



# Total Logistics 2019

An introduction to the global logistics industry and the trends and innovations that shape it.



## Ti's Origin and Development

Ti is a leading logistics and supply chain market analysis company developed around five pillars of growth:

- Logistics Briefing
- Ti Market Research Reports
- Ti Insight portals
- Ti Consulting
- Ti Conferences and Training

Ti acts as advisors to the World Economic Forum, World Bank, UN and European Commission and have 16 years worth of providing expert analysis to the worlds leading manufacturers, retailers, banks, consultancies, shipping lines and logistics providers.

## What Sets Ti Apart?

- Globally recognised and trusted brand
- Global Associate Network provides a multi-country, multi-disciplinary and multi-lingual extension to Ti's in-house capabilities
- More than fourteen years of knowledge delivery to global manufacturers, retailers, banks, consultancies, shipping lines and logistics providers
- Unique web-based intelligence portals
- Interactive dashboard
- On-going and comprehensive programmes of primary and secondary research

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## 1.0 What is shaping the global logistics markets

2.0 An industry in transformation: Consolidation

3.0 Logistics market development by geography

4.0 The emergence of logistics clusters

5.0 Freight forwarding

6.0 Contract Logistics

7.0 European Road Freight/US Trucking

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12.0 Total logistics market size and forecast

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# 1.1 The modern global logistics industry



- The global logistics industry has come about as a result of a confluence of demand-side and supply-side trends
- Political, economic, social and technological factors have facilitated major changes in the way in which multinational manufacturers supply global consumer markets and how retailers source their goods
- This has allowed many of the larger logistics service providers (LSPs) to differentiate their service offering from smaller competitors by leveraging their:
  - Global scale.
  - Technological capabilities.
  - Financial resources.
  - Human capital.

## The confluence of supply-side and demand-side trends



Source: Ti

## 1.2 Trade and globalisation

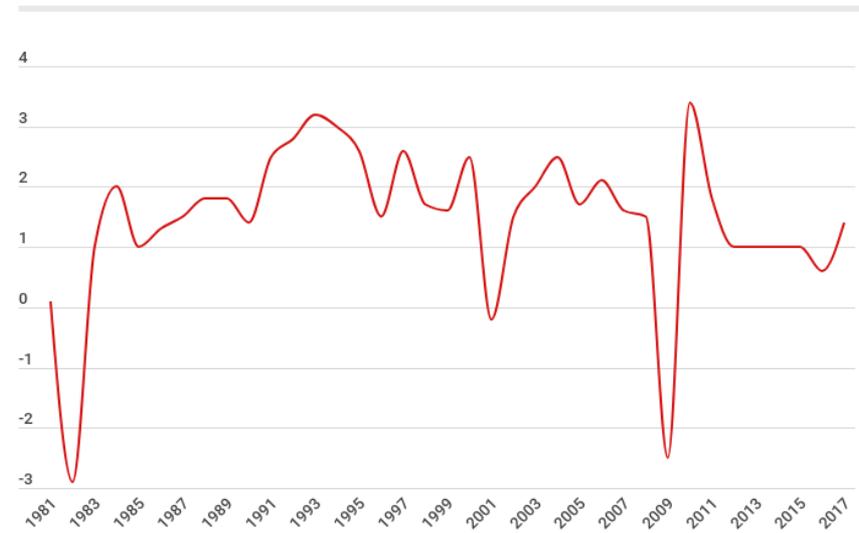


- One of the driving forces behind the trend towards the free movement of goods between countries has been the World Trade Organisation (WTO).
- Perhaps the defining success of the WTO has been the development of China as the powerhouse of global industry.
- However, recently the WTO has been unable to secure trade deals and new bilateral or regional trade agreements are developing:
  - The Trans-Pacific Partnership (TPP) included originally Australia, Brunei Darussalam, Chile, Malaysia, New Zealand, Peru, Singapore, Vietnam, the US and Japan.
  - The Transatlantic Trade and Investment Partnership (TTIP) is a trade agreement presently being negotiated between the US and the EU.
  - The Association of Southeast Asian Nations (ASEAN) and the group's six major trading partners began negotiations in May 2013 to form the world's largest economic bloc.
- The North America Free Trade Agreement (NAFTA) has had a major impact on the flows of goods.
- An increasing number of manufacturers are choosing to supply the giant US consumer markets from production locations and distribution facilities in Mexico, where costs are substantially lower.
- The renegotiation of NAFTA has been a priority for the US under the Trump presidency, but its replacement with the United States, Mexico & Canada Agreement (USMCA) do not seem likely to disrupt established trade flows.

## 1.3 World trade growth

- World trade has been very volatile over the past decade, with underlying development being driven – until very recently – by strong growth of export and import traffic from China and related economies.
- International trade used to grow at a multiple of economic growth considerably higher than 1. Now this relationship is closer to 1:1. Why is this?
  - Developed countries – including the Eurozone – have yet to fully recover and therefore there is less demand for imports of consumer goods.
  - Developing countries have been forced to focus their investment on domestic infrastructure to maintain their rate of economic growth.
  - The downturn has created more protectionist policies that have acted as a drag on international trade.
  - Most manufacturing that can be outsourced to Asia has been outsourced. The gains to international trade could be regarded as being a ‘one-off’.

### Ratio of world merchandise trade volume growth to world real GDP growth



Source: WTO

## 1.4 Global to regional trade networks



- The world's economy is moving from globalisation to regionalisation of supply chains. This involves a transformation from East–West and West–East flows to complex networks of developed and emerging markets. What is the evidence for this?
  - Global flows of goods are becoming more disparate. In 1990 63% of global flows of goods moved through the top 50 routes. By 2011 this had fallen to 54%.
  - Cross-border flows of goods, services and finance from emerging markets in 2012 accounted for 38% of the total, up from 14% in 1990.
  - South–South trade has grown from 6% of goods flows in 1990 to 24% in 2012.
- This shows that trade is re-balancing – with obvious consequences to shipping lines, air cargo carriers and freight forwarders.
- Another factor in the 'localisation' of supply chains in emerging markets will be the development of 'megacities'.

## 1.5 The importance of megacities on supply chains



- Another factor in the 'localisation' of supply chains in emerging markets will be the development of 'megacities'. These are usually defined as a city of over 10m people.
- Why should this have an impact on supply chains?:
  - Megacities will create their own economies of scale, supplied by local/regional production facilities.
  - Consumer goods will be customised to local tastes.
  - Each city will develop its own unique ecosystem, which takes into account the movement of people, data, finance, energy, waste, goods and services.
  - Transport demands will be specific to each city's needs and capabilities: poor planning and infrastructure will result in high logistics costs.
  - Fulfilment, packaging, miniaturisation and reverse logistics will require increased intensity of logistics provision.
- Although there may be some regional homogeneity in logistics and supply chain

terms, it will be very dangerous for business to take this for granted.

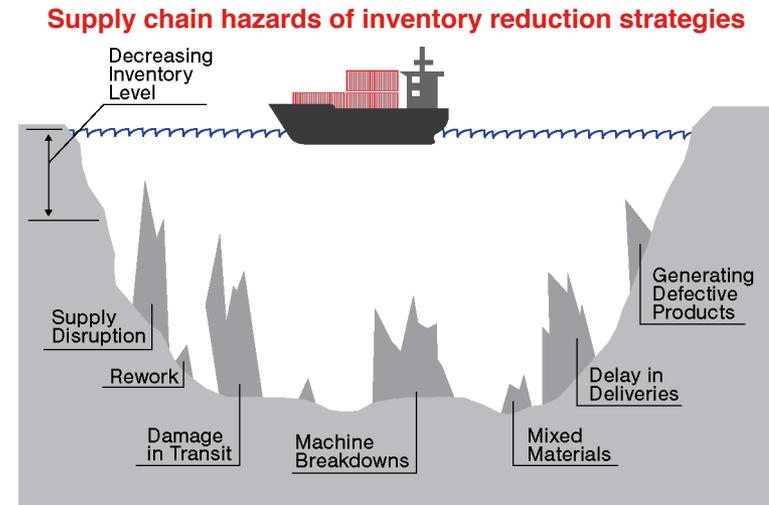
## 1.6 Just-In-Case manufacturing



- For much of the 20th century the predominant manufacturing strategy was based around creating economies of scale. This involved long production runs that created high levels of stock at low unit costs. Products were then ‘pushed’ out into the market. This was termed Just-in-Case manufacturing.
- During this period the transport market was characterised by:
  - Full loads (inbound and outbound).
  - Low levels of service provision required.
  - Long lead times.
  - Regular, stochastic movements.
- Demand could often be volatile and manufacturers, retailers and other supply chain partners held high levels of inventory.
- Stock would become quickly redundant or be lost or stolen.
- In addition in fast-moving sectors such as the fashion or electronics industry, product life cycles were becoming measured in terms of months, not years.
- Manufacturers and retailers also needed the flexibility to release new products on short lead times.

## 1.7 Modern supply chain management practice

- During the 1980s and 1990s Japanese manufacturing processes, such as those of Toyota, were adopted throughout the world.
- Smaller production runs were adopted with production lines running on an 'as and when' basis depending on demand: the 'Kanban' system.
- This Build-To-Order (BTO) strategy reduced the need for buffer stocks.
- Along with a change in production systems, Just-in-Time (JIT) delivery schedules were introduced that complemented the on-demand nature of manufacturing.
- As the inventory (or water in the picture metaphor) falls, the business (or boat) becomes far more vulnerable to the hidden 'rocks' beneath. From a transport perspective, the hazards include misdelivery, damage of goods in transit or late delivery.



Source: Ti

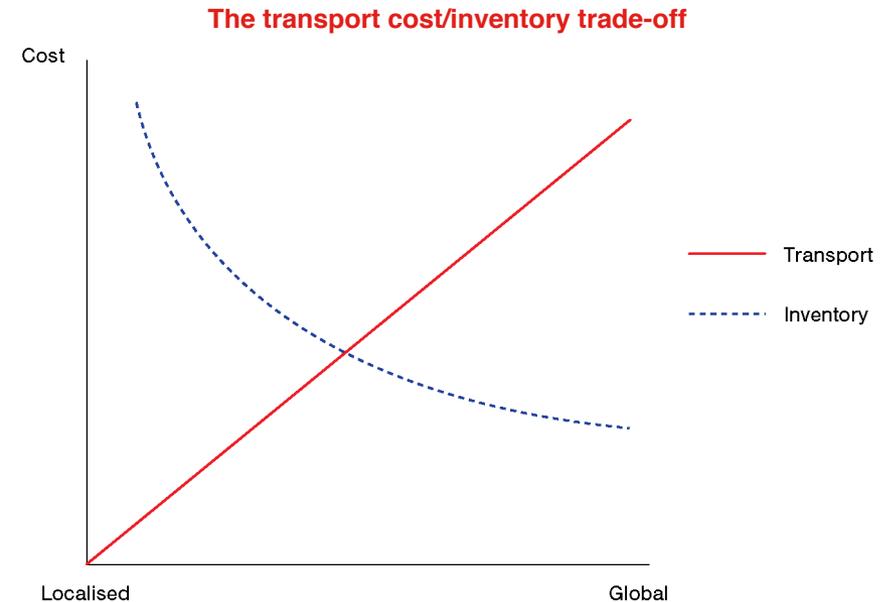
## 1.7.1 The impact of supply chain management practice on logistics



- Modern supply chain management practice had a very major impact on transportation requirements.
- Freight operators were required to provide more frequent services, moving smaller consignments on a less predictable basis.
- Efficiency was also affected as, in terms of transport costs, it is far more economic, on a per kilo basis, to run larger trucks than smaller ones.
- There were also modal consequences, as the flexibility of road services placed rail operators at a considerable competitive disadvantage when competing within the new paradigm.
- However, despite rising transport costs overall, logistics costs (including inventory financing) fell, making the trade-off more than worthwhile for shippers.

## 1.8 Centralisation of inventory

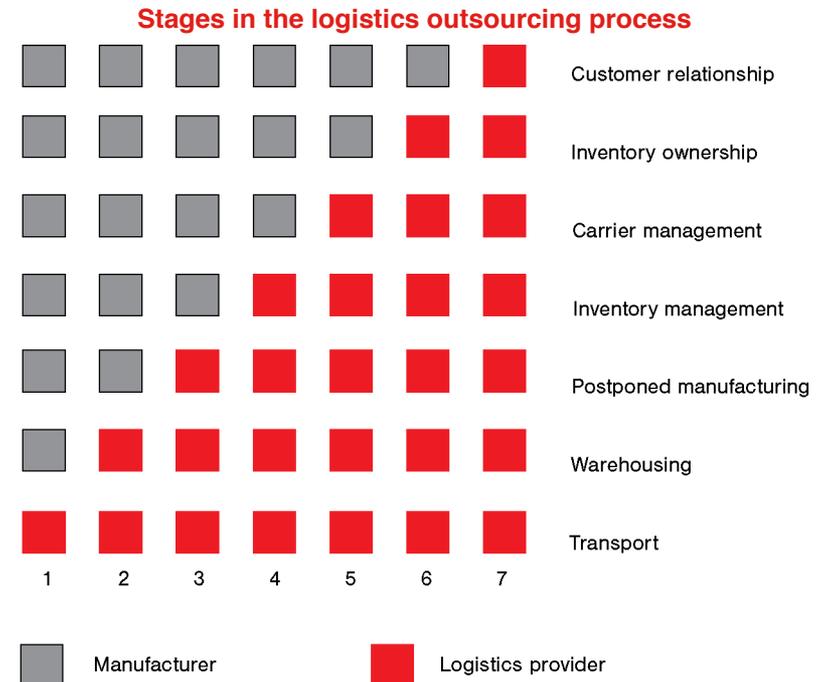
- Distribution strategies have been largely influenced by the trade-off between the cost of moving goods to market and the cost of holding inventories.
- The relative cheap cost of transport has allowed manufacturers and retailers to store goods in centralised locations and supply them over longer distances.
- This has many advantages:
  - Cost of inventory holding falls.
  - Less buffer stock is required in each warehouse.
  - There is less 'shrinkage' (loss of stock through theft or damage).
  - Lower levels of redundancy occur.
  - Warehouse costs are lower.
- When goods are stored in close proximity to the end market, transport costs are low. If a regional distribution strategy is implemented, the number of national warehouses fall and so do stock levels. However, transport costs rise, due to the increasing distance to market.



Source: Ti

## 1.9 Outsourcing logistics

- The outsourcing of logistics has been one of the defining trends of the global logistics industry.
- The logistics provider's importance has risen considerably with the ongoing trend towards outsourcing non-core competences.
- The first stage of outsourcing usually involves the transportation function. Transport providers often have more buying power than the client they are working for, which allows them to get better deals for trucks and materials.
- They may also have invested in specialist technology and be better able to hire and manage driving staff.
- There is also the question of managing peaks and troughs of demand: working for multiple clients, a transportation provider is better able to manage spare capacity.
- The next stage of outsourcing is usually warehousing. This is a labour-intensive activity and one which many companies are happy to be undertaken by a third party.

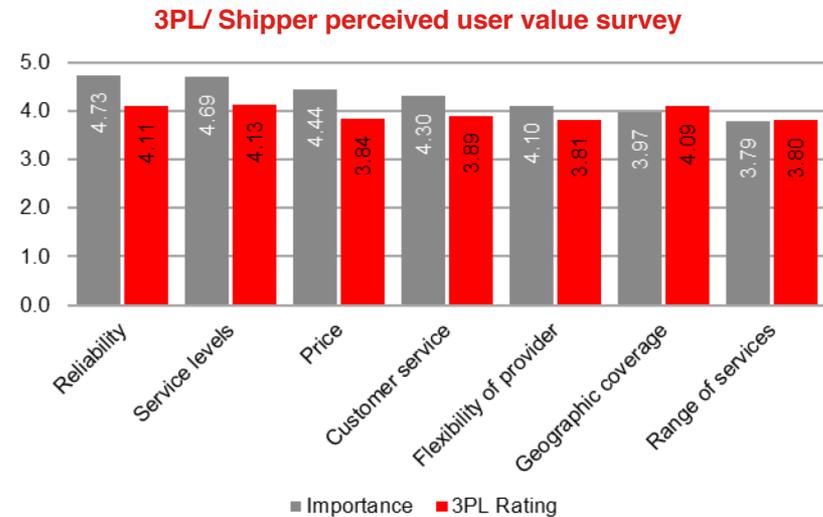


Source: Ti

## 1.9.1 Why outsource logistics?



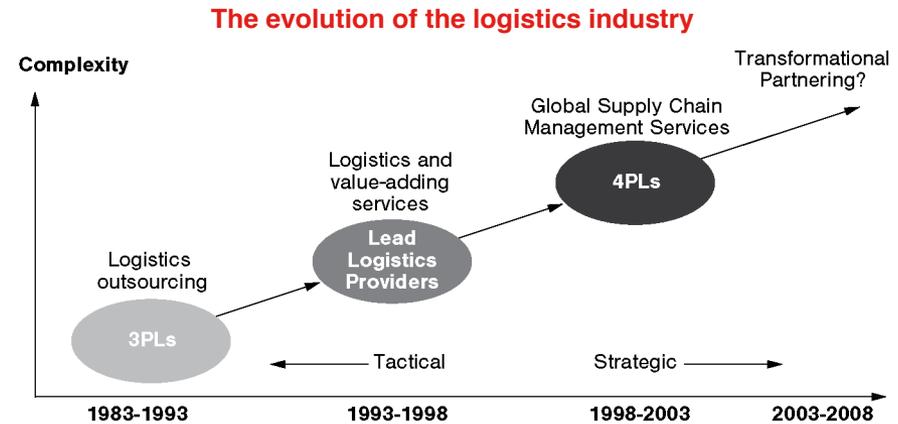
- Companies can outsource their logistics functions for many different reasons, from the purely financial, to the expectation of using a company as a catalyst for change management.
- At the most basic level, vehicle contract hire, one of the primary aims will be to take assets off the balance sheet.
- At the other end of the spectrum, high-end LSPs have a greater element of strategic control.



Source: Ti

## 1.10 Evolution towards value-adding services

- The demand by logistics companies' customers for increasing levels of value has been mirrored by an equal desire by the logistics companies themselves to improve their profit margins.
- Increasing sophistication and complexity of supply chains is a considerable opportunity for LSPs to achieve this goal by moving away from the provision of commoditised activities.



### FROM:

- Single function transactional relationship
- Local, regional reach
- Physical asset heavy, process execution
- One time cost reduction
- Cost plus management fee
- Fixed upfront cost to charge



### TO:

- Strategic multi-functional partnerships
- Global, door-to-door coverage
- Integrated IT solutions ready to use
- Continuous innovation (cost & service)
- Risk/gain share (tomorrow's lower cost, today)
- No/reduced need for capital

Source: Ti

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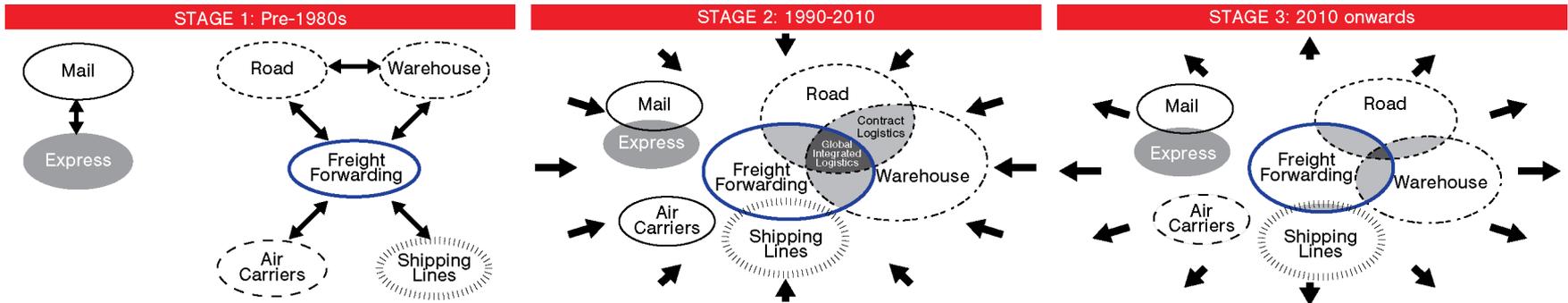


## 2.1 Consolidation and fragmentation in the logistics industry



- The fundamental changes in the logistics industry have been driven by a number of imperatives, both demand- and supply-side led.
- The speed at which change has taken place over the last decade is as a result of the mutual benefit and opportunities to both logistics service providers and users, which these trends have created.
- **Stage 1:** Right up until the 1970s and 80s each of the functions highlighted were largely discrete, with little overlap.
- **Stage 2:** The largest companies, already dominating their national markets, expand into neighbouring sectors.
- **Stage 3:** This shows the reverse pressures that have existed since the recession of 2008. Due to the absence of expected synergies or poor integration, companies have sold off their loss-making acquisitions.

### Merger and fragmentation of logistics functions



Source: Ti

## 2.2 Key industry trends



- The push for globalisation
  - Manufacturers and retailers have increased both the level of global sourcing and the scope of the markets that they supply.
  - Many logistics companies have chosen to globalise their operations in line with the changing requirements of their clients.
- Liberalisation of markets
  - The liberalisation of the European postal markets has been one of the driving forces behind the high level of M&A activity in the late 1990s and early 2000s.
  - There has also been deregulation in Europe's rail industry, which prompted some state-owned railways to prepare for a more competitive environment.
- Product differentiation
  - Many segments within the logistics industry are commoditised.
  - The largest companies have sought to address this challenge by making targeted acquisitions which increases their exposure to vertical sectors or supply chain segments in which there is less competition.
- At the same time, they can leverage their own competitive advantages, such as access to finance, intellectual capital, IT capabilities and global scale.
- Supplier rationalisation
  - Additionally, logistics companies are increasingly being asked to provide a range of value-added services, rather than just one element of transportation or warehousing.
  - Using a smaller number of logistics suppliers benefits the manufacturer or retailer by reducing the amount of supplier administration required.

- **Organic growth**
  - Organic growth is viewed as being the safest way in which to develop presence in new markets.
  - However, in the race to build European and global platforms it has become increasingly unfashionable.
  - Acquisitions can deliver immediate revenue streams and an operational presence, which organic growth cannot.
- **Alliances**
  - Alliances are a quick and easy way to offer clients enhanced services in different geographies or to add functionality.
  - They are very common in the freight forwarding sector as they allow national or regionally-based operators to compete effectively on a global basis.
  - Alliances work best in stable, conservative markets where the threat of competitors acquiring alliance members is low.
- **Joint ventures**
  - JVs are typically used by companies that have complementary services or attributes to exploit a particular market.
- In some markets it is a legal requirement for a foreign company to work with a local partner.
- In China, following deregulation, some express companies chose to maintain their links with the local partner due to contacts with local officials and market knowledge.
- **'Piggybacking'**
  - Expansion by 'piggybacking' involves developing services geographically on the back of the volumes of a key client.
  - This has become a frequently used mode of expansion due to the internationalisation of manufacturing and retailing.

## 2.4 Acquisition strategies



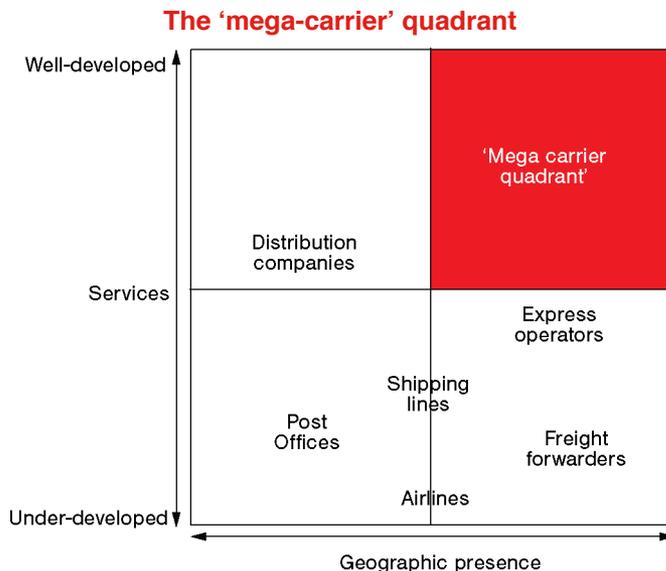
- ‘Blockbuster’ deals
  - A small number of global logistics companies have undertaken one or more ‘blockbuster’ deals to acquire immediate scale.
  - Examples include the acquisition of GeoLogistics by Agility, TNT by FedEx, and Danzas, AEI, Airborne and Exel by Deutsche Post.
  - It gives the company immediate scale and market presence, therefore providing competitive advantage over smaller players.
  - It also reduces the level of M&A activity required in identifying a series of potential targets.
- Evolution strategies
  - This involves increasing presence in the home market and consolidating market position in a core competence.
  - When this has been achieved the company develops into associated competencies and markets in close proximity or with similar attributes.
  - In this way, a portfolio of capabilities and markets can be built without the risks of the ‘blockbuster’ approach.

Major acquisitions in the global logistics industry				
Year	Acquirer	Target	Geography	Approx. cost
2016	DSV	UTi	Global	\$1.35bn
2016	FedEx	TNT	Global	€4.4bn
2015	CMA CGM	NOL	Global	\$1.9bn
2015	XPO	Con-Way	Global/USA	\$3.0bn
2015	XPO	Norbert Dentressangle	Europe/USA	\$3.5bn
2015	Kintetsu World Express	APL Logistics	Asia Pacific	\$1.2bn
2015	Japan Post	Toll Group	Asia Pacific	\$6.5bn
2015	FedEx	GENCO	North America	\$1.4bn
2015	Geodis	Ozburn-Hessey	USA	\$800m
2014	Norbert Dentressangle	Jacobson	USA	\$750m
2014	XPO Logistics	New Breed Holding	North America	€560m
2012	Russian Railways	GEFCO	Europe	€800m
2012	Ingram Micro	Brightpoint	Global	\$840m
2010	Norbert Dentressangle	TDG	Europe	€232.8m
2008	SNCF Geodis	IBM Logistics	Global	Not disclosed
2007	Toll	Baltrans	Asia Pacific	€300m
2007	CEVA	EGL	Global	\$2bn
2007	Norbert Dentressangle	Christian Salvesen	Europe	€365.1m
2005	Deutsche Bahn	Bax Global	Global	\$1.1bn
2005	Kuehne + Nagel	ACR Logistics	Europe	€440m
2005	Agility	Geologistics	Global	\$454m
2005	DPDHL	Exel	Global	€5.6bn
2005	Maersk	P&O Nedlloyd	Global	€2.3bn

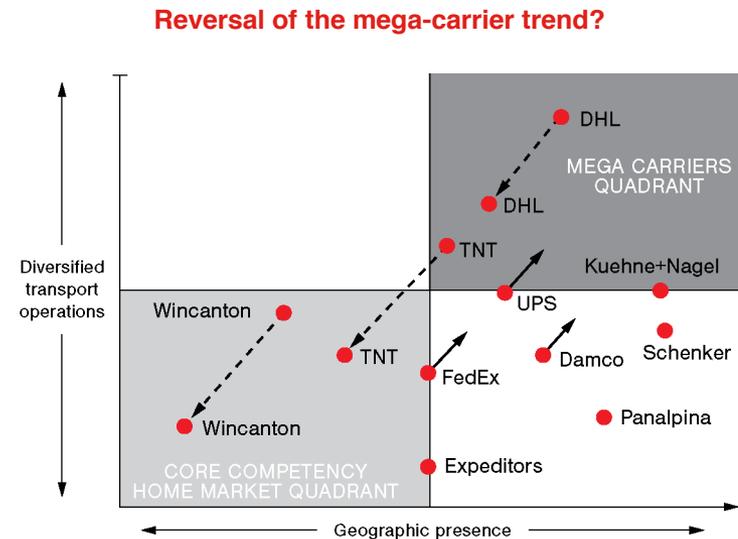
*Source: Ti*

## 2.5 The emergence of the ‘mega-carrier’

- The largest freight forwarders, distribution companies, express operators, shipping lines, in-house operators and post offices have engaged in a strategy of developing into ‘one-stop shop’ providers of multiple functions.
- From their relative starting points there has been convergence towards the ‘mega-carrier quadrant’. Contract logistics companies in particular have tended to offer clients the most sophisticated logistics activities.
- The result of this has been a frenetic period of acquisition as companies have extended their capabilities horizontally into adjoining logistics segments, as well as geographically.
- Whilst some companies are still acquisitively building global presence others, including even DHL, TNT and Wincanton, have retreated towards the core competency/home market quadrant.



Source: Cooper, Browne & Peters in European Logistics



Source: Ti

## 2.6 The future of the global logistics industry



- The global logistics industry is at a crucial point in its development.
- Not only is there a host of economic, security, legal, political and societal pressures, but also a plethora of disruptive forces, many of which are as a result of the development of new technologies.
- In the next five years deals will be driven by a number of drivers:
  - Technology is becoming the most important competitive differentiator as consumer behaviour and expectations change. Companies with specialist capabilities will be targeted by larger players.
  - Traditional retailing patterns are changing, due not least to the advance of low-cost retailers such as Aldi and Lidl. This will mean logistics companies will need to diversify into other sectors where there is a greater demand for value-adding logistics services.
  - The development of e-commerce will also be a major disruptive force. Logistics companies will need to add niche services, both in fulfilment and last-mile delivery.
- Near-sourcing will increase the need for logistics capabilities in emerging markets at the periphery of Europe, such as Turkey and North Africa. Geographic expansion through acquisition will be widespread.
- Fast-growing sectors, such as healthcare/pharmaceutical, offer higher margin opportunities, especially in the temperature-controlled market. Logistics companies will continue to target these niche markets for inorganic expansion, buying operations and capabilities.
- European logistics companies will also be targeted as stronger, profitable Asian companies expand their networks into Europe.

- 1.0 What is shaping the global logistics markets
- 2.0 An industry in transformation: Consolidation
- 3.0 Logistics market development by geography**
- 4.0 The emergence of logistics clusters
- 5.0 Freight forwarding
- 6.0 Contract Logistics
- 7.0 European Road Freight/US Trucking
- 8.0 Express parcels
- 9.0 Air cargo
- 10.0 Shipping
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- 12.0 Total logistics market size and forecast
- 13.0 Supply chain technologies
- 14.0 Supply chain dynamics of vertical sectors
- 15.0 Risks in global supply chains
- 16.0 The e-commerce logistics phenomenon
- 17.0 Supply chain innovation and disruption
- 18.0 Ethical and sustainable supply chain strategies



## 3.1 Influences on market characteristics



- Despite growing globalisation, logistics markets are largely defined by national characteristics. A mix of government regulation, social factors and economics is behind the development of logistics provision.
- Regulation
  - Until relatively recently, most European countries operated a system of permits that acted as quantitative controls on the entry of new operators into the transport market.
  - These were swept away during the 1980s and 90s by liberalisation, but controls still exist in terms of quality, if not quantity.
  - In many countries in the developing world restrictions exist on foreign investment in the transport sector.
- Openness and trade
  - The openness of a country's economy is also important to the transport market.
  - Belgium and the Netherlands, for example, have highly developed international road freight markets due, in part, to their geographical location on key transit routes, but also due to their role as important trading hubs.
- Retail development
  - Consolidation of a country's retail sector is very important. In the UK large contract logistics players developed by doing business with a handful of giant supermarket chains.
  - This contrasts with Italy or Spain where a fragmented retail sector, in which local stores predominate, has meant that logistics companies have not developed to the same sort of scale.
- Import/export balance
  - In some developed markets, such as Europe, the balance of logistics provision will be on secondary distribution (from warehouse to retailer or consumer) as relatively few consumer goods are manufactured in the region.
  - However, in China the transport market is still largely focused on moving goods from factory to port – a largely commoditised activity.
- Urbanisation and population distribution
  - Countries with dense urban communities can be better served by a range of more sophisticated contract logistics and express parcels providers than those with dispersed populations.

## 3.2 Africa: Summary

- The African logistics sector is more a collection of national markets than other, more integrated regions.
- Logistics costs in Africa remain high, constraining the development of the sector.
- Corruption is rife in many parts of the continent and this not only creates delays, but adds to the cost of moving goods.
- Despite being resource rich, Africa's logistics sector will only take off when African industry moves up the value chain and manufacturing becomes more important.
- South Africa is viewed as an important emerging market with large investment opportunities.
- Nigeria is the second largest market in Africa. The principal interest that Nigeria holds for foreign logistics companies stems from its major oil production operations.



## 3.2.1 Africa: Trade



- There is a relatively high degree of confidence in the growth potential of the Asia-Africa trade lane explained by investments made by Chinese government and business which have improved the scale and efficiency of Asia-facing logistics infrastructure in sub-Saharan Africa.
- China's One Belt One Road scheme to re-establish the ancient Silk Road and link China with Europe via an overland road and rail network, also includes financing that targets infrastructure development in East Africa.
- The majority of East Africa's individual markets stand to gain from Chinese demand for

consumer goods and agricultural products as it switches to a more consumption-based growth model.

- China's own slowdown could have adverse effects on the African economy. China's lower growth is part of a global economic slowdown, which is likely to lead to lower exports from Africa as demand falls generally. This is compounded by lower commodity prices.
- In addition, there is potential that financing for projects may tighten, delaying the start or delivery of projects, or perhaps threatening the projects altogether.



