically accounts for roughly 70 percent of US GDP, making it perhaps the most important driver of logistics activities. According to the Bureau of Economic Analysis (BEA), consumer spending grew by 3.4 percent in 2015. This number is consistent with recent values, discounting the exceptional uptick of 4.2 percent in 2014. The University of Michigan’s Consumer Sentiment Index gives cause for still greater optimism, as it registered an average value of 92.9 in 2015 versus 84.1 in 2014. A stronger housing market reflects this increase in consumer confidence: the Census Bureau reports that housing starts rose by nearly 11 percent in 2015, and new home sales increased by 14 percent. Against this positive news, it should be noted that the stronger housing construction market could reduce the already limited supply of truck drivers and hike labor costs for logistics firms, as builders and trucking companies compete for the same constrained labor pool.

Stronger consumer spending and confidence would ordinarily be expected to increase the demand for logistics services. In late 2015 and early 2016, however, key indicators of freight

transportation trended downward. Some analysts argue that this presages another recession, while others posit that it signals an inventory correction. The fact that total **inventory** (which had been steadily increasing at an average annual rate of 5.4 percent between 2009 and 2014) only rose 0.25 percent between 2014 and 2015 lends credence to the latter hypothesis (see figure 4). And, as figure 5 illustrates, although freight transportation indicators such as truck tonnage are more volatile than consumer spending, their evolution tends to follow the same general pattern. Furthermore, the steady rise in the Cass Freight Index in the first three months of 2016 suggests that freight is on the path to recovery.

Figure 4
Inventory has been building since 2009

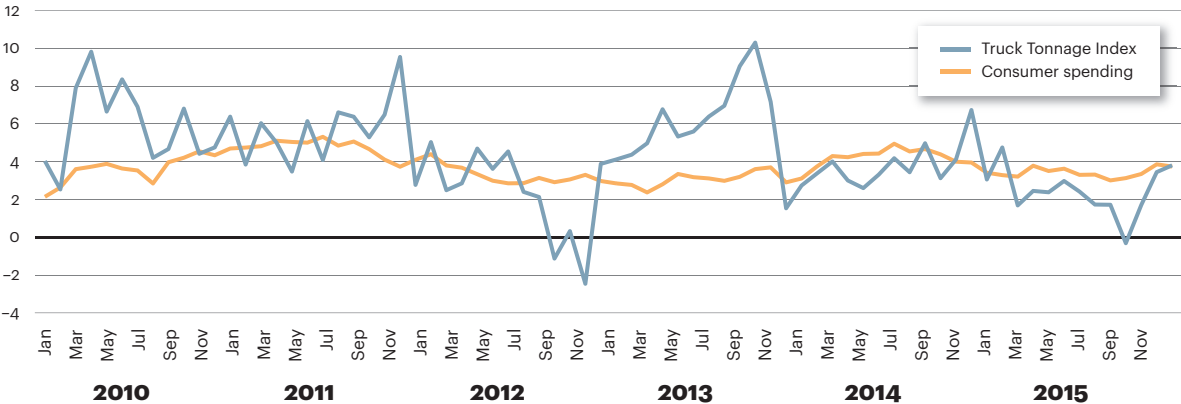
Total US private inventories
\$ billion



Note: Total US private inventories includes manufacturing, retail, and wholesale and represents stock or goods available for sale. Annual numbers are the yearly average.
Source: Bureau of Economic Analysis

Figure 5
Truck tonnage is more volatile than consumer spending but follows the same general pattern

Truck Tonnage Index vs. consumer spending
% change versus previous year



Note: Consumer spending is measured by personal consumption expenditures.
Sources: Department of Transportation, Federal Reserve; A.T. Kearney analysis

Also of import to logistics companies, **global oil markets** continue to be plagued by excess supply and capacity. Global oil prices are at multiyear lows, averaging about \$50 per barrel in 2015 compared to around \$100 per barrel over the previous four years. The IMF and the Energy Information Administration (EIA) forecast that the price of oil will average about \$35–\$36 per barrel throughout 2016, although a May 2016 *Wall Street Journal* survey of investment banks placed the estimate for West Texas Intermediate at \$41 per barrel. While the low price of oil has reduced fuel costs for logistics companies, a large portion of those costs was being passed on to shippers through fuel surcharges. Perhaps more notably, low oil prices have drastically reduced activity in the burgeoning US domestic energy industry, with knock-on effects in auxiliary industries and on spending by consumers employed by those industries—all of which affects freight volumes.

A final factor worth noting is the **strong dollar**, which rose 23 percent against a trade-weighted basket of currencies between July 2014 and December 2015 according to the Federal Reserve. The strong dollar will tend to reduce the volume of exports moving through US ports, while raising the volume of imports. It will be important to keep an eye on simmering labor tensions at major West Coast ports. The Washington Council on International Trade estimates that the West Coast labor slowdown in late 2014 and early 2015 cost the Washington state economy alone \$770 million, and it took the US freight market many months to return to normal after the labor action ended. Also, demand may shift from ports on the West Coast to the East Coast once the expanded Panama Canal comes into service in summer 2016, allowing larger ships from Asia to transit the canal to dock at East Coast ports.

While forecasts for economic growth, consumer spending, and fuel prices are generally favorable, uncertainty remains on multiple fronts. In particular, the economic recovery continues to be tenuous and susceptible to domestic and global factors. Likewise, oil prices are increasingly showing signs of upward pressure. How these trends evolve in 2016 will largely determine the state of logistics in the coming year.

The Logistics Industry in 2015, Mode by Mode

“Logistics and transportation are major ongoing expenses for large companies, and there is significant pressure from the C-suite to reduce these costs. There are many inefficiencies in the supply chain—a lot of trucks are still in the wrong place at the wrong time, for example. Freight goes by air when it could just as easily go by sea. Freight moves by expedite when it’s not urgent. Products are misdirected or shipments delayed due to less than 100 percent inventory accuracy. All these types of inefficiencies need to be addressed with laser focus to bring supply chain costs down.



“Customers, carriers, and 3PLs need to take a collaborative, problem-solving approach to service and cost. Our industry needs to show customers that we bring value-creating ideas to the table, not just capacity. I see the industry evolving in this direction. Larger players are emerging and combining solutions with assets on a collaborative basis with the customer. Over time, I think the industry will consist of a few very large players with very extensive capabilities to help customers take inefficiencies and costs out of their supply chain. There will also be superlative niche players, but they will be the exception, not the norm. The level of value-add that I’m talking about requires a significant technology spend that will be out of reach for smaller players.”

— **Bradley S. Jacobs, chairman and chief executive officer,**
XPO Logistics

Motor Carriers: A Year of Rate Weakness

Motor carriers is the largest transportation mode, with \$583 billion in revenues in 2015. According to the American Trucking Associations, the motor carriage industry also employs more than seven million people in the United States. The for-hire segment, which includes less-than-truckload (LTL) and full truckload (FTL), accounts for 59 percent of expenditures. The FTL subsegment can be further divided into dry van, temperature-controlled (or reefer), flatbed, bulk, tank, intermodal drayage, and other specialized equipment.

For motor carriers and their customers, the predominant characteristic of 2015 was overcapacity, which drove rates down after several years of rising prices. Rates started off weak at the beginning of the year and declined steeply as the year progressed. Carriers largely responded to this deteriorating environment by improving operational efficiency and holding back on fleet orders. Slumping rates were not the only headwinds facing motor carriers. It is becoming increasingly difficult and costly to recruit and retain truck drivers, as the labor market tightens, regulations become stricter, and the trucking lifestyle loses its appeal.

Declining rate environment

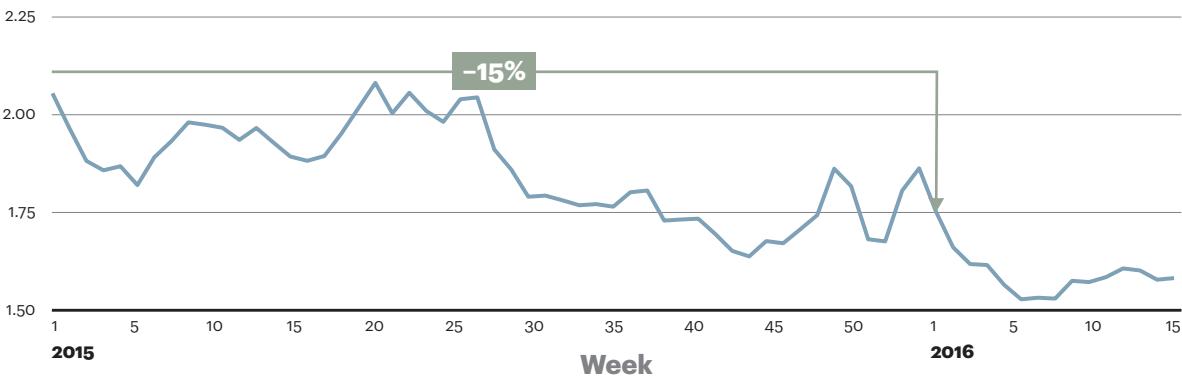
According to Truckstop.com, dry van spot market rates declined 15 percent between week 1 in 2015 and the same week in 2016—and they continued to fall in the early part of the year

(see figure 6). The Cass Freight Index confirms the declining rate trend, with April 2016 figures showing an 8.3 percent drop in expenditures year-on-year, while shipments fell 4.9 percent in the same period.

