

# Base 10

PREPARED MIND

Shipping & Logistics

## THESIS

Base10 believes the shipping and logistics industry is in the **early stages of widespread automation**, and we see compelling opportunities to partner with entrepreneurs across all sub sectors of the industry. These entrepreneurs are taking advantage of the seismic, yet **slow shift away from paper, email, and spreadsheet-based transactions towards real-time cloud-based platforms** that increase the speed and ease at which goods and services move across the globe.

## Industry Key Takeaways

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- The size and structure of the global shipping and logistics market leads us to believe there will be **multiple startup winners in each subsector** of the shipping and logistics market. The global logistics industry accounts for **6% of global GDP, or \$5 trillion**. The domestic trucking industry alone is **\$800B**.
- The domestic trucking industry remains largely relationship driven, and transactions remain primarily facilitated through phone, spreadsheet, and email. This dynamic is leading to a **proliferation of tech enabled service providers that are facilitating the flow of information throughout the subsector**.
  - Companies of high interest to Base10 include Shipwell, RoadSync, and Project44.
- Direct to consumer logistics, driven by Amazon normalizing two-day delivery, will lead the creation of new companies and categories of direct to consumer (DTC) e-commerce companies that can provide Amazon like logistics. **The businesses that will thrive in this category will be in specialized high repeat verticals, with telemedicine as a prime example**.
  - Companies of high interest to Base10 include The Pill Club and Nurx
- The warehousing and shipping fulfillment subsectors have seen an influx of new entrants as entrepreneurs learn from Amazon's warehousing and shipping fulfillment model, replicate that process, and reduce the capital burden on ecommerce companies. This trend makes it easier for new ecommerce companies to successfully execute on **the most important consumer ecommerce need; fast and reliable shipping**.
  - Companies of high interest to Base10 include Easypost, Shipbob, and Clearmetal
- Air and sea freight carriers are the least tech advanced players across the entire shipping and logistics sector. As a result, **automation within the subsector will happen later and over a longer time horizon** but will be as large an opportunity as the US trucking market.
  - Companies of high interest to Base10 include Fleet and Cargobase.

## AI & Automation Key Takeaways

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- **AI will have a near-term tangibly positive impact on driver safety and fuel-efficiency through on-board sensors** that will utilize real-time data monitoring to help drivers anticipate and avoid dangerous situations and suggest routes and speeds to increase fuel efficiency.
  - Companies of high interest to Base10 include vNomics, Decisiv, Fleetup, and Fourkites.
- **Autonomous robots are already being effectively utilized by large retailers and e-commerce companies to assist both the in-store shopping experience and warehouse inventory processes.**

This will assist e-commerce fulfillment companies, such as **Shipbob**, to streamlining their operations and increase capacity without increasing square feet.

- The case for autonomous trucks, driven by increased safety, alleviation of driver shortage, and decreased carrier cost will outweigh the primary headwinds of long-term driver employment and lack of regulation, and **we will see autonomous trucks on the road in the next 5-10 years.**

## Progress and Next Steps

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- **Base10's Prepared Mind is the result of several years of work meeting with entrepreneurs, executives, and analysts in the industry and seeing firsthand how leading competitors operate.** This report is a selective summary of what we have learned and includes highlights from several high impact conversations (out of dozens) with founders, executives, and analysts we have spoken with.
- Base10's Prepared Mind into the shipping & logistics industry has directly led to investments in **Shipwell and RoadSync (US trucking) and The Pill Club (Consumer Logistics).** In both cases we partnered with **entrepreneurs with domain expertise** who are seeing, anticipating, and capitalizing on the trends we observed throughout this report. They are **using data and automation** to build defensible businesses and disrupt the industry.
- We continue to speak with industry participants daily and learn more about the pain points across the entire sector. Our high priority focus is in the subsectors of warehousing and shipping fulfillment and international air and sea freight. **We are in active discussions with several entrepreneurs building new and compelling business models** across these and other subsectors within the industry.

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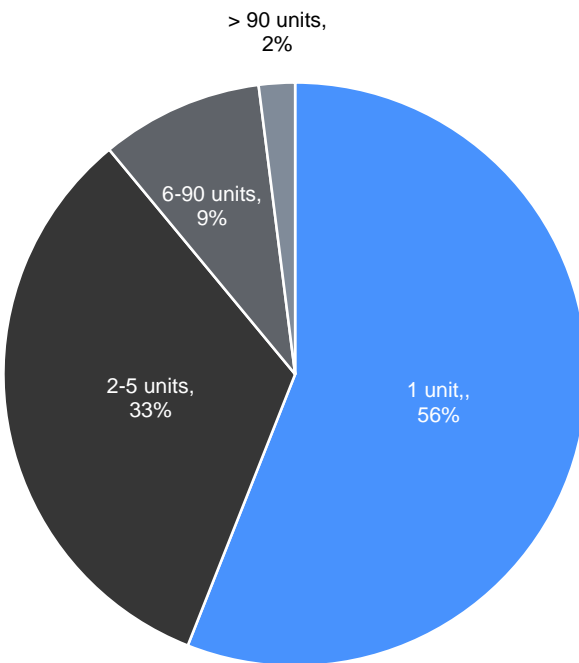
SUMMARY

# Shipping & Logistics Subsectors Undergoing the Most Disruption

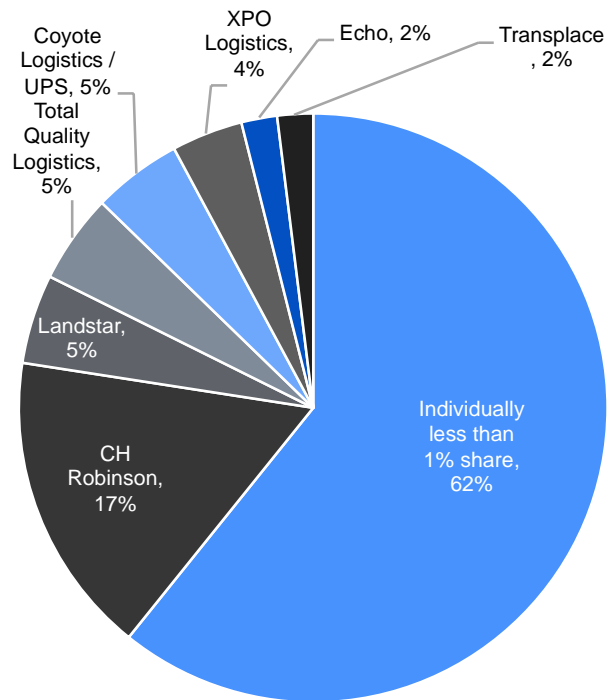
## US Freight Brokerage Market

The US freight brokerage market is estimated to be \$60B<sup>1</sup>. The market is characterized as highly fragmented with 60% of brokers having less than 1% share. This is largely due to the makeup of the full truckload (FTL) carrier market where nearly 90% of FTL carriers own five or fewer trucks.

Distribution of FTL Carriers by Number of Power Units in Fleet



Distribution of FTL Carriers by Number of Power Units in Fleet



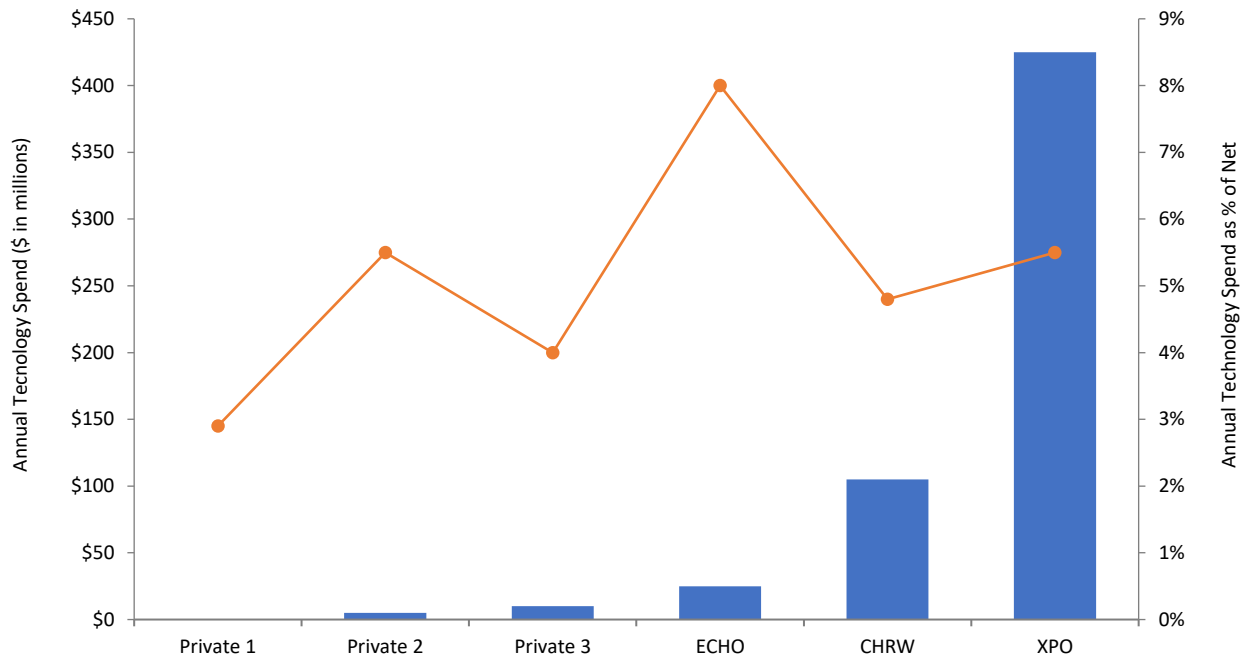
Source: American Trucking Association & Wall Street Research

<sup>1</sup> American Trucking Association & Wall Street Research

As shown, the freight brokerage market is characterized by thousands of small brokers working with thousands of small carriers. There are several large brokers who have each amassed greater than 1% market share, and these brokers continue to gain share for two primary reasons:

1. Their scale gives them access to more carriers and allows them to be more competitive on rates vs. smaller players, and;
2. They've had the capital to invest in technology over the last decade and have a better technological footprint than many of their smaller competitors.

### Brokerage Technology Spend Comparison

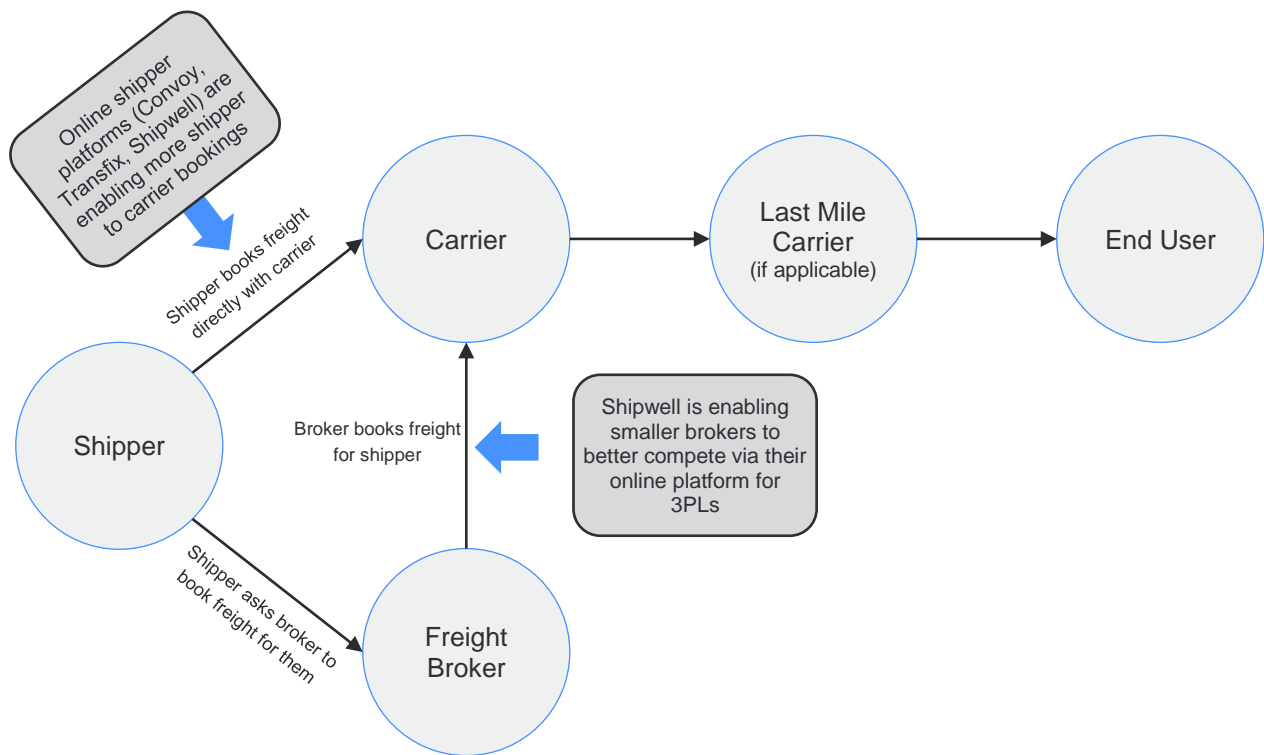


Source: Public company filings, Base10 research, Wall Street research

The impact of point two is such that smaller brokers, or 62% of the market, generally lack sufficient capital to effectively invest in the technology necessary to compete in today's freight brokerage market. This opens two attractive avenues for tech enabled new entrants like **Shipwell**, Convoy, and Transfix.

1. They can create a marketplace solution that allows shippers to book freight directly with carriers online and cut out the broker, or;
2. They can open their platforms to freight brokers and sell the technology to 62% of the broker market who may be unable to invest in their own technology platforms.