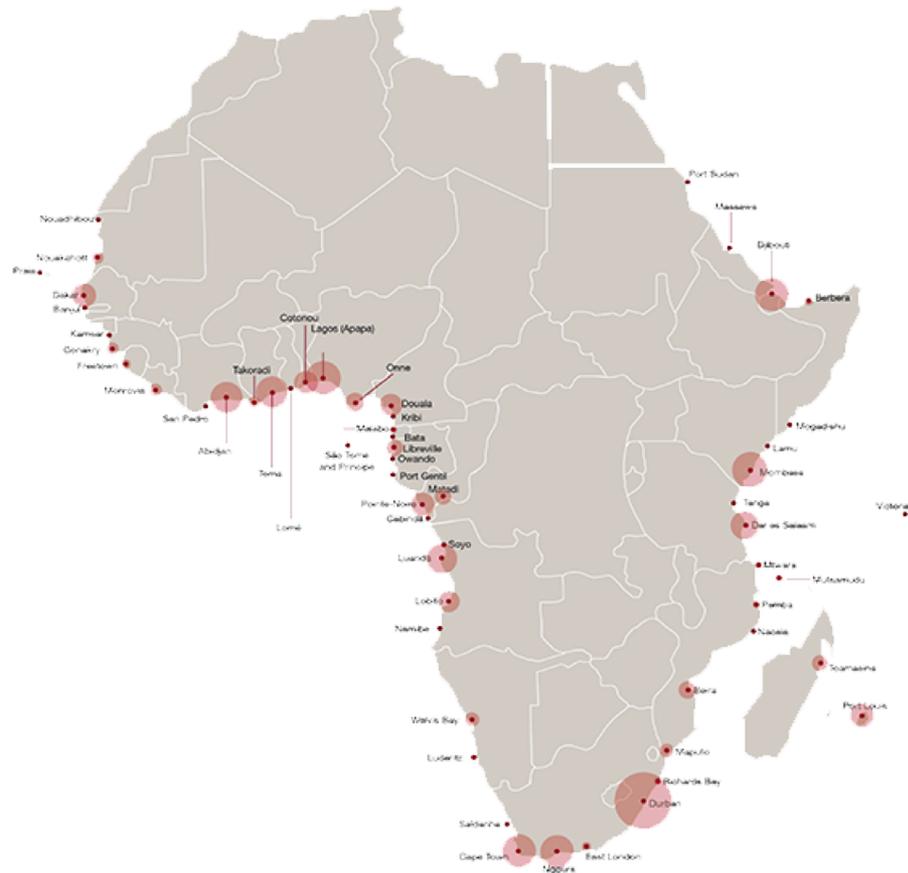
## 3.2.2 Africa: Transport Infrastructure



- The weakness of the transport and logistics sector in sub-Saharan Africa is a major factor in the indirect costs which have held back African economic development.
- High inland transportation costs have had a major impact on global supply chains originating and ending in Africa.
- In this respect the region's geography is partly to blame. There is a low ratio of roads per square kilometre and a scattered population with long distances between urban areas. Furthermore, Africa has the highest number of landlocked countries of any continent.
- Therefore, inland transportation costs are higher in Africa than in other regions. It is estimated that it costs US\$1,100, on average, to import a typical container inland and US\$872 to export one. This is higher than all other regions except Eastern Europe and Central Asia.
- African landlocked countries paid close to one-third more in inland transportation costs than landlocked countries outside Africa (US\$2,200 versus US\$1,500).
- Africa also has the highest average costs for both import and export port and terminal handling fees, although rates vary widely.
- There are also invisible costs which are generated by Africa's inefficient transport system. Due to high levels of unpredictability in delivery times, companies are forced to hold higher inventories than elsewhere in the world.
- It is estimated that firms in Africa lost some US\$850 a year in additional interest paid solely to buy inventories in advance. This estimated loss was 40% higher for African firms than for businesses in East Asia.

### 3.2.3 Africa: Ports

- As much as 90% of all international trade across the African continent takes place by sea. As such, the infrastructure which supports these volumes is of critical importance, but inefficiency remains a significant challenge at many of the region's ports.
- The World Bank assessed that on average it takes 22 days from arrival for containerised cargo to exit the Douala port in Cameroon. The port – a natural hub for central African trade – is a major constraint on wider economic growth in Cameroon as well as neighbouring and landlocked Chad and Central African Republic.
- For comparison, cargo dwell time in Durban, South Africa is four days, while in Mombasa, Kenya, 11.



Source: PwC

### 3.2.3 Africa: Ports



- Given the importance of sea freight Sub-Saharan Africa's trade, it's not surprising to see many investment projects at the ports across the continent.
- Cameroon has plans for central Africa's first deep sea port at Kribi, 150 km south of Douala, where a second phase of construction began in March 2016, funded with \$675m in finance from the Export-Import Bank of China.
- Neighbouring Gabon plans upgrades at two ports, in Owendo and at the export-oriented Port-Gentil.
- Upgrades at the Port of Lome, Togo, resulted in MSC launching a service to and from Asia, while in east Africa, there is competition between ports in Kenya and Tanzania to become the region's primary gateway.
- Tanzania's project is ambitious – located in Bagamoyo, north of the nation's current principle port at Dar es Salaam, the project broke ground in 2015 with intentions to eventually handle double the capacity of its southern neighbour. Road and rail links are also a part of the Bagamoyo project, with most of the required \$11bn in funding coming from a government-owned investment firm in China.
- Underdeveloped hinterland areas which weigh down productivity and efficiency are also in line for upgrades, including DP World's planned logistics hub in Kigali, Rwanda.
- The project forms only one strand of DP World's foray into eastern and southern Africa – it already has a concession at Djibouti's Doraleh container terminal and Mozambique's Port of Maputo, an important terminal for landlocked nations across southern Africa, including Gauteng Province, Swaziland, Botswana, Zimbabwe and Malawi.
- In addition, DP World is bidding for the concession to run Mombasa port's second terminal, while in May 2016 it won a 30-year concession to construct and operate Berbera Port in Somaliland – a project totalling \$442m.

## 3.2.4 Africa: Challenges



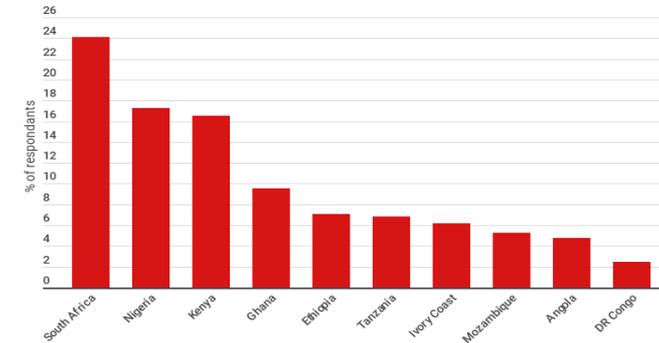
- The Agility Emerging Market Logistics Index found in 2018 that poor infrastructure, corruption and government instability make up the top three risks to industry in the region.
- Transport is not the only inefficient link in African supply chains. The length of time it takes to clear customs is a major problem for importers. It takes on average 35–40 days to complete these procedures, one–third more than in East Asia.
- The transport problem in Africa requires action on two fronts: infrastructure and de–regulation. Creating a major road network in Africa linking economies such as South Africa and Nigeria has been talked about since 2006. It was estimated that such a network would generate an expansion in overland trade of US\$250bn in 15 years.
- Apart from weak infrastructure, high transport costs are mainly the result of a lack of competition in the trucking industry. Without proper deregulation of trucking services, prices will remain high and firms will not benefit from the investment in roads. In West and Central Africa, this strategy is most needed. Cartels should be abolished and the tax structure should reward those who operate more modern vehicles and utilise them more intensively.
- Supply chains in Africa face a number of other problems, ranging from endemic corruption, lack of training, poor employee relations, security, technology and a paucity of developed international logistics service providers. However if African countries can at least address the region's fundamental infrastructure weaknesses, then many more Western companies may be tempted to invest in this high potential market.

### 3.2.4 Africa: Opportunities

- South Africa, Nigeria, Kenya, Ghana and Ethiopia have been regarded as the most promising markets for some time. South Africa remains the undisputed leader when it comes to growth opportunities for LSPs. This reflects the fact that it has the best infrastructure and connectivity of all the Sub-Saharan African markets in the Index.
- Growth in the middle class and consumer spending remains the top driver of Sub-Saharan Africa's logistics markets according to survey respondents. Supply chain professionals also have faith that infrastructure is meaningfully improving in the region.

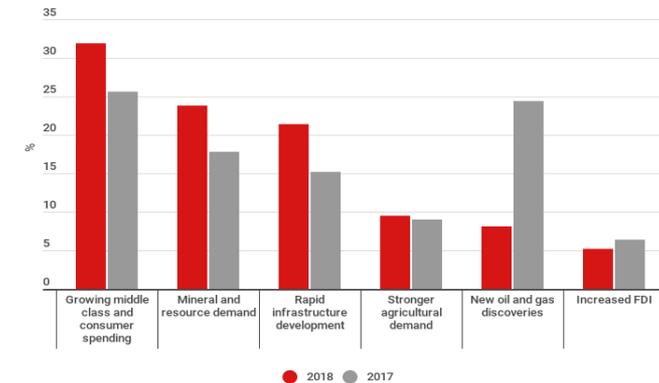
#### Sub-Saharan Africa's most promising market

Which of these African countries do you believe has the most potential as a logistics market over the next 5 years?



#### Drivers of growth in Sub-Saharan Africa

What do you perceive to be the most significant driver of growth in the emergence of Africa's logistics market?



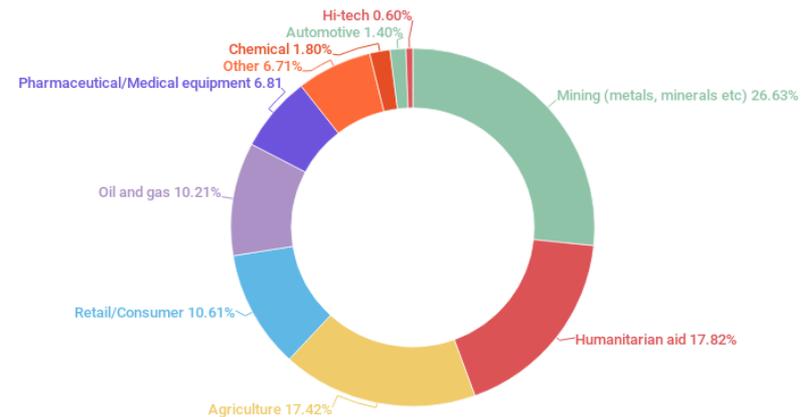
Source: Ti

## 3.2.5 Africa: Opportunities

### Vertical sectors

- Mining is considered to be the vertical with the greatest potential for logistics market growth by more than a quarter of the respondents (27%) to the Ti survey.
- Respondents maintain a relatively high level of confidence in the oil & gas sector, perhaps due to ongoing substantial investments in African oil projects and the emergence of East Africa as a gas region of global importance.
- Retail & Consumer is also becoming more popular, pointing to the changing landscape in West and East Africa, where the middle class and spending power are expanding rapidly.

### Vertical Sector Potential: Sub-Saharan Africa



Source: Ti

## 3.2.6 Africa: market snapshots



### South Africa

- A particular concern is that infrastructure development appears to have stalled, both in transport and electricity, with power shortages still chronic.

### Ethiopia

- Ethiopia is regarded as one of the most promising logistics market in sub-Saharan Africa. Its ambition to become a low-cost manufacturing hub has caught the eye of a number of investors.
- In particular, it is positioning itself as an alternative fashion & textiles producer, competing against the likes of Bangladesh and Vietnam. It also has significant air freight operations with exports centred around flowers. Africa's largest air cargo terminal recently opened at Addis Ababa airport.
- However there are on-going risks related to the ongoing threat of terrorism, especially in border areas with Somalia, Kenya, South Sudan, Sudan and Eritrea.

### Nigeria

- Nigeria has faced economic challenges in the past few years. Low oil prices are interacting with difficult domestic political and economic conditions. Economic activity is being disrupted by shortages of foreign exchange (thanks to lower oil revenues), militant activity in the Niger Delta and electricity blackouts.

### Uganda

- Uganda has improved its underlying structures supporting international trade – lower trade barriers, significant improvements to customs procedures and superior infrastructure. A ten-year infrastructure overhaul worth \$11bn is planned, which is expected to have positive spill overs on agri-processing, manufacturing and trade. Upgrading its transportation network and electricity generation capacity is its top economic priority.

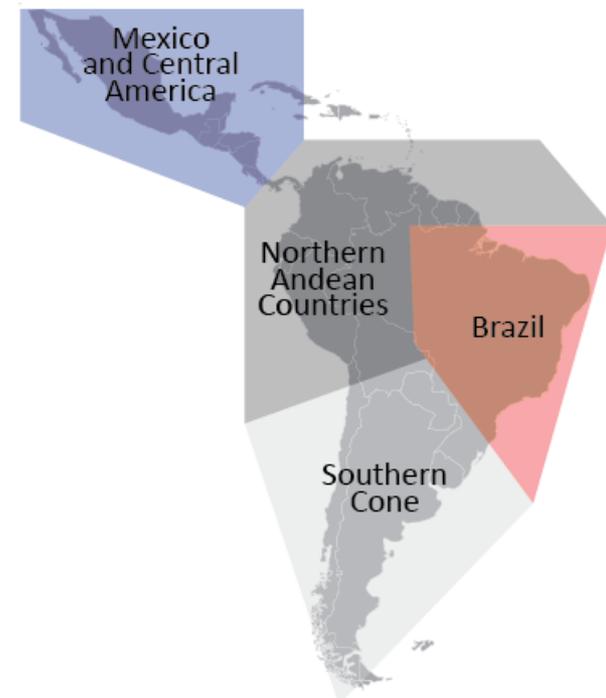
### 3.3 Latin America: Summary



- South America has enjoyed an unprecedented increase in international trade due to demand for commodities such as minerals, oil, steel and agricultural goods.
- Trade and associated logistics service growth has been particularly strong with China.
- However, infrastructure remains a major issue for the region. Congestion at ports and airports, lack of paved roads and outdated rail systems have caused delays in the transport of goods and commodities to global markets.
- Intra-South American volumes are increasing as road and rail networks connecting east to west South America are created.
- Increases in trade have provided many new opportunities for global and regional 3PLs, ocean carriers and other transport operators.
- As a result of varying complexities, McKinsey suggests that large companies operating in Latin America tend to segment their supply chain organizations into regional "clusters."

These clusters are designed to balance market size, cultural similarity, and the cost and ease of moving goods across internal borders, within the cluster.

Supply chain clusters in LATAM



Source: McKinsey & Company

### 3.3.1 Latin America: Trade



- Top trade partners for the region are Europe and the US, but China and other emerging markets, such as the Middle East and Africa, are increasing their market share.
- As with GDP, the region's international trade is dominated by Brazil and Mexico.
- Mexico benefits from its proximity to the US market. In particular, the Mexican automotive and electronics industries have greatly prospered helped by labour and transportation costs in Mexico being lower than in China.
- However, this reliance on the US can be a hindrance as Mexico found out during past economic downturns and NAFTA re-negotiation. Consequently it has forged numerous free trade agreements with other countries, as a means to lessen this dependence.
- Trade within the region is also on the rise, but the geographic makeup of the region, infrastructure problems and individual country border requirements and taxes make it problematic at best. They also cause higher transportation costs.

Latin America export volume growth year-on-year % change



Source: CPB Netherlands Bureau for Economic Analysis

### 3.3.2 Latin America: Transport Infrastructure

- Infrastructure remains a major issue for the region. Infrastructure projects have not been able to keep pace with the increase in trade. Congestion at ports and airports, lack of paved roads and out-dated rail systems has caused delays in the transport of goods and commodities to global markets.
- However, the last few years have seen major investments in the transportation infrastructure of most South American countries, particularly in Argentina, Brazil, Chile and Peru. In particular, demand for South American raw materials, agriculture and oil products have sparked much of the investment.
- Much of the investments have come from foreign-owned companies and consortia. China is investing heavily into South America to satisfy its need for oil and other raw materials to fuel its economy.
- Brazil, South America's largest country, geographically and economically, has experienced significant investment.

Top 10 Ports: Latin America (TEU)



Top 10 Ports: Latin America		2017 (TEU)
	Colon, Panama (m)	3.89
	Santos, Brazil (m)	3.85
	Balboa, Panama (m)	2.91
	Manzanillo, Mexico (m)	2.83
	Cartagena, Colombia (m)	2.66
	Callao, Peru (m)	2.25
	Guayaquil, Ecuador (m)	1.87
	Kingston, Jamaica (m)	1.68
	Buenos Aires, Argentina (m)	1.47
	San Antonio, Chile (m)	1.3

Source: Individual ports/Ti

### 3.3.3 Latin America: Roads

- The Pan America highway was created to attempt to connect North America with Central and South America, by road. It spans Mexico, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Colombia, Ecuador, Peru and Chile. Highways linking to it extend all the way north to Alaska and southward into Argentina.
- The highway consists of roads that often follow long-established routes. It stems from a cooperative plan in which each country has jurisdiction to designate, maintain, or build its part.
- Road conditions vary greatly. In some areas, especially near large cities, the highway is carefully graded and well paved. In some remote areas it is nothing more than a rough gravel road and a few sections are impassable during part of the year.



### 3.3.4 Latin America: Panama Canal

- The canal is approximately 80 km long and connects the Atlantic Ocean to the Pacific Ocean. The state owned Panama Canal Authority (ACP) is responsible for the operation, administration, management, preservation, maintenance, and modernization of the Canal.
- In 2007 work began on the expansion of the Panama Canal. The \$5.4bn project, completed in 2016, has allowed 2,000 more ships a year to use the canal. This was done by creating a new lane of traffic along the canal, through the construction of a new set of locks. Furthermore, the expansion enables larger vessels, carrying up to 13,000 TEUs, to travel through the canal, compared to the old limit of 5,000 TEUs.
- The Canal and Panama's business-friendly regulations have sparked comparisons to Singapore. Economic growth in Panama has been steady and as a result, it is now one of the five richest countries in mainland Latin America. A free-trade zone in Colón, at the

canal's Atlantic end, has also attracted the regional bases of businesses such as Procter & Gamble.

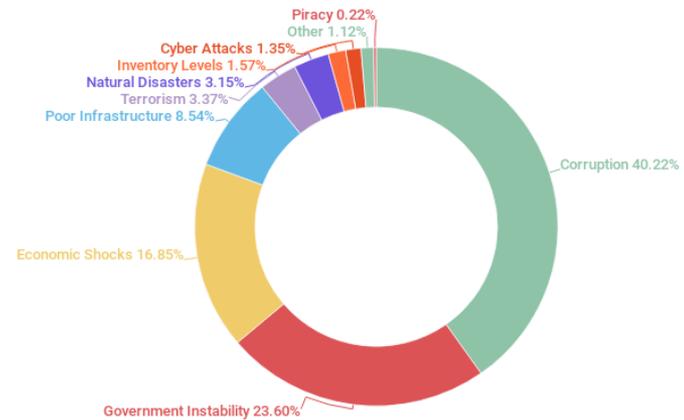
The Panama Canal



### 3.3.5 Latin America: Challenges

- Corruption and government instability remained the top two risks in Latin America, accounting for almost two thirds of total responses in a Ti survey, an increase of 4.5pp compared with the previous year. These findings come as little surprise in a year where corruption continued to make headlines across Latin America.
- Bribery of public officials and in public procurement as well as embezzlement of public funds remain prevalent. Recent events in the region go a long way in explaining respondents' particularly high ranking of government instability.
- Brazil's numerous political and business corruption scandals have been well-documented, while disastrous governance in Venezuela has left many describing it as a failed state.

### Supply Chain Risks: Latin America



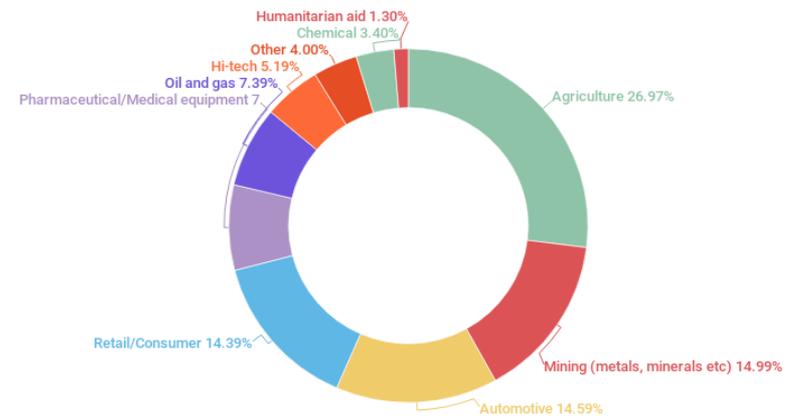
Source: Ti

### 3.3.6 Latin America: Opportunities

- Agriculture remains by far the most chosen sector, with 27.0% of respondents believing it has the greatest potential for future logistics growth. In a second tier, mining, automotive and retail & consumer all have approximately a 15% share. There is then a clear drop-off, with the next sector being healthcare & pharmaceutical (about 8%).
- That agriculture has been identified as the most-promising sector is perhaps no surprise given that is already a large and historically established sector. This reflects that agriculture offers a diverse range of opportunities, with perishables including fruits, vegetables, flowers, fish and meat interesting many logistics providers.
- Automotive and retail & consumer are very different opportunities. Automotive offers both export opportunities and growth from domestic demand, whereas retail & consumer is highly oriented towards serving domestic markets.
- Overall, the variety of sectors with relatively high shares points to divergent stages of economic development across the region and

illustrates that there are two distinct opportunities for LSPs – one serving locations rich in mineral wealth and one serving locations with increasing individual wealth.

#### Vertical Sector Potential: Latin America



Source: Ti

## 3.4 Middle East: Summary



- Middle Eastern economies vary substantially and range from Egypt, with its large population and growing economy based on tourism and manufacturing, to the oil- and gas-driven economies of the Gulf.
- Oil, gas and chemicals are the most important sectors in terms of logistics. These include the movement and storage of bulk products, as well as (more importantly for contract logistics players) oil field maintenance services.
- Gulf States, in particular, have diversified into sectors such as airlines, tourism and ports.
- By building a large complex of container ports, as well as substantial air freight facilities, Dubai has sought to position itself as the logistics provider for a huge area of the Middle East, Central and Southern Asia.
- Pharmaceutical logistics is attracted to the mix of good quality, temperature-controlled warehousing and intensive air freight services.
- Tourism and hotel support logistics is also important.
- Parts of the region have been highly disrupted from geo-political conflict which has impacted on traditional supply routes, especially those connected to Syria, Iran and Iraq.
- Tensions have also appeared in the Gulf, with supply of Qatar being impacted by a blockade initiated by several of its neighbours, including Saudi Arabia.

### 3.4.1 Middle East: Roads



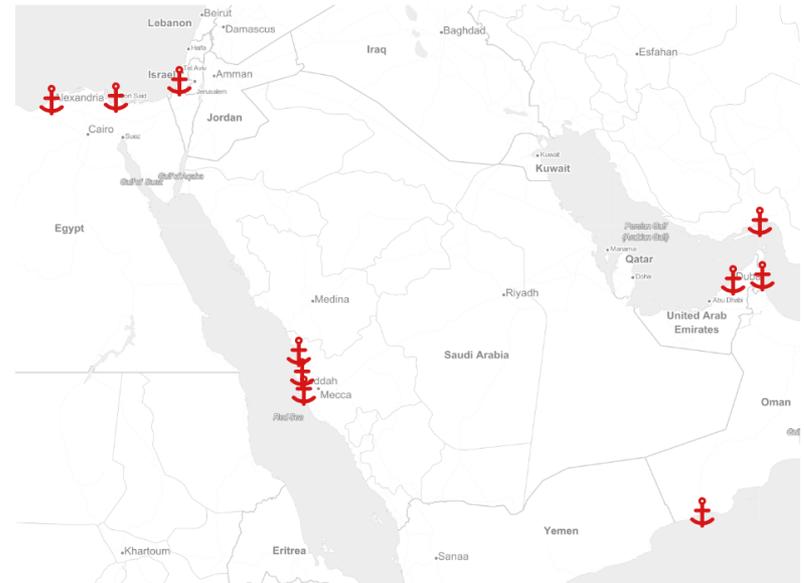
- The quality of road infrastructure across the Middle East varies quite considerably. According to the World Economic Forum Global Competitiveness Index, the United Arab Emirates ranks first in the world for the quality of its roads. It has over 4,000 km of high speed roads, through which the vast majority of trade between the Emirates is conducted. However, Algeria, Egypt, Lebanon and Yemen are all ranked amongst the world's worst.
- The UAE is continuing to improve its network, with the biggest current project being the US\$3.5bn Al Mafraq-Al Ghuwaifat road upgrade, which includes upgrading 246 km of roads in the Western region of the Abu Dhabi, close to the border with Saudi Arabia.
- Elsewhere in the region, countries are also investing in improving their road networks in order to boost their economies. For example, Algeria is close to completing a 1,216 km, six-lane, €11bn, East-West Highway.
- In March 2017, the Egyptian government announced the construction of 1,000 km of roads.
- In Iran, the first section of a 1,200 km of motorway construction project is due to open in 2022.
- In Kuwait, the \$3bn Sheik Jaber Bridge crossing the bay of Kuwait is due to be completed in 2018.
- As part of its Vision 2020 economic diversification strategy the Omani government plans to spend \$8bn on 12,704 km of roads.
- Qatar's Expressways Program comprises of 40 major projects including 900 km of new and upgraded roads and will be completed before the 2022 FIFA World Cup.
- In June 2017, the US\$4-5bn 'King Hamad Causeway' connecting Saudi Arabia with Bahrain was approved.

### 3.4.2 Middle East: Ports



- The Gulf's sea ports are a crucial part of its transport and trade infrastructure.
- In the UAE, capacity at Jebel Ali will be increased to 22.1m TEUs through the development of a \$1.6bn fourth terminal. By 2030, the government wants Jebel Ali to have a capacity of 55m TEUs and operate as the world's largest port. Elsewhere, capacity at Khalifa Port will be expanded by 2.4m TEUs through the construction of a second terminal which is set to start in 2018. The terminal's capacity will later be increased to 3.5m TEUs.
- As for Qatar, Hamad Port's capacity will be expanded to 6m TEUs when it is finished in 2020.
- In Saudi Arabia, capacity at Jeddah Islamic Port is planned to be increased by 1.6m TEUs through the expansion of the South Container Terminal. Meanwhile King Abdullah Port is expected to have a colossal capacity of 20m TEUs when it is completed in 2020, up from 4m TEUs at present. In addition, the planned new megacity of Neom will have its own new port. The first phase of the development is

Top 10 Ports: Middle East (TEU)



Top 10 Ports: Middle East		2017 (TEU)
	Dubai (Jebel Ali), UAE (m)	15.37
	Jeddah, Saudi Arabia (m)	4.15
	Salalah, Oman (m)	3.95
	Port Said, Egypt (m)	2.97
	Bandar Abbas, Iran (m)	2.61
	Sharjah (Khor Fakkan), UAE (m)	2.32
	King Abdullah, Saudi Arabia (m)	1.7
	Alexandria, Egypt (m)	1.61
	King Abdulaziz International Airport, Saudi Arabia (m)	1.58
	Ashdod, Israel (m)	1.53

Source: Individual ports/TI

expected to be completed in 2022.

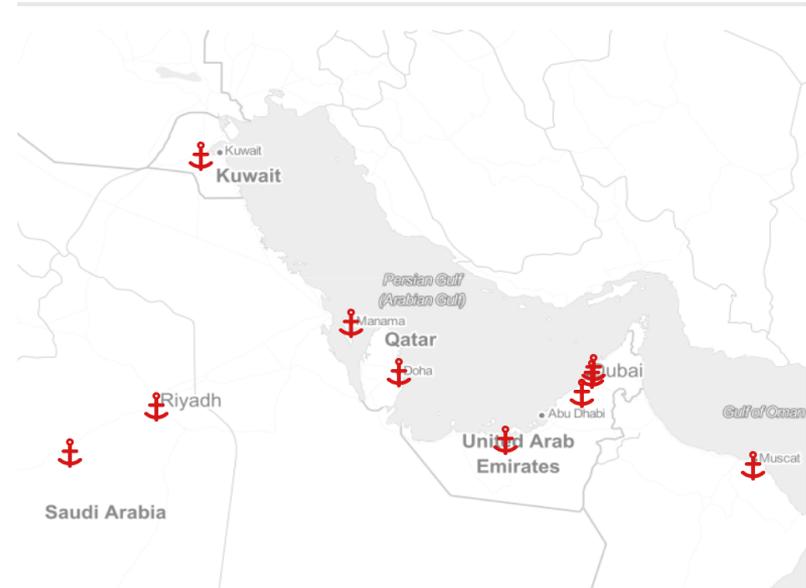
- In Bahrain, the Khalifa Bin Salman port handled less than 300,000 TEUs in 2016, but has the capacity to handle up to 1m and capacity can be increased to 3m if necessary.
- Kuwait's traffic is over 1m TEUs. At present, Shuwaikh handles the majority of container traffic though Shuaiba is also important. A new port, Mubarak al Kabir (MAK), will be developed by December 2019 and will have a capacity of 3.6m TEUs.
- Oman's location makes it a prime transshipment hub. The Port of Salalah is its biggest port but Sohar and Duqm are also major facilities. Salalah's capacity is due to increase by 2.5m TEUs as a result of expansion of the existing terminal. A further 3-4m TEUs of capacity will be added if plans to build a second container terminal go ahead. Sohar's capacity is due to be expanded by 5m TEUs if plans to build an automated container terminal go ahead. Duqm's will also be expanded by 2020, though this will be for a new liquids and oil terminal opening.
- Finally, following the opening of a second terminal in February 2018, capacity at Iran's biggest port of Shahid Rajaei will be further increased by a third phase of development which will add 1.2m TEUs by 2020.
- Overall, it is abundantly clear that if these planned investments go ahead, there will be vast under-utilisation of terminal capacity across the region, as there simply will not be the demand for the available capacity.

### 3.4.3 Middle East: Airports

- As with ports, the Gulf region has an abundance of modern airport infrastructure.
- Bahrain’s international airport handled over 200,000 tonnes of cargo in 2016. A \$1.1bn airport modernisation programme is underway. While it is mainly focused on a new passenger terminal, which is due to be completed in 2019, it will also ensure that its cargo capacities will be increased further.
- Kuwait is similar to Bahrain in that it has a single major international airport which also handled around 200,000 tonnes of cargo in 2016. There are plans for Kuwait International Airport to ultimately have cargo capacity of 6m tonnes.
- Muscat airport in Oman reported cargo volumes of 162,000 tonnes in 2016. Muscat Airport’s capacity will be extended in March 2018 by the opening of a new cargo terminal with an operational capacity of 317,515 tonnes. It could be expanded to handle 453,592 tonnes in the future.

- These three countries airport tonnages are dwarfed by the three other GCC countries.

Top 10 Airports: Middle East (Tonnes)



Top 10 Airports: Middle East		2017 (tonnes)
	Dubai, UAE (DXB) (m)	2.65
	Doha, Qatar (DOH) (m)	2.02
	Dubai, UAE (DWC) (m)	0.97
	Abu Dhabi, UAE (AUH) (m)	0.72
	King Abdulaziz International Airport, Saudi Arabia (m)	0.43
	Riyadh, Saudi Arabia (RUH) (m)	0.37
	Manama, Bahrain (BAH) (m)	0.29
	Kuwait International Airport, Kuwait (KWI) (m)	0.24
	Muscat International Airport, Oman (MCT) (m)	0.2
	Sharjah, UAE (SHJ) (m)	0.15

Source: Individual airports/Ti

### 3.4.3 Middle East: Airports



- Qatar's Hamad airport in Doha handled 2.02m tonnes in 2017, being a major transit hub. If Qatar's plans to build a second terminal go ahead, cargo capacity at Doha would be increased to 2.8m tonnes.
- The UAE is an even bigger transit hub. Dubai International airport handled 2.65m tonnes in 2017. Construction work has begun on a 30,000 sq m addition to Dubai International's 1.2m tonne Cargo Mega Terminal (CMT), increasing capacity by 25% to 1.5m tonnes a year.
- A new 40,000 tonne cargo facility is also under construction. The Emirates also features two other major cargo airports: Dubai World Central (almost 900,000 tonnes in 2016) and Abu Dhabi (over 800,000 tonnes). DWC ultimately aims to expand to become the world's largest airport, with a capacity of 220m passengers and 16m tonnes of cargo. However, expansion of the airport has been delayed from original plans.
- Unlike Qatar and UAE, Saudi Arabia is not a transit hub. Its most important airport, Jeddah, handled over 700,000 tonnes in 2016. A new air freight facility planned at King Abdulaziz International Airport (Jeddah) is part of Saudi Arabia's plans to increase total air cargo capacity in the Kingdom to 6.8m tonnes per year by 2030. The capital's airport, Riyadh, handled over 350,000 tonnes in 2017.
- Cargo capacity at Riyadh is expected to reach 1m tonnes in 2020 through development of existing facilities and the construction of new buildings. In addition, King Fahd in Dammam is another important airport, handling almost 140,000 tonnes in 2018. This is especially true for the oil & gas sector, with Dammam being the centre for the industry. Capacity at King Fahd will be expanded by 150,000 tonnes through the opening of a new cargo terminal at the end of 2018.
- Finally, like Saudi Arabia, Iran is not a transit hub. Its airports handled around 550,000 tonnes of freight in 2016, although just over 200,000 tonnes was international freight. This number should increase significantly if the country emerges from international isolation.