Figure 6
Spot market rates dropped 15 percent in 2015

Dry van spot market rates

\$ per mile



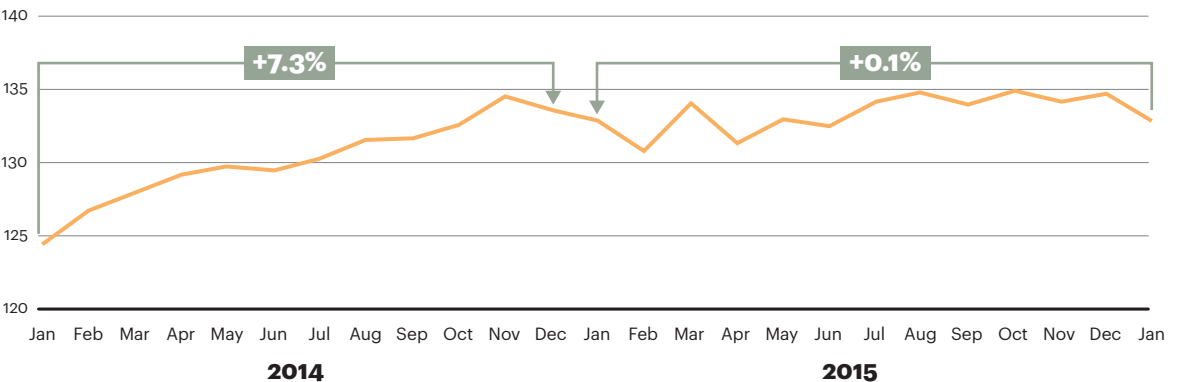
Note: Includes fuel.
Source: Truckstop.com

According to the Bureau of Transportation Statistics, truck tonnage held steady in 2015 after a significant rise in 2014 (see figure 7). The decline in rates, in this context, could be explained by the addition of capacity and the fact that trucking companies were pursuing lower-yield traffic such as intermodal and LTL traffic.

Figure 7
Truck tonnage flattened in 2015, after rising more than 7 percent just one year earlier

Truck Tonnage Index

Seasonally adjusted monthly values (2000 [index year] = 100)



Source: Bureau of Transportation Statistics

Meanwhile, US on-highway diesel fuel prices—a key measure used to calculate fuel surcharges—declined nearly 30 percent between January 1, 2015 and December 31, 2015, from \$3.137 per gallon to \$2.237 per gallon according to EIA. While fuel surcharges pass on the costs of high diesel to shippers, they can also provide a marginal benefit to efficient carriers.

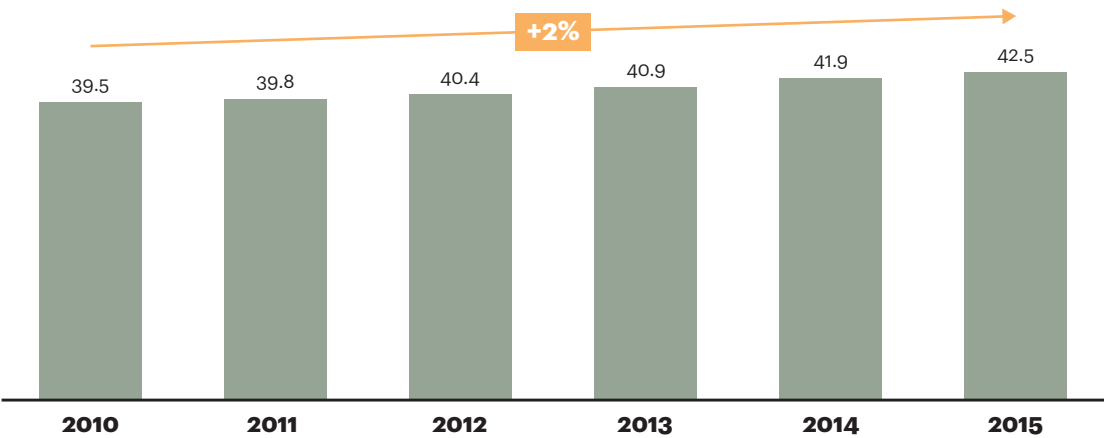
In the face of declining prices, carriers worked to become more efficient, and indeed operating metrics such as share of loaded miles registered modest improvement. Carriers also reduced their investment in new equipment. For example, FTR Associates reports that Class 8 net orders fell from 376,000 units in 2014 to 284,000 in 2015. Carriers confirmed that they will continue to moderate their tractor purchases until demand and rates stabilize.

Truck driver shortage

Despite softening demand and lower rates, competition for drivers is intense. According to the Bureau of Labor Statistics (BLS), demand for drivers bottomed out at slightly more than 1.5 million in 2010, while today demand is approaching 1.7 million drivers. And although BLS records show an annual wage increase of just 2 percent between 2010 and 2015 (see figure 8), government statistics fail to tell the full story: industry interviews suggest that truckload carriers tend to pay higher wages than reported and are subject to greater annual increases than the average. Likewise, many publicly traded carriers’ financials show employee compensation rising faster than overall revenue growth.

Figure 8
Officially, truck drivers’ wages have grown by 2 percent annually

Heavy truck drivers, annual median wage
\$ thousand



Note: Does not include owner-operators.
Source: Bureau of Labor Statistics

One factor affecting driver availability is stringent regulations such as electronic logging, hair-follicle-based drug tests, and a driver drug-testing information clearinghouse. According to *Supply Chain Digest*, these regulations could reduce effective industry capacity by up to 15 percent. Another factor is the uptick in housing starts, since construction draws on a labor pool similar to truck drivers.

“Last year [2015] was a roller-coaster year for the trucking market, with good market conditions in the first half and a pretty soft second half. Contract rates held up throughout 2015 despite the soft second half of the year. However, the softening supply-demand dynamic resulted in significant downward pressure on spot rates as the year progressed. There were many other headwinds in 2015: inventories were high, the dollar was strong, and intermodal service quality recovered. In general, full truckload carriers were able to maintain volumes and yields, provided the carriers had minimal exposure to the spot market. Less-than-truckload carriers experienced modest volume declines, but yields increased year-over-year. Today, big carriers are healthy, with modern fleets and technology, multiple service lines for shippers, and access to capital. In addition, shippers receive good service and can choose among many different suppliers. Looking ahead, smaller carriers may struggle under the weight of forthcoming regulations, competition for drivers, and their reliance on truck brokers. Some slow consolidation may be inevitable as small carriers decide it’s not worth continuing in business given a challenging spot market and the coming requirement to operate in absolute compliance with federal regulations.”

— **John G. Larkin, managing director, STIFEL**

Specialized trucking segments

Dedicated fleets represent a bright spot for carriers and an area of increased importance for shippers. Shippers are using dedicated fleets to drive efficiency in complex networks, secure capacity, and ensure service requirements are met. In parallel, dedicated fleets are a primary growth area for many of the largest carriers.

The **LTL** market has seen mixed results over the past year. Several large LTL carriers declined in revenue and tonnage, while others—those more focused on e-commerce or retail—were able to maintain or slightly grow their business volume. In general, LTL carriers report stable pricing, and many have invested in dimensional scanning devices to help maintain price discipline.

Markets with more specialized equipment such as **flatbed and dry and liquid bulk** have also been weak. According to Truckstop.com, flatbed rates declined 11 percent from January 2015 to April 2016. Rates for other specialized equipment have also fallen consistently, posting a 17 percent decline over the same period. Flatbed rates, however, may have bottomed out, as they increased nearly 13 percent between February 2016 and April 2016.

Brokerage services have been thriving in the present environment, as they seek to earn margins by improving both the shipper and the carrier experience. For example, CH Robinson’s 2015 net revenues (after purchased transportation costs) increased 13 percent over 2014. Key to their success has been the development of improved load-matching algorithms and the investment in systems to improve load visibility.