While Convoy and Transfix are concentrated on number strategy one, Shipwell is currently pursuing both customers, as illustrated below:



Illustrative End to End Freight Process

In conversations with many 3PL's, carriers, and shippers, as well as third party research from multiple resources, **we believe automation within this market is less than 10%<sup>2</sup>**. The industry continues to be dominated by paper orders and bills and is driven by relationships. The vast majority of the industry still operates in this manner and almost all industry players we spoke with believe the transition to digital is still in the first or second inning and **will take decades to fully automate**.

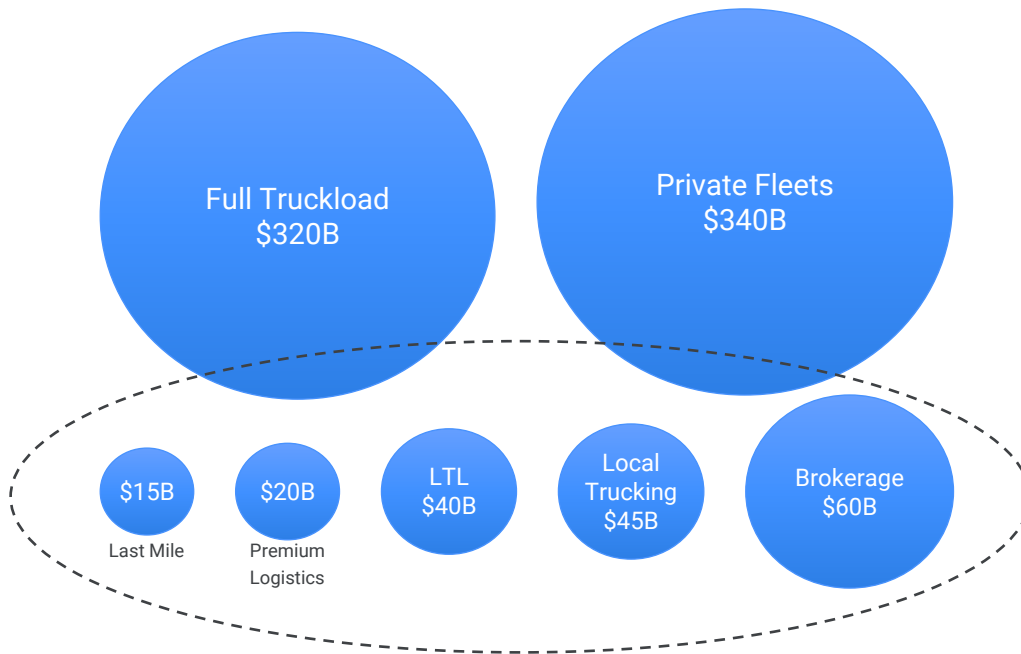
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<sup>2</sup> Base10 research & Wall Street research



# Domestic Trucking Market

The domestic trucking market is very large at \$800B<sup>3</sup> and is composed of several different segments with the bulk being made up of full truckload and private fleets. Diagram below.



The two areas within this subsector where Base10 has spent the most time are full truckload (FTL) and less-than-truckload (LTL), and brokerage. FTL, as shown above, is characterized as extremely fragmented with many small carriers; 89% of the market is made up of carriers who own less than five trucks. This dynamic, plus the lack of many players with significant scale, creates significant opportunity for tech innovation and disruption. **The most interesting tech trend we see in the FTL and LTL market is the migration of freight transactions from Electronic Data Interchange (EDI) to API.** The movement to API is the driving force behind the increase in startup activity in the space as it has given engineers real-time access to prices and capacity of thousands of carriers. Historically, this information was only available via a phone call or email. **By making this data available to any industry participant with access to an API connection, carriers have taken the first step towards the automation of freight booking.**

## EDI Overview

To better understand why the shift to API is such a watershed moment for the industry, it is best to first understand EDI.

### What is EDI?

- EDI is the electronic exchange of business documents in a standardized format. These specifically formatted business documents are “transaction sets” and the customers and carriers one does business with are “trading partners.”

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<sup>3</sup> American Trucking Association & Wall Street research



- The key to EDI, and the reason it works, is that every document that is sent between counterparties needs to be in the standard format in order for your customer or client's EDI to read it, process it, and respond to it.

#### What is the Origin of EDI?

- EDI was created in the 1940s and first implemented in the transportation and logistics industry in the 1970s.
- Despite the advances in technology, the internet, and cloud communications, EDI technology and processes looks almost identical to how they did when they were implemented.

#### How is EDI Specific to the Trucking Industry?

- There are five transaction sets normally used by the trucking industry: load tender, response to load tender, carrier shipment status, carrier freight invoice, and acknowledgment.
- Each time one of these transaction types is sent out, the sender must wait for the recipient's software to read the document, determine the request based on the EDI format and code, check its fleet or inventory and then send a message, or ping, back to the sender in the same EDI format.

#### What are the Main Drawbacks of EDI?

- EDI, while done electronically, is inefficient and time consuming as the information is sent over timers and there is a delay between when the counterparty receives it and when they send back a response. In that time, it is possible a customer's needs have changed.
- EDI does not allow for real-time management of one's fleet and inventory, yet this is the technology that 95% of the FTL fleets use.

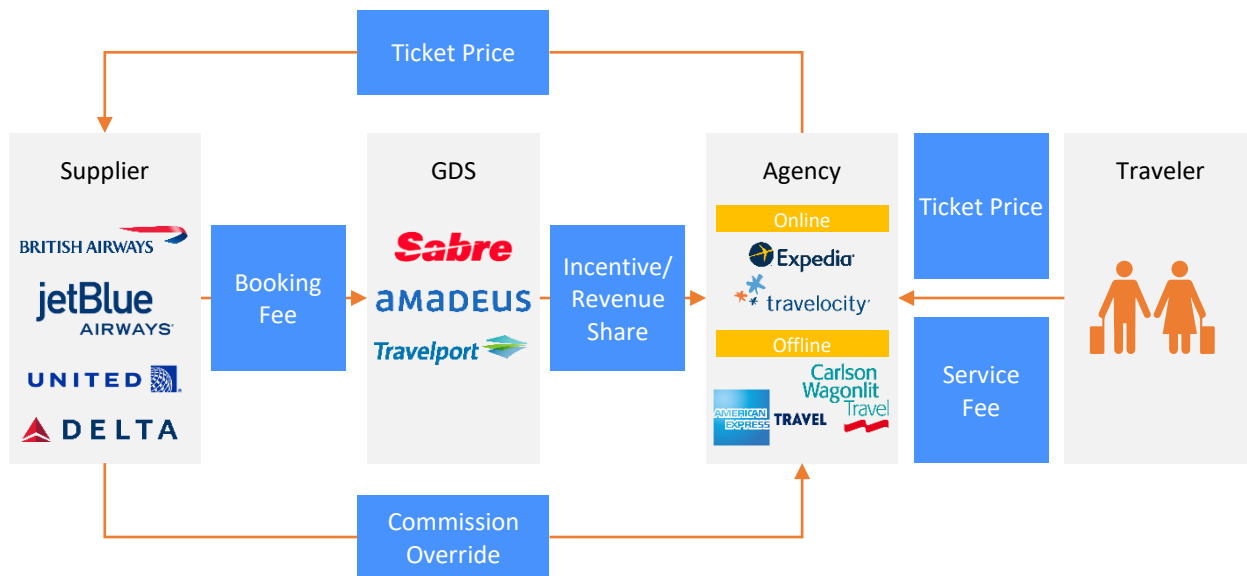
#### We See This EDI Dynamic Creating Two Potential Avenues of Investment

- The elimination of EDI via API and the subsequent cloud software services and analytics that can be built on top of it.
- Smart software solutions for companies that do not want to totally ditch their EDIs that provide the capability to allow current EDI systems.

The online consumer travel agency went through a similar path as what is currently happening in the domestic trucking market. In the early 1960s, American Airlines founded Sabre (Semi-Automatic Business Research Environment) to help travel agents gain better access to airfare in order to speed up the booking process and ultimately sell more seats. **Sabre (\$6B market cap) and its two primary competitors, Travelport (\$2B mkt cap) and Amadeus (\$35B mkt cap), are essentially connection layers that provide electronic connections, primarily via APIs, between air carriers (Delta, United, etc.) and travel agencies (Priceline, Expedia, Hotwire, Kayak, etc.) so that both parties can transmit real-time information instantaneously and allow travelers to book airfare at the click of a button.** Sabre, Travelport, and Amadeus changed the travel industry by moving every booking away from paper and to the internet, and leading to the creation of online travel sites like Priceline (\$98B mkt cap), Expedia (\$20B mkt cap), TripAdvisor (\$5B mkt cap).

Subsequently, Sabre has built a host of other functional software on top of its connection layer that it sells to many of its customers who use their connection layer. **We believe companies like Shipwell and Project 44 can do for the trucking industry what Sabre, Travelport, and Amadeus did for the consumer travel industry.** By focusing on securing the connections to carriers and acquiring shippers and brokers as customers, these companies will create a competitively advantaged position within the industry. Down the

line, they will be able to build value added software offerings on top of their data offering and grow their businesses well into the future.



*Illustrative Example of Online Travel Ecosystem*

**While we think EDI to API is the most impactful trend, we are not overlooking other startups focused elsewhere and using other innovations to create compelling platforms.** One such example is Trucker Path, which initially gained popularity as a social media app for truckers with discussions of best truck stops, best routes, parking suggestions, weigh station status, cheapest fuel, etc. It has over 600,000 monthly active users and used its active user base to begin building a marketplace where truckers could match with shippers. The Company was recently acquired by Chinese social networking company Renren. We believe there are more Trucker Paths out there.

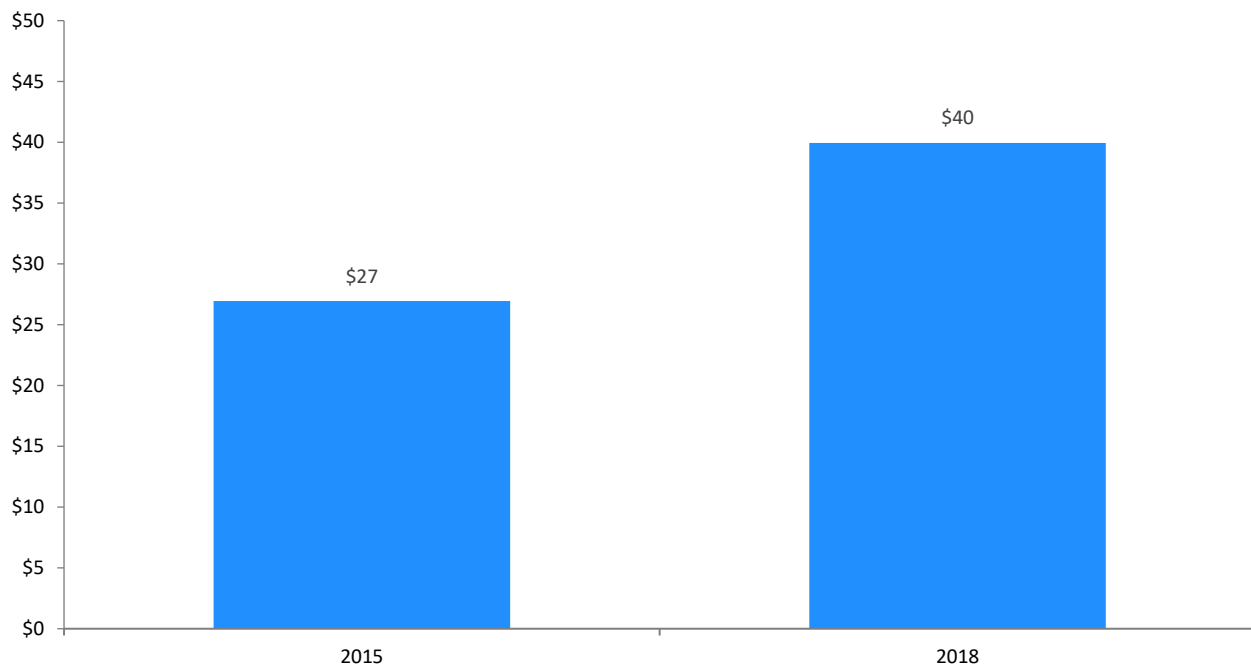
## US E-Commerce Parcel Shipping Market

**The US E-Commerce Parcel Shipping Market is estimated to reach \$40B<sup>4</sup> by 2018** driven by the growth of Amazon and other e-commerce retailers as consumers continue to shift from brick and mortar to online shopping. **As e-commerce continues to grow, companies that handle shipping and fulfillment processes for non-Amazon retailers will grow with it.** To capitalize on this trend, Base10 is evaluating several startups who manage outsourced inventory for retailers and provide shipping and return fulfillment. These companies own or lease warehouse space and manage inventory for smaller e-retailers who do not have enough capital to build their own warehouse operations. They provide a critical component in the transportation and logistics ecosystem as they substitute a service for capital deployment for many e-commerce companies.

<sup>4</sup> Shipbop

## U.S. E-Commerce Parce Shipping Market (\$B)

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Source: Shipbob

We believe this trend is in the early stages as e-commerce only accounts for ~9%<sup>5</sup> of total retail sales in the US. Startup Shipbob, which recently raised a Series B, is an early mover in this subsector. Shipbob provides easy-to-use logistics technology along with access to distributed fulfillment centers and shipping fulfillment for e-commerce companies across the US.