### 3.4.4 Middle East: Logistics



- Global LSPs play a crucial role in Middle East logistics. For example, most of the big names in global air and sea freight forwarding are also the biggest players in the Middle East. Of course, regional and local players also count themselves among the market leaders in certain geographies, such as Aramex across many countries.
- International express is different with just a few players dominating the market. The market is characterized by the big three integrators of DHL Express, FedEx and UPS facing competition from Aramex.
- Activities such as warehousing, incorporating none or few value-added or bespoke services typically associated with contract logistics are generally provided by local LSPs. Transport is in a similar condition, with provision dominated by local companies. In fact, investment in domestic transportation services is prohibited in Saudi Arabia, and heavily restricted elsewhere.
- Even in areas such as ‘less-than-truckload’ the sector is dominated by local providers, although as is so often the case the UAE is different with a strong presence by global providers managing local sub-contractors in areas such as container transport or air and sea freight interfacing services.
- However, it would be a disservice to certain local and regional players to suggest they do not compete for the more complex and bespoke logistics contracts with global LSPs. It is just that there is a sizeable portion of the logistics market that is dominated by more informal and basic provision, such as that which serves informal retailers.

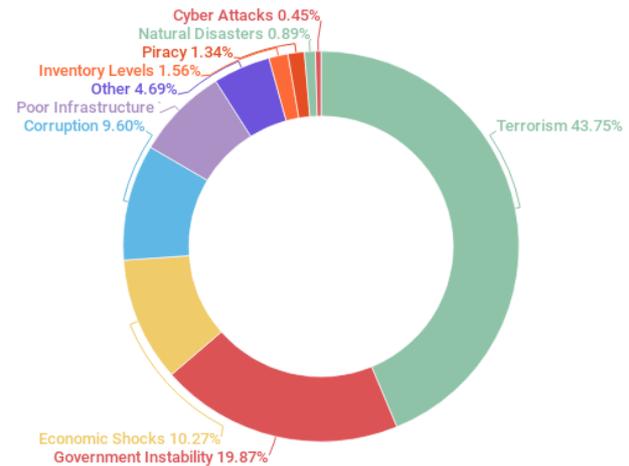
### 3.4.5 Middle East: Challenges



- Terrorism and government instability is ranked as the most significant of supply chain risks across MENA, accounting for almost two thirds of the total responses. The dominance of the two risk factors reflects ongoing conflicts and terrorism risk present in parts of the region.
- Economic shocks are also important, suggesting that respondents are becoming aware of the new realities in the region following the oil price crash. GCC countries have been buffeted by falling oil prices, leading to far-reaching consequences for businesses.
- Similarly, the perception of ‘corruption’ as a supply chain risk across the Middle East and North Africa is increasing. The corruption purge in Saudi Arabia might be behind the rise in the share of this factor.
- The perception of poor infrastructure as a supply chain risk to growth in Middle East & North Africa continues to decline which is likely a result of vast investments in infrastructure

across the region. These include the development of numerous special economic zones, ports and airports, leading many to suggest that the region actually has too many ‘mega hubs’, with some destined to be underutilised.

### Supply Chain Risks: Middle East & North Africa

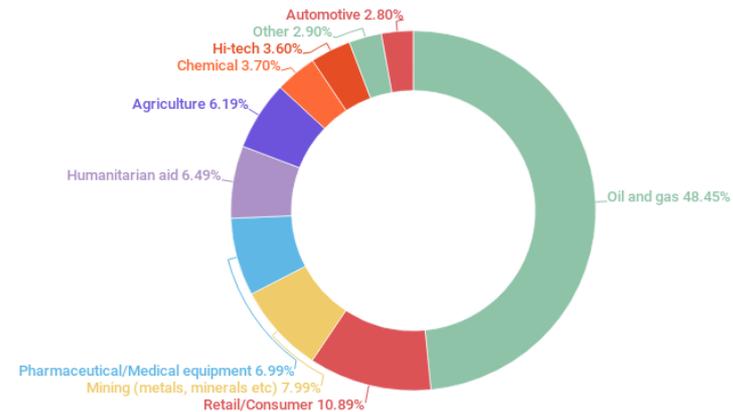


Source: Ti

### 3.4.6 Middle East: Opportunities

- Almost half of respondents (48.5%) stated that the oil & gas sector has the greatest potential for future growth, up by 0.6pp year-on-year.
- This is not surprising considering the significance of the sector to the region. While many governments have announced strategies or 'Visions' to diversify away from oil & gas, these are long term ambitions. Significant change will not be realised over the course of a few years.
- In addition, investors may view growth opportunities in oil & gas as far from exhausted, particularly given the opening of the market in Iran should relations be normalized.
- Retail & Consumer sector has the second biggest opportunity, especially important given the increasing levels of consumer spend in the region. Development of cool chains will be a critical part of this.

### Vertical Sector Potential: Middle East & North Africa



Source: Ti

## 3.5 Asia Pacific: Summary



- Increasing intra-Asian trade, along with a growing increase in imports not only for manufacturing inputs but also consumer products, characterises Asian logistics.
- Instead of specialising in producing certain types of goods, Asian exporters have specialised in certain stages of production and become vertically integrated with each other.
- Consequently the air and sea freight markets are critical for the movement of intermediate goods around the region before final assembly.
- As China's labour market becomes more expensive, supply chains are encompassing ever more remote markets such as Laos.
- Poor infrastructure, tolls and taxes, bureaucracy, corruption, a lack of integrated service providers and a raft of operational inefficiencies result in a higher proportion of logistics costs to developed markets.
- This is offset to a degree by considerably lower labour costs.
- China's Belt and Road Initiative has led to huge investment in transport infrastructure across the region as it seeks to integrate with Asian and European markets, as well as exert political muscle on the regional stage.



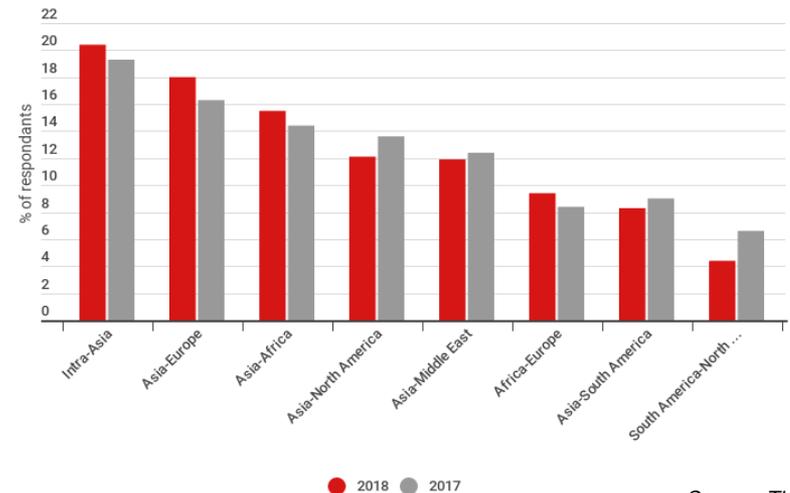
### 3.5.1 Asia Pacific: Trade



- Export volume growth has been expanding since 2016 although at varying rates.
- This ‘lumpy demand’ pattern is no doubt partly due to the implementation of tariffs on Chinese goods by the US authorities and a new round which came into effect in January 2019 could exacerbate the situation.
- Since Donald Trump entered the White House, trade policy has been dominated by relations with China. There have been two rounds of tariff implementations initiated by the US resulting in retaliation by the Chinese government.
- Following the USA’s withdrawal from the TPP free trade agreement negotiations, a new agreement has been established - Comprehensive and Progressive Agreement for Trans-Pacific Partnership or (CPTPP). The agreement brings together a string of economies in Eastern Asia and the Pacific rim; Australia, New Zealand, Canada, Japan, Malaysia, Chile, Peru, Mexico, Brunei, Singapore and Vietnam.
- The EU signed up to its biggest ever bilateral free trade agreement in 2018 - the Economic Partnership Agreement or EPA with Japan. The accord has even been branded the “cars for cheese” agreement.
- As seen from the chart below, Asia trade lanes dominate in terms of exporters confidence, especially Intra-Asian lanes.

### Prospects for emerging market trade lanes

Which of the following trade lanes do you believe have the greatest potential for future growth?



Source: Ti

## 3.5.2 Asia Pacific: Ports



- Asia Pacific has long been at the heart of global container shipping. Nowhere is this more clearly demonstrated than by looking at the world's busiest ports measured by container throughput, or twenty-foot equivalent units (TEU). According to data compiled by Lloyds List, out of the top 100 global ports, Asia dominates the rankings with nine out of the top 10 and 48 overall. The region has a massive total throughput of 351.4m TEU, approximately 65% of global volumes.
- Most of this cargo is destined for the US and Europe via the main East-West trade lanes. However, the trend of the last few years has been the rise to prominence of intra-Asia trade.
- Although countries such as China, Japan and South Korea boast huge, modern container ports, other Asia Pacific nations are spending billions on upgrades to keep up with the demand for containerised goods. Indonesia,

Top 10 Ports: Asia Pacific (TEU)



Top 10 Ports: Asia Pacific		2017 (TEU)
	Shanghai, China (m)	40.23
	Singapore, Singapore (m)	33.67
	Shenzhen, China (m)	25.21
	Ningbo-Zhoushan, China (m)	24.61
	Hong Kong, China (m)	20.77
	Busan, Korea (m)	20.49
	Guangzhou, China (m)	20.37
	Qingdao, China (m)	18.26
	Tianjin, China (m)	15.04
	Port Klang, Malaysia (m)	11.98

Source: Individual ports/Ti

## 3.5.2 Asia Pacific: Ports



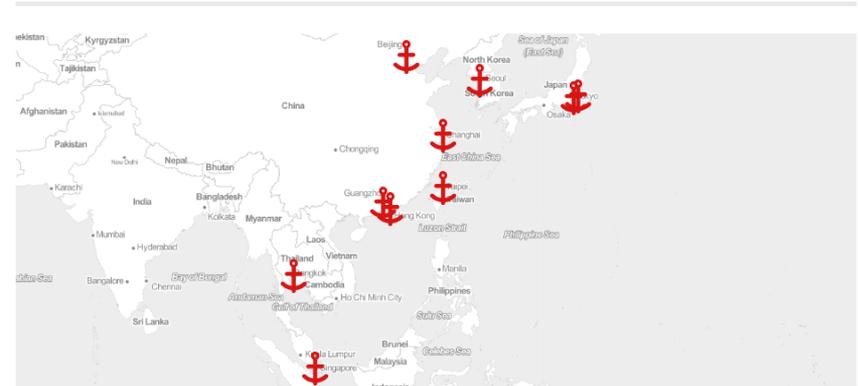
for example, will build up to 35 new ports over the next four years.

- Port investments are also being driven by the rapid escalation in container ship sizes. Amid continuing financial woes, the world's largest carriers have gone on a mega-vessel ordering spree in a bid to lower unit slot costs and achieve consistent profitability.

### 3.5.3 Asia Pacific: Airports

- Asia’s airports are essential gateways and transshipment hubs for the region’s exports and imports of higher value intermediate and finished products.
- Hong Kong is the busiest airport in the region for air cargo, followed by Shanghai and Incheon (Korea).
- Electronics, machinery and pharmaceuticals have long been the main types of air cargo transiting these airports although increasingly the mode is being used for e-commerce shipments of all kinds.
- The growth of the movement of perishable fresh fruit and vegetables and biogenic drugs has led to the development of cool chain facilities at airports.
- A buoyant global economy means that consumers around the world have more money to spend on consumer electronics, traditionally a main stay of the air cargo sector. New products are generally air freighted for the initial launch.

Top 10 Airports: Asia Pacific (Tonnes)



Top 10 Airports: Asia Pacific		2017 (tonnes)
🇭🇰	Hong Kong, HK (HKG) (m)	5.05
🇨🇳	Shanghai, CN (PVG) (m)	3.82
🇰🇷	Incheon, KR (ICN) (m)	2.92
🇯🇵	Tokyo, JP (NRT) (m)	2.34
🇹🇼	Taipei, TW (TPE) (m)	2.27
🇸🇬	Singapore, SG (SIN) (m)	2.13
🇨🇳	Beijing, CN (PEK) (m)	2.03
🇨🇳	Guangzhou, CN (CAN) (m)	1.78
🇹🇭	Bangkok, TH (BKK) (m)	1.44
🇯🇵	Tokyo, JP (HND) (m)	1.27

Source: Individual airports/Ti

### 3.5.3 Asia Pacific: Airports



- China is by far the largest exporter, having comprised 44.0% of all emerging market air freight to the EU and 50.5% of air freight to the US in 2016. In total, China represents around half of emerging market air export tonnage to the US and EU.
- At times over the past two years, eastbound air freight tonnage on Europe-Asia services exceeded westbound volumes on certain key markets, confirming a long-term 're-balancing' of the previous strong directional imbalance.

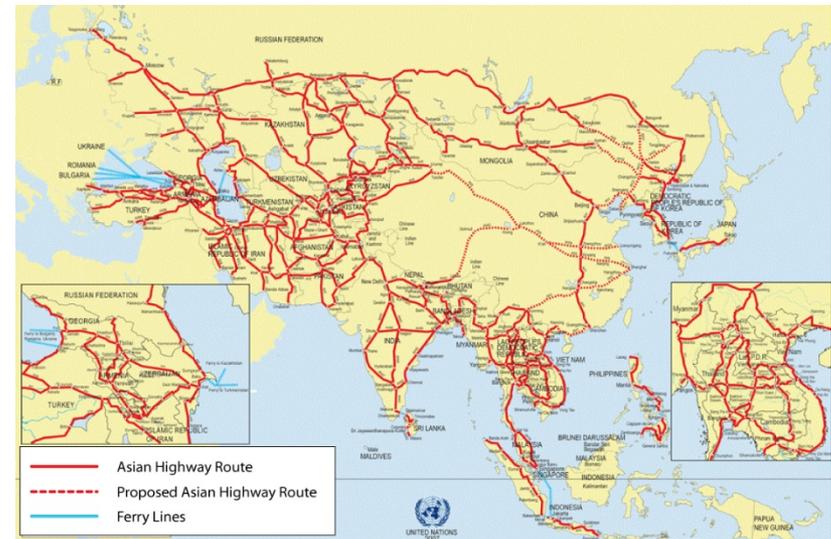
### 3.5.4 Asia Pacific: Roads



- The quality and quantity of roads suitable for commercial logistics in Asia Pacific is severely lacking when compared to the multi-lane highway networks and toll roads found in developed Western economies.
- However, planned and ongoing infrastructure improvements will transform regional road networks in line with other logistics developments as Asia's economies continue to lead the way in global growth.
- The Chinese road network has seen rapid development since the turn of the century. This is planned to continue for the foreseeable future, as the national 2030 Road Master Plan has set a target of 5.8m km of total road network, including 400,000 km of national highways and over 180,000 km of expressways.
- New multi-country highways will be the key to unlocking the road freight potential of mainland Asia Pacific. For example, the Asian Highway Network is Asia's biggest road infrastructure project, covering 141,000 km of

roads passing through 32 countries.

- The project aims to coordinate upgrades of existing national highways and build new roads to connect them. A 25.6km section of Asian Highway 1, which in theory will link Istanbul to Tokyo via Kolkata and Bangkok, has opened to link Myanmar and Thailand. The road is part of the planned India-Myanmar-Thailand trilateral highway and will eventually be further linked to Cambodia, Laos and Vietnam.



### 3.5.5 Asia Pacific: Main Country Logistics Markets



#### Japan

- Japan is considered to be Asia's logistics leader in terms of sophistication and transport connectivity although it is a market that foreign companies find difficult to penetrate.
- There are signs that the structural downturn in the market is finally spurring companies to sell their logistics subsidiaries to third parties.
- Japanese companies are also shifting their production abroad, mainly to China, which will increase demand for the services of international logistics companies.

#### China

- A large proportion of the logistics sector is export orientated, focusing on consumer goods such as furniture, clothing and consumer electronics.
- The growth of the retail sector (and especially e-commerce) has created the demand for domestic logistics services. Alibaba's logistics subsidiary Cainiao and JD.com have invested billions in warehousing and last mile

transportation networks spanning the country and beyond.

- As the cities in the western interior of China become more prosperous, logistics companies have been required to expand their services away from the eastern seaboard.

#### India

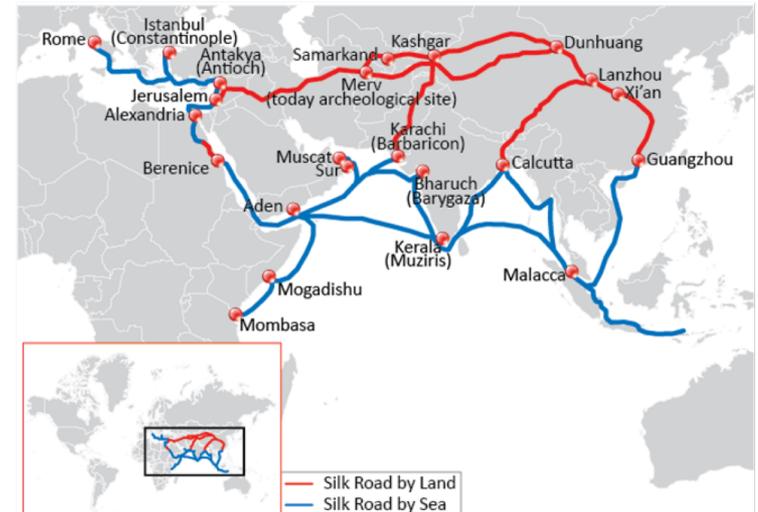
- India is seeing a boom in economic and trade activity, although it has been held back by its transport infrastructure. India's logistics costs are approximately 2-3 times higher than in developed countries.
- Local and international logistics operators are stepping up their investment in the market.
- The implementation of a harmonized Good and Services Tax means that logistics companies can now treat the country as a single market, creating national rather than regional supply chains.
- E-commerce logistics is becoming increasingly important with the entry of Wal-Mart and Amazon to the market.

### 3.5.6 Asia Pacific: China's Belt and Road Initiative

- To support and encourage its domestic economy, China is also a leader in encouraging intra-regional trade. The intra-Asia trade corridor represents about 25% of Asia's total exports. This is due in part, to the connectedness of the Asian supply chain. For example, most of China's regional Asian trade is in the assembling of intermediate parts manufactured in Southeast Asian countries.
- The 'hubs' of this region include China, Japan and South Korea with the 'spokes' including the countries of Southeast Asia. This 'hub' and 'spoke' system within north and Southeast Asia divides the manufacturing process of higher value goods between countries. Specialization of each part of the manufacturing process within each country or factory is aimed to improve efficiency and lower unit costs.
- It is also important to link China with Europe. The Eurasian land bridge, a key facet of the

BRI surpassed another milestone in 2018, as the 10,000th cargo train completed its journey along the line. The project which began in 2011 has grown rapidly over the last two years.

- The service now connects 48 Chinese cities with 42 European ones.

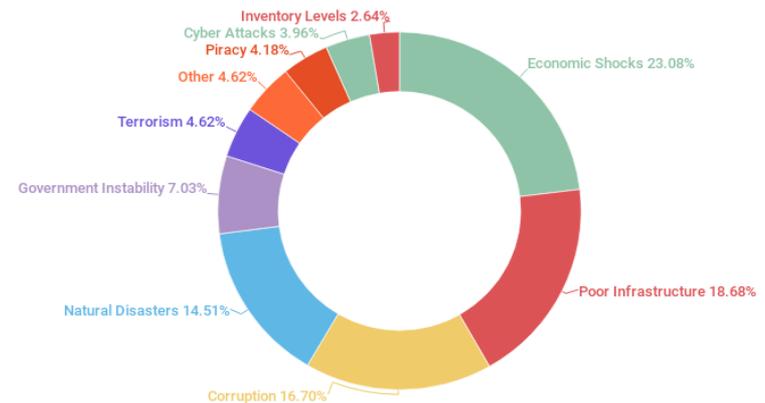


### 3.5.7 Asia Pacific: Challenges



- Economic shocks, poor infrastructure, corruption and natural disasters have been rated as the most significant supply chain risks across Asia Pacific. Overall, the four risks account for 72.0% of the total responses.
- While growth prospects remain positive for Asia Pacific, the survey's results imply that economic shocks will pose the main threat to growth in the region. The dominance of this factor may suggest that respondents anticipate unexpected events to negatively impact the region's positive outlook. This could relate specifically to the threat of a 'hard landing' in China, or to broader concerns around protectionism, for example.
- Natural disasters are perceived as the fourth most threatening supply chain risk for the region. This factor dropped two positions, perhaps indicating that respondents have more faith in the ability of the governments of the region to introduce countermeasures to better prepare for future events – or possibly suggesting that memories of the impact of natural disasters fade after a short while.
- Climbing two positions compared to last year, 'poor infrastructure' was cited as the 2nd most significant supply chain risk across Asia Pacific. This is consistent with the rise of 'strong transport infrastructure' as a driver of growth in emerging logistics markets.

#### Supply Chain Risks: Asia Pacific



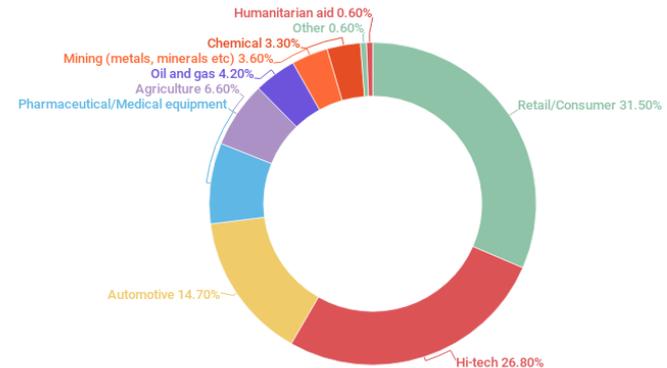
Source: Ti

### 3.5.8 Asia Pacific: Opportunities



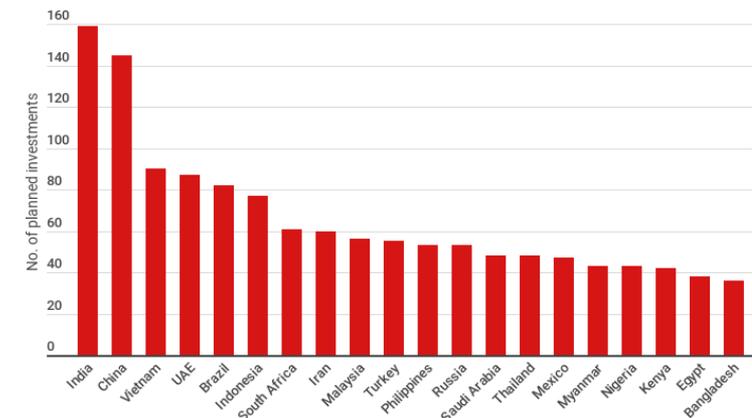
- Retail & consumer, high tech and automotive rank as the vertical sectors most likely to create opportunities for LSPs across the Asia Pacific.
- Together the three verticals accounted for 73.0% of the total responses, underlining that retail sales volume growth driven by increased spending power of the region's middle classes as well as manufacturing production remain fundamental drivers of growth.
- The high position of the Pharmaceutical/ Medical equipment sectors indicates the growing importance of healthcare logistics in the region. As spend increases and drugs become more sophisticated, logistics opportunities will increase as will the need for higher levels of investment in technology and facilities.
- In a Ti survey, 9 of the top 20 emerging markets for potential investment were located in Asia Pacific and all of the top three.

### Vertical Sector Potential: Asia Pacific



Source: Ti

### Markets for potential investment over the next five years



Source: Ti

## 3.6 Europe: Summary



- Much of the region's logistics activity focuses around the major ports and airports situated in Germany, France, Belgium, Netherlands and France.
- European Logistics Centres have developed, especially in the Benelux countries, to distribute imports from Asia and North America.
- Although highly integrated by strong transport infrastructure and a common Customs area, each country market retains its highly individual character, underpinned by local regulations.
- Since joining the EU, lower cost operators based in Central and Eastern Europe have taken large market share, especially in the international road freight sector
- Congestion is a growing problem, especially in and around urban areas. This has led to public policy initiatives to ban or limit diesel vehicles.
- The industry is struggling to attract drivers due to better employment prospects in other sectors. Immigration controls (c.f. Brexit) could exacerbate this problem.
- Logistics markets in Western Europe are highly competitive. Not only is there a wealth of global LSPs, but there is also no shortage of medium to large national players with good logistics capabilities.
- There has been considerable consolidation in the market, as operators have expanded internationally and into complementary segments (e.g. freight forwarding, road freight and contract logistics).
- E-retailers, led by Amazon, are demanding higher customer service in logistics and last-mile operations, transforming the contract logistics and express markets.
- Digitalization of freight markets could release new efficiencies and improve truck utilization, leading to lower emissions, congestion and better profitability.

## 3.6.1 Europe: Country snapshots



### Germany

- Industrial logistics is very important to the market due to the importance of the chemical and automotive sectors. Exports are an important part of the market mix.
- With strong grocery retailers such as Metro, Aldi and Lidl, German logistics operators are certainly exposed to large scale grocery retailing.
- Germany is home to a number of the world's largest logistics companies, including DHL and DB Schenker. However, many large corporates like to do business with specialist mid-sized companies.
- One characteristic of the German market is the number of partnerships that exist between the fragmented logistics companies to offer national coverage.

### France

- Outsourcing was slow to take off in France due to the regulated nature of the market and

the structure of the retail sector.

- The French market was characterised by the number of strong regional players which were in existence. This was symptomatic of France's large geography which forced alliances between medium sized companies to provide national distribution.
- Following consolidation, a number of large national players have emerged (e.g. Geodis, XPO).
- The hypermarket model is widespread, where emphasis is placed on bulk purchases of goods at a discount from manufacturers, rather than the JIT delivery.
- The transport market is being squeezed by Eastern European and Spanish hauliers and has been hurt by the migration of manufacturing eastwards.
- Working time regulations have increased pressure on the labour market and increased costs.

## 3.6.2 Europe: Transport Infrastructure



### UK

- The UK has a dense transportation network with numerous good quality ports although roads and airports are congested especially in the South East.
- The UK has the most mature contract logistics market in Europe due to early deregulation. The ability to out-source logistics fuelled the growth of value adding services and created efficiencies faster than the rest of Europe.
- Many logistics companies were acquired by European/US rivals in the 1990s/2000s (e.g. Exel by Deutsche Post).
- A large proportion of the market is dedicated to the distribution of imports through ports and the retail sector.
- E-retail is now changing the structure of the market significantly in terms of logistics provision.
- Uncertainty due to Brexit is hanging over the industry as operators wait to see the impact on supply chains.

### Italy

- Much of the logistics intensity is focused around the north of the country where the main population and industrial centres are based. Transport infrastructure (ports, airports and roads) is largely aligned with this distribution.
- The Italian logistics market is highly fragmented with a large proportion of owner-drivers. The own-account sector is also stronger than in other countries although this has led to inefficiencies.
- The lack of large Italian logistics players has made it difficult for other foreign owned companies to develop scale in this sector through acquisition.
- Low levels of regulation as well as ease of entry and exit from the market have made it more difficult for larger transport concerns to build scale and profitability.
- Cabotage is seen as a growing issue for domestic hauliers, losing market share to eastern European providers.

#### Spain

- The logistics market is highly competitive and centred around Madrid and Barcelona which are also the focus for transport infrastructure.
- Ports, such as Barcelona, are investing heavily in intermodal operations as they seek to develop their European 'gateway' status.
- The road network has produced two major transit routes. The north-south route links France with the Mediterranean while the east-west route connects Barcelona with the rest of Iberia.
- Foreign companies have traditionally struggled against local, commoditised freight providers, although this is now changing.
- The entrance of international retailers has changed a market previously dominated by micro-stores to one in which hyper- and supermarkets are much more important.
- The automotive sector is playing less a role in logistics as manufacturers migrate production to Eastern Europe.

#### Central & Eastern Europe

- This region has been a dynamic market for larger logistics companies. Although the region suffered from poor infrastructure and patchy services, since 2000 the sector has grown enormously.
- The automotive sector has been the leader in this trend, with German vehicle manufacturers the largest investors.
- Increasingly the consumer sector has been building a substantial logistics infrastructure in most of the countries of the region.
- A feature of the CEE logistics market is that there are very few indigenous contract logistics providers but a large number of local road freight operators.
- Many of these have expanded into Western Europe with lower labour costs providing them with competitive advantage.

### 3.6.3 Europe: Ports



- Rotterdam is by far the largest port in Europe. However, its closest rival Antwerp has had higher growth rates over the past few years and is closing the gap.
- The largest ports are located in proximity to the economic centre of Europe: Belgium, Netherlands and Germany.
- However, ports in Spain, Greece, Italy and Turkey are important for supply southern Europe through Mediterranean routes.
- They can also offer a quicker route to market for vessels sailing from Asia through the Suez Canal.
- Europe is fortunate in having a string of new container port developments due to come into operation over the next ten years and is well provided for, compared with many other parts of the world.
- Many manufacturers and retailers are developing ‘port-centric’ distribution facilities, leading to demand for warehousing space close to or in ports.

Top 10 Ports: Europe (TEU)



	Top 10 Ports: Europe	2017 (TEU)
	Rotterdam, Netherlands (m)	13.73
	Antwerp, Belgium (m)	10.45
	Hamburg, Germany (m)	8.86
	Bremerhaven, Germany (m)	5.51
	Valencia, Spain (m)	4.83
	Algeciras, Spain (m)	4.38
	Piraeus, Greece (m)	4.06
	Felixstowe, UK (m)	3.85
	Marsaxlokk, Malta (m)	3.15
	Barcelona, Spain (m)	3.01

Source: Individual ports/Ti

### 3.6.3 Europe: Ports

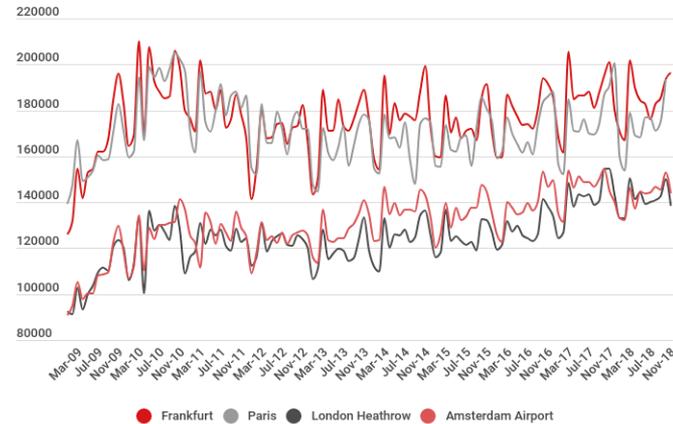


- Intermodal strategies are also becoming more important, avoiding road freight bottlenecks in ports by moving containers to inland clearance depots by rail.
- Shortsea shipping is being encouraged by the EU to take the pressure off road infrastructure by connecting European countries by 'Motorways of the Sea'.

### 3.6.4 Europe: Airports

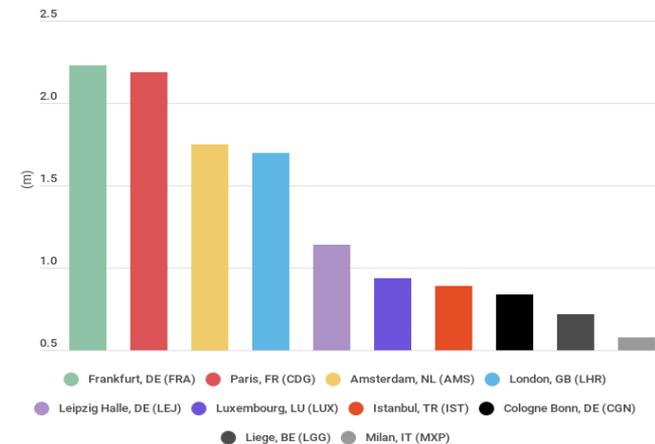
- Frankfurt and Paris are the leading two airports in Europe in terms of cargo volumes, followed by Amsterdam and London Heathrow.
- Their proximity to the economic centre of Europe allows for quick delivery of air cargo consignments which are usually time sensitive.
- Germany hosts three of the top ten cargo airports in Europe, testament to the importance of its manufacturing industry and large consumer markets.
- Key airports host the major international express operators: Paris and Liege – FedEx; Cologne Bonn – UPS and Leipzig – DHL.
- Expansion of London’s Heathrow Airport has been mired in controversy due to environmental concerns, delaying a new runway.
- Other airports in Europe also suffer from similar constraints such as night flying bans.
- Emissions and noise will continue to be important challenges to the industry.