Also, sophisticated shippers are beginning to take advantage of the softer motor carrier market. CH Robinson executives say that in Q1 2016 they saw twice the number of requests for proposal (RFPs) compared to previous years, and awarded rates are generally lower than before. Shippers are using collaborative optimization sourcing strategies and supporting software to optimize their networks and minimize empty miles.

Softness in the motor carrier market, however, is probably more a short-term phenomenon than a “new normal.” With the labor market improving and carriers cutting expansion plans, an acceleration in economic growth will likely lead to tighter capacity and increasing rates.

Parcel and Express: Fueled by B2C

Parcel and express (including courier and messenger), an \$82 billion industry in the United States, is new to the State of Logistics Report this year. FedEx, UPS, and US Postal Service (USPS)—three of the largest transportation companies in the world—are the dominant players, and they enjoy complete network and last-mile delivery infrastructures. Regional and local carriers, which account for the rest of the market, mostly base their competitive advantage on lower operating costs.

The parcel and express industry offers two broad types of service: time-definite delivery (such as next-day air express) and deferred (or ground).

At FedEx, ground services revenue grew by 9 percent in 2015 (excluding their new acquisition GENCO), while UPS ground gained around 3 percent. Express service revenue at both companies was flat versus 2014, and overall composite yields declined.

Challenges of B2C and omnichannel retail

The main drivers for growth in the parcel and express market are the explosion of B2C e-commerce and omnichannel retail, which are transforming the service mix toward ground services and challenging players’ operating models in last-mile delivery and reverse logistics.

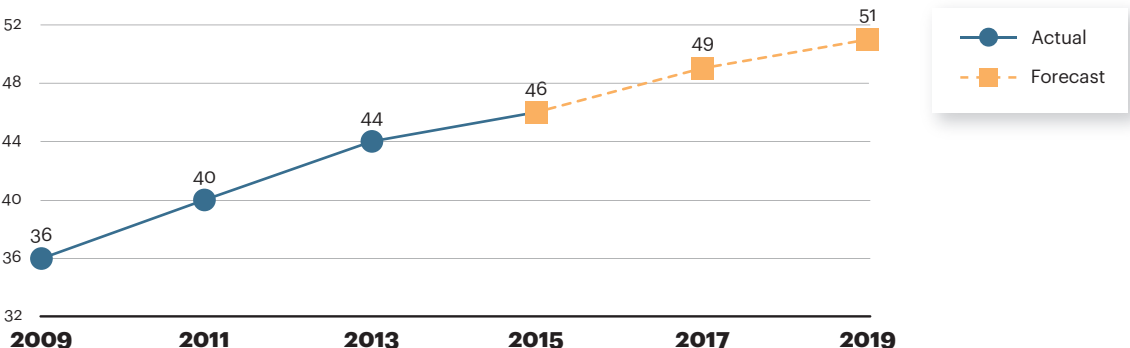
In 2015, B2C e-commerce shipments accounted for a significant and growing share of parcel and express carriers’ ground business. E-commerce is likely to double in size by 2020, and UPS projects that rising e-commerce volumes will have a proportional effect on its parcel business (see figure 9).

The challenge of surging B2C growth for the leading companies is the following: as a rule, B2C shipments generate lower revenue than the average shipment and have higher operating costs

Figure 9
UPS projects significant growth in B2C parcels

UPS B2C parcel growth

% of US domestic shipments



Source: UPS Overview Investor Relations (May 11, 2016)

associated with residential deliveries. Moreover, an increasing number of retailers are moving toward same-day delivery, often shipping from nearby stores rather than regional distribution centers, which will tend to divert volume from the market leaders. Finally, e-commerce offers flexible return policies, which is generating a large volume of small shipments directly from consumers. These shifts present a major challenge to the pickup and delivery density of FedEx and UPS. However, this trend plays to the strengths of USPS, which saw shipping and package volume grow 14 percent in 2015.

Parcel and express industry leaders are working feverishly to address these challenges. One way they are doing so is by investing significantly in technologies such as robotics, vehicle routing software, and partnerships with USPS. (USPS partnerships include FedEx SmartPost and UPS SurePost). Solutions tailored to address the ever-growing needs of B2C and omnichannel shippers include FedEx's Delivery Manager, as well as UPS's Access Point network and My Choice. In addition, they are acquiring other companies to increase the scope of their services and create a broader platform to handle B2C: for example, in 2015 FedEx purchased GENCO and UPS bought Coyote Logistics.

"Many complex factors are affecting parcel and express carriers: pressure on express yields, growth in low-stop-density B2C shipments, labor classification and employee challenges, and looming robotics investments. But the consumer trend toward online shopping and instant gratification could be the most transformational force at work. As retailers adapt their operations to meet demand for online shopping and compete on rapid fulfillment, we are seeing their demand for transportation and logistics services also change. While there are many start-ups targeting this need, crowdsourced models seem to be struggling. And retailers are being forced to insource, heavily subsidize delivery costs, and increase inventory levels. Today's large parcel and express carriers play a critical role in the US logistics system. Adapting their services to a market with demand for "last mile combined with some last minute" will be the critical challenge—or opportunity—facing this sector in the years ahead."

— **David Vernon, equity analyst, Sanford Bernstein**

Additionally, according to the *Wall Street Journal*, UPS recently invested \$28 million in same-day delivery start-up Deliv—a company that, similarly to Postmates, crowdsources its last-mile delivery service. *Forbes* reports that Uber has also been testing package delivery using its network of more than 160,000 active drivers. On a more traditional note, regional parcel couriers are improving their technology and efficiency. Heavy-hitting USPS is addressing the new market landscape in multiple ways, particularly by leveraging its last-mile network, and it has the potential to do even more.

An important development is that large retailers are beginning to insource portions of their logistics function and starting to build their own networks. In 2015, Amazon began acquiring its own infrastructure. Moreover, it continues to add warehouses in dense urban areas such as New York City, and it is also leasing airplanes and purchasing additional ground transportation capacity. Large retailers clearly have the business volume and financial resources to reach scale in densely populated areas. And if the case of Amazon is any indication, investor markets are generally allowing them to invest without expectations of near-term returns.

Rail: An End to “Black Gold”?

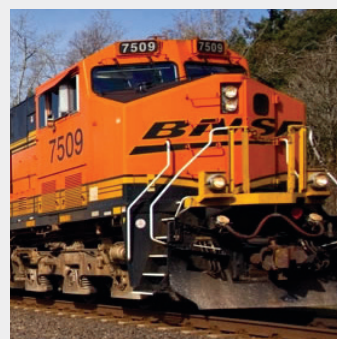
The 140,000-mile US freight rail transportation system is the largest in the world. It recorded revenues of more than \$80 billion in 2015. Within the United States, rail transportation employs 185,000 people according to the Association of American Railroads (AAR). The industry is highly concentrated, with AAR statistics indicating that seven Class I railroads generate 95 percent of revenue. Unlike their counterparts in the US highway and air systems, freight railroads are responsible for the maintenance and capital projects of the networks on which they operate.

Changing traffic mix

A steep decline in coal traffic and crude by rail, macroeconomic weakness, and a pause in the growth of intermodal traffic resulted in an overall rail volume reduction of 2.5 percent in 2015, in stark contrast to 4.5 percent growth in 2014.

AAR figures indicate that rail carloads of coal fell 14 percent between 2014 and 2015 as “cheap” natural gas and environmental regulations caused demand for US coal to decline (see figure 10 on page 15). The rate of decline in coal traffic accelerated sharply last year from the steady 3 percent carload decrease seen on average over the four previous years. It is clear that coal has lost importance, as the share of coal-fired electricity generation has fallen from 56 percent in 2000 to 33 percent in 2015 according to the EIA. In fact, 2015 was the first year that natural gas—enabled by fracking technologies—surpassed coal as the primary fuel for electricity generation. Regulatory changes established in the Clean Power Plan and public sentiment in favor of alternative fuels exacerbated the decline in coal use.

“In 2015, changes in energy markets—in particular, the abundance of low-cost natural gas and the conversion of many utilities from coal to gas—fundamentally altered the mix of commodities carried by US railroads. The decline in coal carloads may be the most significant structural change for US railroads since the passage of the 1980 Staggers Act that partially deregulated the industry. Energy market dynamics have also reduced crude-by-rail traffic, with an even greater impact on commodities that support additional new well development. The good news is that railroads are positioned to significantly increase intermodal traffic, and the underlying truck-to-intermodal conversion rate potential remains strong. The efficiency of rail directly contributes to fuel savings, resulting in lower costs and reduced emissions which benefit the supply chain and the overall economy. Railroads will continue to build on this strength through additional conversions in their intermodal lanes as they remain focused on new ways to improve efficiency and reliability in order to attract more of this traffic. In addition, thanks to significant capital investments made by the private-sector railroads, the nation’s “steel wheel” network is in excellent condition. Permitting, primarily at the state and local levels, needs to support and facilitate the investment required for continued growth in intermodal and other sectors. Rail transportation’s top-shape infrastructure, coupled with its intrinsic environmental and economic advantages, make it a great choice for rail customers and policy makers.”