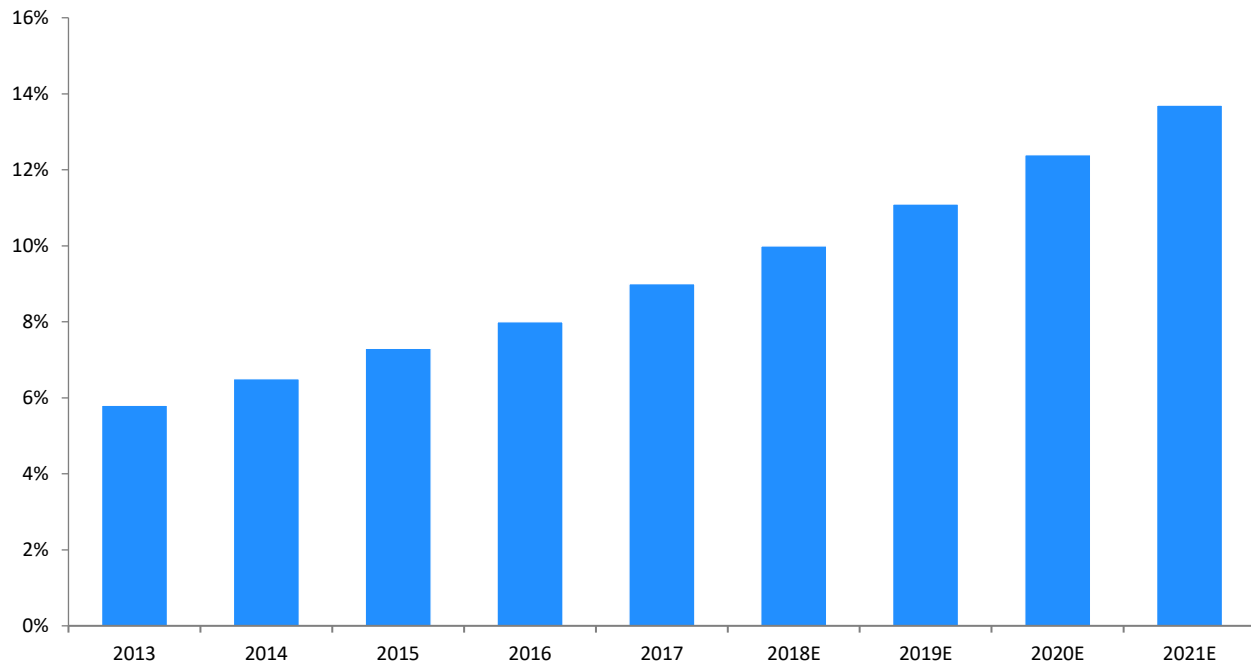
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<sup>5</sup> US Census Bureau

# Consumer Logistics & Telemedicine

## E-Commerce Share of Retail Sales in U.S.

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Source: US Census and Statista

Base10 is also researching and investing in the logistics trends underlying the proliferation of direct to consumer (DTC) e-commerce businesses, what we call Consumer Logistics. We believe the increase in sophisticated e-commerce shipping and inventory fulfillment companies, such as Shipbob, will continue to help the formation and growth of additional DTC brands. **We are particularly interested in subscription e-commerce businesses in specialized high repeat verticals as we believe the availability of specialized logistics fulfillment can serve as catalysts and help de-risk many subscription DTC brands.**

Within this DTC Consumer Logistics trend, we identified telemedicine as a subsector with significant automation potential. However, like all things consumer, we believe it is imperative that any successful telemedicine business have unique and defensible barriers of entry to reduce the Amazon threat. We saw the best way to create a telemedicine company with barriers to entry was to have pharmacy licenses in states across the US allowing for fast country-wide expansion, as well as integrations with multiple insurers that would reduce CAC and lead to faster subscriber growth rates.

**After looking at several telemedicine categories, we saw birth control as the most attractive given its status as a preventive service covered by the Affordable Care Act, which meant that insurers were mandated to cover the cost of birth control to all US women.** And after talking to a handful of birth control telemedicine companies via our automated outreach, **we quickly identified The Pill Club as the most compelling investment opportunity.** The Company demonstrated early success owning pharmacies and integrating with insurers in each state where it sells birth control and other women's health products.

As culmination of our research into this trend, Base10 co-led the Series A into The Pill Club, along with Shasta Ventures. TPC is on a mission to revolutionize women's health for the 21st century and believes women have the right to be in control of their health and bodies at all times, and in order to do so they need access to an ubiquitous platform providing 24 hour access to health needs from reproduction to vitamins and dietary advice. TPC's entry point to becoming this platform is by prescribing and delivering birth control and other women's health products and services to women across the country. **Currently, TPC can deliver birth control to 99% of the US female population and can prescribe birth control to 77% of the US female population, all of which is 100% covered by insurance providers.**

The Pill Club competes with other online pharmacies such as Nurx, Lemonaid, Pill Pack, and NimbleRx, among others. Each of these is taking advantage of new and improved logistics processes to help grow their business and subscriber base. Base10 met with all competitors in the space prior to our investment as part of our diligence process. **We chose The Pill Club because we believe they have the clearest value proposition to the consumer and will create the strongest brand around their service giving them superior customer retention and LTV.** Further, by targeting a niche sector and focusing on the long-term value proposition of birth control delivery, we believe The Pill Club represents a point of differentiation and competitive advantage against Amazon.

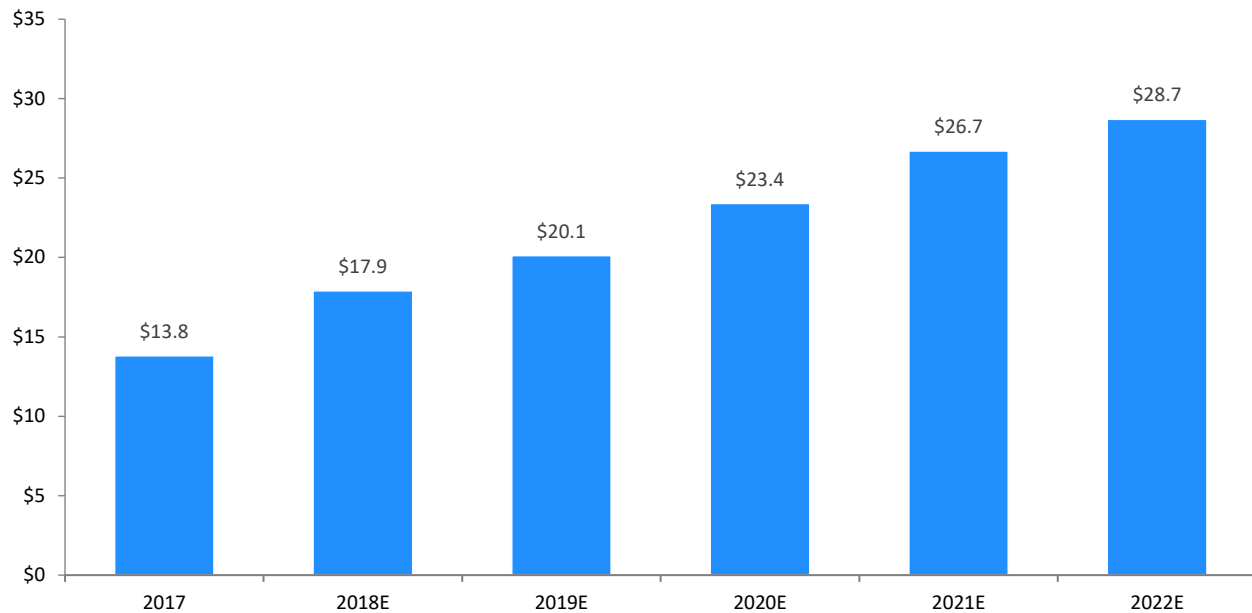
## Fleet Management & Safety Market

In 2012, Congress passed MAP-21 that outlined the criteria for highway funding, including a provision requiring the Federal Motor Carrier Safety Administration (FMCSA) to develop a rule mandating the use of electronic logging devices (ELDs). **An ELD is a device carried by truck drivers that replaces the paper logbook some drivers previously used to record their compliance with Hours of Service (HOS) requirements. December 2017 is the deadline for carriers to implement certified ELDs to record HOS.** Fleets previously equipped with ELDs will have until December 2019 to ensure compliance with the published specifications.

**This government ELD mandate represents a large data opportunity in the fleet management and safety market.** Startups such as Keeptruckin and Samsara are supplying their own ELD devices and using that data to create predictive analytics about safety and fuel efficiency. Other companies without ELD devices are marketing themselves as SaaS services and taking customer data and providing fleet management and safety analytics. Various third-party sources project the fleet management and safety market to currently be in the \$12-\$17B range and is growing at a CAGR of 15-20%. **Base believes this is an interesting market that will double in size in the next several years given ELD's impact on increased data transparency.**

## Fleet Management Market (\$B)

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Source: *marketsandmarkets*

There is a lack of public companies in the fleet management and safety market, however, one large player is Fleetcor (NYSE: FLT, \$18B mkt cap). While Fleetcor's primary business is a payment network for truckers and transportation service providers, they have a \$100M+ revenue fleet tracking and maintenance management business for FTL carriers. **We have had consistent dialog with executives and significant stakeholders of Fleetcor regarding this market and believe they would be potential acquirers and consolidators as the fleet management and safety market continues to grow.**

## AI Automation Overview

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Base10 has been in consistent dialogue with the four members of our AI Advisory Board, listed below. We have put together the below AI overview based on our conversations with them.

### AI Industry Practitioners

- [Mr. Scott Phoenix](#), CEO of Vicarious (\$125M of capital raised; venture-backed by Jeff Bezos, Elon Musk, and Mark Zuckerberg)
- [Mr. Mohammed Sabah](#), Head of Engineering and Data Science at The Honest Company (\$300M of capital raised; venture-backed by General Catalyst, IVP, Pritzker)

### University Labs

- [Stanford AI Lab: Dr. Juan Carlos Niebles](#) is a Senior Research Scientist at the Stanford AI Lab and Associate Director of Research at the [Stanford-Toyota Center for AI Research](#) and member of Base10's AI advisory board. Part of his research focuses on autonomous vehicles and computer

vision, and he is helping Base10 evaluate autonomous trucking and autonomous warehouse robot startups.

- NASA: [Dr. Omar Hatamleh](#) is the Chief Innovation Officer for NASA and Chief Corporate Advisor to Base10. He helps facilitate Base10's relationship with large corporations who collaborate with Base10 on industry specific research.

## Shipping & Logistics AI Trends

Based on our ongoing dialogue with our advisors, we believe existing AI technology will have a near-term impact automating processes within the following shipping and logistics subsectors.

### Fleet Management & Predictive Maintenance

AI can deliver powerful predictive analytics to reduce maintenance costs by predicting the best time to replace components that are about to fail, and thereby preventing expensive and unexpected breakdowns.

**Currently, fleet operators put trucks through maintenance procedures at preset mileage milestones or after they have broken down. This is an inefficient process as often times trucks would have otherwise run well, long after predetermined milestones.** In this case, taking the truck offline for pre-planned maintenance incurs a maintenance cost it may not have needed plus a loss of revenue from use of the truck. In the second maintenance case, the truck experiences an unexpected shut down triggering lost revenue, freight delays, unhappy customers, and unexpected maintenance costs. **Neither of these scenarios are ideal from a cost or business standpoint.**

**By applying machine learning to the pre-existing fleet data, carriers can immediately have a better picture into the maintenance cycle of their fleets and can start anticipating when to take trucks to maintenance based on historical performance instead of standard miles driven metrics.** Additionally, new technology in the form of smart sensors are emerging that is combining the historical data set with data gathered from active monitoring of trucks to more accurately predict maintenance needs in real-time. **A truck integrated with a variety of smart sensors can identify where and when maintenance is required.** Internal diagnostics, for example, can alert users to maintenance issues while a truck is traveling down the road at seventy miles per hour and alert the driver of the impending failure, possibly preventing disaster.

The smart sensors can also anticipate spare parts logistics. The potential wearing out of truck parts would be predicted ahead of time so that replacements can be delivered at the right time and to the right place. **These AI enabled advancements will significantly reduce downtime for carriers thereby saving them costs, keeping the movement of freight constant, and creating a more efficient environment for shippers and carriers alike.**



*Remote Diagnostics Powered by Smart Sensors Will Improve Safety and Reduce Maintenance Downtime*



Additionally, the introduction of AI and the use of big data will be able to analyze the optimal routes and driving conditions depending on weather, traffic, road conditions, etc. **Drivers will be told in real time to change routes depending on weather forecasts or anticipated traffic delays based on historical patterns and/or real-time data.**

**The smart sensors will have the ability to tell drivers how to control acceleration to reduce fuel consumption (see demo in the video embedded below).** They will also have the ability communicate and interact with smart sensors on other trucks and suggest the drivers drive closer to each other at faster speeds. That will minimize the constant acceleration and deceleration that results in increase fuel consumption, and the reduced distance between trucks will minimize the drag thus increasing efficiency.

A host of companies are also developing AI powered fuel efficiency analytics which directs truckers to take different routes, avoid certain weather, and pick their stops in order to maximize fuel efficiency.

Startups like Vnomics, Decisiv, inthinc, Greenroad, Peloton, and Smartdrive are developing these tools. **Vnomics and Decisiv are both early stage companies and Base10 is in contact with them as they consider their next round of funding.**



*Vnomics Demo (click picture for link to video)*

## Driver Safety

Distractions and exhaustion due to long hours of driving is one of the key safety issues faced by truckers and is one of the main contributors to accidents. **According to the FMCSA, ~411,000 trucking accidents occurred in 2014 in the United States including 3,500 fatal crashes and 82,000 injury crashes with distractions and exhaustion due to long hours of driving being the primary contributor to accidents.** Luckily, AI powered services and devices are coming to reduce these numbers and increase truck driver safety. Driver assist and collision avoidance technologies have been making headways into the automotive

industry and have been contributing to the reduction of accidents over the last few years. They contain **advanced autonomous concepts, such as spatial sensing, that have the ability to make optimal choices in real-time which tell the driver to turn, brake, stop drifting, etc.**

**With AI advancements, it is becoming possible for systems to perform several multi tasks faster than humans can.** All at once, the sensors will be able to tell where all surrounding objects of the car are at all times. If successfully implemented, whether on autonomous vehicles or human driven vehicles, this technology will help eliminate most injuries on the road due to driver error.