Europe airports: Cargo volumes (tonnes)



Source: Individual airports/Ti

Top 10: Cargo airports - Europe (Tonnes)

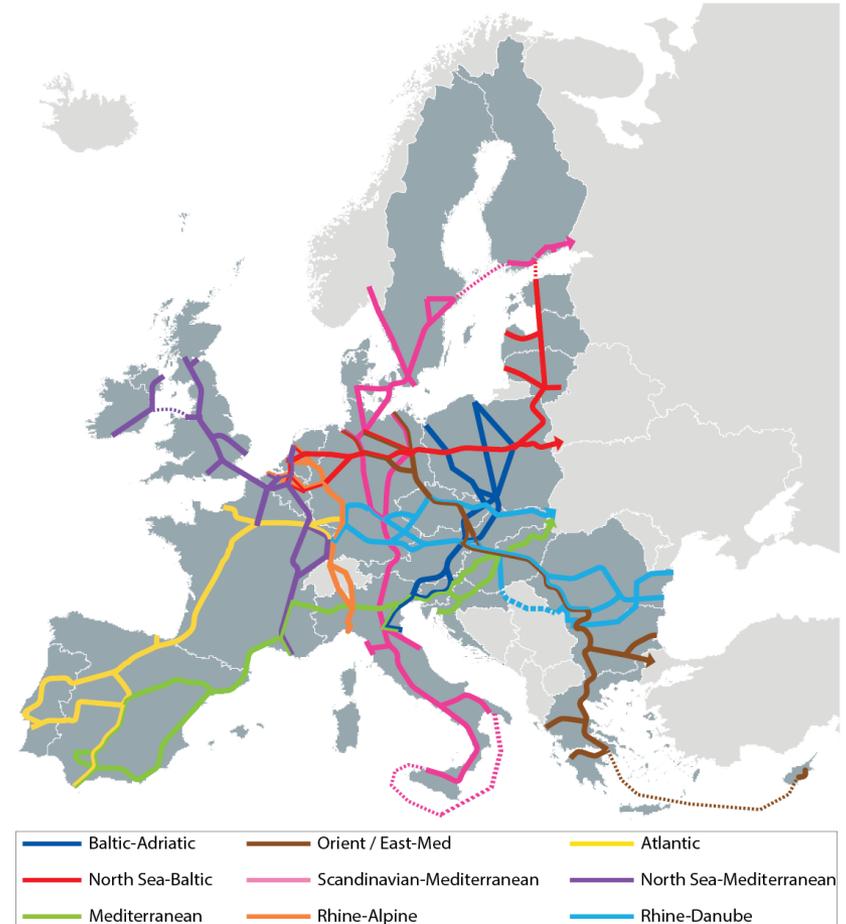


Source: Individual airports/Ti

### 3.6.5 Europe: Roads

- The Trans-European Transport Network (TEN-T) is part of a set of European Union infrastructure plans called the Trans-European Networks (TENs), which were devised by the European Commission in 1990.
- TEN-T was specifically developed to promote connectivity between members of the common market, by removing cross-border infrastructure gaps, such as incompatible rail standards. It is composed of nine separate corridors of coordinated transportation infrastructure, including roads, railways and inland waterways.
- The current policy for TEN-T (2014-2020) was agreed in January 2014 and has a budget of €26bn. It calls for the development of a ‘core network’ of the nine corridors. An associated requirement is the raising of funds for the TEN-T, to be secured through the Connecting Europe Facility (CEF).
- By 2020, the implementation of all necessary projects should have been agreed and construction should be underway. The completion of the network is not expected until

2030, with a more extensive ‘comprehensive’ network to be in place by 2050.



### 3.6.6 Europe: Brexit Challenges



- Brexit is expected to have far-reaching consequences for the road haulage industry. Many uncertainties could arise for UK haulage companies as a result of Brexit, particularly in terms of employment, drivers' hours rules, access to markets and tighter border controls.
- Once the UK has exited the EU (March 2019), relevant transport legislation will still stand unless the UK Government repeals this or takes steps to amend the various statutes. There would seem to be little sense in the UK looking to unravel transport legislation that came from Europe as that would undermine the ability of UK hauliers to participate in European trade and the movement of goods.
- However, while departure from the EU would have very little impact on UK laws which emanated from Europe, as soon as amendments proposed by the European Commission in the Mobility Package come into force, the UK rules in the road haulage sector will diverge significantly from those in Europe. To prevent this, the UK would have to implement the proposals in the Mobility Package in order to maintain parity with EU standards.
- Depending on any deal which may or may not be agreed between the UK and EU, supply chains may be affected. In particular there are concerns of bottlenecks at Dover/Calais crossing.
- Contingency plans are being put in place to create a giant truck park in Kent to accommodate lorries which may be affected by new border controls.
- Manufacturers and retailers have started to stockpile products to ensure continued supply if there is disruption.

## 3.7 North America: Summary



- The North American logistics market is fragmented. Besides transportation and distribution services, numerous niche players offer specialised services such as reverse logistics, IT services and consulting.
- Trade continues to improve steadily and the economy is growing strongly. However, a driver shortage, tight capacity, infrastructure and regulations are affecting the industry.
- Ports and airports are investing in new capacity in order to cope with on-going demand.
- The widening of the Panama Canal and the expansion of regional industrial activities are amplifying volumes in the southeast of the US.
- Rail and intermodal services are booming, although shippers across the region complain of poor rail freight service, tight capacity and labour disputes.
- Large fleet owners are investing heavily in new trucks, which is driving associated supply chains. However given signs economic growth is cooling, this investment may not continue.
- Hours of service (HoS) regulations have further reduced the capacity of the trucking market by limiting drivers' hours.
- Infrastructure is a key issue for the region. For example, Canada is seeking to improve roads and rail along the US-Canada border.
- Amazon has transformed the retail logistics market with many retailers going out of business in the process. Investment in warehouses has boomed as it becomes critical to hold inventory near to consumers in order to facilitate time sensitive last mile deliveries.
- Although the pace of growth of the economy is benefiting the logistics market as a whole, the rising cost of moving goods will not be good news in the long term. Rate increases will inevitably filter through into the price of goods, which may fuel inflation. This will have much deeper consequences for fiscal policy.

### 3.7.1 North America: United States



- The truckload sector is highly fragmented with more than 500,000 carriers. The majority of these carriers are smaller operators, working with fewer than 20 trucks.
- The less-than-truckload sector is much more consolidated than the truckload sector, with fewer than 10 companies in North America accounting for more than two-thirds of the industry revenue.
- Out-sourcing in the US market is not as far advanced as in parts of Europe, with a large proportion of business remaining in-house. The largest contract logistics player in the market is DHL Supply Chain.
- Following the widening of the Panama Canal, East Coast ports are expanding in anticipation of gaining market share from the shifts in trade that is expected.
- Intermodal transportation is increasing in importance. This is due to a number of reasons such as the lower costs of intermodal transportation, a shift from exclusive use of trucking because of tight capacity and the more 'environmentally friendly' use of rail versus truck.
- Other trends affecting the US logistics industry include the rise in e-commerce activity. Retailers are adapting by dedicating more of their distribution centres to the service. Amazon is investing heavily in distribution centres right across the country.
- As with other markets, the transport industry is constrained by a driver shortage which has pushed up logistics costs.

### 3.7.2 North America: Canada

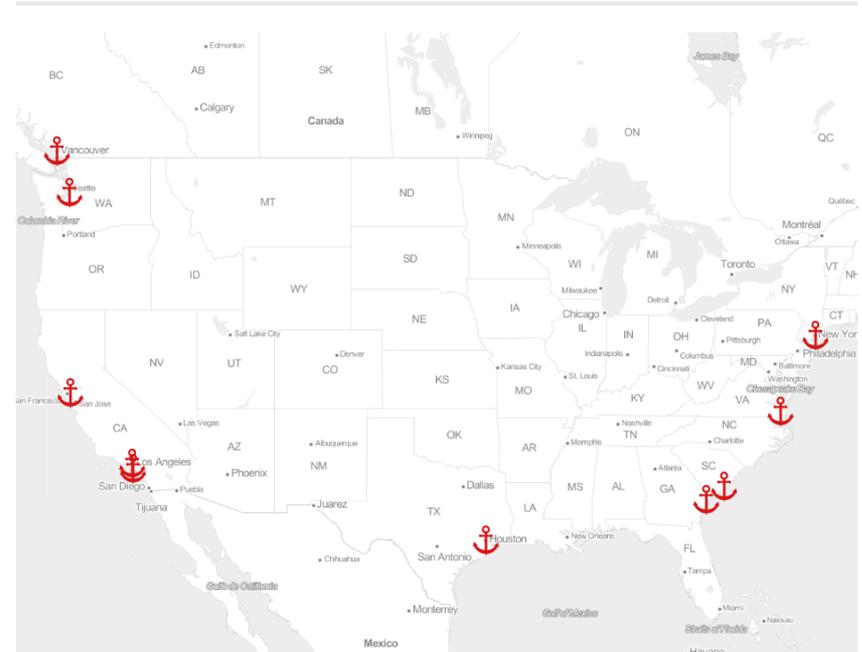
- Canada enjoys a substantial trade surplus with the United States, which absorbs more than 70% of Canadian exports.
- With 90% of Canadians living within 100 miles of the US border and 85% of Canada's 20 largest cities located within 110 miles of the border, Canada-US trade is robust.
- A significant proportion of trade is cross-border intra-company transfers. Automotive parts, for example, frequently cross the border several times before entering the final assembly stage.
- In the oil and gas extraction sector, storage and transportation of equipment represents a significant proportion of investment.
- Due to the growth in international demand as well as consumer demand, investments in distribution facilities in Canada have increased greatly.

### 3.7.3 North America: Ports



- Competition is fierce among the North American ports. The US ports are straining under increasing tonnage and in some cases the inability to service mega-ships. This has led, at several times in the past five years, to ships diverting to Canadian rivals.
- Many of the ports are seeking funding for dredging to deepen harbours and obtain the equipment needed to support the increasingly large mega-ships blamed, by US West Coast ports in particular, for congestion problems.
- A strong US economy and the threat of tariffs on Chinese imports led to another congestion crisis at the end of 2018 at West Coast ports.

Top 10 Ports: North America (TEU)



Top 10 Ports: North America		2017 (TEU)
	Los Angeles, USA (m)	9.34
	Long Beach, USA (m)	7.54
	New York/New Jersey, USA (m)	6.71
	Savannah, USA (m)	4.05
	Seattle & Tacoma, USA (m)	3.67
	Vancouver, Canada (m)	3.25
	Norfolk, USA (M)	2.84
	Houston, USA (m)	2.46
	Oakland, USA (m)	2.42
	Charleston, USA (m)	2.18

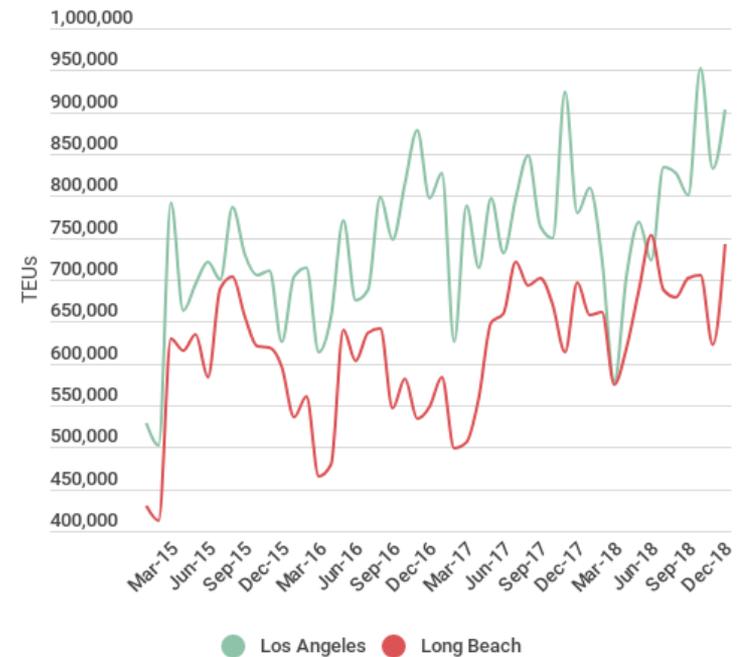
Source: Individual ports/Ti

### 3.7.3 North America: Ports



- The widening of the Panama Canal has provided opportunities for East Coast ports to take direct calls from Asia. The Georgia Port Authority has announced a major expansion programme. There are also plans to build landside rail freight transport infrastructure.
- The supply chains of car assembly plants in Georgia, South Carolina and Alabama are becoming increasingly global, linking to not only Europe but increasingly South America and driving container volume growth.

## LA & Long Beach: Port volume development

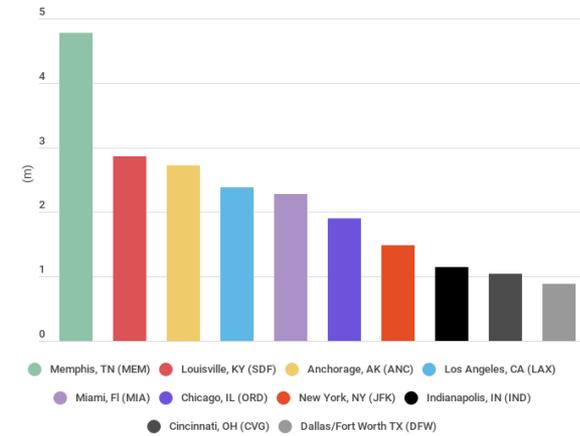


Source: Individual ports

### 3.7.4 North America: Airports

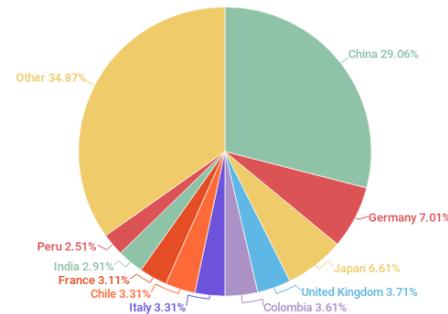
- Memphis International Airport is the United States' busiest cargo airport and is the second largest air cargo hub in the world in 2016, after Hong Kong.
- FedEx has a parcels hub at the airport, operating 400 flights a night.
- Anchorage International is the region's second busiest cargo airport, although most of its cargo is transit.
- Louisville is also an air express parcels hub, operated by UPS.
- Miami is used as an air cargo hub for Latin American traffic used especially for the movement of perishables, flowers and fresh fruit and vegetables.
- As the chart shows, China is the biggest origin of air cargo imports by a substantial margin. It is also the biggest export market.

Top 10: Cargo airports - North America (Tonnes)



Source: Individual airports/Ti

Top 10 US air import origins



Source: Individual airports/Ti



### 3.7.6 North America: Challenges

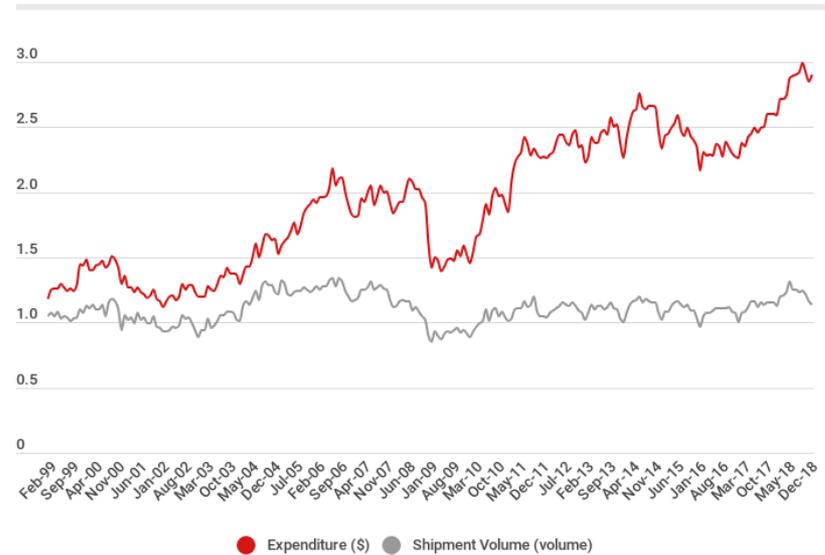


- Road infrastructure across the region is in need of much improvement. Years of neglect and lack of government investment has been an ongoing problem. However, with increasing regional trade and rising intermodal usage, the need for improvements has reached critical levels.
- Logistics costs are rising due to tight capacity in the trucking markets. This situation has been exacerbated by a driver shortage (see Cass Freight Index opposite).
- Ports are finding it difficult to cope with the import volumes of containerized traffic. The situation has been made worse by ‘lumpy’ demand caused by the implementation of tariffs.
- Ironically a slowdown in the Chinese economy caused partly by these tariffs will, in the long run, lead to a slowdown in trade and container shipping.
- The protectionist measures taken by the Trump administration and withdrawal from

agreements such as the TPP will be a headwind to global trade.

- Rail and intermodal services are criticized by shippers as being of poor quality.

### Cass Freight Index



Source: Cass Information Systems

- 1.0 What is shaping the global logistics markets
- 2.0 An industry in transformation: Consolidation
- 3.0 Logistics market development by geography
- 4.0 The emergence of logistics clusters**
- 5.0 Freight forwarding
- 6.0 Contract Logistics
- 7.0 European Road Freight/US Trucking
- 8.0 Express parcels
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- 12.0 Total logistics market size and forecast
- 13.0 Supply chain technologies
- 14.0 Supply chain dynamics of vertical sectors
- 15.0 Risks in global supply chains
- 16.0 The e-commerce logistics phenomenon
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- 18.0 Ethical and sustainable supply chain strategies



## 4.1 Where to locate distribution centres?



- Manufacturers and retailers spend millions on restructuring logistics systems to ensure customer expectations are met, whilst inventory and transport costs are minimised.
- Function in supply chain
  - If a distribution centre function is to carry out primary logistics activities (e.g. feeding vendor-managed inventory into a manufacturing site) the main hub will be located near to the customer.
  - If the hub is designed for secondary logistics purposes (for example, to distribute finished goods to a consumer market) then its location will be governed by the need for geographic centrality.
- Customer distribution profile
  - The customer distribution profile is of importance to the location of a hub.
  - This may mean geographic centrality, although if the customer distribution profile is global (for example, a medical technology spare parts operation) then the 'connectedness' of an airport may be the overwhelming requirement, more than its physical location.
- Type of product that is being shipped
  - This is important both from the perspective of a product's physical attributes, as well as intrinsic value.
  - If small packages are being shipped, location next to a parcels hub or airport will be important.
  - For higher volume/lower value goods, location at a road interchange or proximity to a seaport may be more important.
- Customer service levels required
  - In sectors where suppliers have to offer their customers a very high level of service (such as in the after-sales market), achieving deliveries in small time windows will have a major effect on the structure of a distribution network.
  - This may require a network of close-to-customer Forward/Field Stock Locations (FSLs), replenished from national or regional distribution centres.

## 4.1 Where to locate distribution centres?



- ‘Secondary’ supply chain attributes. Once ‘primary’ supply chain attributes have been identified, a system of subsidiary factors can then be prioritised and ‘weighted’ in importance:
- Air links
  - Where volumes include air cargo, proximity to an airport is obviously important. However, not any airport will do, as the level of ‘connectedness’ is essential.
  - For high value-density shipments, the need for proximity to an international air express hub has led spare parts operations, retailers, high-tech companies etc. to cluster around airports such as Memphis (FedEx) and Louisville (UPS).
- Shipping links
  - Similar issues of ‘connectedness’ exist for sea freight. As well as the number of routes available from a seaport, fleet deployment (number of ships), container carrying capacity (number of TEUs) and number of shipping lines are important factors.
  - At a country level, China, Hong Kong and Singapore have the highest level of connectivity.
- Road links
  - For most manufacturers or retailers, road links are the most important modal factor in the location of a distribution hub, influencing access and time to market.
  - In Europe this has led to the development of hubs around towns such as Venlo, Eindhoven or Roermond in the Netherlands.
- Non-modal factors. Generally, where there is little to choose between locations on the basis of transportation, decisions will be made through a combination of the following factors:
- Cost of rental, land and build costs
  - The costs of renting, buying and building distribution warehousing varies considerably even over relatively short distances.
  - In Europe rental is highest at Heathrow Airport in London. It is many times that of regions such as Limburg in the Netherlands or even of Frankfurt Airport in Germany.

## 4.1 Where to locate distribution centres?



- Labour
  - Labour is an increasingly important factor in the location of a distribution centre.
  - Legislation in some countries has made the workforce significantly less flexible than in others.
- Other factors
  - Other factors involved in the location of distribution centres include the flexibility and efficiency of customs operations.
  - The availability and quality of a large number and range of logistics service providers.

## 4.2 Centralisation of distribution in Europe



- Most distribution structures normally fall into one or more of the following distribution centre functions:
  - Global distribution centre: often located close to a worldwide manufacturing site and serves to distribute goods to the different worldwide geographic regions.
  - European distribution centre (EDC): serving as a central storage of goods for the European, Middle East and Africa (EMEA) regions.
  - Regional distribution centre, serving as a main distribution centre for a specific region within EMEA. For example, the UK/Ireland region or the Nordic region.
  - Country/local distribution centre, serving final distribution to customers.
- The industry trend towards European distribution centres has been driven by the removal of barriers to cross-border transactions between countries within the European Union.
- Several European countries possess many of the key attributes that make them good

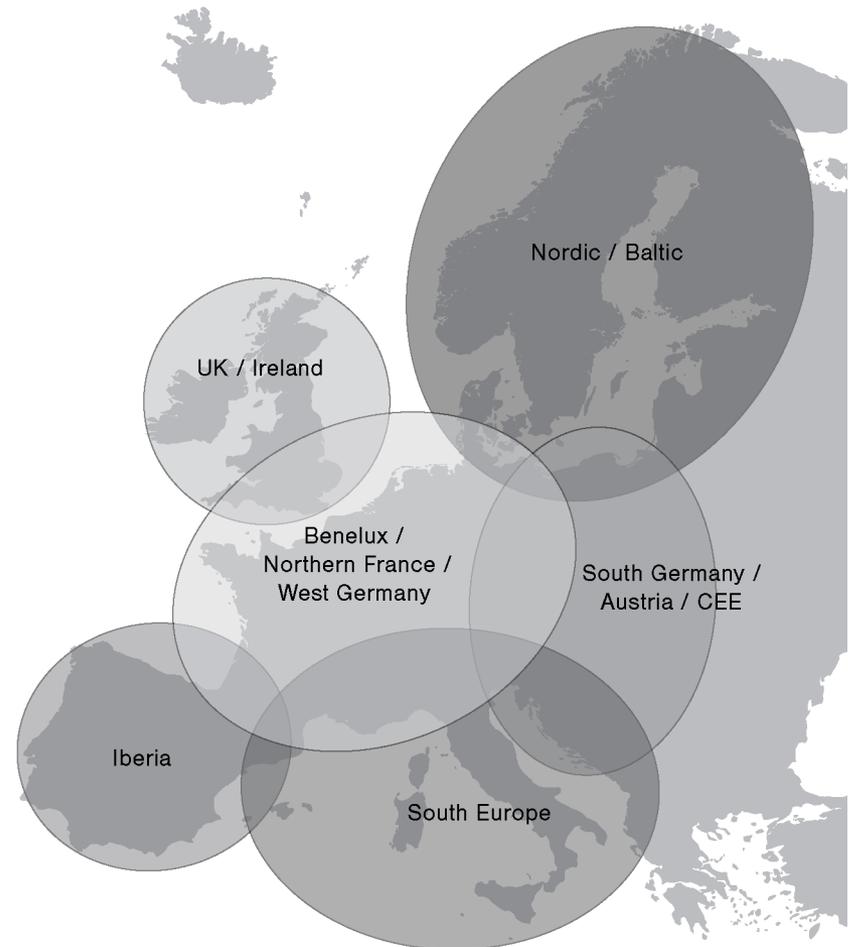
locations for distribution facilities. The most popular are Belgium, Germany and the Netherlands:

- Belgium benefits from its proximity to seaports (such as Antwerp) and airports (Brussels).
- Germany benefits from being the largest economy in Europe, its proximity to rail hubs and its infrastructure.
- The Netherlands benefits from its proximity to seaports (Rotterdam) and airports (Amsterdam Schiphol), its transport infrastructure, the incentives offered to investing companies, the multilingualism of its nationals and the positive business environment (including flexible customs regime).

## 4.2 Centralisation of distribution in Europe

- The accession of Central and Eastern European countries into the European Union has had an impact on European distribution.
- Their relatively less expensive land and labour costs have encouraged many Western companies to locate production and/or distribution facilities there.
- This, in turn, is changing distribution structures.

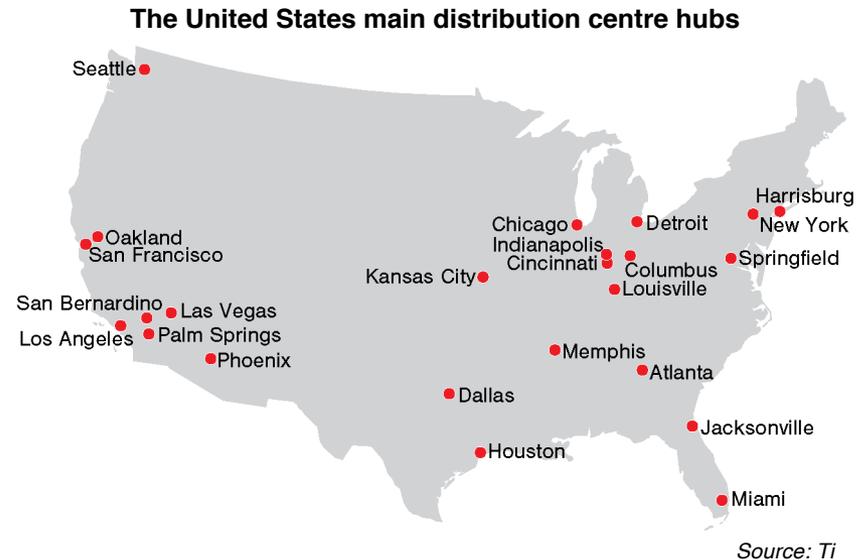
Preferred/future European distribution centre locations



Source: Ti

## 4.3 Centralisation of distribution in the United States

- Distribution space in the United States is divided between coastal areas and 'inland ports'.
- Traditionally, ports in California, Seattle, Florida and the East Coast around New York and New Jersey have been a magnet for warehousing and distribution space.
- The saturation of coastal space has also seen the development of 'inland ports' in locations such as Chicago, Atlanta and Dallas.
- These 'inland ports' have also seen an increase in activity due to the increasing level of goods that are arriving from Asia Pacific and, in particular, China.
- There have also been major changes in distribution patterns in the retailing sector. This is characterised by centralised distribution centres around the centres of gravity of major markets.



## 4.4 Key distribution hubs in China

- Since the mid-2000s, the significant demand and growth potential of Chinese distribution markets has been driven by a number of key factors including:
  - World Trade Organization-related policy changes.
  - A strengthening manufacturing sector.
  - Growth in export markets.
  - ‘Open Skies’ aviation agreements.
  - Expanding domestic markets and investment.
- Geographically, distribution centres in China have been based in three regions: the Pearl River Delta (south), the Yangtze River Delta (east) and the Beijing Tianjin area (north-east).
- Chinese infrastructure is receiving significant investment. Ports have played a vital role in the development of the logistics industry and will continue to develop. Excluding Hong Kong, Shanghai and Shenzhen rank amongst the largest ports in the country.
- In terms of air transport, Hong Kong remains the most important link, primarily due to the

large number of destinations served, the modern facilities and the efficiency of the operation. Shanghai, Beijing and Guangzhou are the three major air cargo hubs situated on mainland China.

China main distribution centre hubs



Source: Ti

- 1.0 What is shaping the global logistics markets
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## 5.1 The freight forwarding industry: market update



- The international freight forwarding sector is facing a challenging time not least because the global economic environment has remained volatile and difficult to anticipate.
- After a sustained period of weakness, Ti expects 2018 air and sea freight growth rates to come in below those seen in 2017, however, growth is still some way ahead of the averages seen between 2011-2016. This trend is the result of the end of the restocking cycle which brought a large proportion of volumes to the air freight market over the course of 2017.
- The forwarding sector has always dealt with uncertainty and volatility well – that is the nature of the job. However it also faces longer term, structural challenges which will prove more difficult to deal with.
- Political upheaval throughout the world has cast doubt on the sustainability of globalization. Remote manufacturing which has characterized trade over the past few decades (and international freight forwarding) is under threat from protectionist forces.
- This is likely to have an important impact on cross-border trade. The growing prominence of regional trade blocs, such as a TPP alliance shorn of the USA, will tend to favour road-based transport and, particularly in Asia, low value, low margin shipping.
- That combined with near-sourcing, driven by increasing labour costs in Asia, will mean that products manufactured in a region will increasingly stay within that region.
- Trade relations between China and the US also impact on the market. Volumes shipped between the two, particularly in the second half of 2018 were lower year-on-year. Sea freight in particular suffered, with US exports to China down by 25.8% year-on-year in the first nine months of 2018.
- In addition there is the looming threat of disruption from a range of players including the giant e-commerce retailers, such as Amazon and Alibaba, as well as a host of tech start ups.

## 5.1 The freight forwarding industry: market update



- In recent years, shippers have increasingly demanded real-time information, quotes and visibility of their consignments in transit.
- Over the coming year, this trend will continue and technology will be used to enable more interconnections and more open sharing of data related to shipment information.
- This may be from incumbent service providers, but it is just as likely to come from parties outside the industry who are more comfortable with designing and operating systems with inherent transparency.
- Those that cannot or do not invest in the necessary technology will rapidly lose their place in the market.
- New forwarders (such as Flexport), unburdened with legacy systems, are rapidly gaining ground, building their entire customer offering around the latest technologies.
- As they operate today, start-up tech forwarders are not designed to manage substantial volumes of complex business from large shippers. However, tech forwarders are undoubtedly set up well to serve SMEs that require simple, standard forwarding services.
- Overall, forwarding start-ups have not displaced large incumbents. They have however changed the strategies of large forwarders, which have set up their own online forwarding platforms in response.
- Large forwarders are transforming from within, embracing new technology in an effort to keep up with innovation and customer service levels offered by start-ups. This change has led to the launches of platforms like Shipa Freight, Saloodo! and KN FreightNet. These platforms aim to provide an easier entry point to their logistic services, particularly for SME's.
- Modal shift from air to sea has long been a trend in freight forwarding. Global manufacturers have found ways in which to flex their supply chains to utilise lower cost sea freight rather than more expensive air cargo.

## 5.2 Structure of the freight forwarding industry



- Freight forwarders play an important role in facilitating international trade, fulfilling a number of distinct functions.
- In basic terms they act on behalf of exporters to buy and manage transportation services. These usually include air or sea freight, as well as the land transportation required to move goods from the shipper to the port.
- In its purest definition a freight forwarder owns no assets of its own, rather it manages the transport and warehousing assets of others.
- In reality many freight forwarders are also involved in 'integrated logistics' as this enables companies to move from the buying and selling of carrier capacity to offering value-added services, increasing what is traditionally a low-margin business.
- Customs Brokerage
  - Freight forwarders also play an important role in liaising with various customs authorities, acting on behalf of the exporter or importer.
  - This includes the preparation of trade documentation, as well as the payment of customs duties on behalf of the shipper.
- Non-Vessel Owning Common Carriers (NVOCCs)
  - A specific type of operation exists in the sea freight sector known as Non-Vessel Owning Common Carrier (NVOCC). This is not only a term to describe a specific business function in the freight forwarding industry, but in some markets, mainly the United States, it also carries legal weight.
- Air freight wholesalers
  - Although the major freight forwarders are able to buy and fill belly-hold space direct from the airlines on certain key routes, many smaller forwarders do not have the necessary volumes.
  - Instead, a group of companies known as 'wholesalers' buy capacity, which they then sell on in smaller 'packages' to freight forwarders.

## 5.3 Modal choice



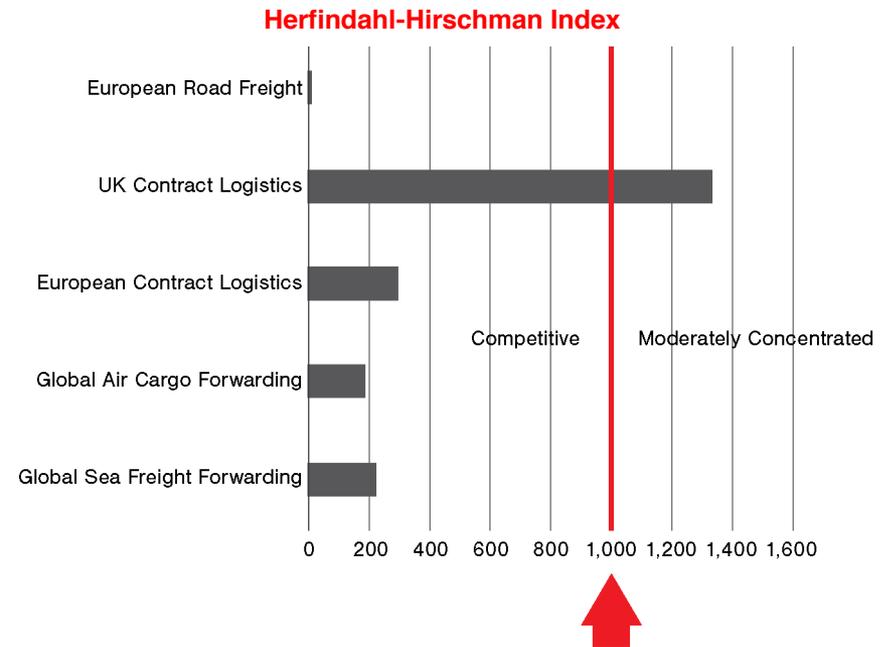
- The decision by a shipper to use either air or sea freight is driven by four main factors:
  - **The value of the goods.** If the transportation element of the final cost of the goods is small, say in the case of high-tech shipments, shippers can afford to send the goods by higher cost modes, such as air.
  - **The time sensitivity involved.** Although the goods themselves may not have an innate high value, such as a spare part for a production line or a ship, the consequential loss that could be incurred by longer shipping times may itself be a factor in the choice of mode. This works equally well for documents and goods with short product lifecycles where there is a critical need to get to market.
  - **The weight of the shipment.** The cost of transporting heavier weights usually precludes the use of air, either through cost, or through the constraints placed upon air freight consignments by the size of capacity.
  - **Product attribute.** Some consignments, such as some classes of dangerous goods, are not allowed to travel by air. This leaves a shipper with sea freight as its only option.