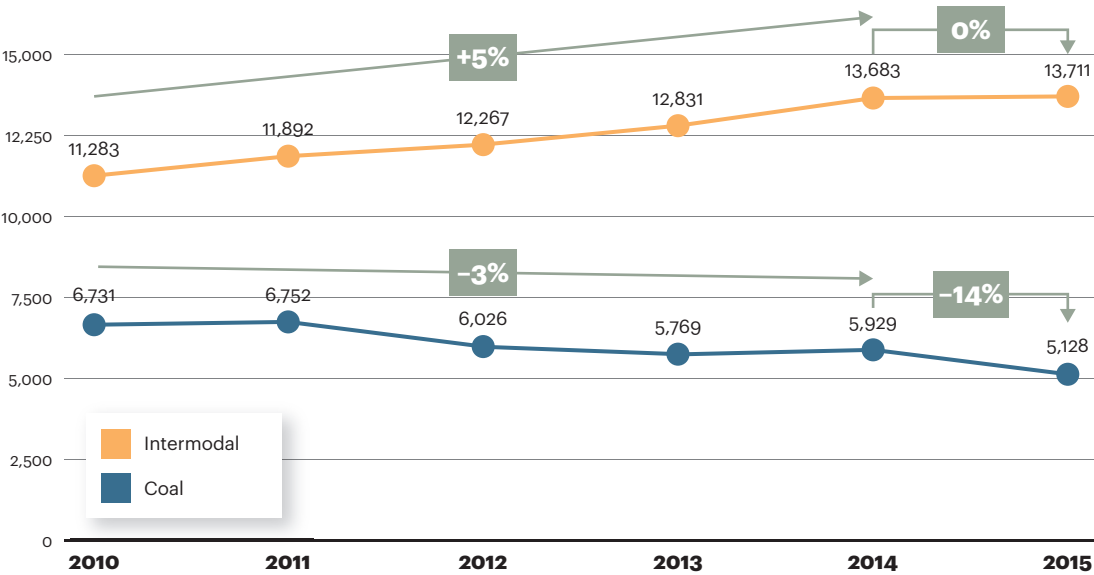


—Matt Rose, executive chairman, BNSF Railway Company

Figure 10
Coal volumes are on a downward trend, while intermodal traffic has stalled

US Class I rail traffic

Thousand carloads



Sources: Association of American Railroads; A.T. Kearney analysis

Intermodal traffic, a steady source of growth for the rail segment in recent years, saw volume stall in 2015. With lower fuel surcharges and declining base rates in road freight, many shippers may have opted to move their goods by truck rather than rail. The 2015 hiccup, however, is likely to pass as overcapacity in the trucking sector dissipates, West Coast port issues are resolved, and continued investment in rail infrastructure improves intermodal service.

Capital expenditures

The Federal Railroad Administration estimates that between 15 and 20 percent of freight rail revenue is used for capital expenditures to maintain and improve service and safety. Class I railroads' capex increased by an annual average of 12 percent between 2010 and 2015 according to information contained in their annual reports, helping to ease the capacity bottlenecks of earlier years (see figure 11 on page 16).

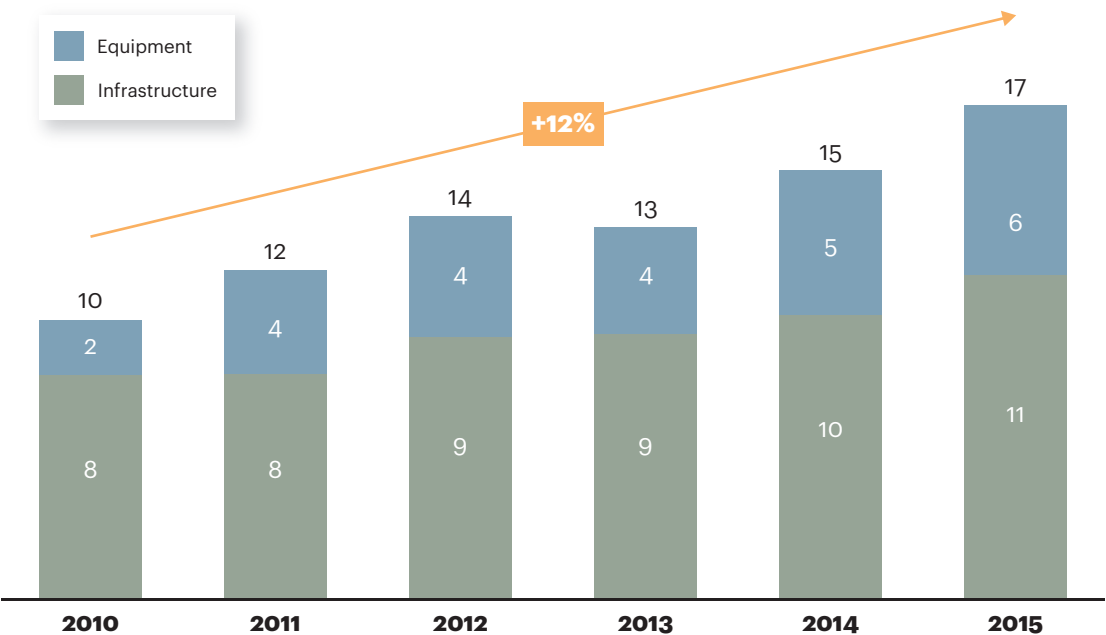
Positive Train Control (PTC), a technology to analyze real-time conditions and prevent accidents, is the latest safety initiative. According to the AAR, railroads have invested more than \$6 billion in PTC to date, and an additional \$10 billion will have been invested by the time implementation is completed in 2018.

Overall, rail transportation has a number of intrinsic benefits versus highway transportation: its environmental impact is lower, it has greater fuel efficiency, and its network is maintained by users. Service, however, historically has been slower and less reliable than highway transport. As networks continue to improve, more extensive use of rail could have many benefits to shippers.

Figure 11
Capital expenditures grow annually by 12 percent

Capital expenditures by Class I railroads

\$ billion



Note: Numbers may not resolve due to rounding.
Sources: annual reports; A.T. Kearney analysis

Airfreight: Overcapacity and Falling Rates

US companies, especially in high-value industries, use international airfreight to import a sizable share of their inputs and to export a considerable proportion of their output. This makes airfreight a critical link in their supply chain. (Strictly domestic airfreight, on the other hand, is of marginal size and importance to shippers.)

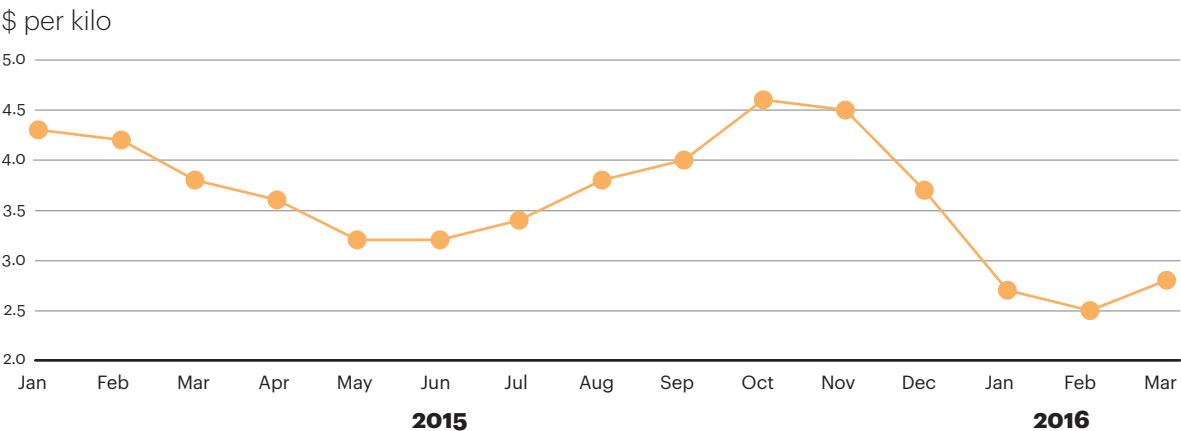
The volume of airfreight relevant to US shippers (domestic airfreight, plus import/export) was valued at more than \$67 billion in 2015. Boeing reports that airlines domiciled in Asia hold 36 percent of global market share in terms of revenue ton-kilometers, versus 25 percent for those in North America and 21 percent for those in Europe. Cargo space can be hired from two sources: cargo airlines, which can offer space on their entire aircraft; and passenger carriers, which offer space in their lower cargo holds.