Many of the same companies working on fleet management and predictive maintenance are also working on driver safety including vNomics and Decisiv.

## Inventory Management

**AI can be used to enhance multiple functionalities of inventory management. We believe the two most compelling AI powered inventory management tools are inventory monitoring/anticipation, and real-time tracking.** Lowe's, Wal-Mart, and Coca-Cola are already employing robots with the ability to walk the floor and assist shoppers and warehouse workers in finding products/inventory while simultaneously creating real-time data by using computer vision and machine learning to scan inventory and look for patterns in product or price discrepancies. A quick demo of Lowe's LoweBot is below (click photo for link to video).



Many impressive companies are increasing warehouse efficiency through autonomous robot development including Hstar, Locus, 6 River, Grabbit, Seegrid, and Clearpath. We have been actively researching this space with the help of Base10's Chief AI Advisor [D. Scott Phoenix](#). Scott is the Founder & CEO of AI robotics company Vicarious.

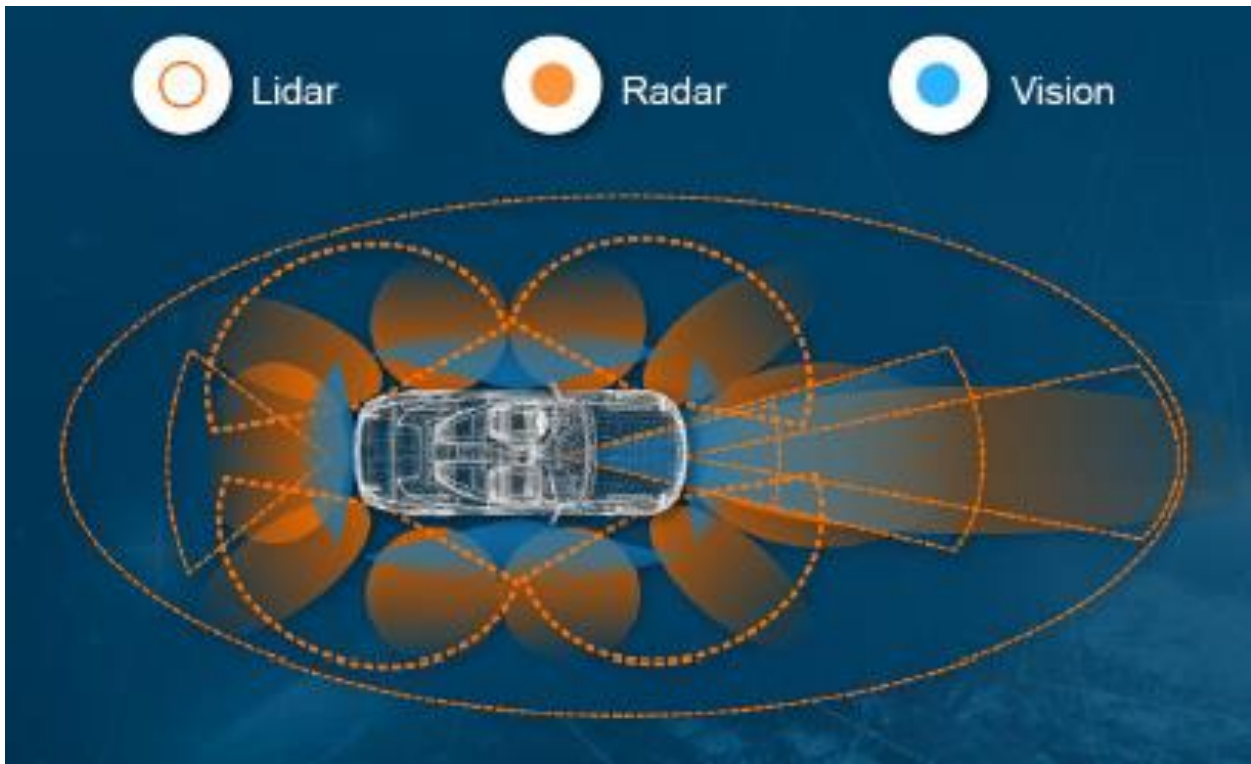


6 River Demo (click photo for link to video)

## Autonomous Trucks

**Autonomous vehicles require advanced machine learning built on top of a mountain of data where the algorithms driving the car are constantly learning every minute the car is in use.** The autonomous driving system itself uses a combination of advanced sensors and complex computer vision algorithms to respond to their surroundings. They depend on data collected by various sensors like Laser Illuminating Detection and Ranging (LIDAR), cameras, radar systems, and sonar to provide continuous feedback to the on board computer as it continues to learn and adapt in real time.

The LIDAR system perpetually shoots laser beams off surrounding objects to construct a dynamically changing 3D map which identifies possible hazards and distances from all objects on the road. These beams can cover a 360-degree view of the car and are working the entire time the car is in motion providing accurate mapping of the vehicle's surrounding to the onboard computer at all times. The radar system is used to monitor the velocity of surrounding objects and react by reducing speed or maneuvering around objects. Cameras can be used to recognize traffic lights, and signs. The sonar system is used as a redundant system to verify other data from the other sensors. The data from all sensors get passed to algorithms and classified accordingly and the car learns and adapts as it drives.



*Autonomous System in Action*

**One of the primary remaining challenges to full commercial development and deployment of autonomous vehicles is accurately identifying and categorizing all surrounding objects of the vehicle.** For example, many systems still have trouble instantly distinguishing between small vehicles, bike, pedestrian, or a dog. The detection systems often need several iterations identifying and classifying the object. The vision-based safety system has been challenging due to trade-off between fast image analysis and accuracy. Researchers are working on developing advanced algorithms that can perform these detections with high speed and minimum error with the eventual goal of being able to identify a pedestrian vs. a dog or other moving object in real-time.

### Where the Technology is Today

Cognitive	Context	Customer
<ul style="list-style-type: none"> <li>Ability to understand, reason and learn</li> <li>Natural language processing, conversation and machine learning</li> </ul>	<ul style="list-style-type: none"> <li>Real time situation detection</li> <li>Ability to react to those situations in real-time</li> <li>Context to include weather, traffic, social media, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Personalized – learns about you</li> <li>Proactive – not just command and control</li> <li>Portable – home, phone, car</li> </ul>

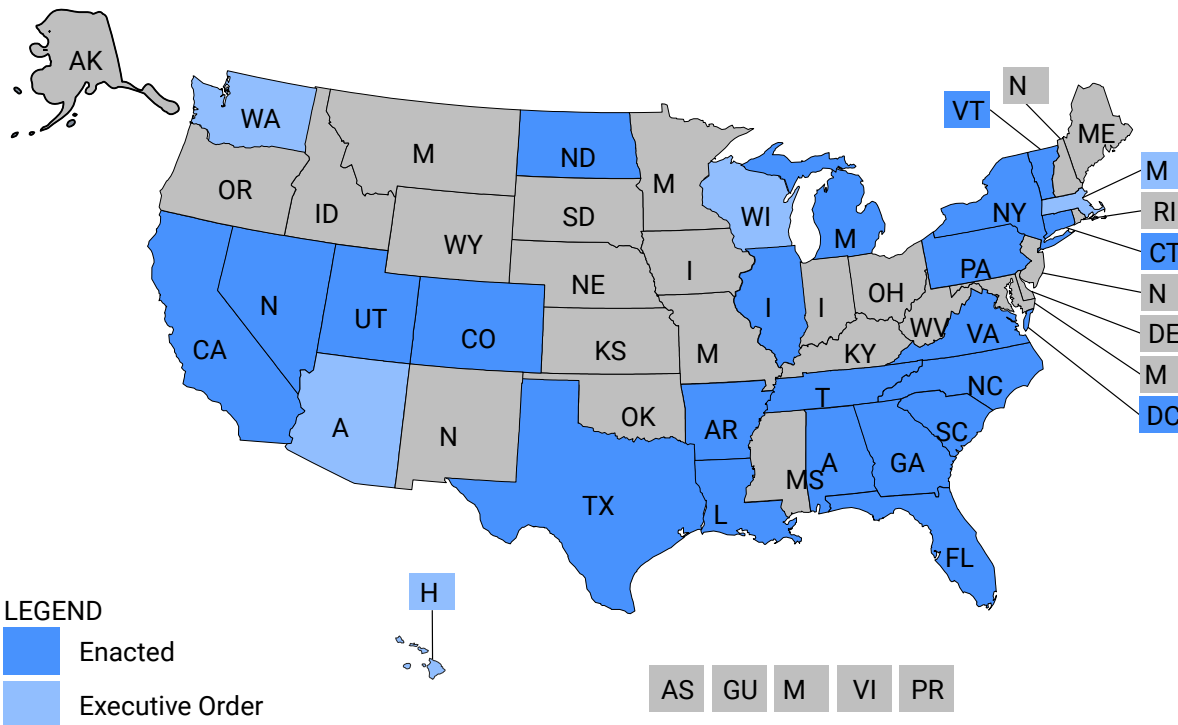
*Source: Adapted from an IBM Presentation at TU Automotive Conference Detroit, 2017 Cowen and Company*



Despite the remaining challenges, autonomous vehicle technology is already at a stage where it is ready for commercial development as seen with Tesla's recent introduction of its self-driving semi-truck. This is only the first step in a long line of new developments that will significantly alter the dynamics of the transportation industry. Tesla's truck, in its current state, is only intended for short haul routes and will likely only be employed by LTL carriers who can send it on shorter lanes in between distribution centers. As the technology continues to develop, we will see more vehicles provide greater levels of autonomous capabilities eventually leading to full size semis capable of long-haul routes across inclement weather and roads.

We believe the inhibiting factor will not be technology but regulation. Currently, roughly half of US states have issues some sort of legislation regarding autonomous vehicles.

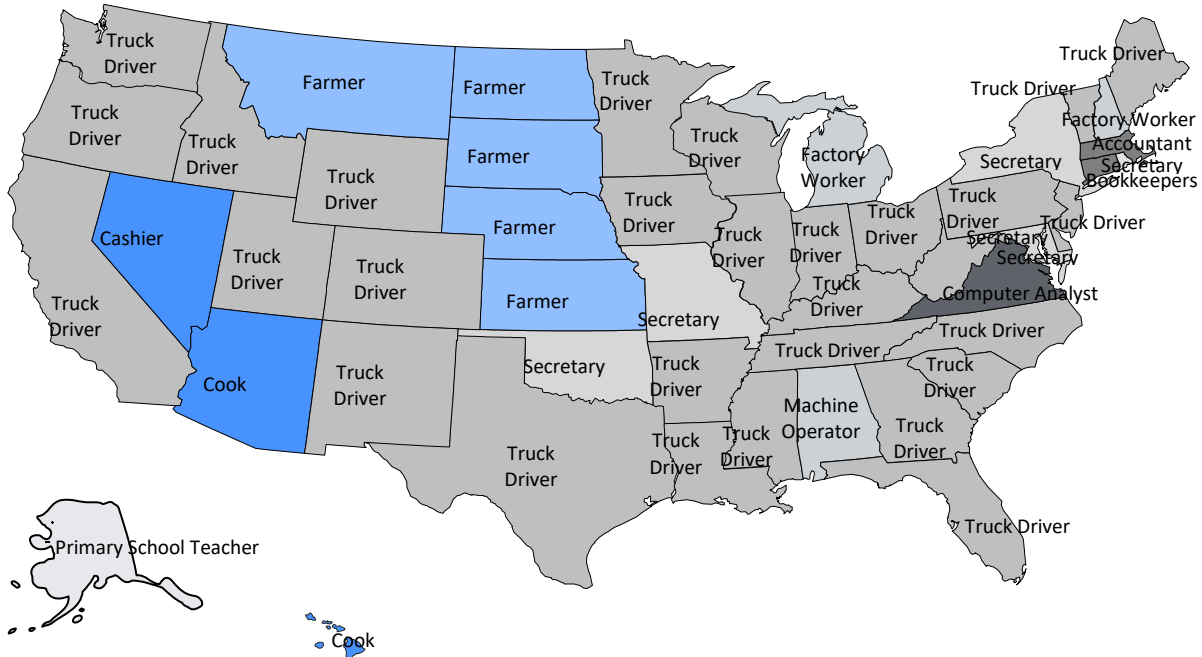
### States with Enacted Autonomous Vehicle Legislation



Source: National Conference of State Legislatures

According to the ATA, there were ~3.5M truck drivers employed in the US 2015. This represents a material portion of the American working class, and regulation will be needed to deal with the impact that autonomous trucks will have on these people. **Data from Goldman Sachs suggest that full commercial development of autonomous trucks could reduce the number of trucking jobs by 25,000 per month leading to significant savings for carriers, as shown below.** With vested interests on both sides of the debate, the regulatory debate will shape the speed at which autonomous vehicles enter the roads.