Key factors in modal choice		
Merchandise attributes	Air freight	Sea freight
High value	Y	N
Time sensitivity	Y	N
Quick response	Y	N
Short product lifecycle	Y	N
High value: density ratio	Y	N
Dangerous goods	N	Y

Source: Ti

## 5.4 Fragmentation and consolidation

- Freight forwarding is a highly fragmented market, characterised by small to very small companies.
- Low barriers to market entry allowed very small enterprises to enter the market and compete effectively with the major players, depressing margins.
- This is despite the development of a small number of large companies that have sought to differentiate their products through intellectual capital and IT systems that provide visibility and coordination between the forwarder and the physical asset operators.
- In order to gauge an idea of the level of fragmentation in the freight forwarding market, the Herfindahl-Hirschman Index (HHI) can be utilised.



Source: Ti

## 5.5 The restructuring of the freight forwarding sector



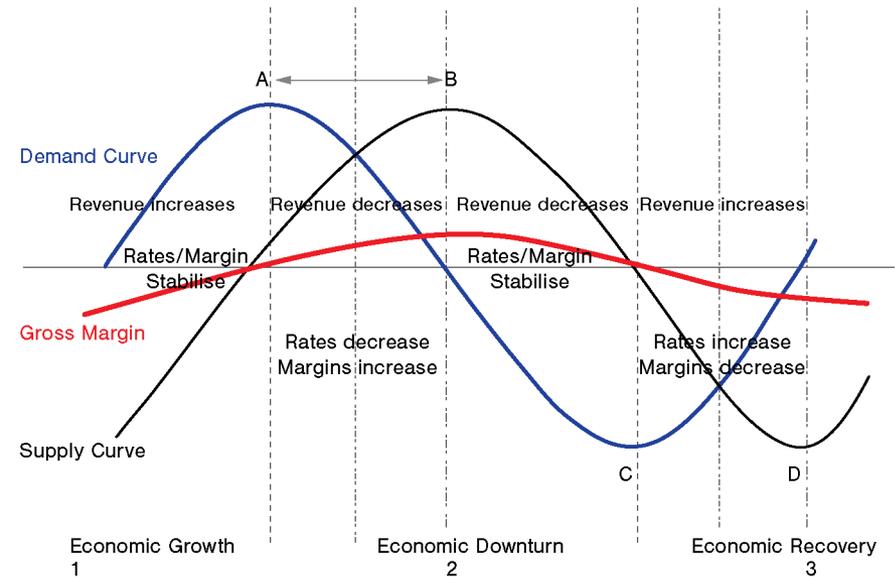
- The last few years have seen considerable merger and acquisition activity as all the major logistics companies have sought to increase their presence in the global forwarding market.
- The highlights of this trend are:
  - CEVA rejected DSV's acquisition offer but allowed CMA-CGM to invest and increase their holding to 33.3%.
  - The purchase of Exel by Deutsche Post. Exel itself was the product of a merger between contract logistics company Exel and forwarder Ocean Group (including MSAS). Deutsche Post had already acquired a number of other large forwarders, notably Danzas, AEI and ASG.
  - Deutsche Bahn's acquisition of German forwarder Schenker and US forwarder Bax Global.
  - UPS' acquisition of two US forwarders, Fritz and Menlo (formerly Emery).
  - CEVA's acquisition of EGL.
  - DSV's acquisition of UTi Worldwide.
- The reasons behind these different purchases vary to a degree by company, but have a unifying logic in reflecting the trends in the market for freight forwarding.
- Through acquisition DPDHL created a logistics division that combines the ability to move large volumes of freight both by sea and by air, using its forwarding capability, with the road transport and warehousing capabilities of its contract logistics business.
- Post-2015, there has been a growing acceptance of technology-enabled forwarding services. These include:
  - Freight marketplaces – independent marketplaces for rate quotation and the freight booking
  - Booking platforms – online booking capabilities linked to an existing freight forwarder, and only offering its own services
  - Digital forwarders – a technology led 'full service' forwarder

## 5.6 Freight forwarding market dynamics

- Essentially, a freight forwarder acts as an intermediary in the market between shipper and carrier.
- The business model depends on their ability to buy capacity and sell it at a profit. This means that the fortunes of the freight forwarding sector are directly affected by supply issues in the shipping and air transport industries, as well as underlying demand from shippers.
- The freight forwarding market is countercyclical, which means that in times of economic downturn it is able to enhance profits, even though total revenues weaken.
- As volumes weaken in a recession, the carriers (either shipping lines or airlines) have excess capacity, which allows the freight forwarders to drive down rates, whilst passing on only a proportion of these savings to the shipper.
- As the economy picks up, carrier capacity starts to tighten and rates subsequently rise. Although the forwarder finds it difficult to pass

on all these rate rises to its clients, its profits in absolute terms increase due to increased volumes.

**Theoretical countercyclicality in the freight forwarding sector – scenario one**



Source: Ti

## 5.6 Freight forwarding market dynamics

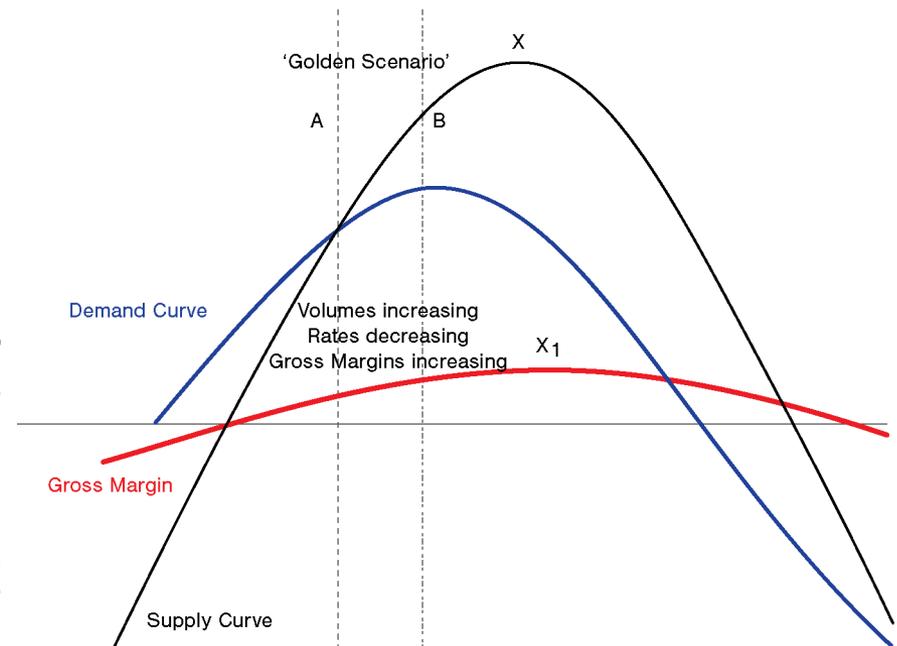


- During a period of economic growth (phase 1 in scenario one), demand and supply increase. In this particular 'normal' scenario, capacity and volumes are assumed to be growing at a similar pace, which means that rates and margins are stable.
- However, as economic growth starts to slow (as the cycle enters its second phase at A), supply continues to increase. The reason for this is that the carriers do not have access to 'perfect' market intelligence.
- Therefore, their decision making as regards whether to bring on or take out capacity lags the actual market situation.
- The effect of this for forwarders is that gross margins start to increase, although revenue growth slows as volumes and rates drop. This part of the cycle demonstrates forwarders' 'counter-cyclical' business model, which is one of the sector's key strengths.
- At point B shipping lines / airlines have realised that they need to adjust their capacity and supply declines. Rates and forwarders' margins start to stabilise.
- At Point C the economy has reached the bottom of its cycle and demand once again picks up. However, due to the lagging effect, supply continues to be taken out of the market, meaning that rates harden and forwarders' margins drop.
- The latter bottom out at Point D, when supply (capacity) is brought back into the market. During this time forwarders still benefit from rising volumes.

## 5.6 Freight forwarding market dynamics

- In a different economic scenario the capacity and demand curves are further out of alignment.
- Supply (Point X) peaks higher and later than the peak in demand. This creates a period of time (between Points A and B) during which volumes are still rising, but are being outstripped by supply.
- This means that rates are falling, forwarders' gross margins are rising and so are their revenues. It could be termed a 'golden scenario' for forwarders.
- The peak of forwarders' gross margin occurs at X1, relating to the peak in supply (rather than that of demand).

Theoretical countercyclicality in the freight forwarding sector – scenario two



Source: Ti

## 5.7 Freight forwarding profitability

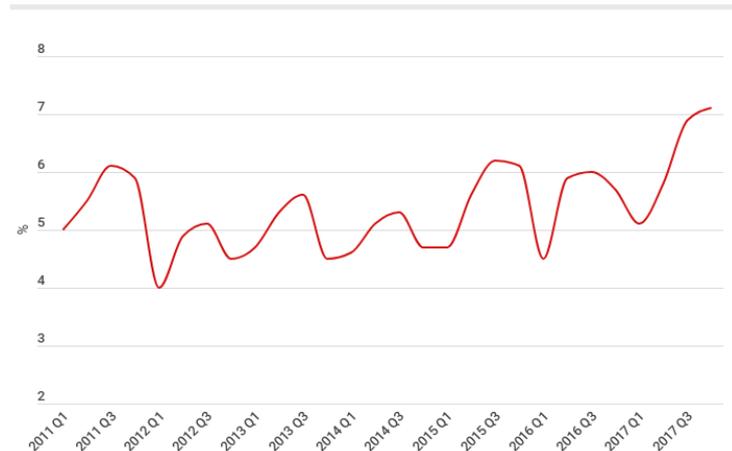


- Freight forwarders are remarkably resilient in terms of profitability. Although margins have undulated slightly in recent years, this is within a range of about two percentage points.
- This is despite the considerable volatility in revenues that was seen over the same period.
- However, there is a considerable range in the profitability of the leading freight forwarders. Expeditors achieve operating profit margins of around 11%, whereas at the other end of the scale a number of companies operate at margins between 2% and 4%.
- Reasons for the variance include:
  - Management and staff. Freight forwarding relies heavily on the ability of staff to buy and sell effectively.
  - Buying power. A freight forwarder with large volumes can buy better rates from a shipping line / airline. It can either benefit from the lower rates by not passing them on fully to shippers or it can use these lower rates to increase market

share, by operating at lower margins.

- Overheads. Some companies will be better at operating with lower overheads than others, including offices and IT.
- Trade lane exposure. Forwarders that operate on the main trade lanes face heavy competition, whilst those that have built up a customer base on more niche lanes or provide certain speciality services or knowledge can charge a premium.

### Average profitability/EBIT margin of a freight forwarder



Note: Average includes margins of DHL Global Forwarding, Kuehne + Nagel, DB Schenker Logistics, Expeditors, Panalpina, DSV and Logwin

Source: Ti

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## 6.1 The contract logistics industry: market update



- Globalisation of supply chains, the growth of e-commerce and technological innovations have changed the structure of the contract logistics market, with logistics providers trying to retain their competitive edge by expanding their service portfolios either organically or via acquisition.
- An analysis of the contract logistics capabilities and strategies of the most prominent logistics providers indicates that they continue to grow in size whilst shrinking in number, maintaining the trend of consolidation from previous years.
- Recent years have seen contract logistics providers pursuing different growth avenues, expanding in high-margin markets, such as healthcare and pharmaceuticals, has become common growth strategy.
- Logistics providers are increasingly forming deeper collaborative partnerships with shippers and taking on greater control of their supply chains.
- Faster economic growth and higher standards of living in emerging markets will push contract logistics providers to expand in these markets.
- The role of Amazon and Alibaba in the logistics sector is still yet to be fully understood. Amazon is a partner, customer and – crucially – a competitor to many contract logistics providers.
- The impact which Amazon is having on the retail sector is unquestionable, with traditional ‘bricks and mortar’ retailers either going out of business or having to change their supply chain models.
- Logistics providers are integrating advanced technologies such as AI, robotics and automation to increase operational efficiency and accuracy. In addition, they are seeking to enhance the value offered to clients with the goal of extending contractual relationships over longer periods of time.

## 6.1 The contract logistics industry: market update



- Following a wave of acquisitions in the industry, key players are focusing on post-acquisition integration. Recognising that leveraging a common structure across the globe can be difficult, key players have put acquisitions on hold, instead focusing on integrating their acquisitions, driving organic growth and consolidating networks.
- Such decisions emphasise that while contract logistics companies typically integrate well due to their asset-light nature, they still need to work on the challenge of integrating the IT systems of the acquired company.
- 2019 looks set to see a continuation of a trend towards greater complexity and more extensive collaboration between logistics providers and their customers.

## 6.2 Emergence of a global industry



- ‘Outsourcing’ has been the main driver of the contract logistics sector over the past few decades.
- Large corporations have focused on ‘core competencies’ and divested their transport and warehousing operations.
- This outsourcing trend has been complemented by the need to manage global supply chains.
- The origins of the contract logistics sector owe a good deal to specific market conditions in the UK and grew out of the wish of grocery retailers and fast-moving consumer goods producers to improve return on capital.
- Although grocery retailing has remained important to the sector, a major driver of the business in the 1990s was the automotive sector in both Europe and North America.
- Increasing numbers of Original Equipment Manufacturers (OEMs) in the automotive, electronics and also consumer goods sectors began to open plants in new production locations in Asia Pacific and Central Europe.
- Faced with under-developed transport markets they approached the existing ‘third-party’ logistics companies to help them with logistics in these new locations.
- This started the trend towards the modern, globalised contract logistics market.

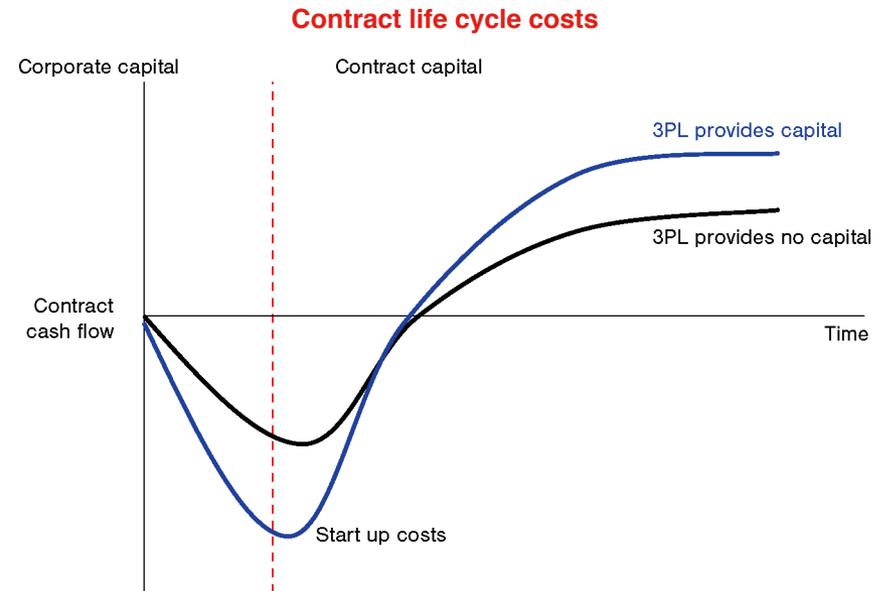
## 6.3 Selecting the right logistics service provider



- Choosing the right outsourced logistics provider is one of the most critical steps that a manufacturer or retailer can take.
- Competitive advantage is achieved by having the best supply chain rather than just the best product and the consequences of getting it wrong can be catastrophic.
- The most important part of the outsourcing process is trust, as without it the relationship between client and supplier becomes adversarial and strained.
- Many clients use a consultancy to undertake supply chain re-engineering and then manage the tender process.
- This type of approach often relegates the logistics providers' input to providing rates for volumes on certain routes, with price a major factor in the decision-making process.
- Many logistics providers prefer to build a more direct relationship with the client in order to maximise their level of value add.
- One of the first issues that the client will look at is the financial standing of a potential supplier.
- Another priority is the level of experience which the logistics supplier has in the client's sector.
- Technology is also an important factor in making an outsourcing decision.
- To many clients the most important issue is that of cost. However, the potential for making savings throughout the total supply chain far outweighs squeezing the transport and warehousing element of the logistics system.

## 6.4 Financial contracts

- One reason behind a company's decision to outsource its logistics to a third party is the desire to take assets off the balance sheet and thereby free up capital to be invested in other areas of its business.
- This is not the case in every contract, as many manufacturers and retailers prefer to own the distribution centres whilst contracting out the transportation activities.
- A transfer of assets effectively means that the logistics provider becomes a provider of capital to its clients.
- The industry as a whole has become sophisticated in this role, especially at pricing the cost of capital into new contracts and making sure that when logistics assets are provided they limit the level of exposure.



Source: Ti

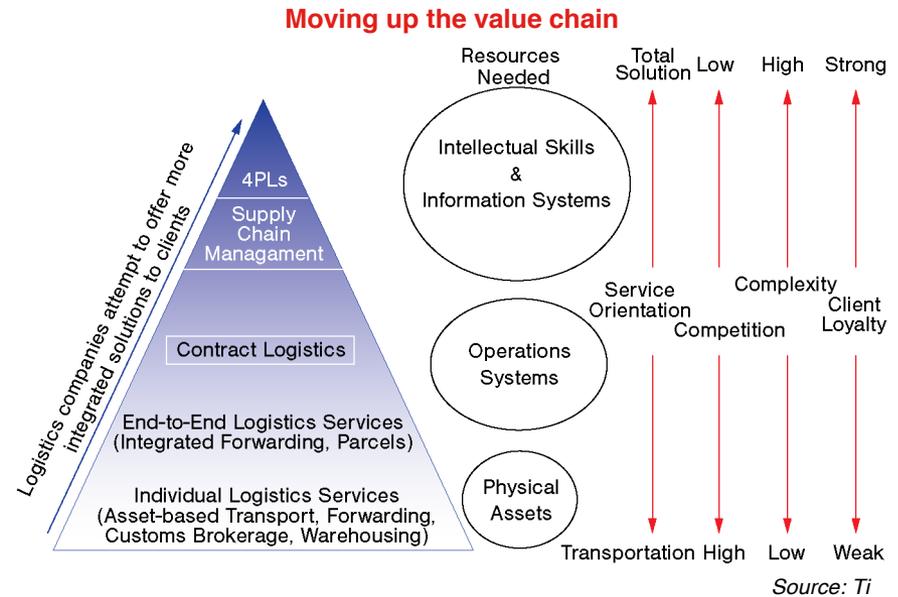
## 6.5 Sales cycle times, contracts and relationships



- Sales cycle times vary considerably depending on whether a logistics provider takes a 'product' or 'project' approach.
- A product, which has easily identifiable attributes, a repeatable format and a set price, should have a low sales lead time.
- Effectively, the client makes a decision to trade off flexibility and customised solutions against speed of implementation and a lower price.
- The project approach requires a much longer lead time to come to fruition.
- The client decides that its needs are so specific or of a magnitude that rules out sharing common attributes with other clients of the logistics provider, that it requires the development of a dedicated, customised solution.
- Relationships in this sector are very rarely on a fixed-price basis. Rather the contractual relationship between provider and customer can take several forms:
  - Open book – this discloses all of the costs encountered by the LSP in fulfilling the contract and sets a fixed profit margin.
  - Closed book – a set price for the contract is agreed and the LSP has to manage the costs.
  - A compromise between the two ('hybrid').
- Open book relationships often have very small margins (and limited upside for the supplier) as the LSP is not taking on much, if any, risk.
- The corollary of this is that neither do they have to invest in assets, which means that although profit margins may be low, return on invested capital is high.
- A closed book agreement may offer high margins if volumes are strong, but much lower return on investment as well as higher risks.

## 6.5.1 Enhancing value through deeper relationships

- Longer-term relationships between customer and logistics service provider afford a host of opportunities unavailable in a short-term, purely transactional relationship.
- A major strategic goal of many transport companies has been to increase their engagement with clients and deliver integrated logistics solutions that leverage their core competencies.
- A deeper engagement allows a logistics company to better understand the needs of its client and develop more innovative solutions.
- This, in turn, de-commoditises its service offering and increases its capacity to enhance margins.
- Deeper relationships also often last longer as the value created for both partners is higher. With the assurance of a longer (contracted) relationship, logistics providers are often more able to invest in new facilities, equipment, resources and technologies that can enhance service quality and capture more value.



## 6.5.2 Collaboration



- The term ‘collaboration’ can be used to refer to co-operative relationships between manufacturers merging their shipment volumes and distribution networks to achieve a range of logistics efficiencies.
- This relationship is often facilitated by a contract logistics provider.
- Within the warehouse, combining inventories can increase distribution centre utilisation.
- On the transport side, co-loading shipments produces synergies where the product is being distributed to similar retail outlets.
- Collaboration can also enhance customer service by providing a critical mass, which allows increased frequency of deliveries.
- Another major benefit is the leverage that shippers gain from negotiating freight rates.
- Consolidating shipment volumes can ensure medium-sized manufacturers can compete in the market on the same basis as larger rivals.
- Collaboration works best if the products and distribution profiles of the collaborating companies are similar.
- Examples of successful collaboration projects include:
  - Global consumer goods giants Kimberly Clark and Unilever have collaborated to build a joint warehouse to supply retailers’ distribution centres in the Netherlands.
  - Reckitt Benckiser, Johnson and Johnson, and Colgate-Palmolive, manage a facility in Unna, Germany, to distribute goods on a shared-user basis.
  - Kuehne + Nagel’s collaboration with JD.com to design a ‘Transfer Centre’ approach – a global supply chain solution which incorporates quality control checks at the consolidation warehouse at origin, prior to shipment to China.
- A major challenge is finding a partner that can facilitate collaboration and act as an independent facilitator.
- The role, which can be undertaken by a logistics provider, may involve promoting the concept, identifying partners, quantifying the benefits, and managing data (for confidentiality, as well as operational, reasons) and operations themselves.

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## 7.1 Europe road freight industry: market update



- The European road freight market remains a fragmented and competitive space where providers face a tough battle to increase volumes and market share.
- The operating environment is by no means easy for the market leaders, with margins low for the likes of DB Schenker, DHL Freight and Kuehne + Nagel, as DSV continues to lead the pack in terms of profitability.
- In domestic markets, which make up over 70% of the total market, consumption and domestic demand are key factors driving growth.
- Driver shortages are becoming more apparent and acutely painful for larger road freight companies. It is difficult to attribute growth in wages directly to driver shortages, but with rising employment levels and wage growth apparent across the continent, it is fair to assume that truckers' wages are broadly increasing.
- EU proposals affecting minimum wage and cabotage rules threaten upheaval, while tech innovations pose a number of questions.
- Disagreements over the EC's Mobility Package of reforms appear to reflect a West-East clash, with the proposals attempting to reach compromises. For example, the proposed rules on posted workers protect Western European companies more than the status quo, whereas the proposed changes to cabotage rules imply the opposite.
- A year and a half after the publication of the first Mobility Package "Europe on the Move", the negotiations on the dossiers in the European Parliament (EP) continue and it seems unlikely that a compromise will be reached any time soon. The inability to reach an agreement reflects the market reality and in particular the East-West clash regarding the social aspects of road freight operations.
- Road freight providers can't rely on volume growth to keep their businesses strong. Increases remain in the low single digits and are set to do so for the foreseeable future.
- The strategies of the market leaders appear to focus on service diversification, enhancing sector-specific offerings, developing their networks and investing in technology. What remains clear is that there are no easy routes to success in European road freight.
- Brexit is creating uncertainty in terms of cross-channel movements, which may cause disruption to supply chains in many sectors, but perhaps most critically, those that rely on just-in-time deliveries. Until the outcome of the process is clearer, there is also uncertainty regarding checks that cargo and drivers will be subjected to at borders, as well as the permits under which operations will take place.

## 7.2 Europe road freight industry: market structure



- Companies with less than 50 employees account for around two thirds of the European road freight market revenues, while companies with over 250 employees account for around 10%.
- Smaller companies are increasingly a physical asset resource that large network transport providers draw on, given their asset light operating strategies.
- The demand side of the European road freight market is quite predictable. European road freight market volume growth tends to be in the low single digits year-over-year, correlating strongly with economic growth and manufacturing growth.
- The supply side of the market, however, is less predictable. Proposed legislation relating to cabotage rules and a driver shortage threatens the market over the longer term.
- Domestic road freight is associated with a much higher rate of empty running than international road freight. Within domestic and international road freight, rates of empty running differ significantly by country. Rates of empty running have remained relatively constant across countries since 2010.
- Diesel, alongside driver costs, are the two most significant costs that road freight providers face. International driver costs per hour for a Bulgarian haulier are four times lower than a Belgian haulier.
- Cost components of road freight typically change only very slowly. The one major exception is diesel, which is the main driver of year-on-year cost fluctuations.
- Road freight rates have grown slowly over the last decade in line with little change in driver and other costs. While the oil price has fluctuated wildly at times over the last decade, diesel prices in Europe change less as around half its price is tax, which is relatively constant over time.
- Domestic road freight accounts for around two thirds of European road freight traffic (one third is international). Cabotage accounts for only 2%, but is more important than this figure suggests because it supports the economics of international road freight. Cabotage mainly takes place in Germany and France, with Polish hauliers accounting for over one third of all cabotage.

## 7.2 Europe road freight industry: market structure



- The European road freight market is not one single market. Rather, it is divided up into a number of different segments that may overlap, yet operate in distinctly different patterns and serve different customer types.
- The big players in the market are the international network transport providers. These are generally described as ‘less-than-trailer’ providers (providers which consolidate and group shipments of various customers to form larger loads), although most of them also provide ‘full load’ services. Other large providers, such as TNT/FedEx, are usually regarded as ‘Parcel Express’ carriers. Fundamentally, these companies are characterised by the use of extensive pan-European networks of cross-docks, that enable truck capacity to be optimised.
- Establishing such networks is demanding in terms of capital, increasing the entry barriers to the sector and making it very difficult for smaller companies to compete. Essentially, these companies offer economies of scale to complex patterns of freight. The offer of higher frequency services and small batch sizes, at an economic cost, is highly attractive and these types of services are gradually winning market share. These companies tend to be less active and competitive in national and regional markets, where small to medium-sized carriers are better able to

compete.

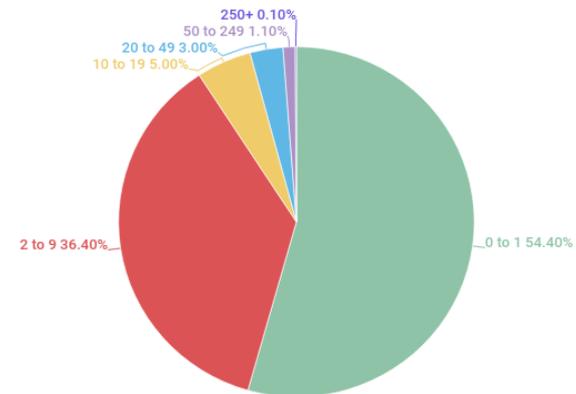
- Generally, large networked providers use smaller truck operators as sub-contractors, to supply trucks for their system. In many cases, over 90% of vehicle capacity is provided by these sub-contractors. The attraction of using sub-contractors is the ability to work assets hard, as well as flexibly. In effect, it exploits the easy availability of trucks and the willingness of smaller companies to get poor returns on their assets.



## 7.2 Europe road freight industry: market structure

- Segment by service attribute
  - A further method of defining the market is by the level of service that can be offered by road hauliers for either parcels or freight.
  - **Express (day-definite or time-definite services).** Express companies usually undertake to deliver consignments by a specified day and even by a specified time.
  - **Standard (non time-definite services).** Where price is more important than time, delivery is usually on a non-specific two to three days basis, or longer, and the service is also referred to as 'deferred' or 'standard'.
- Segment by company size
  - Smaller trucking companies make up most of the market, particularly in terms of the number of vehicles owned.
  - To a greater or lesser extent, the smaller companies are increasingly a physical asset resource for the large network transport providers to draw on.

### Road Freight enterprises in EU28 by employment size class (2014)



Source: Eurostat  
Data is most recent available at time of publishing

- Medium-sized trucking companies are different. Although they may offer networked services covering smaller geographies, the structure of their business is often focused on 'full load' services.
- These tend to serve medium to large customers, with a demand for services of a higher quality and larger scale.

## 7.2 Europe road freight industry: market structure



- ‘Own account’ and ‘hire and reward’
  - Also known as ‘in-house’ and ‘third-party’ this categorisation draws a distinction between road haulage carried out by a manufacturer or retailer for its own products on its own vehicles and that undertaken by a professional provider.
- Segment by operation
  - **Less-than-Truckload (LTL) / groupage networks** undertake the collation of consignments from a number of different sources to make up a full vehicle load. Services often depart on a set schedule.
  - **Full Truckload (FTL)** is defined as any consignment that fills a whole truck. Operators usually undertake the movement of truckloads on a point-to-point basis, direct to the customer from the consignor.
- Segment by speciality
  - **Temperature-controlled** (for example refrigerated, frozen and thermo).
  - **Bulk** (for example liquid or powder).
  - **Air cushioned** (for example the high-tech sector).
- **Finished vehicle transporters.**
- Segment by geography
  - **Intra-regional and local transport.** Most road haulage takes place on this basis: under 50 kilometres.
  - **Inter-regional or national.** Fewer goods volumes are moved on a region-to-region or national basis. This, therefore, requires a (relatively) more sophisticated groupage or part load operation to make operations economically viable.
  - **International.** Only a small volume of consignments are shipped internationally.

- Segment by level of asset ownership
  - The road freight market can also be divided between asset-owning companies ('road hauliers') and those that manage subcontracted road hauliers.
- Using sub-contractors provides the following benefits:
  - **Flexibility.** One of the major benefits of using a subcontracted fleet is the increased level of flexibility that this allows. If a company is able to build a large supplier pool it is better able to match supply against demand.
  - **Employee costs.** With the increase in the payroll and social costs associated with employees, haulage companies have been keener to use self-employed subcontractors.
  - **Asset costs.** A further compelling reason for the use of subcontractors is the positive effect on companies' balance sheets. Asset-light companies are able to provide a much higher return on capital employed.
- Using owned resources provides a different set of benefits:
  - **Availability of supply.** One of the greatest benefits is the reliability of supply, which can be ensured through the ownership of vehicles and employment of drivers.
  - **Reliability of supply.** Companies that run their own vehicles can ensure that sufficient maintenance is carried out or, in fact, have their own in-house workshops.
  - **Quality of personnel and vehicles.** The role of the driver is crucial to how a company is perceived by its clients and to the public at large.
  - **Asset utilisation.** Companies that employ multiple drivers have the opportunity to more efficiently utilise their transport assets by ensuring longer periods of vehicle usage.
  - **Cost of capital.** Large companies are able to acquire capital for investment at a more competitive rate than smaller subcontractors, providing them with one of the few economies of scale apparent in the industry.
  - **Defensive business model.** Those companies with their own fleets are less vulnerable to the impact of tightening capacity on prices during increases in volumes.

## 7.3 Drivers of European road freight growth

- Much research in the past decade has been dedicated to analysing links between road freight sector output and economic performance.
- As part of sustainable transport policies, governments in Europe have been keen to find ways of breaking the link between economic growth and road freight output.
- According to research carried out by Transport Intelligence, comparing GDP and tonne/kilometre growth over the last seven years, there is a strong correlation.

### EU road tonne km growth and real GDP growth

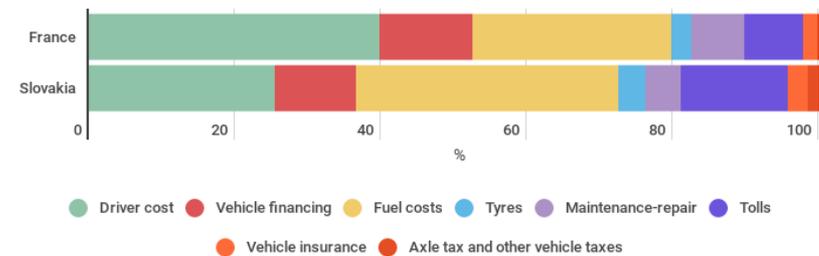


Source: Ti using Eurostat data

## 7.4 European road freight: cost structure

- Even in economies with high labour costs, fuel generally comprises a greater proportion of overall costs than those related to the driver.
- This could vary if the volatility in the fuel market continues.
- Toll costs in Italy and France are more substantial than those in the UK and Germany.
- Whereas in Central European economies the impact of lower labour/driver costs is of greater importance.

### Average cost structure for a 40-tonne HGV France and Slovakia (2017)



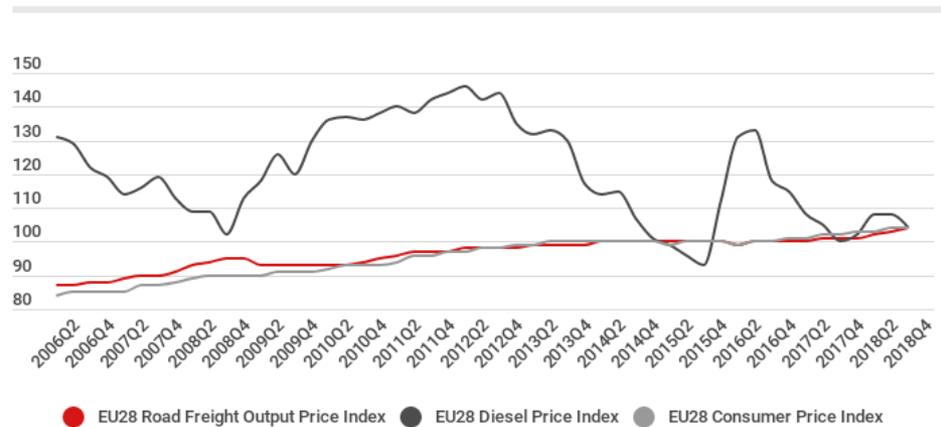
Source: Ti calculations based on Comite National Routier (CNR) data.