Demand for airfreight services remains sluggish because of economic uncertainty, while overcapacity is being exacerbated by the shift to wide-body aircraft by both cargo and passenger airlines. Not surprisingly, rates are depressed: the Drewry Air Freight Index from Shanghai to Los Angeles dropped 37 percent between January 2015 and January 2016 (see figure 12 on page 17).²

² The index measures the average of all-in airfreight buy rates paid by forwarders to airlines for standard deferred airport-to-airport airfreight services for the Shanghai to Los Angeles route (for shipments of at least 1,000 kilos). Rates are expressed in dollars per kilo and include the base rate, the fuel surcharge, and the security surcharge. Door delivery costs are excluded.

Figure 12
Airfreight rates are depressed

Drewry Air Freight Index from Shanghai to Los Angeles



Note: Index shows average of all-in airfreight buy rates paid by forwarders to airlines for standard deferred airport-to-airport airfreight services.
Source: Drewry's Sea & Air Shipper Insight

Overcapacity

According to the International Air Transport Association (IATA), passenger carriers increased their cargo capacity by 9,000 metric tons in 2015, to which cargo companies added another 4,000 metric tons. Given the weak recovery in airfreight demand, global load factors (that is, the percentage of cargo space filled by paid cargo) are at a seven-year low of 41.9 percent, IATA reports. Within North America, the numbers are even lower: 34.2 percent in March 2016 as opposed to 37.4 percent just two years earlier.

Looking ahead, as passenger airlines expand their fleets in Asia and the Middle East, more unneeded cargo capacity will come online. Some regional airfreight lanes in Asia, Africa, and the Middle East are undersupplied, as are specialized lanes such as temperature-controlled airfreight. Chemicals shippers, too, are seeing tighter conditions because the hazardous nature of their cargo requires dedicated aircraft.

Water and Ports: A Sector in Flux

Water and ports is primarily an international business: although US shippers account for a large share of international ocean transportation to and from the country, domestic water transportation—for example, the barging of bulk products down the Mississippi River—accounts for a relatively small amount of USBLC. US water shipping registered 2015 turnover of \$47.6 billion. Broadly speaking, goods are shipped either in containers or in bulk (which can be wet or dry). Container cargo mostly consists of finished goods, while bulk cargo largely comprises raw materials such as oil, liquefied natural gas, coal, minerals, or grain.

Containerized shipping has significant overcapacity, creating a favorable rate environment for US shippers. According to Alphaliner, container carriers increased their TEU capacity by 8.5 percent in 2015, and container rates reached a historic low in April 2016: eastbound rates hit \$753 per FEU, according to the Shanghai Shipping Exchange, down from 2015's already

depressed water freight rates.³ Meanwhile, inbound containerized cargo volumes into the United States are seeing modest growth. This dynamic is likely to drive further industry consolidation. The potential merger of UASC with Hapag Lloyd and of Hanjin with Hyundai could add to the disruption created by previous transactions. Maersk and MSC formed the 2M alliance in 2015, and 2016 could see the birth of two new mega-alliances (the THE and Ocean alliances). The realignment of vessel-sharing agreements resulting from these accords could have a significant impact on US shippers and importers that rely on trans-Pacific services.

Rampant overcapacity is undermining rates in the **dry bulk** segment too. Bloomberg reports that dry bulk carriers have added more than 2.8 million deadweight tons since December 2015, even as water shipping demand for bulk commodities declined. Not surprisingly, after an August 2015 high of 1,222, the Baltic Dry Index entered a six-month decline to bottom out at 290 in February 2016.⁴

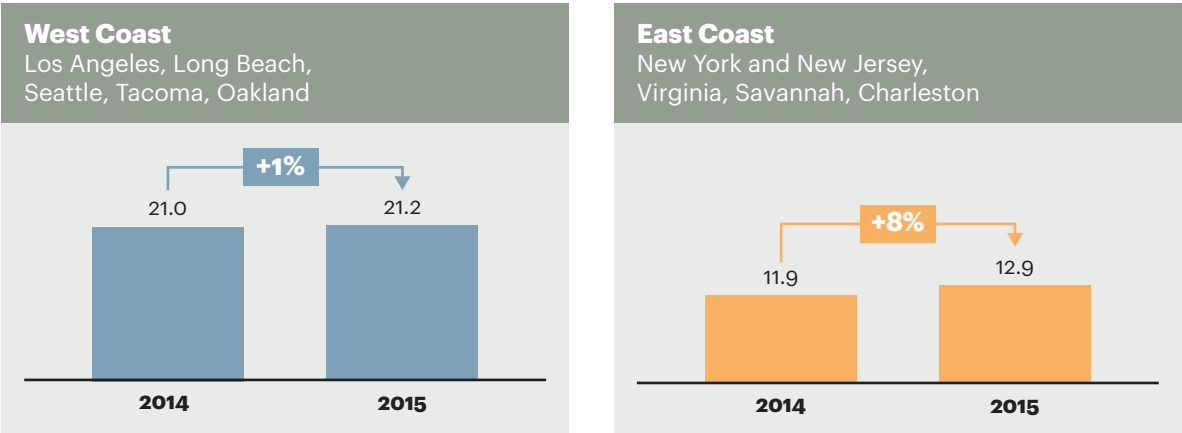
In contrast to containerized cargo and dry bulk, **liquid bulk** rates are holding up better as the capacity build-up has been much more modest. Capacity is likely to grow faster than demand, however, in 2016.

Ports

The ports of Long Beach and Los Angeles are the most important container ports in the United States. Labor issues at West Coast container ports disrupted service in 2015, drove volumes to other ports, and altered seasonal patterns (see figure 13). The vice president of operations at a national apparel wholesaler says that “port strikes [are] an incredible disruptor. This is probably the one thing that shippers worry about the most.”

Figure 13
West Coast ports dominate US container traffic, although labor issues in 2015 drove some shippers to the East Coast

Container traffic at major West and East Coast ports
TEU million



Note: TEU is twenty-foot equivalent unit.
Sources: port statistics; A.T. Kearney analysis

³ TEU: twenty-foot equivalent unit containers; FEU: forty-foot equivalent unit containers
⁴ The Baltic Dry Index, published daily, reports the price of moving major raw materials by sea over more than 20 shipping routes.

Shippers are strongly backing port authorities’ efforts to improve operations. Philippe Lambotte, senior vice president of global supply chain logistics and planning for Mattel, notes that the “senior management of LA and Long Beach ports are engaged in collaborative activities with all parties, including the USC Marshall School of Business for Supply Chain Management, to improve radically the port efficiency for all players.”

Pipeline: Catching Up with Demand

Safety and cost advantages ensure that the majority of crude oil, petroleum products, and natural gas are moved by pipeline. According to the Department of Transportation, nearly 200,000 miles of liquid petroleum pipeline, 320,000 miles of natural gas transmission pipelines, and 2.2 million miles of gas distribution pipelines move energy and raw material from production areas or ports of entry to midstream and end users. The revenue of pipeline operators in 2015 was \$29.5 billion.

US oil and gas production has resurged over the past decade. This revival has required a transformation of the pipeline system, forcing operators to build new pipelines or to repurpose or reverse the flow of existing infrastructure—much of which was built to move product from coastal ports to midcontinent refineries. The speed of the resurgence in production has caused pipeline capacity to fall short. Recent declines in energy prices, however, are enabling capital investments to catch up.

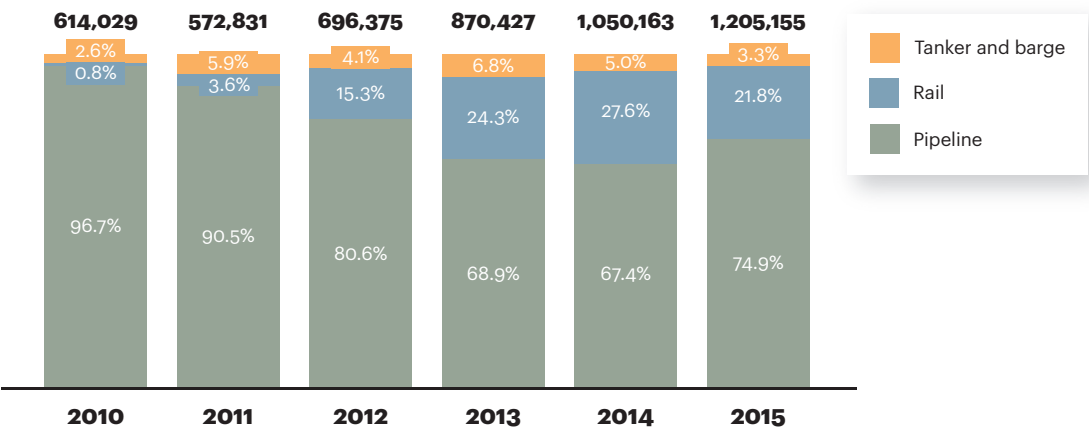
Crude, highly volatile liquids, and refined products

Pipeline infrastructure projects in typical egress areas have a lead time of about three years, while oil and gas development projects are quicker to materialize. Consequently, other modes of transport—including crude by rail (CBR), barges, and trucks—have been used in recent years to bridge the gap (see figure 14).