## Most Popular Profession in Each State

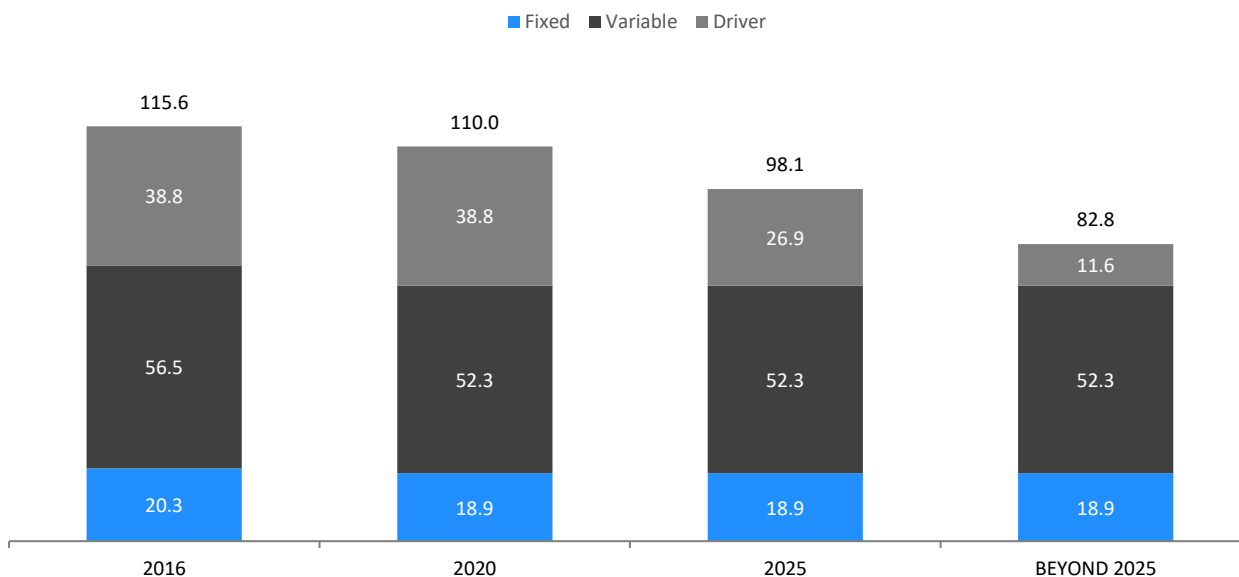


Source: NPR, Census Bureau, IPUMS-CPS/University of Minnesota

However, despite the prevalence of the truck driver profession, Autonomous trucks are badly needed in the trucking industry to meet current and future driver shortages. The ATA said in October 2017 they expect driver shortfall to reach 50,000 by the end of 2017 and 174,000 by the end of 2026. This trend largely stems from the fact that as populations in the US migrate towards urban areas, there are less workers who are becoming truck drivers. This is a critical problem in the US as the movement of goods across the country is the lifeblood of the US economy. Tesla’s self-driving truck released in November is a good start but is far from a solution as it is only meant for shorter haul routes and is more suitable for LTL routes (\$40B market) vs. FTL routes (\$320B market).

We expect driver shortages, increased safety, and potential savings for carriers to overcome the initial apprehension from loss of human jobs and lead more states to provide regulation for autonomous vehicles to operate. Shown in the graph below is average annual operations costs per long-haul truck through 2025 and beyond. As autonomous trucks begin to hit the road after 2020, we expect carriers to see a significant reduction in driver operating cost.

## Average Annual Operating Costs per Long-Haul Truck (\$ 000)



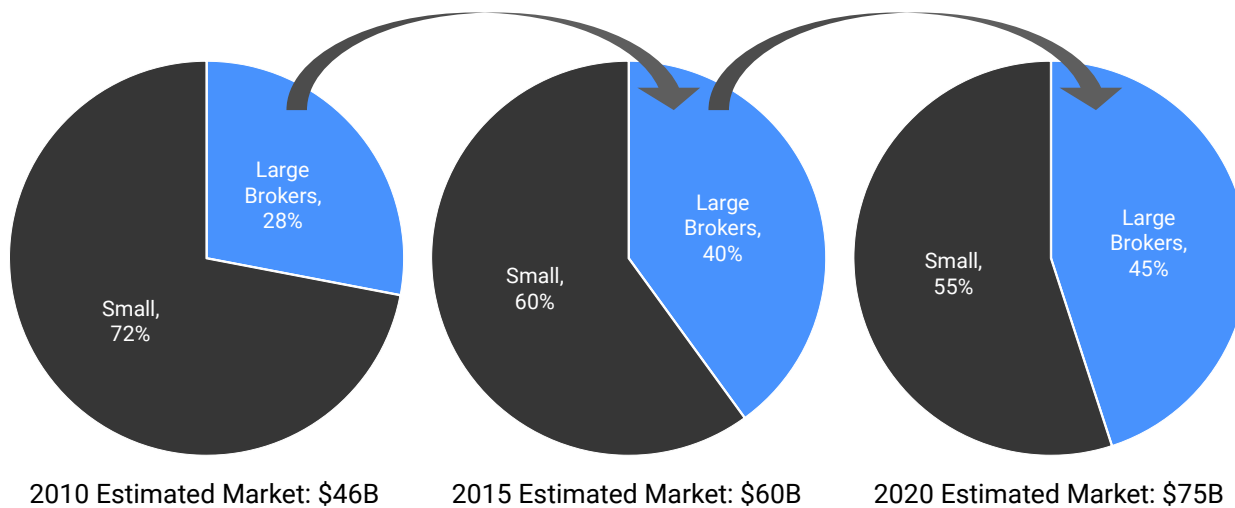
Source: ATA

## Base10 High Priority Subsectors

### Tech Enabled Freight Booking, Shipping and Tracking

- We view this as one of the most attractive categories of investment in the shipping & logistics industry. We made an investment into Shipwell to take advantage of the trend we identified and are tracking other companies as they go through their fundraising.
- Companies of high interest are Shipwell, Project 44, EasyPost, RoadSync, Ship Hero, RoseRocket, and Skuvault.
- Successful later stage companies that have raised past Series B or been acquired include Convoy, Loadsmart, Transfix, Trucker Path, Turvo, UberFreight, and uShip.
- **As more venture dollars come into this space and as more companies develop meaningful technology and acquire valuable customers, we believe it will lead to an increased pace of consolidation within the trucking market, especially on the broker side.** As you can see from the chart below, large brokers increased market share materially from 2010 to 2015 as smaller brokers lacked the capital necessary to defend their business post the 2008 financial crisis.





Note: Large brokers have >1% market share, small brokers <1% market share. Source: Armstrong & Associates, Inc., Company

- As technology continues to proliferate the industry, Base10 believes a similar situation will persist where smaller brokers will lack the capital to either invest in their own tech or acquire powerful startups. **This will lead to the larger players allocating more dollars to internal tech spend and M&A, further consolidating the market, and providing many attractive exits to numerous shipping & logistics startups.** As shown below, while large and small brokers spend comparable percentages of net on technology spend, large brokers spend significantly more dollars leading to more advantaged tech platforms.

## Fleet Safety and Fuel and Route Efficiency Via Predictive Analytics

- As discussed in the predictive analytics sections, we believe there is a lot to be done with fuel safety and efficiency through data collection and analysis. We have met with several early stage companies working to get their product to market and will make an investment if we find the right team and fit.
- Companies of high interest are Optimoroute, vnomics, and Decisiv.
- Successful later stage companies that have raised past Series B or been acquired include Fleetmatics, ClickSoftware, Greenroad, Peloton, and Smartdrive.

## Online Shipping and Booking for International Sea and Air Freight

**While there has been significant capital invested into many startups building cloud solutions for the domestic trucking and logistics market, there are noticeably less companies doing the same thing for air and sea freight.** The sea and air freight markets are particularly complicated as the transit time across ocean is much longer than land and faces more physical and regulatory obstacles that impact on time performance making it harder for companies to provide real-time visibility.

Additionally, unlike domestic freight brokers, the equivalent company in international trade, freight forwarders, remain a vital part of the ecosystem and may never be displaced. They provide the critical function of

handling the shipment from land to port to air or sea then back to port and back to land rather vs. a freight broker who just gets a shipment onto a truck often going to a single destination. Nonetheless, these forwarders primarily function on spreadsheets, email, and phone calls, and we believe there is still a large addressable opportunity for innovative founders to come up with new value-added solutions for an industry that is greater than \$120B<sup>6</sup>. These include:

- Cloud solutions acting as a TMS for the international freight industry. These can be targeted toward carriers, terminals, or freight forwarders. We are interested in companies providing a next gen end to end solution that can instantly communicate across platforms.
- Transaction based platforms similar to Shipwell but for international logistics companies. These provide some sort of value added service to either carriers or forwarders that improve the efficiency of their operations.
- Tech enabled freight forwarders. This has historically been an opaque operation whereby a shipper selects one freight forwarder to handle their goods across the world and then loses visibility into that good until it reaches its destination. Flexport and Cargo Chief are tech enabled forwarders who put technology first and are working to incorporate increased visibility and ease of use to gain a competitive advantage. Base10 believes tech enabled forwarders are the the future of the industry, but we believe there is still plenty of TAM for additional new entrants that find new ways to innovate and gain market share.

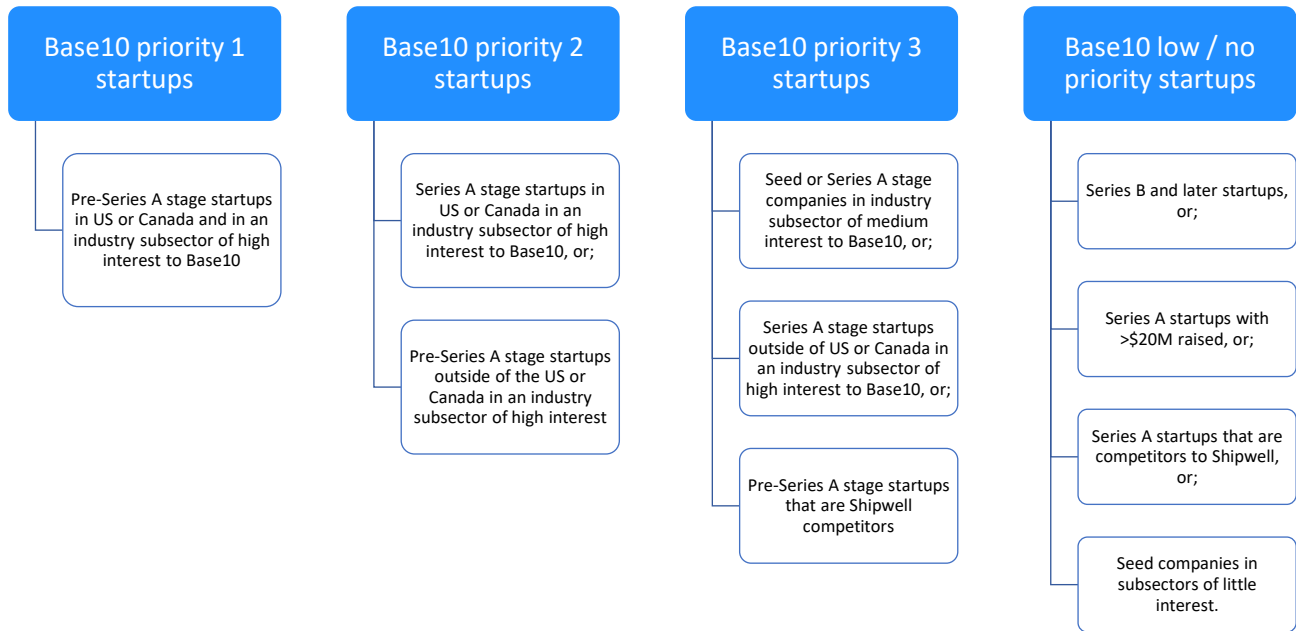
We also think this subsector will spring its own new subsector of startups. Flexport and Cargo Chief are currently investing in their own logistics warehouses to manage goods as they pass from road to air/ocean and back to road. We have been thinking through the idea of Shipbob like companies for the freight forwarding industry that take this capital expense away from the freight forwarders and allows them to focus strictly on technology and the customer. This trend would in turn lead to additional avenues for new tech focused forwarders to carve out a footprint for themselves within the industry due to the reduced capital costs.

**This subsector's TAM, reliance on archaic communication methods, and the general secrecy of most of its participants make us very bullish on our ability to find and back one or two very compelling early stage companies in this sector.**

Companies of high interest are Boxc, CoLoadX, Fleet, OpenSea, Panjiva and Cargobase. Successful later stage companies that have raised past Series B or been acquired include Flexport, Freightos, Intra, Xeneta, and Cargo Chief.

# Base10 Priority Ranking of Startup Landscape

When determining the shipping & logistics startup landscape from Base10's point of view, we initially reviewed several hundred startups who could be categorized as shipping & logistics startups. The list below contains early stage, seed stage, and Series A startups of high interest to Base10 as well later stage startups that are well positioned in the industry and have good investors and/or significant momentum. We also concentrated on companies based in the US; however, there are several companies listed based outside the US that we still have high interest in. Our priority ranking methodology is below:



The list follows below and is as February 2018.