## 7.5 European road freight: rates



- Using a Road Freight Price Index it can be seen that European road freight rates have surpassed the peak seen in 2008, just prior to the recession-related downturn.
- Rates have steadily increased since the worst of the economic crisis, but plateaued and even dropped in 2015, due, no doubt, to the ongoing economic weakness in the region.
- Freight operators are generally able to pass on fuel cost increases to their customers.
- The graph suggests that prices are being set by demand and supply, rather than costs which is a little surprising, as it suggests that there is a degree of tightness in supply. On the other hand, there may be a delay in price formation, something which is not unusual in logistics markets.

### Freight prices and cost drivers in Europe (2015=100)



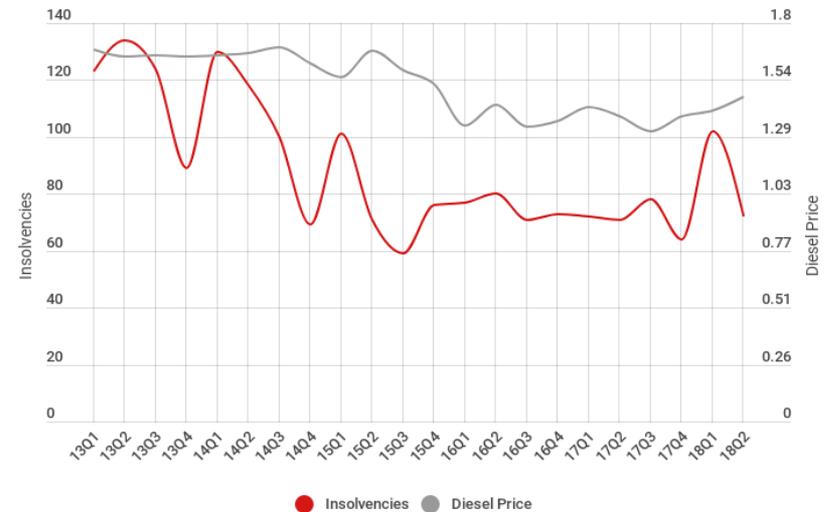
Source: Eurostat

## 7.6 European road freight: profitability and company failure



- The rising cost of fuel is one of the biggest political issues that transport operators and governments face.
- In the UK it was the reason for a wave of fuel strikes in the early 2000s, with operators making the point that increases in the oil price through market forces and taxation were driving companies out of the market.
- However, in reality there seems little evidence for this. Using official company failure statistics from the UK government and a diesel pump price index there does not seem to be a link between fuel costs and company failures.
- The correlation coefficient is  $-0.4$ , which indicates a negative correlation. A strong positive correlation would have been expected if indeed the price of oil were a major factor in transport company bankruptcies.
- Research has shown that there is a stronger link between the level of freight volumes, operating margins and bankruptcies.

### Diesel prices and company failures

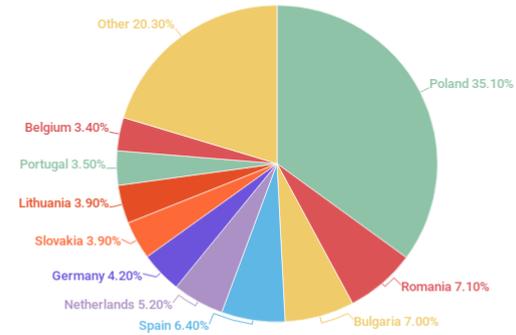


Source: National Statistics/Ti

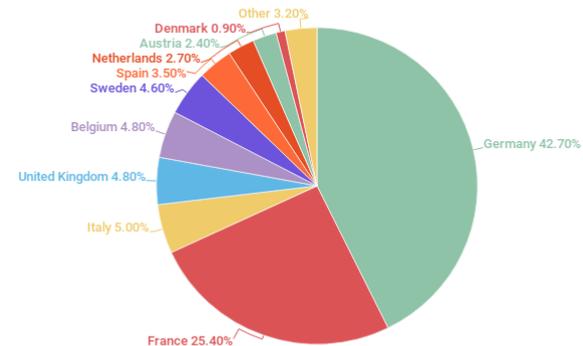
## 7.7 European road freight: Cabotage

- Road freight in Europe is highly regulated, and drivers living and working in one country do not have the right to work in another European country.
- However, 'cabotage', which is the ability of drivers from outside one country to collect a load and deliver it within that country, is permitted.
- This is limited to drivers carrying three loads in seven days. After that they must return to their home country.
- Despite these restrictions, it is quite an important activity in the sector, as it supports the economics of international routes between economies.
- Much cabotage is carried out by Central European drivers exploiting their lower costs in the domestic markets of Western Europe. As a result, some freight companies have been successful in grabbing large segments of the market in Western Europe, prompting a reaction from economies whose road freight sectors have suffered from this competition: notably France and Germany.
- The EU is proposing to change the rules to allow unlimited domestic movements but reduce the period to five days. However, the Mobility Package has hit stumbling blocks and it is unlikely that any new vote will take place before the next European Parliament elections in May 2019.

### EU28 cabotage tkm by nationality of haulier



### EU28 cabotage tkm by country where cabotage takes place



Source: Eurostat

## 7.8 US trucking industry market update



- Road freight remains the dominant mode of transport in North America. The industry claims 70% of the market for freight transport is road freight. The proviso for this number is that ‘energy cargo’ – oil, gas and coal – has distinct transport resources which is not so relevant to trucking.
- The US road freight market has continued to benefit from a healthy economy yet beneath this there are strong signs of a market undergoing significant restructuring.
- Prices for road freight have suffered from substantial inflation, with ‘spot-market’ rates seeing growth in high single-digit percentages. Price increases for customers will affect customer behaviour.
- Overall the American Truck Association (ATA) Truck Tonnage Index at year-end was up 6.6% year-on-year however there was a significant fall off in growth towards the end of the year. Growth in 2017 by comparison was 3.8%.
- Fuel has been an important source of short-term inflation although prices have been falling towards the end of 2018 and beginning 2019. However it is drivers wages that in the long-run that are the major cost-driver. Price inflation will be a feature over both the short and long-term.
- The aging of the truck driver labour-force is already driving-up costs with strong anecdotal evidence that shortage of drivers is increasing wage costs. The ATA estimates that 90,000 new drivers are needed to fulfil demand. The average age of the driving labour force is 55.
- The introduction of the Electronic Logging Device – an electronic monitoring device measuring speed, time and distance – was one of the developments that added to the ‘noise’ around cost. It represents a modest development in trucking but is also an illustration how far this sector has to come in terms of technology.
- The impact of technology on trucking will initially be modest. Although existing vehicles have some impressive semi-autonomous characteristics, the prospect of driverless trucks is many years away. The main possibility here is some form of improvement in productivity. Innovation such as ‘platooning’ may improve productivity in the short-term but the sector is really waiting for good ideas. However new technology is likely to improve safety significantly.
- The increasing cost base in trucking will benefit alternative modes, particularly intermodal services. However it should be expected that other, new services will emerge.
- Over the past decade a major driver of increased productivity has been the IT based brokerages. A good example is UPS’ Coyote Logistics.

ATA Truck Tonnage Index (2000=100)



Source: ATA

## 7.9 US trucking industry – LTL and FTL



- The structure of the US trucking market is dominating by two types of services:
- **‘Less-than-trailer load’ (LTL).** This establishes a network of consolidation centres fed into by truck services. The trucks pick-up smaller loads of one or more pallets and consolidate them into a whole truckload. This offers highly economic means of moving small batches which is very attractive to customers of almost all kinds. It has grown market-share over the past decade. Such solutions require extensive networks of consolidation centres around a hub & spoke model and thus such provision is generally provided by larger companies with substantial capital resources. UPS and FedEx are notable in this market. Average haul length is 1200-1400 miles. That said, there are both national and regional focused services.
- **‘Full-Trailer-Load’** is the traditional form of truck services. Customer purchase whole truck services with the official definition being consignments of greater than 10,000lbs. The structure of this sector is quite different. Although services may be bought through larger companies the sub-sector as a whole is dominated by small truck operators, many of whom sub-contract to larger providers. Within this sub-sector there are further divisions, for example by type of truck –drybed, tanker, temperature controlled etc. In addition there are long-haul service; greater than 1000miles; medium haul 600-100miles; short-haul; less than 600miles.
- Full Truck Load services are also complicated by the nature of the contractual relationship between the customer and the truck company. For large-scale on-going service **‘Dedicated Contract Carriage’** is often used. This offers dedicated trucks to a particular customer, with varying levels of service offered as well. Almost all will include a driver however various forms of depot service, maintenance or transport management planning may be bought as part of the contract package. Contracts may last for 3-5 years and be based on a metric such as mileage or tonnage carried. This sub-segment includes some major providers such as Ryder, Penske and Schneider.
- The trucking sector has consolidated over the past twenty years. Major companies such as FedEx, UPS have entered the market, whilst certain incumbents have become very large, such as Schneider, Werner or Old Dominion
- **Truck Brokerage** is an increasingly important part of the road freight market in the US. Essentially like freight forwarders they are middle-men who buy trucks service to sell onto shippers. The largest of these is CH Robinson, which is very large and influential in the market. However technology has had a substantial impact in this segment, led by Cayote Logistics, now part of UPS.

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## 8.1 The express parcels industry: market update

- Growth in the global express markets has been driven by strong domestic e-commerce sales.
- Domestic markets have been growing more quickly than international markets in most regions, but the gap is narrowing significantly in some. According to Ti figures, there remains a large gap in Asia Pacific, where domestic express market growth grew 13.4% compared with international market growth of 8.7% in 2017. The gap is smaller in North America and Europe, however. In Europe, this is primarily due to the interconnectedness of the market and the lower barriers to international trade.
- Domestic markets have proved capable of seizing on the opportunities that e-commerce brings. A number of issues remain for the international market: there is a higher cost and delivery time associated with international parcels. Trust of international retailers is also a problem for many.
- There is still enormous potential for cross-border e-commerce. It is expected to grow at nearly twice the rate of domestic e-commerce from 2015-2020.
- The B2B market is slower growing than the B2C segment. Numerous reports into B2B parcel volume growth in developed markets have suggested that there is approximately a one-to-one relationship between B2B parcel volume growth and real GDP growth.
- However the boom in B2C e-commerce related parcel deliveries on a worldwide basis far exceeds GDP growth.
- Cross-border e-commerce is boosting the international express market which recorded a bumper year-on-year growth rate of 8.6% in the first half of 2018. International express growth was particularly prevalent in regions with high cross-border e-commerce volumes, such as Asia Pacific and Europe.
- Although overall domestic market growth seems to outperform international growth again, the gap in growth between them is narrowing. Notably, in the major markets of North America and Europe, there was a greater international growth than domestic.
- The market in 2019 will continue to be driven by:
  - The continued growth of e-commerce volumes and especially cross-border business.
  - A healthy global economy and international trade.
  - An busy air cargo market and tight capacity amongst bellyhold carriers which will see more shippers utilising the integrators' systems.
  - Investment by the market leaders in new infrastructure leading to greater efficiencies and opportunities, especially on international lanes.

## 8.1 The express parcels industry: market update



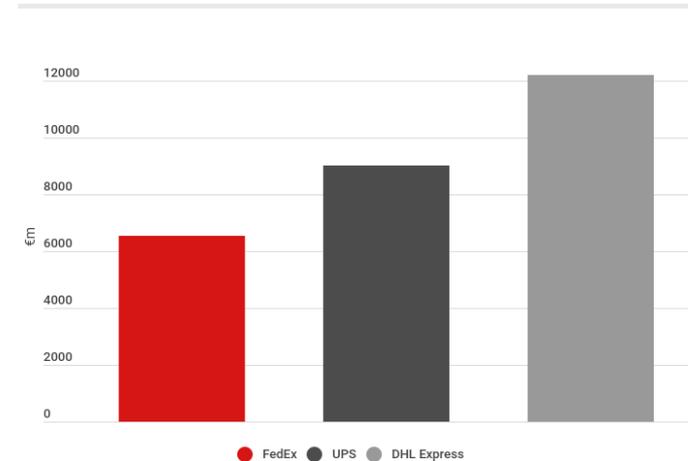
- The market will face challenges of:
  - Increased protectionism and the potential of an escalation in trade tension between China and the US.
  - The threat of a slowing market economy.
  - Longer term fears of e-commerce maturity (although not yet).
  - Labour shortage issues for drivers and warehouse staff.
- The international express market may have to weather some headwinds in the year ahead, not least the trade war between the US and China. This uncertainty, along with Brexit in Europe, has the potential to weigh on the performance of international express carriers. It would be wrong to overstress the importance of such issues in isolation, however, the wider move towards protectionism has the potential to cause an economic slowdown which would be damaging.
- In part, a major strategy announcement in September 2018 by UPS was designed to reassure investors that in the future it would preserve a mix in express volumes to protect against margin erosion.
- This includes being more selective when e-commerce volumes which can be expensive to fulfil and low margin, while also increasing exposure to the pharmaceuticals, life sciences and healthcare sector is of growing importance to the express sector as a whole. Companies see opportunities to make better returns due to the more complex handling, regulatory and operational sophistication of the sector.
- Alibaba, Amazon and JD.com have been driving change over the last several years by developing logistics systems and technologies which blur the line between online and offline retail could rapidly change the market.

# 8.1 The express parcels industry: market update

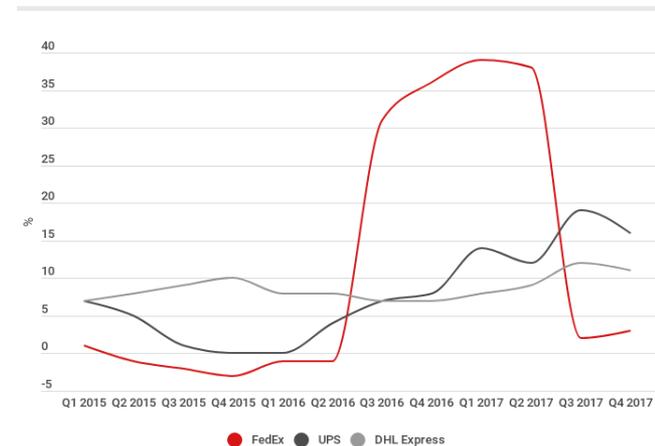


- DHL Express is the largest provider of international express services by revenue. In 2017, it reported revenues of €12.2bn. UPS and FedEx, which are heavily exposed to US exports, reported revenues of €9.0bn and €6.5bn respectively.
- An examination of international express provider volume growth since 2015 reveals that DHL Express' growth has been both strong and stable, averaging 8.6% over the period. UPS' growth path follows a similar overall trajectory to DHL Express, suggesting the two businesses are exposed to similar economic dynamics.
- FedEx growth path was lower than the other major players until Q2 2016, after which volumes spiked due to the integration of TNT Express. Since Q3 2017, international express growth rates have returned to more usual levels.

### International express revenues (2017)



### Year-on-year international express volume growth



Source: Company reports and accounts

## 8.2 The express parcels industry: market development



- The express parcels industry has undergone a major transformation over the past ten years. In the early 2000s, the e-tailing revolution was in its infancy.
  - It was far from certain that many of the major express players, such as UPS, FedEx or DHL, would embrace home delivery due to the high costs involved in the number of undelivered parcels caused by not-at-home end-recipients.
  - Higher margin B2B services, especially in the buoyant economic years in the run up to the Great Recession of 2008, drove innovation in the industry, with huge corporate budgets resulting in initiatives such as electronic proof-of-delivery notes, providing for greater levels of visibility in the supply chain. B2C home delivery companies, often off-shoots of traditional home shopping, catalogue retailers, were seen as a separate sector.
  - Today there has been a transformation in management sentiment and operational and technological focus and B2C is an important part of the major players' thinking and revenues.
  - No doubt the external demands being placed on express parcels carriers to meet the needs of e-retail customers will continue to drive changes in the industry for many years to come.
- 1990s onwards – express companies invest in supply chain visibility technology*
- 1995 onwards – build out regional and global operations networks*
- Mid-2000s onwards – development of B2C capabilities*
- 2015 onwards – adapt operational models to take advantage of new technologies and defend against market disruptors.*
- Domestic postal operators also have significant coverage in their local areas. With strong domestic distribution networks and local knowledge, many of these companies have retained dominance over their own markets.
  - Looking ahead, adapting to the commercial reality of e-commerce looks set to be a feature of the main provider's strategic agendas for the foreseeable future. In 2018, UPS announced a transformation plan that emphasised increasing exposure to high value-add volumes the pharmaceuticals, life sciences and healthcare sectors, while DHL restructured its e-commerce operations to better deal with its last mile cost base.

## 8.3 The origins of the express parcels industry



- The express parcels industry has grown rapidly over the last 30 years. At the outset it fulfilled a need for faster, more reliable services, which also provided customers with an increased level of supply chain visibility.
- Its ongoing success has been based upon the systemic changes that it has been able to facilitate in global manufacturing and its associated supply chains.
- It has enabled and benefited from trends such as globalisation, e-commerce, lean inventory management, Just-in-Time and customisation of mass production.
- The express parcels industry is widely acknowledged as having been developed in the United States by companies such as UPS and FedEx.
- In Europe, TNT's UK operation is generally credited with creating the first next-day parcels service back in 1980. Prior to this, three-to-four day parcel services had been the standard.
- Since the origins of the industry, the market leaders – UPS, FedEx, DHL and TNT – were generally known as the 'Big 4'.
- TNT lacked the resources to compete on the same terms as its three other rivals and has been acquired by FedEx.

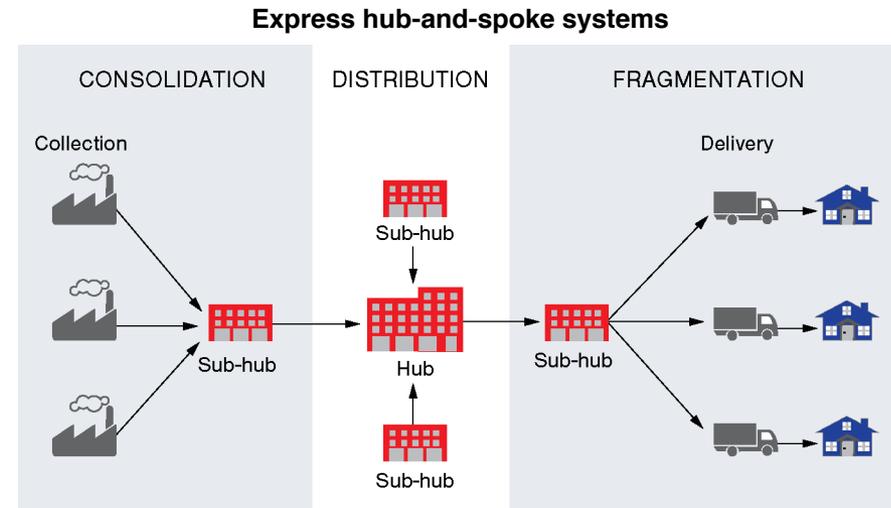
## 8.4 Market definitions and structure



- There is no single definition that encompasses the parcels and express sector.
- A wide variety of companies operate in the market providing services to a number of different segments.
- Time sensitivity
  - Traditionally, there has been a separation in the market between ‘parcels’ and ‘express’ services. The most obvious differentiation between these services is the level of time sensitivity involved.
  - Domestically, ‘express’ usually means next working day. Some companies have a more stringent definition: to qualify as express it must be delivered in the morning of the following day or even by a particular time.
- Size of consignment
  - Traditionally, the maximum weight of a parcel (whether express or not) is usually considered to be about 31.5 kilograms (70 pounds).
  - However, definitions have evolved over the years and now the main integrators segment their volumes in different ways.
  - TNT regards anything under 50 kilograms as a parcel (over is freight), whilst UPS and FedEx use 68 kilograms, and DHL uses 70 kilograms.
- This is a sign that the integrators have been able and willing to penetrate further into what was once considered to be the ‘freight’ segments.
- Business-to-consumer (B2C) / business-to-business (B2B)
  - B2C services (‘home delivery’) have specialist requirements as it is often difficult to carry out a delivery as, unlike businesses, many people are not in during the day to receive goods.
  - Many large B2C operators have been spun off (or in some cases are still owned) by large catalogue and, more latterly, online retailers.
  - Postal operators have been well placed to benefit from the e-retail home delivery trend.
- International / domestic
  - The express and parcels industry can be broadly defined by domestic, regional or international destinations.
  - Domestic express services are normally road-based, whereas international express can require multi-modal transport.

## 8.5 Express operating model – hub and spoke

- All the major European (and global) express and parcels companies operate hub and spoke systems.
- These enable them to provide comprehensive regional and global coverage through the economies of scale that they provide.
- The system works through consolidating smaller volumes from local markets at a central hub and then trunking them to a selection of global gateway hubs, usually regionally based, where the process is managed in reverse.
- One of the benefits of the hub and spoke system is that it allows optimum utilisation of assets and capacity across the network.
- The alternative, line haul between city pairs, is not as efficient and although it may be quicker in terms of transit times, will be less appealing to clients owing to the lower frequency of services or higher costs.



Source: Ti

## 8.6 Long-term trends in the express sector



In summary, the success of the express industry has been based upon providing manufacturers and retailers with the following benefits:

- Speed. By transporting the product more quickly to the customer, the shipper benefits from:
  - Lower sales-to-cash cycle time.
  - Lower total supply chain inventory levels.
  - Better customer service.
- Reliability. Tracking and tracing technology, combined with guaranteed service levels, allows clients to plan schedules with confidence.
- Global service. Most parcels and express operators offer worldwide services, either through their operations or with partners.
- Price. The market is highly competitive both on an international and domestic basis. This provides the shipper with a number of alternatives and, consequently, value for money.

## 8.7 Disruption in the express sector



- It is accepted wisdom that the major express parcels companies, especially the 'Big 3', UPS, FedEx and DHL, have built operations and businesses which are so strong as to make them immune to disruption.
- The global networks they have developed, their brands, their technology and the depth of their finances would seem to make them vulnerable to only a major shift in the demand side (perhaps 3D printing and automation).
- However this is only partly true. There are four types of new market entrant which could compete effectively against the market incumbents (whether the 'Big 3' or national/regional players).
  1. A small number of market entrants which have the resources and the innovative operating models to challenge the 'Big 3', not least in terms of brand, for significant parts of their business. (e.g. Uber, Amazon, Alibaba)
  2. Market entrants which can compete effectively at a micro-level e.g. execution of last mile delivery.
  3. Innovators which can provide platforms that allow shippers to disintermediate larger parcels networks and connect direct to small and medium-size carriers.
  4. Innovators which can provide low-cost technology to SME carriers allowing them to compete with large companies.
- It is perhaps more accurate to say that some of the present operating models of the major players and the technologies they deploy are vulnerable rather than companies themselves.
- Although vast in size, companies such as UPS, FedEx and DHL have shown themselves in the past to be flexible enough to adapt to changing economic and technological environments.
- Many of the innovators which are transforming the industry at present are providing services which can be used by the incumbents rather than actually threatening them. They offer no real threat to the market leaders and are not designed to.
- Therefore, although there is little doubt that the conditions exist for the express parcels industry to be disrupted by new technologies and business models, this is not to say that the giant corporations which dominate parts of the industry face an existential threat.
- In fact, these companies have been at the forefront of innovation over the years and there is no reason to believe that they cannot take advantage of the latest technologies to exploit new markets.

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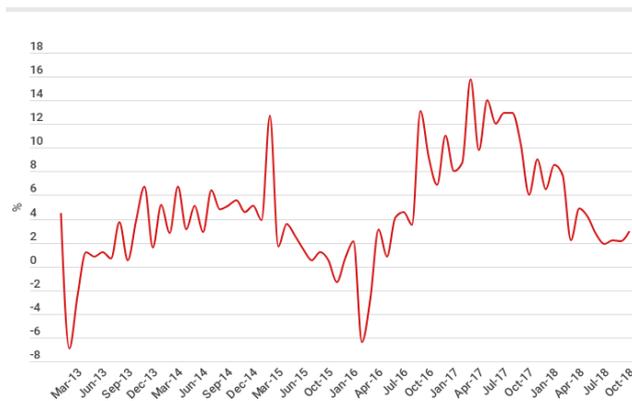


## 9.1 Air Cargo: market update



- The air cargo market in 2018 slowed as compared to 2017, due to technical factors in the first half of the year and underlying demand in the second half. For the moment it appears that air cargo trends have aligned themselves with general trends in global trade.
- Overall IATA reported growth of 3.9% in international freight traffic the year-to-date at the end of November 2018 as compared with the 10% seen in the same period during 2017.

International air freight market FTK growth



Source: IATA

have generally been strong, carrying over from the re-stocking activity seen in 2017. This has depressed growth in airfreight. However the continuing growth of e-retailing has amplified demand for airfreight. Consequently the demand picture is finely balanced. Nonetheless, the clear trajectory of growth by the beginning of 2019 was downwards.

### Growth by Region

- Strongest demand has been seen in North America. Here domestic demand drove imports but exports were also buoyant at the beginning of 2018. However, by the end of the year growth on an annualised basis had slowed to around 1.0%, according to IATA. Routes from Europe to North America were also seeing falling growth, whilst intra-Asian growth was slightly negative.
- Whatever might be driving the slowdown in the Chinese economy, it is reflected in the demand for airfreight around the China and East Asia region, which has seen a quite remarkable shift into 'negative growth' in the latter part of 2018. This is both on the East-West, trans-pacific 'trunk' routes and the supporting 'intra-Asian' routes that feed in components into Chinese assembly plants, which includes routes from South Korea and Japan. This shrinkage is more equivocal on the increasingly dynamic routes into South East Asia from North Asia.

### Growth Factors

- At a global level, 2018 has seen the effects of a number of often contradictory growth drivers. Inventory levels

### Trade wars

- Tensions between the US, China and others is a two – edged sword. During the first half of 2018 strong growth was ascribed to the ‘stocking’ effects of both suppliers and purchasers attempting to build inventory prior to any trade tariffs. Ti has seen little convincing measurement of this, rather evidence was anecdotal. None-the-less it is likely that concern- rather than the reality- about trade frictions have contributed to higher inventory levels. It is also likely that this led to higher demand for airfreight in the first half of the year, but lower demand in the second half of the year due to elevated inventory levels.

### Inventory Driven Growth

- As mentioned above, one of the key drivers of the boom in 2017 and into the first half of 2018 was the increase in inventory levels, itself perceived to be a reaction to trade friction concerns although it is also tempting to feel that there was also an over-shoot from the rapid consumer demand growth seen in 2017, especially in the US. The result has been a fairly predictable ‘whiplash’ effect where the holding of large stock has had a disproportionate effect on airfreight demand. Unless there is a sudden recovery in consumer demand it is likely that raised inventory levels will depress the airfreight market in the short to medium-term.

### Pharmaceuticals

- Again this market sector has been stable compared to other parts of airfreight. However it continues to grow at a highly respectable rate This can disguise the complexity of this market. Much of the real added value in pharma related ‘airfreight’ is not in the transport, but the handling around the movement of product. Pressure on temperature controlled/pharma airfreight prices continues however the complexity and criticality demanded by newer therapies offer a shift to higher margins for certain providers. There is some anecdotal evidence that this is beginning to happen. The big pharma companies that working are on ‘biologic’ therapies are restructuring their logistics. Each therapy differs, but many will not have enormous demands in terms of airfreight whilst a high proportion of therapies will have domestic supply chains.
- The big driver of demand in the pharmaceutical sector is China. It is difficult to get a precise number on the size of the Chinese health-care market although it may be around half that of the US but growing at a very rapid rate. There is a strong possibility that it will be the largest health-care market in the world at some point in the future. Although China has a large pharma production capability its need for imports of products and therapies is very significant and this is beginning to have a major impact on airfreight demand levels and the wider network of logistics provision for the global

pharma supply chain. Although belly-freight capacity is not really an issue nor that of freighters, expect heavy investment in pharma-dedicated infrastructure in China probably led by the Chinese Express companies. However the potential for non-Chinese pharma-specialists is significant, such as UPS. Many Chinese LSPs lack the skill to manage this difficult market although market penetration by non-Chinese has proven to be difficult. Joint venture are likely in the very near future.

airfreight market, especially on trans-pacific routes but also China-Europe routes. It is here that the trade tensions between China and the US have seen the greatest expression. The role of inventory management in this sector is also highly significant. This is clearly illustrated in the slowing of trans-pacific trade growth despite otherwise strong demand in the US. There are other complicating factors that make the role of inventory harder to ascertain, notably market restructuring in China illustrated by the moderating of Apple sales.

### Perishables.

- The perishables market has proved to be more stable than other sectors, not least due its different geography. Sourcing of product is broader than say 'technology/electronics' as is demand. It is noticeable that the sector saw less of a boom in 2017, with WorldACD figures suggesting a growth of 3.8% for much of the year. Equally it the perishables market has been generally less affected- but not unaffected- by trade friction concerns. Exceptions have been sea-food trade between the US and China which has seen considerable changes in geography as both sets of customers seek to change sourcing. Exceptions are areas such as the flower movements from Columbia to the US which continues to grow.

### High-tech consumer

- High-tech consumer products are the key driver to the

## 9.2 Air Cargo: market structure



- Air Cargo is a more complex market that might be assumed. It is subdivided into a number of often quite distinct sub-sectors. These often use distinct 'channels' i.e. different aircraft and even different airports.
- The most distinct channel is that of 'Air Express'. This is explained in greater detail above, however despite the fact that its networks generally are highly distinct, it also encroaches onto large areas of conventional air cargo, for example the Pharma sector is increasingly using *parts* of the large Express carriers such as their hubs. However the pharma sector will avoid using their aircraft. This illustrates the complexity of the air cargo market.
- Air Express has played an important role in the growth of e-retailing. E-retailing often – but certainly not always – looks to use the channels offered by air-express; DHL Express in particular has looked to access this market and it has become a major driver of its growth.
- The relationship between 'manufacturers/retailers' and air freight is more complex than usually imagined. It is assumed that high-value goods are moved by air and low value by sea on a inter-continental basis. This is inaccurate. Even sectors such as pharmaceuticals and higher-priced consumer electronics will utilise airfreight as a smaller proportion of their freight transport requirements within a wider strategy that will have a heavy reliance of container sea-freight.
- Air freight is approached by many manufacturers/retailers as an instrument to be used sparingly, enabling them to respond to quick changes in consumer demand whilst using container shipping as the foundation for their transport needs.
- The latter approach results in inventor levels playing a major role in short-term airfreight demand.
- Many customers of airfreight are highly cost sensitive.
- Around 10% of airfreight movements are Air Express. This is increasing as a proportion of the market.
- A further channel is air-charter, where special cargoes, destinations or high-volume customers charter aircraft for specific routes. The aircraft are invariably 'freighters'. This segment is just a few % of overall volumes measured in freight-tonne kilometres.
- There are 'exotic-trades' within the charter market serving specific cargo types including, hazardous goods, over-sized goods, certain types of fresh or temperature controlled goods such as flowers. Not all or even most of these cargoes are carried by chartered freighters with over-sized goods such as aircraft structures being an exception.

## 9.2 Air Cargo: market structure

- The types of cargoes carried categorised by the WTO are in ranking of importance:
  - Fashion goods
  - Consumer products
  - Temperature controlled goods
  - Pharmaceuticals

As can be seen opposite, by far the largest market for international airfreight is in Asia. This due to both geographical and economic factors. It should also be noted that China is a major market for internal airfreight.

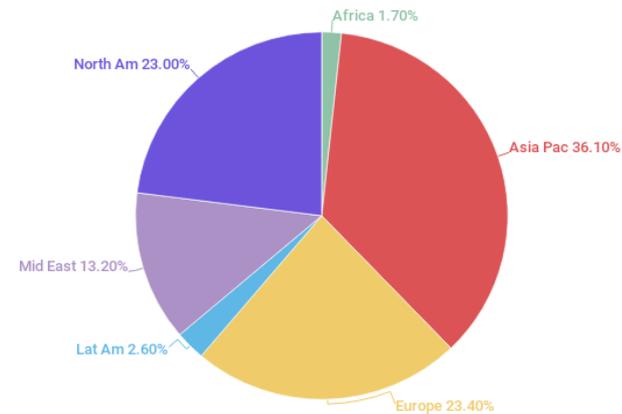
The US is a major market both for international and national airfreight. The largest single airfreight route in the world is that between Asia and North America, accounting for 34% of all international traffic.

The second largest international route is between Asia and Europe, accounting for 31% of all international traffic.

Europe has a smaller airfreight market in proportion of economic size.

The Middle East has a proportionally larger airfreight market for its size, in great-part driven by the capacity of its infrastructure

### International routes as percentage of traffic by FTK November 2018



Source: IATA

The air cargo sector is more fragmented than might be expected and often rather old-fashioned. The past year has seen some movement towards new business models and ‘dis-intermediarisation’, but not very much. The air cargo sector is still some considerable distance from entering a ‘digital economy’.

**Airlines:** Although what might be called passenger airlines dominate airfreight provision as they own- or at least operate – the aircraft, they have a rather strange attitude to airfreight. Airlines rarely have dedicated aircraft to freight, known as ‘freighters’. Generally the freight capacity they sell is ‘belly-freight’ underneath the passenger cabin. Most regard it as a secondary business to their core passenger operations. Also because of their indirect relationship with freight customers, their approach to provision can be somewhat tangential. Their airfreight divisions are entirely dependent on selling capacity through freight forwarders. Airfreight generates 9% of airlines revenue (IATA).