Figure 14
Pipeline infrastructure lost share to other transport modes through 2014 due to capacity imbalances

Crude movement between PAD districts, by mode

Thousand barrels, % of total



Notes: PAD is petroleum administration for defense. Numbers may not resolve due to rounding.
Source: Energy Information Administration

In particular, fast-rising crude production has increasingly forced operators to increase their reliance on CBR. A study published by the EIA in 2012 reported that shipping oil by rail costs up to three times as much as transporting it by pipeline. The lack of pipeline takeaway capacity has particularly beset the Bakken Formation in North Dakota, leading to price differentials with crude oil from other production areas such as the Permian Basin in Texas and New Mexico.

Natural gas

According to EIA figures, in 2013 the industry had the capacity to transport 25 billion cubic feet per day (Bcf/d) from Canada, the Midwest, and the Southeast into the Northeast. The growth of natural gas production in Pennsylvania, Ohio, and West Virginia, however, has forced natural gas pipeline operators to modify their systems to accommodate bidirectional flows of up to 8.3 billion cubic feet per day out of the Northeast. Some observers forecast that nearly one-third of natural pipeline capacity in the Northeast could be bidirectional by 2017.

New infrastructure

There has been heavy investment in new pipeline infrastructure in response to constrained capacity between 2010 and 2015. GlobalData estimates that the United States will account for 20 percent of new oil and gas pipeline construction globally. IHS analysis suggests that planned US pipeline investment over the next 10 years, estimated at an average \$54.8 billion per year, will account for three-quarters of all planned capital investment in transport modes. This 10-year investment is expected to translate into a \$69 billion contribution to GDP.

International Freight Forwarders: A Buyer's Market

International freight forwarding connects shippers with international air and ocean carriers. A.T. Kearney estimates that freight forwarders contract as much as 90 percent of air cargo capacity and up to 50 percent of water cargo capacity worldwide. According to market research firm Technavio, international freight forwarding grossed \$142 billion in global revenues in 2015, about 24 percent of which was based in North America. Net revenues (after purchased transportation) of top forwarders are between 20 percent and 30 percent of gross revenues. As a result, the net impact of international freight forwarding on USBLC is well under \$10 billion.

International freight forwarders are a major enabler of domestic cargo flows, since they either transfer inbound international shipments to domestic providers or transport imported goods themselves. In addition, many freight forwarders offer adjacent services for domestic requirements such as customs clearance, supply chain management, and contract logistics. International freight forwarding is an asset-light industry whose value proposition to shippers consists of: (1) visibility and compliance for their international shipments via a global trade management system; (2) competitive transportation rates, based on aggregating flows from multiple shippers; and (3) simplified supply chain contracting and management, grounded in a broad base of providers and expertise in managing a complex network of international flows.

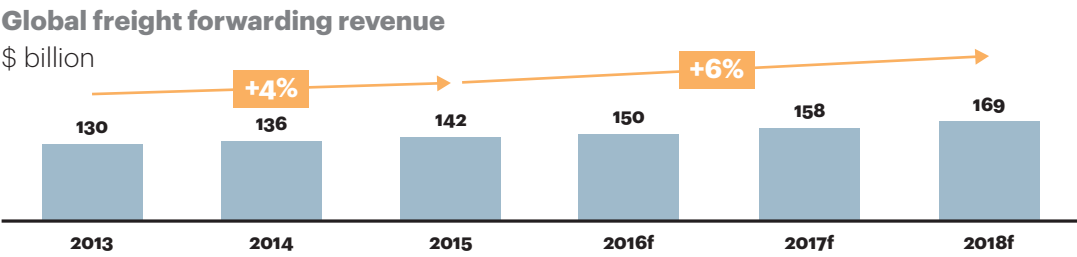
Today, more than 25 global forwarders and thousands of smaller firms are competing to find customers to fill air and water carriers' excess capacity. With so many forwarders offering cargo capacity, shippers are putting every lane out for bid to multiple suppliers, creating intense price competition in the sector. Today, freight forwarding services are undoubtedly a buyer's market.

Against this backdrop, some freight forwarders have resorted to mergers and acquisitions to gain scale, ease competitive pressures, and enter into lucrative new markets such as the United States. Examples include DSV's acquisition of UTi, Kinetsu's purchase of APL Logistics, and GEODIS's acquisition of OHL.

Outlook

Technavio lead transportation and logistics analysts expect the international freight forwarding sector to grow at a healthy 6 percent per year, reaching \$169 billion in 2018 (see figure 15). There are, however, potential disruptors (for example, new manufacturing technologies, tax regulations, or import barriers) that could impact global trade. Likewise, new competitors and technology-enabled business models could emerge.

Figure 15
The global freight forwarding market is expected to continue to grow steadily



Sources: TechNavio Insights: *Global Freight Forwarding Market 2014–2018*; A.T. Kearney analysis

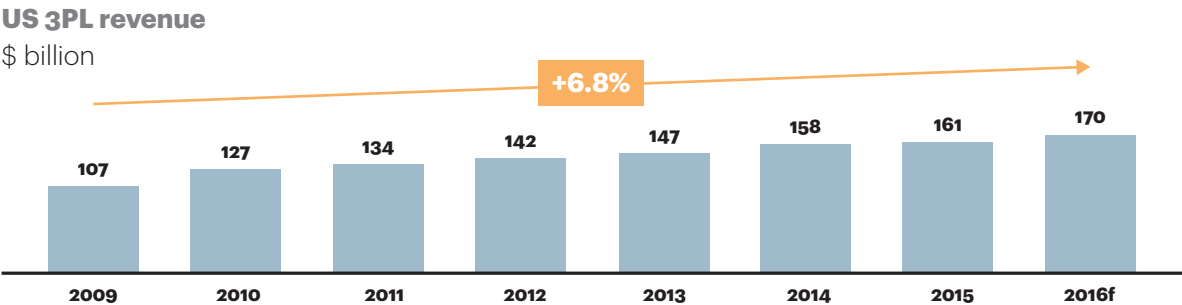
Third-Party Logistics Providers: Driven by Technology

According to Armstrong & Associates, approximately 11 percent of US logistics spend in 2015 was outsourced to third-party logistics providers (3PLs), who move, store, or manage shippers' products without assuming ownership. The 3PL industry comprises four main service segments: domestic transportation management, international transportation management, dedicated contract carriage, and value-added warehousing and distribution. According to Armstrong & Associates, the US 3PL market has grown by roughly 7 percent annually since 2009, driven by an increase in the outsourcing of both core and noncore logistics management activities (see figure 16 on page 22). The industries with the greatest proportion of outsourced logistics operations are high tech, retail, and food and groceries; logistics outsourcing is growing the fastest, however, in the e-commerce and healthcare sectors.

As the 3PL market grows, the competitive landscape is changing. The top providers are refining their market positioning to become one-stop 3PLs and targeting specific industries. In support of these goals, Armstrong & Associates reports that 2015 M&A spending reached nearly \$18.9 billion, including 11 transactions worth more than \$100 million.

The market has also seen an increase in shipper demand for visibility and control into all transportation management activities and assets in order to enable their optimization. Transportation Management Systems (TMS) are the tools that enable this visibility and control

Figure 16
The US 3PL market is experiencing constant growth



Note: 3PL is third-party logistics provider.
Source: Armstrong & Associates

by orchestrating the transport of goods between manufacturing locations, storage facilities, and customers. While most shippers turn to 3PLs for TMS-enabled services, others tend to directly license the technology from niche providers such as Manhattan Associates or Red Prairie. According to Gartner, TMS software revenue has experienced double-digit growth for the past several years. This is another competitive threat, to which most 3PLs have responded with a TMS capability either developed in-house or acquired externally.