Company	Industry Sub Sector	B 10 Priority	Location	Stage	Funding	Notable Investors	Short Description
<b>Easypost</b>	Parcel Shipping	1	California	Seed	\$4	GV, YC, SV Angel	Partners with ecommerce companies to give customers shipping options and issues shipping label at checkout
<b>vnomics</b>	Fleet safety & Management	1	New York	Seed	\$3	NA	Improve skills and safety of fleet drivers, as well as fuel efficiency, through predictive analytics
<b>Ship Hero</b>	Software: IMS	1	New York	Early	NA	NA	Full cloud solution for managing your orders, inventory, shipping and returns
<b>Boxc</b>	International Shipping	1	New York	Early	NA	500, Winklevoss	Offers cheap 3-5-day international shipping to US buyers and accepts returns at US addresses
<b>CoLoadX</b>	International Shipping	1	New York	Early	\$1	Rightside Capital	Digital ocean freight procurement platform to book ocean freight. Also provides software solution
<b>Fleet</b>	International Shipping	1	Oregon	Seed	\$7	Covera, GrowthX	Freight forwarder aggregation platform providing rating, quoting, and booking
<b>OpenSea</b>	International Shipping	1	NA	Early	NA	NA	Online shipping platform allowing shippers to book, ship and track sea freight in real-time
<b>Selery Fulfillment</b>	Order fulfillment	1	Texas	Seed	NA	Tech Wildcatters	Offers distributed shipping fulfillment centers for ecomm customers
<b>RoseRocket</b>	Software: TMS	1	Ontario	Seed	NA	NA	TMS with booking functionality that lets users to book, ship and track truck freight in real-time
<b>Skuvault</b>	Software: WMS	1	Kentucky	Early	NA	NA	Cloud-based WMS with integrations to Amazon, eBay, Shopify, etc.
<b>Shipwell</b>	<b>Trucking Freight</b>	<b>1</b>	<b>Texas</b>	<b>Seed</b>	<b>\$2</b>	<b>Base10, First Round</b>	<b>SaaS/TMS designed to help 3PL companies to streamline their shipping processes</b>
<b>The Pill Club</b>	<b>Consumer Logistic</b>	<b>1</b>	<b>California</b>	<b>Series A</b>	<b>\$10</b>	<b>Shasta, Base10</b>	<b>Birth control subscription and delivery</b>
<b>Fleetup</b>	ELD / Tracking	2	California	Series A	\$5	Humax	ELD + telematics + GPS. Using data to provide insights to fleet operators their performance
<b>fourkites</b>	ELD / Tracking	2	Illinois	Series A	\$17	Bain, Hyde Park	Tracking enhanced by data and analytics. 60+ELD integrations, 40+TMS integrations
<b>Decisiv</b>	Fleet safety & Management	2	Virginia	Series A	\$11	NA	Cloud software and predictive analytics to reduce fleet downtime and maintenance costs
<b>Cargobase</b>	International Shipping	2	Singapore	Early	NA	500	Global network of freight providers that gives companies access to air freight services
<b>clearmetal</b>	Logistics	2	California	Series A	\$12	NEA, Innovation, Skyview	AI analytics platform to streamline shipping and supply chain > improve efficiency, reduce costs
<b>Cloud Fulfillment</b>	Order fulfillment	2	UK	Early	NA	NA	Offers distributed shipping fulfillment centers for ecomm customers
<b>10 4</b>	Software: SCMS	2	Colorado	Series A	\$14	Andrew Leto	Enterprise SaaS to manage global supply chain and book ocean, air, and trucking freight
<b>Sewio Networks</b>	Software: SCMS	2	Czech Republic	Seed	\$1	Y Soft Venture Capital	Real time location platform that creates virtual location model of everything you own
<b>ShipHawk</b>	Software: TMS	2	California	Series A	\$10	DN, Canyon Creek	TMS with rates, multi-carrier rating, order fulfillment, tracking, reporting and predictive analytics
<b>Cargo Chief</b>	Trucking Freight	2	California	Series A	\$10	Walden	Connects shippers, 3PL and carriers to ship goods and find spare truck capacity
<b>Cargomatic</b>	Trucking Freight	2	California	Series A	\$21	Canaan, SV Angel, FJ	Provides shippers with real-time visibility to trucks around them for local shipping
<b>Project44</b>	Trucking Freight	2	Chicago	Series A	\$11	Emergence, Chicago	API connections into LTL & FTL carrier's connection shippers, brokers and 3PLs
<b>Flexe</b>	Warehousing	2	Washington	Series A	\$21	Redpoint	On-demand, outsources warehousing space

Company	Industry Sub Sector	B 10 Priority	Location	Stage	Funding	Notable Investors	Short Description
<b>Hstar Technologies</b>	Warehousing	2	Massachusetts	Grants	\$7	NA	Autonomous robots for warehousing operations
<b>Locus Robotics</b>	Warehousing	2	Massachusetts	Series A	\$8	NA	Autonomous robots, assisted by humans, for warehousing operations
<b>inthinc</b>	Fleet safety & Management	3	Utah	Late stage	\$24	NA	Improve skills and safety of fleet drivers through predictive analytics
<b>NYSHEX</b>	International Shipping	3	New York	Series A	\$13	GE, GS	Online shipping platform allowing shippers to book, ship and track sea freight in real-time
<b>PiggyBee</b>	Personal Shipping	3	Belgium	Seed	NA	NA	Connects people who want to get or ship something with travelers heading in that direction
<b>Sendle</b>	Personal Shipping	3	Australia	Series A	\$7	Full Circle	Parcel delivery for same city / nearby city shipments for flat rates (under \$10 / shipment)
<b>Ecomdash</b>	Software: IMS	3	North Carolina	Seed	\$2	Gemini Southern	Omnichannel IMS integrated into ecommerce platforms
<b>SalesWarp</b>	Software: IMS	3	Maryland	Seed	\$5	Camber Creek, Dingman	Omnichannel IMS integrated into ecommerce platforms
<b>SKU IQ</b>	Software: IMS	3	California	Seed	NA	Plug and Play Ventures	Omnichannel IMS integrated into ecommerce platforms
<b>Shippabo</b>	Software: SCMS	3	California	Seed	\$2	Wonder Ventures	Cloud-based supply chain management platform
<b>Deposco</b>	Software: WMS	3	Georgia	Early	NA	UPS	Cloud-based supply chain software inventory, order and warehouse management
<b>PeopleVox</b>	Software: WMS	3	UK	Series A	\$6	Index Ventures	Cloud-based WMS with API integrations to shipping platforms
<b>Keychain</b>	Trucking Freight	3	California	Seed	\$3	NA	Online shipping platform allowing shippers to book, ship and track truck freight in real-time
<b>Freightera</b>	Trucking Freight	3	British Columbia	Seed	\$2	SVB	Online shipping platform allowing shippers to book, ship and track truck freight in real-time
<b>Truckin</b>	Trucking Freight	3	Germany	Seed	NA	NA	A platform that connects freight forwarders with local carriers
<b>TrucksOnTheMap</b>	Trucking Freight	3	UK	Seed	NA	NA	Looks for empty trucks anywhere on an online map and allows shippers to find empty space
<b>KeepTruckin</b>	ELD / Tracking	Low / none	California	Series B	\$28	Index, GV, Scale	ELD + Mobile app for drivers to track driving logs and for dispatchers to manage their drivers
<b>Samsara</b>	ELD / Tracking	Low / none	California	Series C	\$80	Andreesen, General Catalyst	Uses ELD device to track and manage trucking fleets. Former founders of Meraki
<b>Greenroad</b>	Fleet safety & Management	Low / none	Texas	Series G	\$100	Benchmark, DAG	Improve skills and safety of fleet drivers (taxi, cab, uber, bus) through predictive analytics
<b>Peloton</b>	Fleet safety & Management	Low / none	California	Series B	\$80	Intel, Nokia, UPS	Improve skills and safety of fleet drivers, as well as fuel efficiency, through predictive analytics
<b>Smartdrive</b>	Fleet safety & Management	Low / none	California	Series J	\$180	Michelin, NEA	Improve skills and safety of fleet truck drivers through predictive analytics
<b>Flexport</b>	Freight Forwarding	Low / none	California	Series C	\$200	First Round, Founders, DST	Full service freight forwarder in the form of online dashboard
<b>Freightos</b>	Freight Forwarding	Low / none	Israel	Series B	\$56	GE Ventures, Aleph	Full service freight forwarder in the form of online dashboard
<b>Intra</b>	International Shipping	Low / none	New York	Series B	\$40	ABS	Ocean e-commerce shipping network with visibility into 35% of global container traffic
<b>Xeneta</b>	International Shipping	Low / none	Norway	Series B	\$21	Creandum, Alliance Venture	Allows importers, exporters and freight forwarders to benchmark their ocean freight rates

Company	Industry Sub Sector	B 10 Priority	Location	Stage	Funding	Notable Investors	Short Description
<b>Bellhops</b>	Moving	Low / none	Tennessee	Series B + Debt	\$27	Binary	Moving company using certified student movers to provide a price discount vs. traditional movers
<b>Deliv</b>	Parcel Shipping	Low / none	California	Series B	\$40	UPS, GGP, Macerich, Taubman	Postmates for retail orders providing same day retail delivery
<b>Narvar</b>	Parcel Shipping	Low / none	California	Series B	\$34	Battery, Accel	Partners with eetailers to give customers shipping options and issues shipping label at checkout
<b>ShipBob</b>	Parcel Shipping	Low / none	Illinois	Series B	\$23	Bain, Hyde Park	Offers distributed shipping fulfillment centers for ecomm customers
<b>Shippo</b>	Parcel Shipping	Low / none	California	Series B	\$30	Bessemer, USV	Partners with eetailers to give customers shipping options and issues shipping label at checkout
<b>Roadie</b>	Personal Shipping	Low / none	Georgia	Series B	\$25	UPS	Neighbor shipping network. Shippers match with a Roadie heading in the shipments direction
<b>Shyp</b>	Personal Shipping	Low / none	California	Series B	\$62	KPCB, Slow, Homebrew	A Shyp Hero comes to collect customers shipment, professionally packs then ships
<b>Stitch Labs</b>	Software: IMS	Low / none	California	Series B	\$23	True Ventures, Triangle Peak	Omnichannel IMS integrated into ecommerce platforms
<b>Brightpearl</b>	Software: RMS	Low / none	Texas	Series C	\$42	SVB, MMC	RMS for midsized eetailers helping automate back office. Integrations with Amazon, Shopify, etc.
<b>MetaPack</b>	Software: WMS	Low / none	UK	Series A	\$33	Index Ventures	WMS integrated with 400 carriers and 4,000 delivery services
<b>Convoy</b>	Trucking Freight	Low / none	Washington	Series B	\$81	Greylock, Bezos, Benioff, Hoffman	Online shipping platform allowing shippers to book, ship and track truck freight in real-time
<b>Loadsmart</b>	Trucking Freight	Low / none	New York	Series A	\$13	NA	Online shipping platform allowing shippers to book, ship and track truck freight in real-time
<b>Transfix</b>	Trucking Freight	Low / none	New York	Series C	\$79	NEA, Lerer	Online shipping platform allowing shippers to book, ship and track truck freight in real-time
<b>Trucker Path</b>	Trucking Freight	Low / none	California	Series A + debt	\$52	SVB, Renren	Trucker social media app w/ best truck stops, best routes, weigh station status, cheapest fuel, etc.
<b>Turvo</b>	Trucking Freight	Low / none	California	Series A	\$25	Slow, Felicis, Activant	Connects shippers, carriers, 3PL via Slack like product to book shipments and exchange invoices
<b>uberFreight</b>	Trucking Freight	Low / none	California	Series F	\$11,500	Benchmark, Softbank	Uber where the counterparties are FTL truck drivers and shippers
<b>uShip</b>	Trucking Freight	Low / none	Texas	Series D	\$70	KPCB, Benchmark, DB Schenker	Marketplace where individuals or businesses can ship with carriers who have spare room on trucks
<b>6 River Systems</b>	Warehousing	Low / none	Massachusetts	Series A	\$21	Eclipse, Norwest	Autonomous robots, assisted by humans, for warehousing operations
<b>Clearpath</b>	Warehousing	Low / none	Ontario	Series B	\$42	RRE, GE, iNovia, SVB	Autonomous robots for warehousing operations
<b>Gorbit</b>	Warehousing	Low / none	California	Series B	\$15	Formation 8, Nike	Autonomous robots for warehousing operations
<b>Kinetic</b>	Warehousing	Low / none	New York	Seed	NA	City Light, Pilot Mountain	Wearables to improve how warehouse workers lift heavy items to reduce industries
<b>Seegrid</b>	Warehousing	Low / none	Pittsburgh	Series D	\$60	Giant Eagle	Autonomous robots for warehousing operations

## COMPARABLES

## Comparable Companies

CY'18; All figures in US\$ millions except share price data. Data as of February 2018.