**Air Freight Forwarders:** Essentially ‘middle-men’, they still occupy what might be called the high-ground in the sector. All airfreight is purchased through a forwarder of some-sort. The forwarders can have quite a difficult relationship with airlines not least as airlines resent the domination of the customer interface by forwarders. Much of the real attraction of large forwarders to airfreight is the prospect of ‘added-value’ activities.

**Air Express:** The large global Air Express players; DHL

Express, UPS, FedEx, are quite unique airfreight resources. Not only do they have some of the largest fleets of aircraft in the world, but they are also major purchasers of belly-freight and they have very large airfreight and logistics hubs. They have a very direct relationship with customers and do not market their services through freight forwarders. However their services are generally more expensive than ‘standard’ air freight and they focus on specific sub-sectors in the wider airfreight market.

**Airports;** These are more important than many realise. The largest can demand a premium for access to their infrastructure and their co-operation is essential for the likes of freight forwarders to deploy their added-value services effectively. Airlines and airports have a complex relationship. It is a key judgement for airports on how much to charge airlines without driving them to use other locations. There is a slight tendency towards the creation of freight dedicated airport locations, particularly in Europe but it is hard to see airports such as those in Singapore, Hong Kong or Dubai being replaced.

**Airport Logistics Providers:** Part of the ‘eco-system’ of any freight orientated airport is the logistics service providers around the airport. These can be an important discrete part of any airports market position. They include customs brokers (often provided by freight forwarders), road transport providers, airside cargo handlers and various forms of warehouse operations.

## 9.4 Air Cargo process

The conventional air cargo operations have changed remarkably little over the past few decades. It can be characterised as:

The exporter will book the consignment with a freight forwarder who usually manages the whole process. Certain elements may occasionally be contracted to different forwarders or customs brokers.

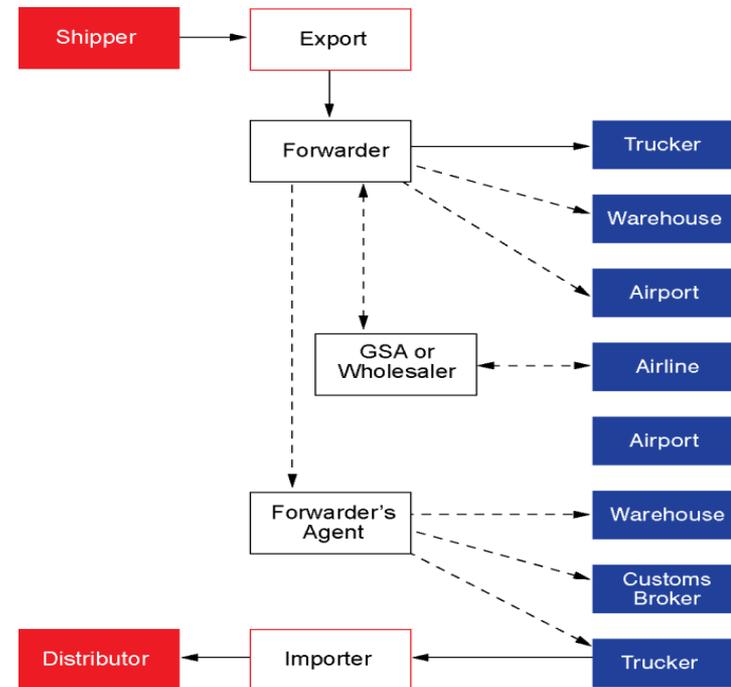
Some freight forwarders will be able to provide physical resources for the whole process although frequently even the largest will outsource part of the process.

Often at one end of the route there is a higher level of outsourcing.

Outsourcing compounds the complexity of the activity. Numerous information interfaces can make this an opaque process.

Despite the complexity of information exchange in the airfreight process, it remains a 'paper heavy' process. With key pieces of data such as air way bills only now starting to be communicated electronically.

### Air cargo processes: Traditional air cargo



## 9.5 A sustainable cargo sector



- Modern aircraft have high fuel efficiencies and manufacturers have made the most significant advances in fuel efficiency of any transport sector in order to drive down costs
- Direct emissions from aviation account for about 3% of the EU's total green-house gas emissions, which is equivalent to 13% of GH G emissions of the transportation sector. The large majority of the se emissions come from international flights.
- It is difficult to attribute which emissions relate to cargo and which to passengers, as in most cases cargo is carried on scheduled passenger flights. This means that with or without cargo, each flight would have generated a certain amount of emissions.
- By 2020, global international aviation emissions are projected to be around 70% higher than they were in 2005, even if fuel efficiency improves by 2% per year. The International Civil Aviation Organization forecasts that by 2050 they could grow by a further 300-700%.
- For optimum fuel efficiency, aircraft need to be light and have low drag. Fuel needs to have high energy content per unit volume/weight. Some alternative fuels are being considered such as ethanol or hydrogen.
- Since 2012 emissions from flights from, to and within the European Economic Area have been subject to the EU Emissions Trading System(ETS)which the EU describes as the 'cornerstone' of its climate change policy.
- Airlines receive tradeable allowances covering a certain level of CO2 emissions from their flights per year. The EU ETS works on a 'cap and trade' principle where a 'cap', or limit, is set on the total amount of green house gases that can be emitted by an organisation. This limit is gradually reduced over time.
- An airline can buy 'emission allowances' or 'off-sets', generated by emission-saving projects around the world and allow it to go above Their emissions cap. Exceeding its cap other wise would attract large fines.
- The theory behind what could be considered as a well-meaning but bureaucratic and complex mechanism, is that it gives value to each tonne of emissions and encourages airlines to take steps to become more energy efficient. The EU also believes that it creates a major driver of investment in clean technologies and low-carbon solutions, particularly in developing countries, which generate the 'emission allowances'.
- The ETS scheme is highly controversial and many non-EU airlines and governments threatened not to comply. This led to a watering down of the provisions, exempting international long-haul flights. Chinas aid the ETS rules would cost their airlines \$123 mint he scheme's first year. At present the system is still in its early days and it is difficult to identify how successful it is for the intra-European flights to which still applies.

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## 10.1 Container Shipping: market update



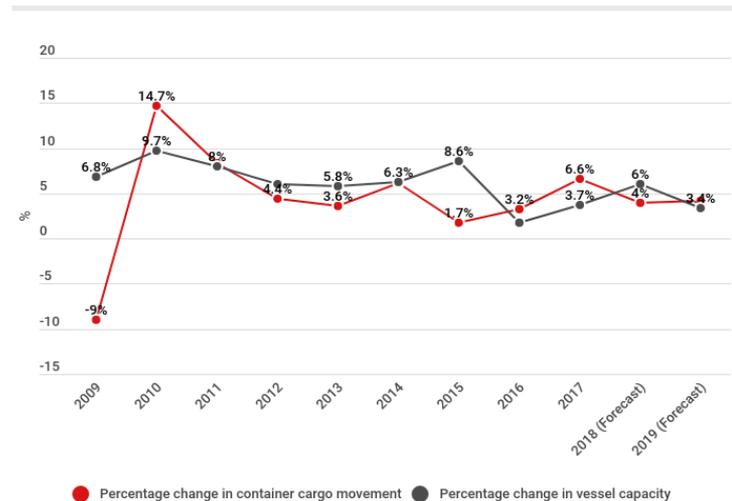
- Overall the market reports growth of 4-4.5% in container volume demand. In comparison 2017 saw growth of 5.8%.
- The condition of the container shipping market has been fairly stable over the past year with a continuation of the state of oversupply. There are modest signs of a reduction in the level of 'new-build' but it hardly represents a fundamental change in a market that is persistently unprofitable for many of its participants.
- Pricing has been also comparatively stable although this has not resulting in much improvement in the financial state of the sector. The problem is that that pricing 'equilibrium' in the market
- The larger container Shipping Lines have begun to develop new corporate strategies that appear to seek higher profit margins through reducing their exposure to container shipping activities.
- The fall in oil prices has helped drive-down both freight-rates and the shipping lines costs.
- Finances of the largest container shipping companies are reasonably stable with stable or rising profits due in significant part to falling fuel costs. Amongst smaller player financial stability is markedly lower.

## 10.2 Container Shipping market demand & supply



- Although there is growth in the demand for container shipping this is matched by the level of building. Whilst building is not quite as intense as in previous years, the global container shipping capacity has seen a 6% increase over 2018 taking it to 22m Twenty Foot Equivalent Units. This represents an addition of 276,000 TEU over 12 months. As has been the case for much of the past decade most of this capacity is in the form of very large vessels including ultra large vessels of over 20,000 TEU. Most orders were for vessels over 10,000 TEU. The rate of scrappage has fallen. Whilst this may have been seen a surprising it is a symptom of a shipping sector still willing to commit capital to the market. There are some suggestions that fleet growth will fall in 2019 to between 3-4%.
- Demand for container services has been under-pinned by strong consumer growth, particularly in the US but to a lesser extent other parts of the west and China. However all of these economies are slowing – possibly just temporarily, yet this is likely to have significant effect on the short-term state of the container market. As the graph opposite illustrates the balance between demand and supply is quite fine.

### Supply-Demand (year-on-year percentage changes)



Source: NYK Line

- The corporate strategy of some of the largest container shipping companies has continued to evolve, with some taking an unexpected direction. There appears to be concerted attempts not so much to move away from container shipping, rather to use it as a platform for something resembling vertical integration.
- Maersk, which underwent a radical restructuring in 2017, has seen further moves to sell the parts of its business exposed to the oil & gas sector. Other than this the clear movement at Maersk is to try and create what it calls an “integrated transport company” with greater integration of services with customer demand based around better information capture from customers. It also implies greater integration with landside transport. In the medium-term this may imply some further strategic change at Maersk, possibly through acquisition or merger.
- CMA CGM has pursued one of the more idiosyncratic strategies through the purchase of a major stake in the freight forwarder and contract logistics provider CEVA. Again the thinking behind this appears to be to shift into a different business to improve margins and to create more integration between its core container shipping activities and other areas of logistics.
- A further major event is the commencement of the ONE joint venture between NYK Lines, K Lines and Mitsui OSK. The merger of these three Japanese companies’ container shipping business saw a difficult start with severe integration problems although the situation has now stabilised.
- The conditions in Asia for medium sized shipping lines is more difficult. However there has been extensive state intervention and this may be an augur of further problems in the market. For example South Korea has resumed ‘soft-finance’ policy for its shipping sector, enabling them to buy new vessels from South Korean ship yards on favourable terms. The ship-yards are also receiving subsidies for production. Similar policies are being pursued in Taiwan.

## 10.4 Container Shipping market structure



- The container shipping industry is characterised by three key attributes:
  - It has a high level of fixed costs.
  - There is little difference in the types of service offered.
  - It is highly concentrated, with a few shipping-lines accounting for the majority of market-share.
- The result is a need for economies of scale. This has meant for sometime that larger shipping-lines have taken-over their smaller rivals. This has led an increasing level of concentration in the leading shipping lines with 30% of capacity accounted for by the largest 3 lines. The largest, Maersk is three times the size of 6<sup>th</sup> largest line and twice as large as the 5<sup>th</sup> largest.

Rank	Carrier	No. of Vessels	TEU Capacity	Market Share
1	Maersk Line	741	3,986,085	19%
2	MSC	482	3,068,295	15%
3	CMA CGM	471	2,467,534	12%
4	COSCO	297	1,767,604	9%
5	ONE	239	1,492,329	7%
6	Hapag Lloyd	209	1,476,356	7%
7	Evergreen	195	1,058,203	5%
8	OOCL	98	667,946	3%
9	Yang Ming	101	592,069	3%
10	PIL	127	376,167	2%
11	ZIM	74	356,967	2%
12	HMM	54	335,497	2%
13	Wan Hai	93	237,599	1%
Total of Top 13		3,181	17,882,651	86%
Market Total		5,140	20,790,940	100%

Source: NYK Line

### Recent Container Shipping M&A

Year	Activity	Description
2017	Merger	NYK, Mitsui OSK & K-Line
2017	Acquisition	Maersk acquires Hamburg Sud
2016	Acquisition	Hapag Lloyd acquires UASC
2016	Acquisition	CMA CGM acquires NOL
2016	Bankruptcy	Hanjin Shipping
2016	Merger	COSCO & China Shipping
2014	Acquisition	Hapag Lloyd acquires CSAV

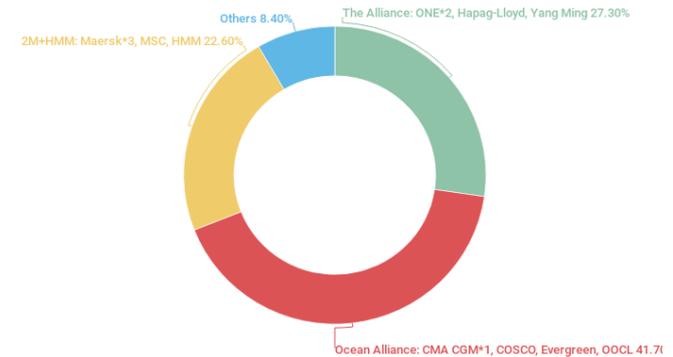
## 10.4 Container Shipping market structure

**Conferences & Alliances.** In order to amplify the gains of economies of scale, shipping lines have a record of creating ‘conferences’ or ‘alliances’. These have had an uneven history, often being ruled to be anti-competitive. Although alliances still exist, they now only share capacity and are not allowed to collaborate on pricing.

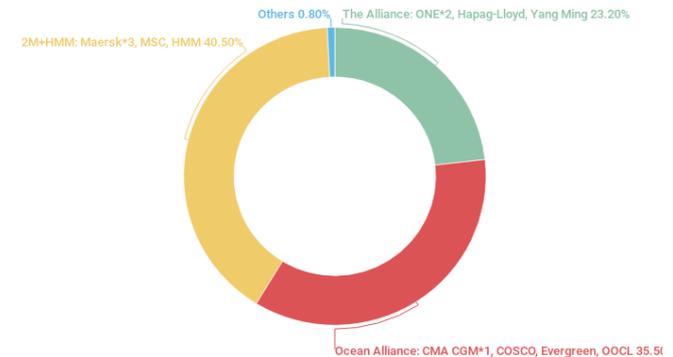
**Ports & Terminals.** For obvious reasons container shipping lines have a close relationship with ports and the container terminals within ports. A number of the largest container shipping companies have extensive investments in ports, with Maersk in particular operating APMT, one of the largest container terminal companies in the world. Others, notably CMA-CGM and MSC have direct equity holdings in variety of ports. COSCO—the Chinese State-owned shipping line also has a major container terminal company as a subsidiary. At one time ownership of a container terminal used to facilitate better, quicker loading and unloading, however this is no-longer so much the case with competition really driving a more open market.

### Share of Megacarriers and Alliances on Core Routes

North America



Europe



\*1 CMA CGM includes APL

\*2 ONE's share is estimated by NYK based on the share of three Japanese shipping companies at the time of calculation

\*3 Maersk includes Hamburg Sud

Source: NYK Line

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- Intermodal largely refers to the market for traffic using both road freight and rail freight. In addition there are intermodal services around river barges. The term does not really apply to sea freight.
- The key asset here is the intermodal terminal, characterised by gantry cranes capable of handling containers. The terminals interface with both major road and rail routes. Often called 'Dry Ports'
- The intermodal market in Europe is a rather opaque and eccentric part of the wider freight transport sector with a heavy participation by both National rail companies and local government. The latter often owns intermodal infrastructure.
- The attraction of intermodal services is supposed to be reduced cost for large consignments over long distances.
- A further and increasingly important role for intermodal services is 'environmental' alternative to road freight. In Germany in particular there is political pressure on larger automotive and chemical producers not to use road freight.
- The future of intermodal in Europe is unclear. Although rising road freight costs as a result of a shortage of drivers and of new regulations around drivers in German and France may make intermodal more attractive, provision is not particularly flexible and may not be able to adapt to new opportunities.
- Intermodal is heavily dependent on the quality of rail infrastructure as well as dedicated intermodal terminals and road freight resources. Rail, especially in Germany is facing major investment demands and this may feed through into costs.
- Increasing trans-continental traffic, notably East-West traffic but also Europe-Asia/China raises significant growth prospects but the infrastructure is not in-place yet to deliver this.
- Interfacing both with Russian rail, but also south Caucuses and Central Asia will become increasingly important very rapidly.

- There are several core types of customer for intermodal services in Europe.
- **Chemical sector:** this industry requires the movement of bulk cargoes to and from large, often port based facilities. Intermodal is a potentially useful solution to this problem. It also offer the option of interfacing with barge transportation. In particular the chemical sector uses intermodal services to move tank containers which are distinctive to the chemical sector.
- **Automotive Sector.** Although the automotive sector is uncomfortable with rail as a mode, seeing it as too rigid and unreliable, it does make extensive use of intermodal services for the movement of finished vehicles. This is especially true in Germany where the movement of vehicles from assembly plants is dominated by intermodal and 'straight' rail-freight. Intermodal is particularly applicable for deliveries direct to customers/dealerships or to local inventory locations. Germany also has a history of using local intermodal consolidation centres at a local level to collect automotive components from component suppliers by road and feed them onto rail services to the assembly plant. The large assembly location at Wolfsburg operates on such as basis.
- **Containers:** shipping containers are frequently moved using intermodal solutions. Not only out of ports such as Antwerp and Hamburg but even in the UK. Here containers are moved by rail from the port to an intermodal facility- there two principal ones in Daventry and Manchester- and then moved by truck to the customer.
- **Swap Bodies:** In certain locations, notably western Germany, the Rhineland, the Netherlands and Antwerp, there is significant use of trucks using swap-bodies to facilitate intermodal movements. Such consignments are for all types of cargoes and are used to attempt to reduce truck use and avoid congestion points. They are also used on trans-Alpine routes as well.
- Intermodal services are unusually influenced by geography. Not only does distance matter in the services overall competitiveness, but the location of the service is remarkably important. In certain places in Europe intermodal has a strong presence in the freight transport market which is not seen elsewhere.
- **Germany** has a particularly strong intermodal sector although it varies greatly from region-to-region. Intermodal is particularly strong in the Rhineland region with its combination of large bulk chemical works, automotive assembly plants. It also strengthened by the proximity of the Rhine. One of Germany's large intermodal facility is located at Duisburg on the Rhine that is both a rail/road intermodal and River barge terminal. Elsewhere in Germany intermodal terminals are more evenly spread although still numerous. They are increasingly used to access suppliers and markets in central Europe.

- **France** is surprisingly a less active market for intermodal services than Germany. Despite having an extensive rail network the prominence of intermodal is lower. However certain key sectors still use intermodal, notably the automotive sector although even here it has lost ground as the sector has become disillusioned with the performance of rail freight. France's container port sector is also proportionately smaller than France the Netherlands or Belgium and thus there is less activity here.
- **Trans-Alpine-** a particular important axis for intermodal. One of the attractions of intermodal moving across the Alps is the ability to avoid the bottlenecks in the road network. Provision here is also efficient helped by the fact that the network is comparatively focused on North-South movements and thus is more efficient.
- **Europe-Turkey.** Routes into Turkey are significant intermodal routes. These include the rail 'axis' into Istanbul which interfaces with a string of intermodal terminals from Barcelona and through Germany and the Balkans. There are also significant routes developing through the Mediterranean which road/rail/sea routes into Istanbul. These should be watched carefully as they have significant opportunities for growth in traffic into and out of central Asia/China.
- **China Land Bridge via Poland.** This is one of the most rapidly developing intermodal locations although at

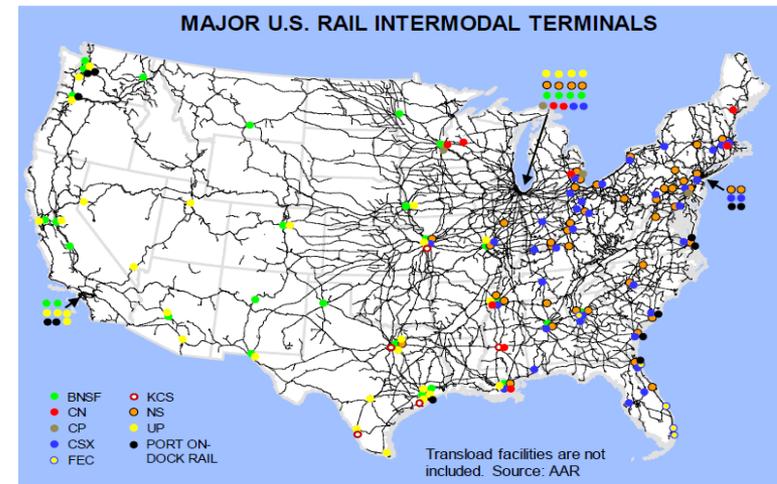
present its growth has outstripped its infrastructure. Although the core 'Europe-China Land Bridge' is rail freight, the 'feed-in' to the system is essentially intermodal.

### Main Players

- **Deutsche Bahn.** German state railways has always invested heavily in Intermodal and now has a terminal structure across Europe. In particular the purchase of the Spanish company Tranfesa gave it a capability from Barcelona to Turkey. Deutsche Bahn also has the advantage of its subsidiary Schenker which is one of Europe's largest road freight operators.
- **Bertschi AG.** A leading Swiss intermodal service provider rooted in the trans-Alpine route but with capabilities across Europe. Strong in Chemical sector tank-containers.
- **GEFCO.** Formerly part of Peugeot-Citroen now an independent LSP. Major road freight provider but with very significant rail capabilities including a network of rail terminals. Intermodal traffic is heavily orientated to finished vehicles.

## 11.3 North American intermodal market

- Intermodal activity in North America is much better defined than that in Europe. Much better integrated into other aspects of freight transport it is a powerful alternative to road freight.
- The reasons for the strength of North American intermodal:
  - Freight orientated rail companies with good infrastructure.
  - Ability of road freight providers to adapt to intermodal
  - Appropriate geography
  - Right mix of cargoes
  - The ability to 'double stack' containers on special rail cars increases the economic efficiency of intermodal.
- Whilst there is significant river barge traffic in the US, intermodal activity is focussed on road/rail.
- Demand is dominated by the movement of containers in and out of mainly west-coast ports. It is one of the most important routes for imports and exports in the US and Canada.
- In 2018 13.7m containers (both twenty foot and forty foot) were moved by intermodal services. This represented 24% of all revenue of US rail companies.
- Automotive traffic is of importance in North America, however its profile is different. When moving finished vehicles distances are generally significant and railheads comparatively more numerous, therefore the road freight component proportionately less. However the movement of components for assembly by rail is more common and therefore intermodal solutions are more frequent.



### Main Players

- Within the US Intermodal market – although not Canada and Mexico- the interface with the customer for intermodal services is predominantly through road freight companies that have opened intermodal capabilities. Some of these are:
- **J B Hunt.** A leading ‘Intermodal Marketing Company’, it is both a large road freight and operates a complex of intermodal hubs.
- **Schneider:** Both a road freight provider and a contract logistics company, Schneider has entered the intermodal sector aggressively with a heavy emphasis on technology.
- **XPO.** Entered the US Intermodal market through the purchase of Pacer.
- **Hub Group.** Started as an intermodal company, running terminals around Chicago and has expanded into other areas such as road freight, from there.

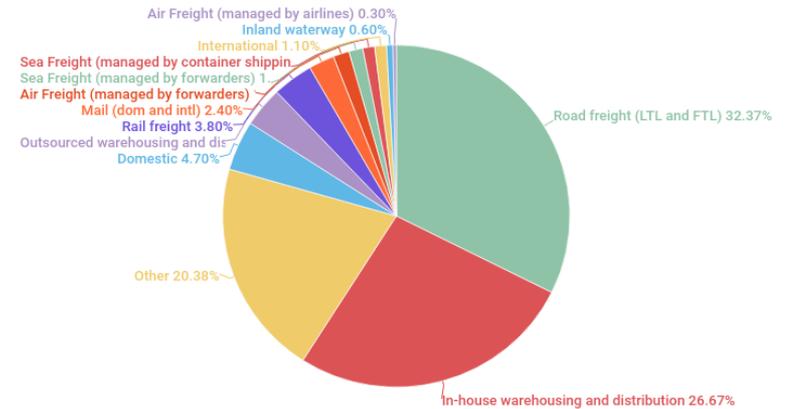
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## 12.1 Total logistics market size – Global

- Ti estimates that the total global logistics market size in 2018 amounted to €5.6 trillion.
- Road freight (LTL & FTL) is estimated to be the largest segment, accounting for almost one third of global logistics spend (€1,810bn).
- In-house and outsourced contract logistics together represent the next largest segment of the market (€1,702bn).
- Thus road freight and contract logistics together account for over 60% of the global logistics market.
- The global parcels market (domestic and international) is valued at €321bn, just under 6% of the market.
- Global rail freight spend amounts to just over €210bn and around 4% of total global logistics spend.
- Perhaps surprisingly, the air freight and containerised sea freight sectors, allied with associated forwarding operations, also only account for approximately 4% of global spend.

### Total logistics market size - Global (€m, 2018)



### Total logistics market size - Global (€m, 2018)

Road Freight (LTL and FTL)	1,810,510
In-house warehousing and distribution	1,488,773
Domestic Parcels	261,818
Outsourced warehousing and distribution (contract logistics)	213,852
Rail freight	211,731
Mail (dom and intl)	133,245
Air Freight (managed by forwarders)	83,984
Sea Freight (managed by forwarders)	71,123
Sea Freight (managed by container shipping lines)	63,707
International Parcels	58,950
Inland waterway	32,178
Air Freight (managed by airlines)	14,821
Other	1,137,888
<b>Total</b>	<b>5,582,579</b>

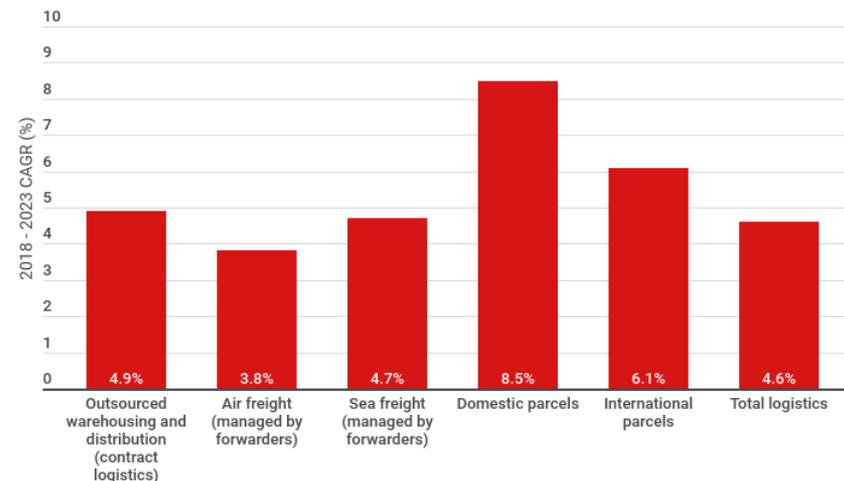
Source: Ti

## 12.1.2 Total logistics market size – Global forecast



- In real terms, Ti estimates that the total global logistics market is forecast a 2018-2023 CAGR of 4.6%. Holding prices and exchanges rates at 2018 levels, this would give the market a value of €7 trillion by 2023.
- Over the same period, real global GDP is forecast a CAGR of 3.6% according to the IMF October 2018 World Economic Outlook Database. Real import and export growth are forecast at 4.1% and 3.6% respectively.
- Some markets, such as road freight, tend to track GDP growth quite closely. Contract logistics is also strongly affected by the performance of the global economy and trade.
- Unsurprisingly, freight forwarding growth rates are heavily influenced by the performance of international trade growth.
- Conversely, some markets are powered by structural shifts
- For example, powered by e-commerce, the global parcels market is forecast relatively strong growth.
- Domestic markets are better equipped to deal with increased online spending, but international barriers are being broken down and the cross-border segment of the parcels market is expected to see strong growth too.
- Over the longer term, industry innovation and disruption may substantially impact growth rates.

### Total logistics market size - Global Forecast

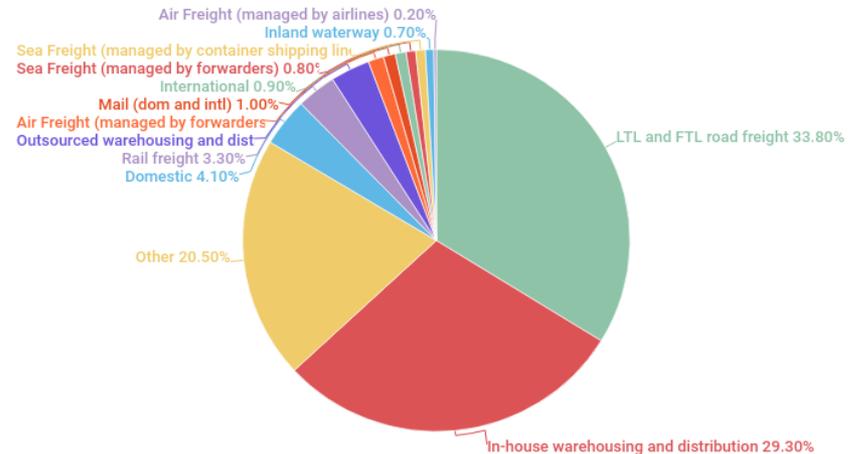


Source: Ti

## 12.2 Total logistics market size – Asia Pacific

- Asia Pacific’s logistics spend is estimated to amount to more than €2.4 trillion, nearly 45% of global logistics spend.
- By comparison, Asia Pacific represents around one third of global GDP.
- This logistics spend premium arises due to the fact that logistics operations in emerging Asia are often more inefficient relative to mature markets such as the US or Europe.
- Poor or under-developed infrastructure, higher tolls and taxes, bureaucracy, corruption, a lack of integrated service providers and a raft of operational inefficiencies are just some reasons why the logistics burden tends to be higher in emerging markets.
- Offsetting this to some degree is the fact that labour costs are considerably lower in emerging markets.
- As was the case with the global market, road freight accounts for approximately one third of global logistics spend, as does the sum of in-house and outsourced contract logistics.

### Total logistics market size - Asia Pacific (€m, 2018)



### Total logistics market size - Asia Pacific (€m, 2018)

LTL and FTL road freight	818,944
In-house warehousing and distribution	710,172
Domestic parcels	100,247
Rail freight	80,586
Outsourced warehousing and distribution (contract logistics)	79,786
Air Freight (managed by forwarders)	31,954
Mail (dom and intl)	25,354
International parcels	21,009
Sea Freight (managed by forwarders)	20,563
Sea Freight (managed by container shipping lines)	18,419
Inland waterway	15,927
Air Freight (managed by airlines)	5,639
Other	497,312
<b>Total</b>	<b>2,425,911</b>

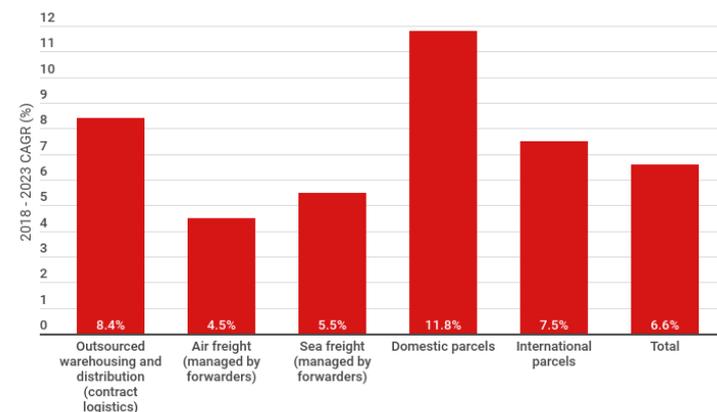
Source: Ti

## 12.2.1 Total logistics market forecast – Asia Pacific



- In real terms, Ti estimates that Asia Pacific's total logistics market is forecast a 2018-2023 CAGR of 6.6%, making it a key driver of global growth.
- The real GDP CAGR for emerging and developing Asia is 6.5% for the period according to the IMF October 2018 World Economic Outlook Database. Its real import and export growth figures are 5.6% and 4.1% respectively.
- Growth forecasts for developed markets such as South Korea, Singapore and Japan are lower.
- Domestic parcels growth is expected to be in the double digits as emerging markets rapidly transition towards e-commerce. China's growth is particularly impressive.
- Outsourced contract logistics is forecast a 2018-2023 CAGR of 8.4% thanks to superior domestic growth indicators in much of emerging Asia compared to developed Western economies. Outsourcing rates are also thought to be on the increase.
- Prospects for freight forwarding growth are less attractive and are in the mid-single digits.
- Threats to the market include the economic slowdown in China and its prospect of a trade war with the US.
- Conversely, the trade war could prompt manufacturers to shift some production to South-East Asia, which would increase demand for sophisticated logistics operations in these countries.