Another dominant theme in the industry is the need to develop long-term relationships for profitable and sustainable growth. 3PL-shipper relationships have continued to evolve from transactional price reduction to total cost improvement to overall P&L impact. This means that a price-based RFP approach is giving way to a collaborative, interactive, design-based approach that is generating higher margins for many 3PLs.

Outlook

Technology will continue to play a significant role in the evolution of the 3PL market. A key deliverable will be increased visibility and control into end-to-end logistics operations. There are two main examples of the role of technology: (1) the concept of a Lead Logistics Provider (LLP) enabled by a “control tower,” and (2) a cloud-based TMS.

Control towers have entered the logistics mainstream, as the largest 3PLs have rebranded their portfolio of offerings as TMS-enabled total logistics orchestration. An LLP will manage as many of the logistics activities as a shipper desires, from network design, strategic sourcing, and carrier management to load tendering, track and trace, and freight audit and pay. While many shippers have achieved a steady-state solution with an LLP, even more report that the undertaking is a work in process, with systems interfaces and uneven capabilities identified as the key improvement areas.

A cloud-based future of TMS is an emerging disruptor that will fuel the growth of nontraditional new entrants. One example is Amazon Logistics, which combines a state-of-the-art cloud-based TMS with a rapidly growing domestic fleet and automated distribution facilities. This marriage of technology solutions and physical infrastructure is already proving to be highly disruptive for both asset-based 3PLs and their traditional customers, the brick-and-mortar retailers.

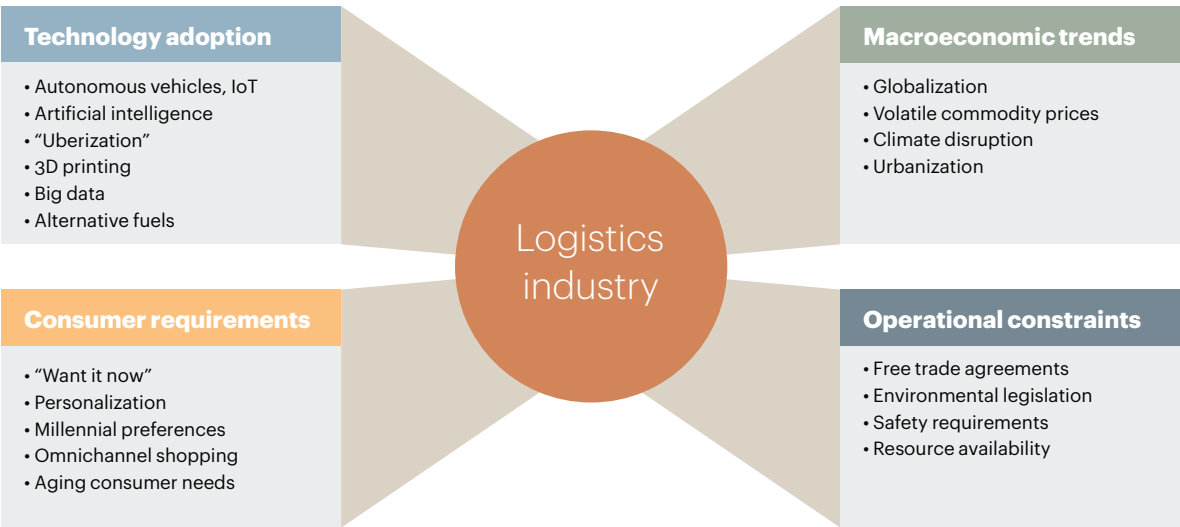
On the Cusp of a New Era

The next 10 years will see major changes in the logistics industry and will bring it into a new era. Multiple forces will disrupt the industry’s fundamental elements at a pace that is more exponential than linear. These forces are: (1) technologies that will create step-change efficiencies in connectivity, labor, and assets; (2) macroeconomic trends that will dictate new trade flows; (3) consumer requirements that will stretch capabilities; and (4) operational constraints that will reshape the rules of the game (see figure 17). Adaptability to these potential changes will define the future winners and losers of the industry.

Although the relative impact of the four disruptive forces will vary by mode, logistics company executives across the spectrum will want to pay special attention to two of them in particular:

- **Technology adoption.** The pace and breakthrough nature of technological innovation—and the rate at which it is adopted—will heavily impact supply chain assets, processes, and people. Automation technologies paired with “Uberization” platforms and optimization tools have the potential to transform asset utilization and driver requirements. 3D printing promises to transform the shape, composition, and footprint of entire supply chains, while inroads in the use of alternative fuels may revolutionize transportation economics and drastically change the mode mix. Evidence of disruptive technology adoption in the market includes brokerage firms such as Transfix, which propose pure technology solutions in comparison to the manual-plus-technology solutions in place at traditional brokers. Advanced load-matching algorithms and automated processing from load tendering through delivery, supported by free mobile and web-based apps for truckers and shippers, are coming together to provide an alternative to the more manual brokerage models.
- **Operational constraints.** Operational constraints such as regulations and resource scarcity will influence the scope, scale, reach, and ability to perform transportation and logistics

Figure 17
Logistics industry disruptors



Note: IoT is the Internet of Things.
Sources: CSCMP; A.T. Kearney

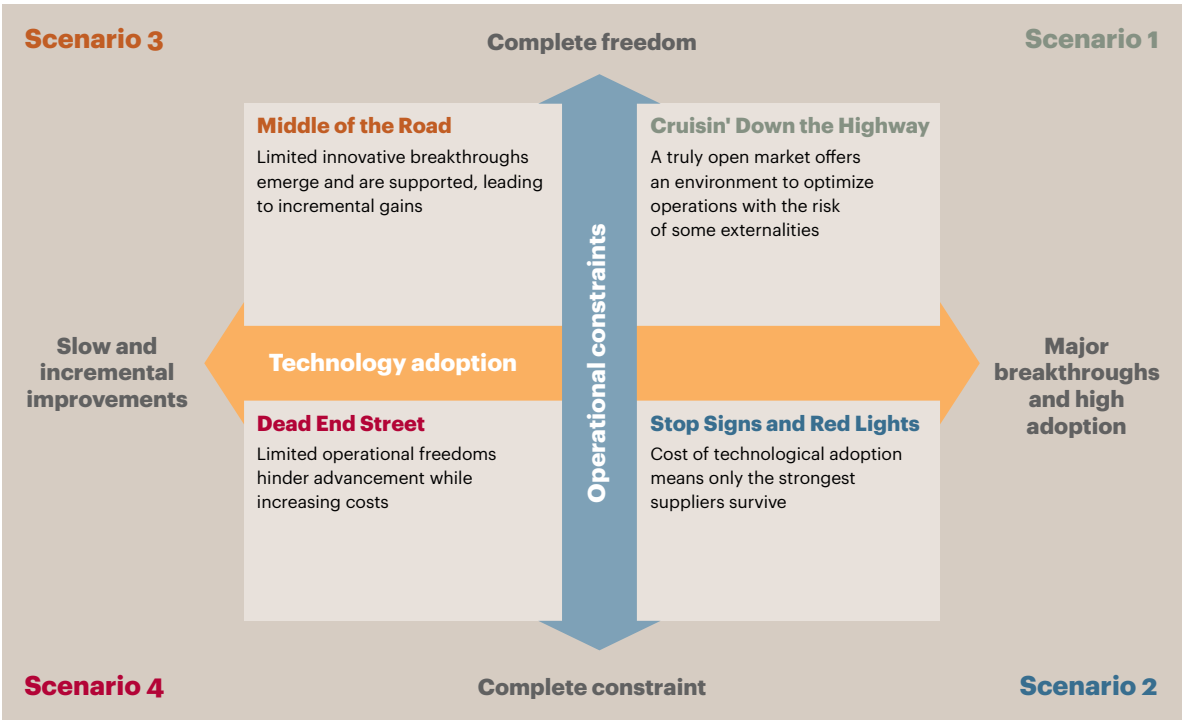
activities. Changes in environmental, trade, safety, and labor regulations may accelerate, slow, or even change direction depending on the political leadership at any given moment. Resource limitations such as road and rail congestion can be exacerbated by inadequate infrastructure planning. Similarly, resources such as skilled drivers and supply chain assets may face permanent or temporary shortages that can significantly hinder a shipper’s ability to perform.

No one knows what the future will bring. To start the dialogue, CSCMP and A.T. Kearney developed four scenarios to characterize “alternative futures” and analyze their implications. The elements and outcomes of this exercise will certainly vary by industry, mode, and entity, but the following scenarios provide a general perspective for the logistics industry and can help its leaders to better understand the strategic implications.