Company Name	Ticker	Share Price \$M	Market Cap \$M	Enterprise Value \$M	Revenue \$M	Rev Growth	Gross Profit \$M	GPM	EBITDA \$M	EV / Rev	EV / GP	EV/EBITDA
<b>Truckload</b>												
<b>Knight-Swift Transportation Holdings Inc.</b>	KNX	45	8,007	8,833	5,489	127%	1,099	20%	896	1.6x	8.0x	9.9x
<b>Werner Enterprises, Inc.</b>	WERN	40	2,886	2,951	2,262	8%	1,531	68%	411	1.3x	1.9x	7.2x
<b>Heartland Express, Inc.</b>	HTLD	23	1,924	1,873	783	24%	467	60%	212	2.4x	4.0x	8.8x
<b>Marten Transport, Ltd.</b>	MRTN	22	1,202	1,201	778	12%	226	29%	167	1.5x	5.3x	7.2x
<b>Covenant Transportation Group, Inc.</b>	CVTI	28	512	724	740	5%	178	24%	130	1.0x	4.1x	5.6x
<b>USA Truck, Inc.</b>	USAK	21	163	284	487	11%	73	15%	45	0.6x	3.9x	6.3x
	Min		163	284	487	5%	73	15%	45	0.6x	1.9x	5.6x
	Median		1,563	1,537	780	12%	346	27%	189	1.4x	4.0x	7.2x
	Average		2,449	2,644	1,756	31%	595	36%	310	1.4x	4.5x	7.5x
	Max		8,007	8,833	5,489	127%	1,531	68%	896	2.4x	8.0x	9.9x
<b>Less-than-truckload</b>												
<b>Old Dominion Freight Line, Inc.</b>	ODFL	143	11,745	11,762	3,717	11%	1,152	31%	894	3.2x	10.2x	13.2x
<b>ArcBest Corporation</b>	ARCB	37	949	1,046	3,033	7%	73	2%	185	0.3x	14.4x	5.6x
<b>Saia, Inc.</b>	SAIA	76	1,915	2,042	1,529	12%	291	19%	219	1.3x	7.0x	9.3x
<b>YRC Worldwide Inc.</b>	YRCW	16	521	1,302	5,209	NA	536	10%	337	0.2x	2.4x	3.9x
	Min		521	1,046	1,529	7%	73	2%	185	0.2x	2.4x	3.9x
	Median		1,432	1,672	3,375	11%	414	15%	278	0.8x	8.6x	7.5x
	Average		3,782	4,038	3,372	10%	513	16%	409	1.3x	8.5x	8.0x
	Max		11,745	11,762	5,209	12%	1,152	31%	894	3.2x	14.4x	13.2x



Company Name	Ticker	Share Price \$M	Market Cap \$M	Enterprise Value \$M	Revenue \$M	Rev Growth	Gross Profit \$M	GPM	EBITDA \$M	EV / Rev	EV / GP	EV/EBITDA
<b>3PL Providers</b>												
<b>FleetCor Technologies, Inc.</b>	FLT	203	18,244	21,946	2,528	13%	1,896	75%	1,358	8.7x	11.6x	16.2x
<b>XPO Logistics, Inc.</b>	XPO	95	11,390	16,094	16,009	6%	7,642	48%	1,615	1.0x	2.1x	10.0x
<b>J.B. Hunt Transport Services, Inc.</b>	JBHT	121	13,287	14,365	7,894	11%	1,302	16%	1,205	1.8x	11.0x	11.9x
<b>C.H. Robinson Worldwide, Inc.</b>	CHRW	94	13,171	14,343	15,606	7%	2,519	16%	955	0.9x	5.7x	15.0x
<b>Ryder System, Inc.</b>	R	90	4,756	10,040	7,562	5%	1,664	22%	1,894	1.3x	6.0x	5.3x
<b>Landstar System, Inc.</b>	LSTR	108	4,551	4,411	3,930	9%	587	15%	322	1.1x	7.5x	13.7x
<b>Hub Group, Inc.</b>	HUBG	52	1,769	2,049	4,342	9%	506	12%	180	0.5x	4.0x	11.4x
<b>Forward Air Corporation</b>	FWRD	61	1,802	1,831	1,191	9%	670	56%	168	1.5x	2.7x	10.9x
<b>Echo Global Logistics, Inc.</b>	ECHO	29	811	999	2,096	12%	366	17%	69	0.5x	2.7x	14.4x
<b>Roadrunner Transportation Systems, Inc.</b>	RRTS	8	314	713	2,129	4%	426	20%	119	0.3x	1.7x	6.0x
	Min		314	713	1,191	4%	366	12%	69	0.3x	1.7x	5.3x
	Median		4,654	7,225	4,136	9%	986	19%	639	1.1x	4.9x	11.6x
	Average		7,009	8,679	6,329	8%	1,758	30%	789	1.8x	5.5x	11.5x
	Max		18,244	21,946	16,009	13%	7,642	75%	1,894	8.7x	11.6x	16.2x
<b>Freight Forwarders</b>												
<b>Kuehne + Nagel International AG</b>	KNIN	184	22,003	21,431	19,541	5%	7,080	36%	1,308	1.1x	3.0x	16.4x
<b>Expeditors International of Washington, Inc.</b>	EXPD	67	11,858	10,828	7,214	6%	2,422	34%	779	1.5x	4.5x	13.9x
<b>Panalpina World Transport</b>	PWTN	166	3,937	3,643	5,860	4%	1,447	25%	198	0.6x	2.5x	18.4x
	Min		3,937	3,643	5,860	4%	1,447	25%	198	0.6x	2.5x	13.9x
	Median		11,858	10,828	7,214	5%	2,422	34%	779	1.1x	3.0x	16.4x
	Average		12,600	11,967	10,872	5%	3,650	32%	762	1.1x	3.3x	16.2x
	Max		22,003	21,431	19,541	6%	7,080	36%	1,308	1.5x	4.5x	18.4x

## Comparable Transactions

### Top 10 Transportation and Logistics deals in 2017

Announced	Target Name	Acquirer Name	Status	Deal Value \$B	Category
05/15/17	Abertis Infraestructuras SA	Atlantia SpA	Pending	18.3	Passenger Ground
04/10/17	Swift Transportation Co	Knight Transportation Inc	Pending	3.0	Trucking
06/13/17	Shanghai International Port (Group) Co Ltd	China Cosco	Pending	2.8	Shipping
03/27/17	Florida East Coast Railway Co	Infraestructura y Transportes	Pending	2.1	Rail
03/14/17	Air Methods Corp	American Securities LLC	Completed	1.6	Passenger Air
03/23/17	Vanderlande Industries Holding BV	Toyota Industries Europe AB	Completed	1.3	Passenger Air
04/24/17	Thessaloniki Port Authority SA	Investor Group	Pending	1.2	Shipping
05/02/17	Gramercy Property Europe PLC-European Logistics Portfolio	AXA Real Estate Investment Managers SA	Pending	1.1	Logistics
04/07/17	Beacon Rail Leasing Ltd	JPMorgan Asset Management Inc	Completed	1.1	Rail
06/30/17	CIT Rail Holdings	SASU France VTG AG	Pending	1.1	Rail

### Top 10 Transportation and Logistics deals in 2016

Announced	Target Name	Acquirer Name	Status	Deal Value \$B	Category
05/23/16	SF Holding (Group) Co Ltd	Maanshan Dingtai Rare Earth & New Materials Co Ltd	Completed	\$ 16.8	Trucking
01/16/16	YTO Express Co Ltd	Dalian Dayang Trands Co Ltd	Completed	8.8	Trucking
09/19/16	Port of Melbourne Corp-Port of Melbourne Concession	Investor Group Australia	Completed	7.3	Shipping
03/15/16	Asciano Ltd	Investor Group	Completed	6.7	Shipping
04/04/16	Virgin America Inc	Alaska Air Group Inc	Completed	4.2	Passenger Air
12/01/16	Hamburg Suedamerikanische DampfschiffahrtsGesellschaft KG	Maersk A/S	Pending	4.0	Shipping
05/25/16	Poste Italiane SpA	Cassa Depositi e Prestiti SpA	Completed	3.3	Logistics
07/02/16	Shanghai Yunda Freight Services Co Ltd	Ningbo Xinhai Electric Co Ltd	Completed	2.8	Trucking
03/15/16	Asciano Ltd-Patrick Terminals & Logistics Business	Investor Group	Completed	2.2	Shipping
08/09/16	Press Ganey Holdings Inc	EQT VII Ltd	Completed	2.2	Logistics

## Top 10 Transportation and Logistics deals in 2015

Announced	Target Name	Acquirer Name	Status	Deal Value \$B	Category
11/10/15	New Kansai International Airport Co Ltd- Operating Concession of Kansai International Airport & Osaka International Airport	Kansai Airports	Completed	\$ 17.9	Passenger Air
06/29/15	GE Capital Fleet Services-US & Mexico Fleet Operations	Element Financial Corp	Completed	7.2	Other T&L
03/11/15	ITR Concession Co LLC	Industry Funds Management Pty Ltd	Completed	5.7	Passenger Ground
06/12/15	Zhejiang Transfar Road-Port Development Co Ltd	Zhejiang Transfar Co Ltd	Completed	5.2	Trucking
02/18/15	Toll Holdings Ltd	Japan Post Co Ltd	Completed	5.1	Logistics
04/07/15	TNT Express NV	Fedex Acquisition BV	Completed	4.7	Logistics
07/23/15	LeasePlan Corp NV	LP Group BV	Completed	4.1	Other T&L
09/09/15	Con-way Inc	XPO Logistics Inc	Completed	3.0	Trucking
11/13/15	Skyway Concession Co LLC	Investor Group	Completed	2.9	Passenger Ground
07/30/15	Swissport International AG	HNA Group Co Ltd	Completed	2.8	Passenger Air

## Research Process

# Real Economy Research

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In order to understand the shipping and logistics industry at a deeper level, Base10 has spoken 40+ current or former shipping and logistics professionals (and counting). Below we have summarized some of high impact calls with professionals at large and well-established companies, founders and executives at rapidly growing transportation startups, and industry analysts.

## High Impact Corporate Interviews

### CHAIRMAN & CEO OF PUBLIC 3PL

#### Key Takeaways

- Believes disruption to freight broker market will be very slow and the freight broker market will continue to grow for foreseeable future due to fragmentation of FTL shippers and tight capacity.
- Data is king in the shipping and logistics industry.

#### Notes

- Industry
  - Current size of 3PL market (freight brokers) is \$70B. Still extremely fragmented after the top 5.
  - Third party logistics providers (freight brokers) are growing double GDP on annual basis.
  - The FTL and LTL market is at peak cycle capacity driven by 1. increased demand for shipping driven by growth in ecomm, 2. new entrants driving price transparency and reducing friction between shippers and carriers, 3. reluctance by carriers to make significant investments to expand fleet and increase capacity.
  - 85% of FTL carriers have 25 trucks or less.
    - Small carriers are often reluctant to adopt new technology.
  - His company has 100k carriers in their database and are working with 8-13k at any given time.
  - Large 3PLs are at a competitive advantage because they have access to the most data.
  - Rollout of ELDs (Electronic Logging Devices) is very interesting for the industry in terms of enabling more data collection. The companies with access to this data will have a competitive advantage. Base10 should look for companies that are going to have a first mover advantage in collecting and analyzing the ELD data. Data is king in this industry.
- New Entrants
  - The problems for Convoy, Uber freight and other new entrants not partnering with brokers is they struggle when capacity gets tight. They cannot get competitive rates when there is low capacity and as a result, shippers will leave them. He does not believe they are a full-service solution.
  - Has had customers try Uber freight and Convoy and they love interface but hate pricing.
  - Their prices for comparable freight is 40% cheaper than Convoy on average.
  - Feels a little threatened but not truly threatened. Freight is still a relationship business. If price is same, you do business with people you like, could potentially buy a truck for cheaper, but doesn't think relationships are ever going away. They track problems and most problems require human interactions to fix them.

- The fragmentation that exists in the FTL market makes it harder for new entrants to gain real share because they are starting from scratch in terms of data collection.

## VP OF OPERATIONS AT SCHNEIDER (NYSE: SNDR, ~\$5B MARKET CAP)

### Key Takeaways

- Carriers are the scarce resource.
- Capital allocators are investing in software and technology but not trucks, which are the lifeblood of the industry.
- API migration is imminent, but it may take longer than people think.

### Notes

- Schneider is one of the largest FTL carriers in the US at over 10k trucks.
- Schneider also has a 3PL brokerage arm; they are vertically integrated.
- Believes that smaller brokers will die a slow death due to:
  - Lack of technology and reluctance to innovate
  - New entrants
  - Lack of data compared to larger 3PLs
- Trucks are the scarce resource in the industry and believes that Schneider has a competitive position due to their vertical integrations.
- Freight and trucking is still a relationship driven business and technology not disrupting as fast as Silicon Valley would have you think.
- It is possible that movement towards APIs will be much quicker than what people think if there is momentum among large players which will lead to the entire industry accepting the technology; however, they are unsure what the pace of this is. He is positive APIs are the way of the future and an open API means more business but EDIs will be around for a while.
- People want freight to bill automatically. The slow pace impacts operations in a negative way. Electronic freight bill would be great.
- Empty truckload miles are in single digits for good carriers.
- LTL Market is very tight.
- Surge pricing is going to drive the industry over the next several years as companies want to be asset light. This translates into less companies who actually own trucks. This all equates into tighter capacity and higher rates.
- Average age of fleet is old. People are investing in tech and not trucks. Thus, why carriers are currently king.

## SENIOR STRATEGY MANAGER FOR LUFTHANSA CARGO, 6TH LARGEST CARGO CARRIER BY FREIGHT TONS IN THE WORLD

### Key Takeaways

- Lufthansa believes now is the technological inflection point in the industry. The air freight market is run on phone, email, and spreadsheets but customer demands are driving technological innovation. If they do not innovate, they risk being disrupted.
  - At this point, the bare minimum in the industry is digitized
- Industry is changing as forwarders are becoming tech enabled
- Lufthansa is a large incumbent and their culture is quite focused on operating aircraft and is not focused on improving technology
  - They are looking to seed startups how they develop customers' needs
  - They want to come up with the way that freight is booked in the future
- Current tech trends for international freight booking

- There are some companies with rate comparison platforms where you can get rates online. However, these rates are not real time, they appear online but the company likely got them from an excel sheet and they are 24-48 hours old. You can see the data online but it is stale data.
- Don't know any cargo airline that is able to produce real-time prices outside of their own organization
- Right now, everyone is looking for more efficient way to bring prices to customer because the customer wants price instantly
- API vs. EDI
  - Currently EDI is king. Lufthansa has internal APIs but is a few years away from opening up their own API portals for price discovery
  - Lufthansa has an API interface that can be used to external services
  - Every airline is working on API interfaces
  - Lufthansa does not have all services on their API layer right now. Cannot make bookings on API so they had to find an intermediate solution, which is EDI
  - IT system of air freight carrier is very painful for forwarders to make bookings and very inefficient

## CFO OF A LEADING PRIVATE 3<sup>RD</sup> PARTY LOGISTICS COMPANY

### Key Takeaways

- LTL carriers opening their API has left a void in the TMS market as most systems are not compatible with LTL.
- They are a P44 customer but are currently building their own API connections.