We designed the scenarios with technology adoption and operational constraints as guideposts, using extreme versions of these disruptive forces to give life to the following scenarios (see figure 18):

- **Scenario 1: Cruisin’ Down the Highway.** Thanks to a truly open technology market, major motor carriers are able to deploy fully autonomous commercial vehicles for cross-country transport, helping to alleviate congestion. Supply chains are fully integrated; warehousing and transportation are managed as an end-to-end offering in order to maximize IT efficiencies and minimize the length of transportation flows. Shippers have more choice of supply and can capture value through better pricing and higher service. Regulators understand and trust technology.

Figure 18
Strategic planning scenarios



Sources: CSCMP; A.T. Kearney

- **Scenario 2: Stop Signs and Red Lights.** Fierce operational constraints, including a devastating driver shortage, high fuel prices, and regulatory barriers to new technologies such as autonomous vehicles and robotics, deeply affect the transportation industry. In the face of regulations, only the strongest and most easily adoptable technologies are able to flourish—and only in the hands of those able to invest for the long term.
- **Scenario 3: Middle of the Road.** This scenario is the closest to the status quo. Transportation automation capabilities improve only incrementally, even as the operating environment continues to be relatively unconstrained. Warehousing facilities are regional or central, as shippers maximize the use of transportation (and use robotics to the limited extent possible) in order to keep total ownership costs down. Customers have a few more choices in this market, but no distinctive competitor emerges. Regulators are business-friendly and rational.
- **Scenario 4: Dead End Street.** Regulators are inflexible and hinder the entrepreneurial spirit of the US market. The limited technological advancement and increased cost of regulatory compliance shakes out supply markets, creating higher costs for consumers with limited service differentiation. Great expectations remain unmet.

Although the specific implications of these scenarios will be different for each company, the effects of policy decisions and the rate of technology adoption will have ripple effects throughout the entire logistics industry. While we can aspire to shape regulations and spur innovation to achieve our desired future scenario, we cannot predict with certainty which scenario will actually materialize. Consequently, strategy formulation needs to take account of all of them. With a robust set of plausible scenarios in place, supply chain professionals can ask themselves what decisions they need to take today in order to navigate each of these scenarios effectively in the future. Furthermore, having a more informed view of the operating environment in which a company might find itself in 10 years can help ensure its long-term sustainability and secure its continued growth.

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The authors would like to thank the following A.T. Kearney colleagues for their valuable contributions: Korhan Acar, Sameer Bajaj, Katherine Baronowski, Rupal Deshmukh, Alex Frank, Parham Ghods, Sean Heinroth, John Hubach, Diane Johnson, Anastasia Kouvela, Dickson Li, Shay Luo, Haseeb Mahmood, Andrew Markowitz, Victoria Pisini, Arsenio Martínez Simón, Courtney Rickert McCaffrey, Andres Mendoza Pena, and Balika Sonthalia.

Appendix

Estimating USBLC

Over time, government and other public and private data sources have changed, resulting in the modification, addition, and discontinuation of data series useful for estimating USBLC. Additionally, as the supply chain has evolved, the underlying logic for assumptions has changed and cost categories have grown or declined in importance. In this context, the CSCMP asked A.T. Kearney to reexamine which individual segments to include; reassess the assumptions, data sources, and methodologies to ensure the best available information is being used; and revisit the report's structure to better represent contemporary supply chains. The CSCMP and A.T. Kearney also aim to improve the transparency and replicability of the report by providing more detailed information on data sources. These changes will provide a firmer base for continuous improvement as the data and the supply chain continue to evolve.

Building upon the 26-year history of the CSCMP State of Logistics Report, the overall structure of the USBLC estimate retains the three main categories for consistency: transportation costs, inventory carrying costs, and other costs. In addition, the overall USBLC estimate is consistent with prior estimates. As described below, though, we have developed a number of changes within the three categories:

Transportation costs

Transportation costs are based on 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 used detailed BEA data, their proprietary databases IHS Transearch™ and IHS 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.

Notable changes this year to transportation costs, based upon currently available data and the structure of the industry, include:

- Motor carriers is now segmented into full truckload, less-than-truckload, and private or dedicated carriers. Previous reports segmented the motor carriers mode differently, distinguishing between intercity and local.
- Parcel is included for the first time. This mode includes US-based couriers and messengers and the USPS parcel segment, net of purchased transportation. The numbers are based on BEA output, modified to remove duplicate transportation from other modes (arising from, for example, intra-mode purchases).
- Airfreight includes both cargo and air express. Consistent with BEA definitions, it incorporates both domestic and import/export revenues.

- Similarly, water includes Coastal/Great Lakes, inland waterways, and deep sea. It incorporates domestic and import/export revenues.
- Pipeline reflects all commodity products. Previous reports only included crude oil estimates.
- Freight forwarders is now included, net of purchased transportation cost estimates, under carriers' support activities in the "Other costs" category.

Inventory carrying costs

Inventory carrying costs are now calculated from the bottom up using the sum of their three subcomponents: storage, financial costs, and other. (In previous reports, inventory carrying costs were estimated by multiplying the total value of business inventories by a fixed percentage—19 percent in recent years—and the subcomponents were estimated afterward.)

- Financial costs estimates the weighted average cost of capital for all US public companies and multiplies it by the value of total business inventory. In previous reports, this line was called "interest" and multiplied total business inventories by the Fed's one-month commercial paper rate (close to zero from 2009 to 2014).
- 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. Previous versions of the report calculated this number as total inventory carrying cost less financial cost less warehousing. In the past, this subcomponent represented approximately 70 percent of total inventory carrying costs.

Other costs

Previous reports included two cost segments under "other costs": shipper-related costs, which were primarily an estimate of freight handling costs using BLS data; and logistics administration, a percentage estimate (fixed at 4 percent) applied to the total of all other business logistics costs.

In this year's report:

- Carriers' support activities reflects a much broader 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. The figure in this category is much larger than the freight handling cost in previous reports.
- 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.

Chart 1
Source details

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
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 Business Market Index• 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• Association of American Railroads
Airfreight	<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
Water	<ul style="list-style-type: none">• Inland• Coastal/Great Lakes• Deep sea: domestic, import/export	<ul style="list-style-type: none">• BEA Input/Output Accounts, Annual, Production of Commodities by Industry• IHS Business Market Index
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 Business Market Index

Data element	Sub-elements	Source
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"> • Dr. 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/goods available for sale on the last day of the reporting period.
Other (obsolescence, shrinkage, insurance, handling, others)		<ul style="list-style-type: none"> • A.T. Kearney estimate based on various internal and external studies
Other costs		
Carriers' support activities	<ul style="list-style-type: none"> • Freight transportation arrangement • Packing or 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
Shippers' administrative costs	<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

Historical Comparisons

To facilitate comparisons with the historical series, the USBLC table has been recalculated back to 2006 using current sources and methodologies. In some cases government data has been revised or updated, so some figures (such as GDP) may differ from previous reports.

Chart 2
Ten-year summary of USBLC

Metric	Units	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Nominal GDP	\$ billion	13,856	14,478	14,719	14,419	14,964	15,518	16,155	16,663	17,348	17,947
Total business inventory	\$ billion	1,911	2,047	2,195	1,933	2,032	2,271	2,344	2,412	2,509	2,515
Inventory carrying rate	%	19%	21%	18%	19%	18%	18%	17%	18%	16%	17%
Transportation costs	\$ billion	726	749	774	623	682	749	786	810	879	890
Inventory carrying costs (ICC)	\$ billion	372	421	397	372	375	400	409	428	407	427
Other costs	\$ billion	71	73	74	68	70	74	78	83	87	91
Total USBLC	\$ billion	1,169	1,243	1,245	1,063	1,127	1,223	1,273	1,321	1,373	1,408
Total USBLC as % of GDP	%	8.4%	8.6%	8.5%	7.4%	7.5%	7.9%	7.9%	7.9%	7.9%	7.8%
Total business inventory as % of GDP	%	13.8%	14.1%	14.9%	13.4%	13.6%	14.6%	14.5%	14.5%	14.5%	14.0%
Transportation as % of GDP	%	5.2%	5.2%	5.3%	4.3%	4.6%	4.8%	4.9%	4.9%	5.1%	5.0%
ICC as % of GDP	%	2.7%	2.9%	2.7%	2.6%	2.5%	2.6%	2.5%	2.6%	2.3%	2.4%
Total business inventory as % of GDP (2010=100)	base 100	102	104	110	99	100	108	107	107	107	103
Transportation as % of GDP (2010 = 100)	base 100	115	114	115	95	100	106	107	107	111	109
ICC as % of GDP (2010 = 100)	base 100	107	116	108	103	100	103	101	102	93	95
Total USBLC as % of GDP (2010 = 100)	base 100	112	114	112	98	100	105	105	105	105	104



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