### Notes

- There is a lack of TMS in the market that are compatible with LTL
  - With LTL carriers opening their APIs, there is a need for enhanced functionality of existing TMS systems.
  - The issue is a lot of legacy systems are very hard to change and adapt, which is where a new system has the advantage.
  - They want a TMS that can do both on the same system.
  - Lots of people still use excel as well as different random sources to communicate. The opportunity to standardize all this is still massive and interesting.
- Estimates the TL market is 80% of over the road market while LTL is 20%.
- Most brokers only to TL but thinks there is a shift going on where LTL will become a bigger business as LTL carriers give access to their API.
- Asset based trucking companies have brokerages they start on the side and try to use legacy capacity software systems that are expensive to maintain and don't work very well.
  - A solution that migrated this seamlessly would be extremely valuable.
- They're integrated with P44 but they do have some of their own API connections directly to carriers and will continue to build out their own network, so their customers can take advantage of those.
  - Utilize P44 in the meantime and probably will for quite a while as they are value add.
- The ideal TMS would show you 10 options from 10 different carriers, transit time, broken down by price, linehaul. book, gives you bill of lading, sends to shipper, print it out and hand to truck driver. Also provides tracking.
  - A completely end to end system.

## Founder Interviews

### CEO OF LEADING SHIPPING & LOGISTICS UNICORN WITH OVER \$200M RAISED FROM TOP VC FIRMS

#### Key Takeaways

- Trucking is super competitive chicken and egg problem, but the software side of trucking is pretty simple. Good products will sell.
- The international transportation industry will take decades to automate. So many players still run on fax, phone, and excel.
- Large SaaS opportunity in the international shipping ecosystem.
- Not worried about new entrants because of the size of the market.
  - He believes current forwarders will continue to get disrupted by new entrants with a technology focus.

#### Notes

- Have a trucking business that is growing very fast and will be \$100M+ revenue in next few years. They compete with Shipwell in this regard.
- Trucking is super competitive chicken and egg problem, but the software side of trucking is pretty simple. Good products will sell.
- Can fill their trucks with their forwarding inventory – captive demand but still a massive market and many new entrants can still build very large and successful business.
- Any new entrant into shipping and logistics market must think carefully about how they will position their service.
  - Do they want to charge a SaaS fee, do you want to be transaction based, or do you want to take a margin off the top?
  - When they started they chose the latter and made money on the freight margin, this worked well because people wanted to work with them due to how good their technology was
  - As the business has evolved and grown, larger companies who do not need shipping partner but want their technology are asking if they can just pay a SaaS fee.
  - There are clearly avenues for both options and you need to just look for a strong founding team who understands this and has a clear strategy and contingencies in place.
- The problem with the international shipping market is how opaque it is. If you need to ship freight internationally, you hand it off to a freight forwarder and they manage the whole process. From finding the trucking company to the warehouse to finding the ocean container. The problem is they do not provide any visibility to the customer on this process.
- It is blindingly obvious that better software and connectivity is the answer to a more open and connected industry, but the problem is actually getting people to get off antiquated systems.
- Every day he deals with transactions where the counterparty is still using a phone or a fax machine to transact with a counterparty.
  - He believes it will be decades until the industry is automated. There is still a ton of opportunity.

### CEO OF GROWTH STAGE PARCEL SHIPPING STARTUP (OVER \$30M OF CAPITAL RAISED FROM TOP VC FIRMS)

#### Key Takeaways

- API solution for ecommerce merchants that gets them rates and transit times for USPS, FedEx, DHL, and UPS among other carriers.
- Sees the freight market as attractive given how large the TAM is and how fragmented the FTL market is.

#### Notes

- Shipping is APIs for ecommerce merchants

- Its APIs connect to large global carriers like USPS, FedEx, DHL, and UPS
- They integrate into the shopping carts of their e-commerce customers to automatically select the carrier with fastest shipping time and cheapest rate at checkout depending on where the package is going and what its weight is.
- Does everything behind the scenes so all the customer sees are the best shipping option for the item they are purchasing.
- Could eventually get into freight shipping.
  - They are already plugged into the APIs of a lot of LTL carriers on the parcel side, so they view it as a natural progression.
  - It is a different space than parcel shipping but similar technology layer that requires more features.
  - Freight is different because it likely experiences more touch points than parcel and as such delays are more frequent.
  - Given the increased complexity of freight vs. parcel, you need to provide more features and more visibility to the customer.
  - With parcel, they are able to get the package to the customer with one or two stops but freight can be much more complicated.
  - If your freight package takes up 1/3 of a truck, it usually takes longer and on an LTL carrier there are more chances of delay. It is also more expensive, so the potential route options can be quite different if you are looking for the cheapest price.
  - He sees the freight market as very attractive and one that is still very large with plenty of room for growth for someone with the right technology platform.

## CEO OF GROWTH STAGE SHIPPING & LOGISTICS STARTUP (MORE THAN \$30M OF CAPITAL RAISED FROM TOP VC FIRMS)

### Key Takeaways

- Are an API layer into LTL and FTL.
- Large carriers were initially very reluctant to open up their APIs, but they are beginning to see the benefits and the rest of the industry will follow suit.
- API will replace EDI, but it will take a very long time.
- Their long-term value is the data they collect from every shipment that is facilitated through their API's, not from the SaaS fees they charge users.

### Notes

- They plug into the API, manage the connection, create backed interface and share API plugin with all members of the shipping and logistics ecosystem.
  - Their APIs connect shippers, 3PLs, TMS's and other service providers in order to facilitate the shipping of goods across the US via LTL and FTL for a SaaS fee.
- They own the data rights for every shipment that is booked through their API for a three-year period.
- Met nothing but resistance from industry players for months and months until they finally were able to convince a few large LTL carriers to open up their APIs. Once they did this, the rest have come in like dominos and business has taken off as everyone realized this increases access and is a tailwind to revenue.
  - The industry has relied on paper and relationships for decades. The thought of opening your API was foreign for a lot of the players but the industry is undergoing a sea change and.
  - 90% of the industry still runs on EDI and many players are reluctant to give it up.



- EDI defines \*how\* you can communicate. It is a standard language developed 50 years ago that hasn't changed with the times. With EDI, companies can only share information that can be formatted to EDI. If it is not in EDI format, then the counterparties computer cannot read it. If the computer cannot read it, then a human has to get involved. Thus, EDI's shortcomings are twofold; 1. Limited information can be exchanged and 2. The process is slow preventing real-time visibility to data (inventory, capacity, transit times, etc.).
- APIs are needed in the transportation industry to speed up this process and allow for free flow of information between counterparties.
  - EDI was very expensive to implement for many of the players in Shipping & logistics and it works even though it has tons of limitations vs. API.
  - As the industry moves towards real-time visibility in every part of the ecosystem, the transition will accelerate. If you are a small player still using EDI in five years, you will go out of business.
- They are often the only connection or one of a few connections into the LTL APIs, and it is in their best interest to currently play as nice as possible with all players in industry, so they keep their APIs open.
- Regarding new entrants, if a management team is unique and dynamic then they should be able to get to couple hundred thousand of MRR with half decent platform given the fragmentation in the industry then pivot into larger opportunity if not in their current path.
- Competition is picking up

## CEO OF SERIES A SHIPPING & LOGISTICS COMPANY (\$15M OF CAPITAL RAISED FROM TOP VC FIRMS)

### Key Takeaways

- Has gotten great reception for their product in the 3PL market. There is clearly a lack of good technological solutions in the 3PL market.
- The pain point is the amount of different TMS systems in the market that are outdated. Customers want their solution to plug into their existing TMS.
- FTL and LTL market is currently at peak pricing due to low capacity.

### Notes

- Every 3PL they talk to want to use them. It's clear there is significant demand by 3PLs for better technology solutions given the reception with every potential customer they talk with. The problem is they all want more of an end to end solution where they can integrate with the 3PL's current TMS. The problem for them is there are so many TMS providers and 3PLs can have several different TMS providers. Thus, they are spending a lot of time building integrations with lots of TMS systems to get 3PLs onboarded.
- Business model is SaaS fee + service fees per shipment.
- They see old guard software companies as their main competition, very old school, but only \$20M revenue businesses.
  - Banyan, McLeod, Mercury Gate
- Also view the freight broker as the competitor. 15k of them at 3k different firms.
- Key strategic decision is whether they should start disintermediating freight brokers.
- They view the parcel market as a natural next step if they decide to make that move.
- Industry
  - FTL and LTL market currently at peak capacity since 2008 and is slowing impact of new entrants like Convoy and Uber Freight to disrupt since they cannot compete on price when capacity is tight.
  - Freight brokerage market currently growing 2x GDP.
  - Last remaining innovation in the industry seems to be fully electronic freight bills.
  - Each carrier uses a different format which is why nothing has been standardized.
  - Multiple carriers remarked that if this were to come around it would be game changer.

## Wall Street Analyst Interviews

### ANALYST AT BULGE BRACKET INVESTMENT BANK

#### Key Takeaways

- The domestic trucking market will continue to experience disruption driven by the size, fragmentation, low barriers to entry of the market, and the complexity of the freight market
- The proliferation of technology driven by startups will lead large players to invest heavier in internal tech R&D while also driving them to acquire successful startups who manage to build good business with attractive customer bases
  - This will serve as a catalyst to consolidation as smaller players are left without money to invest in R&D and successful startups that will fall into the hands of the large industry players

#### Notes

- He believes the domestic trucking market is being disrupted and will continue to be disrupted as it is characterized by:
  - A large total addressable market
  - High fragmentation
  - Under-utilized capacity that is underutilized because it does not have exposure to enough shippers to fill capacity when they need to
  - High return on capital in the brokerage space
- Disrupting the commercial freight market is much more difficult than disrupting the ride sharing (taxi) market
  - Freight is complex. Long-haul shipments span multiple days, time zones, states and regulations. Individual loads may require special equipment, handling, or loading instructions, making it difficult to standardize pricing and other complexities in the marketplace.
  - He views the amount of startup capital raised to date in the domestic trucking market as low compared to the overall size of the market. They believe startup dollars will continue to pour into the industry and there will be multiple winners in each subsector over the next 10-20 years
  - Large and established companies, such as CH Robinson and XPO already offer many of the services start-ups are attempting to provide
    - XPO has spent \$1B on technology R&D over the last five years and CH Robinson has spent that amount over the last ten year
    - However, the fragmentation in the industry still allows startups to build the same tools as the incumbents and build successful businesses around the technology they are developing
    - They see this trend as being a catalyst for consolidation. The large brokers and/or carriers will look to consolidate successful startups that are able to build real businesses. Over time, more and more share will accrue to the incumbents with the capital to spend on tech R&D internally and make acquisitions of successful startups in the space
- The proliferation of technology, and in turn shipping rates, may see pricing and margin pressure sweep the industry if the technology being developed leads to improved asset utilization which will in turn decrease spikes in freight prices at times when the market believes capacity is very tight
- They view barriers to entry for new entrants, particularly in the broker space, to be very low. It has become easy to gain access to data as API connections become readily available

## ANALYST AT BULGE BRACKET INVESTMENT BANK

**Key Takeaways**

- She concentrates on the global parcel industry primarily covering UPS, FedEx, and DHL who's growth over the last decade has been driven entirely by the growth in ecommerce
- Amazon's vertical integration into a parcel carrier has massive implications for the rest of the parcel industry and is negative for almost every company except Amazon and will likely cause parcel rates to increase at UPS and FedEx as they no longer can rely on Amazon for "anchor capacity"
- Many startups are vying for last mile delivery dominance and Ravi expects consolidation and new entrant activity to continue

**Notes**

- Growth in B2C commerce has driven over 100% of parcel volume growth over the past decade and currently accounts for half of the domestic ground parcel business in the US
- Disruption in the parcel space has been driven and continues to be driven by proliferation of DTC and ecommerce and expectation of consumer to have free shipping
- Ecomm giants (Amazon and other large players) are aware of this trend better than any other player and are shifting their package delivery in-house, building their own logistics networks and building up density
  - The impact of Amazon vertically integrating could have widespread ramifications for the parcel industry in the US
    - Amazon has signed deals to lease 40 B767s, representing 28% of UPS's and 18% of FedEx's current US air fleet capacity, respectively
    - Amazon is building a \$1.5B air hub in Kentucky that can handle 100+ planes daily
  - The parcel carriers essentially use Amazon deliveries as "anchor deliveries" to offer cheap parcel rates to other ecommerce parcel deliveries
  - If Amazon were to completely vertically integrate it could cause Fedex and UPS to open their internal networks for third party use
- Emerging start-ups are crowdsourcing last-mile delivery which has always been the most complex. A lot of disrupting by offering alternative delivery methods
  - Wal-Mart and Alibaba are rumored to be looking at vertically integrating last mile delivery
  - Wal-Mart is planning to test last-mile grocery delivery using Uber and Lyft. Also beta testing an app that lets Wal-Mart store employees deliver packages on their way home from work
  - Wal-Mart also recently acquired Parcel, a same-day last mile deliver startup to increase delivery of fresh and frozen groceries to consumers
  - Similarly, Target recently acquired Instacart competitor Shipt for \$550M (1x GMV) to do the same thing
- Drones
  - Drones will greatly cut costs of last-mile delivery
  - The FAA projects that ~3M commercial drones will be sold per annum in the US within the next four years
  - The Association for Unmanned Vehicle Systems International forecasts drones will produce \$82 billion in economic value in the first 10 years after commercial flights are approved
  - Amazon says 86% of its packages shipped weigh less than 5 lbs which would suggest that weight will not prevent drones from delivering the majority of parcel packages
- Additionally, there are new startups using sidewalk robots to test last mile delivery
  - Postmates and DoorDash are testing these robots with Starship Technologies claiming they can travel 4mph and carry 40 lbs at a time