Total logistics market size - Asia Pacific Forecast

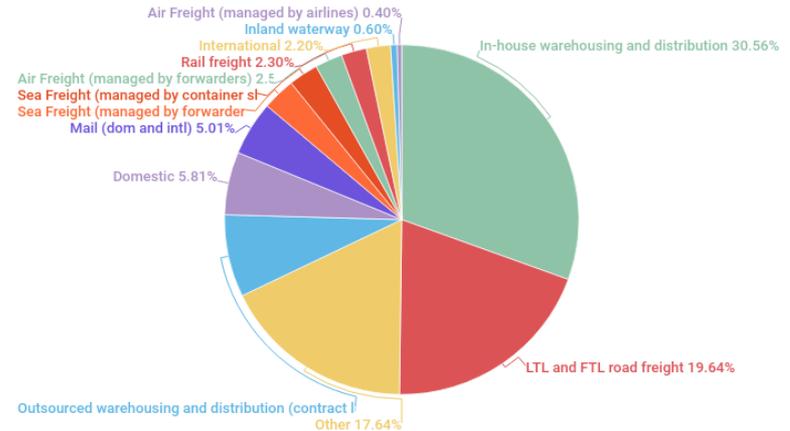


Source: Ti

## 12.3 Total logistics market size – Europe

- Europe’s logistics spend is estimated to amount to around €0.9 trillion, over 15% of the global total.
- By comparison, Europe represents just under a quarter of global GDP
- The logistics sector is thought to operate at a similar level of ‘efficiency’ as the North American market, though considerably more efficiently than Asia Pacific and other emerging regions.
- Due to its maturity in Europe, outsourced contract logistics is particularly prevalent, making up a larger proportion of its market than it does in other regions.
- Road freight is thought to represent around 20% of the market, considerably less than North America and Asia Pacific. Geography and borders play an important role here.
- This also helps to explain why rail freight has a relatively small share of logistics spend in Europe compared to other regions.

### Total logistics market size - Europe (€m, 2018)



### Total logistics market size - Europe (€m, 2018)

In-house warehousing and distribution	277,719
LTL and FTL road freight	178,448
Outsourced warehousing and distribution (contract logistics)	69,213
Domestic parcels	53,275
Mail (dom and intl)	46,004
Sea freight (managed by forwarders)	27,628
Sea freight (managed by container shipping lines)	24,747
Air freight (managed by forwarders)	22,830
Rail freight	21,162
International parcels	19,995
Inland waterway	5,718
Air freight (managed by airlines)	4,029
Other	160,423
<b>Total</b>	<b>911,192</b>

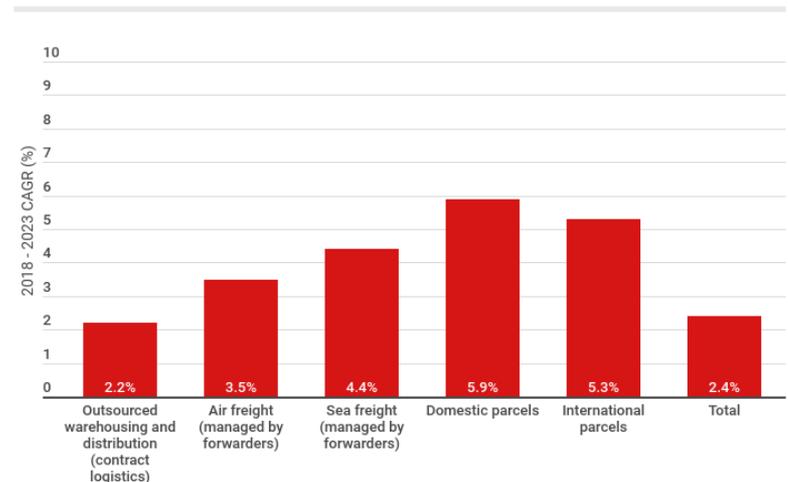
Source: Ti

## 12.3.1 Total logistics market forecast – Europe



- In real terms, Ti estimates that Europe's total logistics market is forecast a 2018-2023 CAGR of 2.4%, lower than the global figure of 4.6%.
- Over the same period, the real GDP CAGR for the EU is 1.8% according to the IMF October 2018 World Economic Outlook Database. On the same basis, import and export volume CAGRs for the Euro area are 4.0% and 3.6% respectively.
- There are considerable differences between the underlying predicted growth rates of a number of logistics markets.
- Domestic parcels growth is expected to be relatively strong thanks to the structural shift towards e-commerce volume in the sector.
- Strong cross-border links mean Europe's international express forecast is not far off domestic express.
- Air and sea freight forwarding growth rates are relatively strong compared to total logistics growth in large part thanks to reasonable trade volume growth forecasts.
- An outsourced contract logistics CAGR of just 2.2% pulls down total logistics growth.
- The European road freight sector is also similarly expected to grow in the low single digits.
- Brexit's uncertain impact on UK and Europe-wide supply chains makes the short-to-medium term forecast for Europe's logistics market more difficult to predict.

### Total logistics market size - Europe Forecast

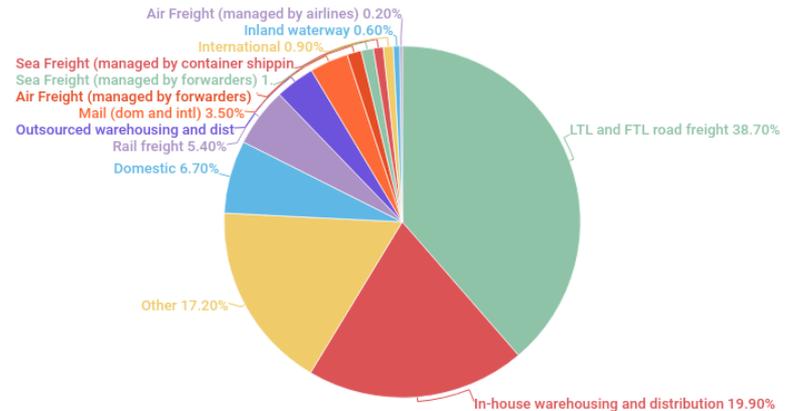


Source: Ti

## 12.4 Total logistics market size – North America

- North America’s logistics spend is estimated to amount to around €1.4 trillion, 25.1% of the global total.
- North America represents around 28% of global GDP.
- North America’s logistics sector is thought to operate at a similar level of ‘efficiency’ as the European market, though considerably more efficiently than Asia Pacific and other emerging regions.
- In sum, outsourced and in-house contract logistics represent almost 25% of the market.
- Road freight is thought to represent just under 40% of the market, considerably higher than Europe. Geography and borders play an important role here.
- This also helps to explain why rail freight, at over 5% of the market, has a relatively larger share of logistics spend in North America compared to other regions.

### Total logistics market size - North America (€m, 2018)



### Total logistics market size - North America (€m, 2018)

LTL and FTL road freight	541,541
In-house warehousing and distribution	278,180
Domestic parcels	93,950
Rail freight	75,426
Outsourced warehousing and distribution (contract logistics)	50,638
Mail (dom and intl)	48,563
Air Freight (managed by forwarders)	18,784
Sea Freight (managed by forwarders)	14,776
Sea Freight (managed by container shipping lines)	13,235
International parcels	12,408
Inland waterway	8,602
Air freight (managed by airlines)	3,315
Other	241,197
<b>Total</b>	<b>1,400,615</b>

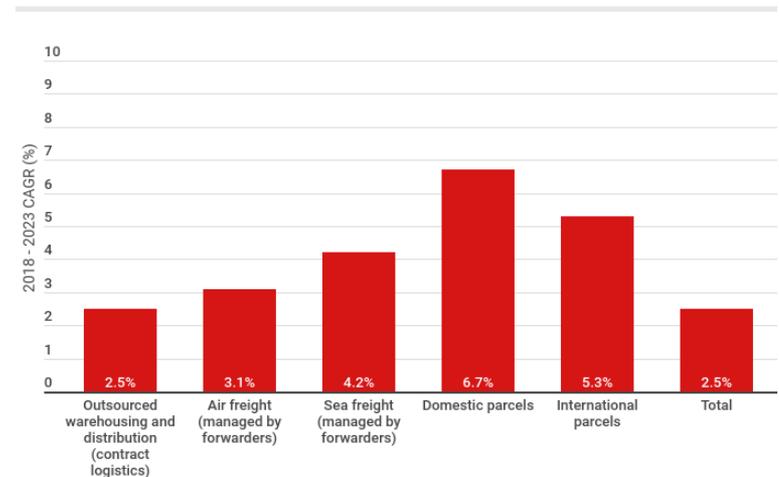
Source: Ti

## 12.4.1 Total logistics market size – North America forecast



- In real terms, Ti estimates that North America's total logistics market is forecast a 2018-2023 CAGR of 2.5%, just ahead of Europe's 2.4%.
  - Over the period, the real GDP CAGR for the US is 1.8% according to the IMF October 2018 World Economic Outlook Database. On the same basis, import and export volume CAGRs for the US are 3.5% and 1.6% respectively.
  - Like in all other regions, domestic parcels growth is expected to be relatively strong thanks to the structural shift towards e-commerce volume in the sector, led by the likes of Amazon.
  - Air and sea freight forwarding growth are reasonably strong in large part thanks to reasonable trade volume growth forecasts. However, a prolonged trade war with China could be damaging to volumes.
  - Outsourced contract logistics is forecast a CAGR of 2.5%.
  - Road freight market growth is broadly expected to be in line with the 2.5% mark of total logistics growth.
- The successful renegotiation of USMCA is good news for intra-regional volumes over the short to medium term.

### Total logistics market size - North America Forecast



Source: Ti

### Overall approach

- Ti has developed its total logistics market sizing by taking a triangulation approach. Where possible, each market size has been estimated through a 'bottom-up' and 'top-down' approach.
- A bottom-up approach may involve the investigation of company-level data, such as the aggregation of leading providers' revenues and/or market share estimates by leading providers.
- A top-down approach may involve the investigation of 'higher level' data, such as regional/ country level studies of the total logistics market or specific logistics markets from a range of secondary sources. Another top-down approach would be the use of macroeconomic data such as GDP or trade data to inform relative proportions of market sizes. In the case of transport markets, country-level volume data can also serve as a useful starting point.
- Ti's ongoing and extensive primary research programme over a number of years including surveys and interviews with market participants has also helped to inform the estimation of market sizes.
- For some markets such as freight forwarding, contract logistics and parcels, Ti has conducted annual market sizing studies for nearly ten years, with methodology

adjusted and refined over time as more and better data has become available.

- Overall, there is no single model or approach taken to estimating market sizes. Rather, information is gathered from as many sources as is reasonable and necessary. It is often said that good forecasting is a blend of both art and science, and so too this is the case for market sizing.

### Forecasts

- Forecast compound annual growth rates (CAGRs) are provided for the period 2018 to 2023 for a range of markets.
- Forecasts are given in terms of 'real' growth rates.
- Real growth rates do not account for price movements, only changes in 'volumes'. Real growth forecasts answer the question: How much will the market grow by holding prices constant over the forecast period? They enable meaningful comparisons of 'underlying' growth in each market.

### Market definitions

- **Rail freight:** Costs here measure the total costs incurred by buyers of rail freight services plus any costs incurred by the provision of in-house rail freight services.
- **Domestic parcels:** Costs here measure the total costs incurred by buyers of domestic parcel services plus any costs incurred by the provision of in-house domestic parcel operations.
- **International parcels:** Costs here measure the total costs incurred by buyers of international parcel services plus any costs incurred by the provision of in-house international parcel operations.
- **Mail:** Costs here measure the total costs incurred by buyers of mail services
- **Outsourced contract logistics:** Costs here measure the total costs incurred by buyers of outsourced contract logistics services. Outsourced contract logistics includes activities such as integrated warehouse and transportation services, supply chain services and value added logistics including sub-assembly, postponed manufacturing, kitting, labelling, returns management etc. Outsourced contract logistics services typically occur within the context of a long term relationship between supplier and client, formalised on a contractual basis.
- **In-house contract logistics:** Costs here measure the total costs incurred by 'in-house contract logistics' services. This covers the same activities as described in 'outsourced contract logistics', though they are performed in-house rather than by an external party. An example would be Walmart running its own warehousing and distribution operation in the US.
- **Air freight (managed by forwarders):** Costs here measure the total costs incurred by buyers of air freight forwarding services.
- **Air freight (managed by airlines):** Costs here measure the total costs incurred by buyers of air freight services directly from airlines. This excludes air freight services purchased by forwarders.
- **Sea freight (managed by forwarders):** Costs here measure the total costs incurred by buyers of sea freight forwarding services.
- **Sea freight (managed by container shipping lines):** Costs here measure the total costs incurred by buyers of sea freight services directly from container shipping lines. This excludes containerised sea freight services purchased by forwarders.

### Market definitions (continued)

- **Inland waterway:** Costs here measure the total costs incurred by buyers of inland waterway freight services plus any costs incurred by the provision of in-house inland waterway freight services.
  - **Road freight (LTL & FTL):** Costs here measure the total costs incurred by buyers of LTL & FTL road freight services plus any costs incurred by the provision of in-house LTL & FTL road freight services. LTL & FTL stand for 'Less than truckload' and 'Full truckload' respectively. Only 'general freight' is included here, bulk freight, project transports, mail and parcels are excluded.
  - **Other:** 'Other' here includes all other logistics services not included within the definitions of the segments listed above, such as non-LTL and non-FTL road freight, other bulk logistics not included within the scope of existing segments such as bulk storage and sea shipping, specialised transportation such as project logistics and other sea freight shipping apart from containerised freight.
- **Micronesia, Mongolia, Myanmar, Nauru, Nepal, New Zealand, Pakistan, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, South Korea, Sri Lanka, Taiwan, Thailand, Tonga, Tuvalu, Vanuatu, Vietnam.**
  - **Europe:** Albania, Andorra, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Kosovo, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Monaco, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, Vatican City.
  - **North America:** Canada, Mexico and United States.
  - **Global:** 'Global' is comprised of all countries in the world. Alternatively, it is the sum of Asia Pacific, Europe, North America and the rest of the world.

### Region definitions

- **Asia Pacific:** Afghanistan, Australia, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, East Timor, Fiji, Hong Kong, India, Indonesia, Japan, Kiribati, Laos, Macau, Malaysia, Maldives, Marshall Islands,

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## 13.1 Increasing supply chain complexity



- The supply chain has become a complicated environment due to trends such as:
  - Just-in-Time systems.
  - Remote manufacturing.
  - Increased inventory velocity.
  - Proliferating SKUs.
  - Omni-channel strategies.
  - Ever-increasing customer demands.
- Unless managers achieve visibility within their supply chains, overcoming traditional functional silos and co-ordinating sales, production and logistics efforts, they risk:
  - Escalating inventory levels.
  - Diminishing customer service.
  - The inability to react to supply chain disruption.
- Technologies have developed to meet these changing needs and are now a critical element of any well-functioning supply chain.
- Although the range of functionalities that these technologies have been designed to address

is diverse, their role is to provide accurate information, enabling managers to make better decisions, whatever the complexity of the supply chain.

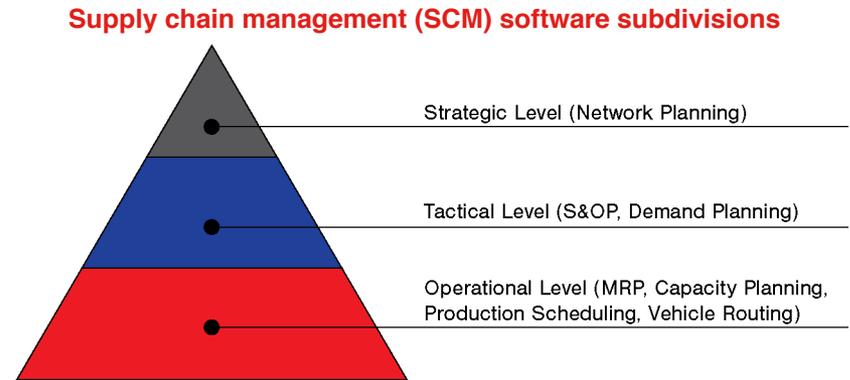
## 13.2 What is supply chain management software?



- Supply chain management (SCM) software can be broadly divided between those applications that focus on supply chain planning (SCP) and those that focus on supply chain execution (SCE).
- **Supply Chain Planning** systems are designed to:
  - Relate demand forecasts for products with the coordination of supply.
  - Schedule manufacturing and provide the relevant data for metrics for performance analysis.
- This ensures the optimisation of inventory and the relation of marketing and sales efforts to production and logistics, in a close collaborative effort.
- Supply chain planning itself can be subdivided between 'strategic' and 'tactical'.
- At the highest level, a manufacturer or retailer will work out its requirements for facilities, distribution channels and inventory holding locations over a two to three year (or more) period.
- At a tactical level, the company will typically plan, during its annual budgeting process, sales targets, materials requirements and labour.
- Typical tasks undertaken by SCP software include:
  - Network planning and design.
  - Capacity planning.
  - Scenario planning and real-time demand.
  - Manufacturing planning.

## 13.2 What is supply chain management software?

- **Supply Chain Execution (SCE)** systems are much more operational, allowing supply chain tasks (such as in the transportation or warehousing functions) to be completed effectively in minutes, hours or days.
- In effect, SCP systems sit 'above' SCE systems, with information from each feeding into the other, establishing plans and then, after execution, providing insight into the effectiveness of the planning.
- SCE software typically includes:
  - Transport management systems (TMSs).
  - Warehouse management systems (WMSs).
  - Inventory management systems.
  - Order processing.



Source: Ti

### 13.3.1 Transport Management Systems (TMSs)

- Early transport management systems (TMSs) were designed solely to manage the movement of trucks, facilitating loading, routing, pricing and costing.
  - A TMS can now be used to tender out shipments to carriers in real time, resulting in significant freight cost savings.
  - Freight payment is also an important feature eliminating administrative activities related to the receipt of invoices from suppliers.
  - There are also some sophisticated systems that support ‘spot pricing’, enabling users to negotiate with various carriers, either via discounts from standard card rates or specifically negotiated deals.
  - Visibility and event management allows for shippers to manage exceptions throughout the execution of the shipment. This will include tracking planned versus actual milestones, diverting shipments and, where necessary, expediting delivery.
- TMSs are now far from being standalone. They will typically be integrated with enterprise-wide resource planning systems (ERPs), linking with warehouse management systems (WMSs) as well as a production and sales and marketing.
  - Along with many applications, TMSs are increasingly migrating to the Cloud and this is bringing their benefits to shippers with much smaller transportation budgets.
  - The leading providers include:
    - Oracle.
    - JDA.
    - SAP.
    - GT Nexus.
    - Descartes.
    - Kewill.

## 13.3.2 Warehouse management systems (WMS)



- As well as supporting the day-to-day operations of a distribution centre, allowing for visibility of stock (and therefore stock levels within the warehouse environment), WMSs also allow for order management, processing and pick & pack.
- At the highest level, a WMS must be able to support sophisticated warehousing needs, including value-added services, lot management, serial number tracking and product recalls.
- WMSs are increasingly being hosted in 'The Cloud' rather than 'on premises'. These 'Cloud' solutions also make it easier to support multiple warehouses on the same platform, enabling inventory 'pooling'.
- When an order is received at a distribution centre, the WMS will provide details to the pickers either in the form of printed-off bills, or through communication with the picker via pick-by-voice, pick-by-light or even through virtual reality glasses.
- The WMS will plan the most efficient route for the picker, which may involve picking by individual order, or where more appropriate, picking by batch.
- Although this sounds very simple in theory, the huge amount of data and variables involved require a very sophisticated solution, even in relatively small operations.
  - The WMS manages and directs the pickers, order processors and other warehouse staff in the most efficient way.
  - Through its barcode or RFID tag, each stock keeping unit (SKU) could have data concerning its type, weight, dimensions, sell-by date and storage restriction.
  - To work out the best location to place the SKU, the WMS will make decisions based on whether the SKU is slow- or fast-moving.
  - All this must be handled in a timely manner to prevent congestion throughout the warehouse.

### 13.3.3 Global trade management systems (GTMs)



- Global trade is a highly complex process that involves multiple partners, as well as a diverse range of capabilities.
- An importer or exporter requires contact with freight forwarders, customs agencies, carriers and banks, as well as its suppliers or customers located in foreign markets.
- Global trade management (GTM) applications manage the flow of goods and information between all these parties and facilitate financial transactions.
- In summary, GTMs include some or all of the following functions:
  - Global sourcing: Provides information on final 'landed cost' of the product, delivery schedules and compliance implications. This can also include risk and quality management, ensuring that all products purchased comply with relevant safety/ product testing requirements.
  - Transport management: As with a domestic TMS, a GTM system will include contract and rate management, carrier selection and booking, as well as freight cost auditing capabilities.
  - Supply chain visibility: Due to the number of parties within an international supply chain, the location of goods and their delivery times is often uncertain. By connecting the full range of supply chain partners, GTMs have the potential to allow the tracking and monitoring of goods.
  - Import and export management: Covering export and import compliance checks, screening restricted parties, product classification and determining licence requirements, the GTM will interface with customs' systems.

## 13.3.4 International transport management systems (ITMS)



- Specific applications have been developed to meet the commercial needs of international freight forwarders.
- The use of an ITMS connected to all the supply chain partners means that one-time entry can be achieved and shipment documentation, such as air waybills (AWBs), bills of lading and manifests can be generated automatically.
- An ITMS provides links to carriers' rates in order for forwarders to develop proposals to potential customers as quickly as possible.
- ITMSs also provide forwarders with the ability to track shipments and, by way of exception reporting, let their customers know if there have been any delays or disruptions.
- Other functions of ITMSs include:
  - Consolidation of loads.
  - Customs clearance.
  - Last-mile delivery / proof of delivery documentation.
  - Warehousing.
  - Invoicing.
  - Profit analysis.

## 13.3.5 Freight exchanges



- The principle of freight exchanges is very simple: to match shippers' demand for transport services with availability of supply in the market.
- Freight exchanges have been in existence for over 20 year and are not part of the recent disruptive trends.
- However, interest is growing in them not least due to the impact of innovators in other sectors, such as Uber.
- Freight exchanges can work in several ways. Some are called 'pure' or 'neutral' exchanges where the platform matches shippers with road freight companies.
- Other 'exchanges' have been developed as a way for a company – such as a freight forwarder – to let carriers know about loads that it is moving on behalf of its customers.
- In effect, this is using the exchange to build a larger supplier pool of carriers.
- When the shipper/freight operator relationship is commoditised through a freight exchange, one of the leading concerns is over security.
- The shipper may not know the trucking company and is reliant on the freight exchange to make sure that it is reliable, has a reputable track record and the necessary security clearances.
- To overcome the problem of the security and reliability of the trucking companies, some exchanges have adopted a 'closed loop' model.
- This means that a dedicated freight exchange is set up for a major shipper, with only quality assured suppliers able to participate.

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- Since the 1980s, the global automotive sector has been widely regarded as the benchmark for logistics excellence.
- The introduction of supply chain concepts from Japan, such as Kanban and JIT, had been adopted by many European and US vehicle manufacturers.
- In Europe, the Single European Market allowed vehicle manufacturers (VMs) previously rooted in high labour cost markets, such as Germany, to exploit lower cost production in Southern and Eastern Europe.
- The recession of 2008-9 prompted VMs to re-focus towards developing markets.
- Since then, German VMs have continued to do well, exporting to Europe and the developing world.
- However, other mid-market brands have suffered, as the EU continues its economic weakness.
- The US market has seen demand recover robustly, resulting in substantial investment in new capacity in North America.
- In recent years VMs have become far more global in their supply chains, with both finished vehicles and major components moving between continents in order to improve utilisation and reduce costs.
- The automotive world looks like it is emerging into one dominated by a few large global VMs with operations in markets such as China, Brazil, Russia, India and elsewhere which are integrated into supply chains heavily rooted in North America, Western Europe and Japan.

## 14.1.1 Production concepts in automotive logistics



- In order to reconcile the need for economies of scale with the desire for a wider choice of products, many VMs have introduced 'flexible manufacturing'.
- VMs such as Ford, Honda or Nissan have the ability to vary the type of model being produced on a single assembly line.
- This means that demand can be better coordinated with supply, by switching production capacity to the more popular models.
- A development has been the evolution of 'build-to-order' systems. Systems such as BMW's KOVP and GM's 'order-to-delivery' have reduced lead times for the delivery of products.
- Since the recession, the predominant focus for many VMs has been to cut costs.
- All of these developments – JIT, flexible production lines, build-to-order systems and leaner production – have increased the demand for transport.
- The improvements in productivity resulting from management concepts such as JIT rely on the power of cheap transport.
- Although transport is perceived to be a relatively unimportant resource within the automotive industry, it is in fact one of growing influence.

## 14.1.2 Supply chain geography of the automotive sector



- Most of the largest VMs market vehicles on a global scale, although several of the largest produce in only one or two continents.
- However, vehicle production is not a 'globalised' activity. This contrasts with some industries, such as electronics or consumer durables, that source materials, semi-finished goods and finished products on a global scale.
- Most passenger vehicles are made near the market where they will be sold. Even components are manufactured near the assembly plant.
- Within Europe it is usual for 90% of component suppliers to be located within 100 km of the assembly plant.
- Distances are greater in North America, although this is simply a reflection of the larger geography.
- The supply chain geography is so pronounced that the car industry has created specific locations, known as 'supplier parks', for component suppliers next to its assembly plants.
- These ensure reliable communication between the component supplier and the VMs' assembly plant, easing the implementation of systems such as Just-in-Time / Just-in-Sequence production techniques.
- However, the movement of finished vehicles and components from continent to continent has been growing, as VMs respond to a larger global demand.
- China imports large quantities of car components, as its parts suppliers cannot provide VMs (Chinese and Western) with the quality required.

## 14.1.3 Dealerships, retailing and logistics

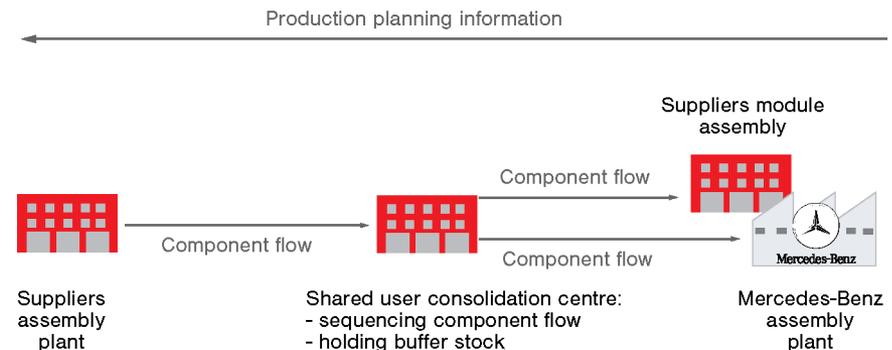


- The traditional ‘production focus’ of the automotive sector has had a big impact on its retailing structures.
- Almost all contact with the customer is through the franchises that purchase the right to sell vehicles on behalf of one particular brand.
- The ability of the VMs to control retailing activity is of increasing importance owing to the spread of ‘build-to-order’ production systems, especially in Europe.
- In most systems the specification of the car is set within the dealership, with the input of data into the VMs’ order capture systems.
- The US consumer is more orientated to ‘impulse purchases’ than in Europe or Japan.
- Consequently dealerships hold more inventory, with the consumer more likely to drive away with the new car on their first or second visit (although a more European model is being adopted).
- Attempts to reform automotive retailing and ‘after sales’ service sectors in both Europe and the United States have largely failed.

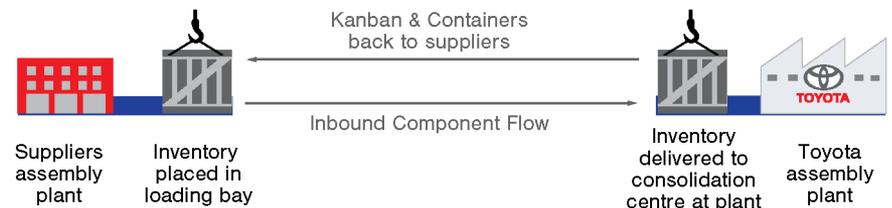
## 14.1.4 Different types of inbound logistics operations

- Whilst all VMs need transport and consolidation services, the nature of inbound logistics operations varies.
- For example, suppliers feeding into VMs in Germany tend to have a requirement for consolidation centres near the assembly plant.
- This is very much the case with Mercedes-Benz (MB) Passenger Car plants where suppliers usually hold inventory in a consolidation centre near the plant.
- Some major suppliers have assembly facilities within the MB plant.
- In contrast, Toyota's LSPs collect from suppliers and consolidate components at a dedicated facility at the plant.
- Toyota requires the supplier to set aside part of his loading bay for Toyota-destined supplies, but the supplier should be operating under the Kanban system and therefore should not need any further inventory management systems.

### Mercedes-Benz passenger cars component feed



### Dynamics of Toyota component feed



Source: Ti

## 14.1.4 Different types of inbound logistics operations



- Component suppliers are also faced with contradictory demands from vehicle manufacturers.
- On the one hand VMs want suppliers to invest in logistics or assembly facilities near assembly plants.
- However, VMs can be unwilling to commit themselves to suppliers for long enough to ensure that the investment is covered.
- The reasons for this are:
  - The increasing trend for VMs to have several different types of vehicle produced at one assembly plant.
  - Continuing variability in sourcing of similar components leading to variability in the volume of component feed to an assembly plant over the medium term.
  - Frequent changes in vehicle model / design affecting the volume of component feed.
- The main function of ‘Sequencing Centres In-line’ (usually referred to as ‘SILS’ or ‘Regional Assembly Plants’) is to break-bulk and feed components into the VM’s assembly plant in the sequence dictated by the production schedule.
- LSPs are well positioned to offer such services and offer them as part of their value add.

## 14.2 Pharmaceutical logistics



- Globalisation is having a major impact on the pharmaceutical drug manufacturing sector and the associated logistics industry.
- Whilst multinational drug manufacturers face rising costs, expiration of drug patents and changes in government legislation in Europe and the United States, opportunities are increasing within Asia and South America.
- Traditionally, little attention was paid to supply chains, as manufacturers were more focused on drug sales and development.
- Manufacturers are now faced with supply chains that are not effective, in a sector that is in transformation.
- Issues such as security, intellectual property and knowledge of government legislation within emerging markets has resulted in manufacturers turning to logistics providers.
- Logistics providers are expanding their service offerings and their geographic reach to meet the needs of the sector.
- The growing demand for biopharmaceuticals has resulted in the need for temperature-regulated transportation and logistics providers have introduced special temperature-controlled containers and monitoring systems.
- Providers are also providing consulting services to assist manufacturers with such issues as trade and compliance concerns.

## 14.2.1 The global pharmaceutical logistics market



- In the past, supply chains were neither flexible nor cost effective, as many pharmaceutical manufacturers appeared to be little concerned about the efficiency of their supply chains.
- As many blockbuster drugs' patents expire and facing mounting government regulations and increasing competition, supply chains have had to change in order to remain competitive.
- In the blockbuster drug model, oral solid-dose pills were shipped to a small number of wholesalers who then moved them on to retailers.
- As the market shifts towards personalised healthcare, many of these newer drugs require more complex manufacturing and distribution processes than shelf-stable pills.
- The push for safety in the supply chain is a factor in requiring backward visibility to manufacturers' suppliers and suppliers' suppliers, in a robust and real-time way.
- Fluctuation in demand for branded and generic products, and changes in distribution channels are also driving the continued evolution.
- The need for a flexible supply chains is great, as the industry undergoes changes in product mix, manufacturing routes and distribution channels for different kinds of products.
- To address the issue of various government regulations and security issues, the pharmaceutical manufacturer must have near-complete visibility of its supply chain.
- However, as manufacturers expand their operations throughout the world it becomes difficult to connect to not only primary suppliers but also to suppliers' suppliers.
- Hurdles exist in implementing the necessary technology including:
  - Cost.
  - Difficulty of implementation.
  - Lack of industry standards.
  - Lack of regulatory guidance.

## 14.2.2 The role of the outsourced logistics provider



- Many logistics providers offer visibility solutions and have also introduced specific industry solutions to address visibility of products whilst in transit, particularly for those products that require temperature monitoring.
- Cold chain
  - Growing global demand for complex drugs is increasing demand for cold chain solutions.
  - Healthcare products that are temperature-sensitive require refrigeration during transportation and storage.
  - Further, these products may also have a short window of viability, which makes rapid transport essential.
- Distribution services
  - Distribution and warehousing services within the pharmaceutical logistics market can be complex due to government regulations, security and safety of the products.
  - For example, if a temperature-sensitive drug arrives at a distribution facility prior to receiving government approvals to market the drug, the inventory must be isolated.
- Packaging and labelling is regulated and often differs from one market to the next.
- Reverse logistics
  - The ability to implement reverse logistics, including recalls, in an organised manner is critical to containing the potential damage from an incident.
  - Products not properly reclaimed and destroyed may end up being resold illegally.
  - Of the estimated 3–4% of products returned, it is estimated that about 1.5–2% of pharmaceuticals manufactured will be destroyed.
  - The majority of major logistics providers offer reverse logistics services.
  - Some niche players provide returns and recall management solutions specifically targeted to the pharmaceutical drug industry.

## 14.3 Consumer goods and retail logistics



- The consumer and retail industries are hugely important for the global logistics industry.
- In the contract logistics industry they account for more than half of all revenues.
- Although most movements of consumer goods (which include food and drink) take place at either the local or national level, an important and growing segment occurs on an international basis.
- Consumer packaged goods (CPG) manufacturers have complex supply chains.
- Not only do these companies produce a range of foodstuffs, beverages, cleaning products and beauty goods, they also operate in a range of temperatures (from ambient, through various levels of chilled, to frozen).
- In Europe, the consumer goods industry was transformed by the advent of the Single European Market.
- This allowed manufacturers to exploit the lower labour costs of the peripheral members of the EU (such as Spain and Portugal), whilst being able to export to the rest of the region.
- Meanwhile, the migration of consumer durables manufacturing to Asia Pacific meant that sea and air gateways to Europe evolved into important logistics nodes.
- At the same time as this, the manufacturers' relationships with retailers changed, as retailing became much more centralised.
- General food and drink production and distribution still largely takes place on a **local** or national level.
- However, at the CPG level (dominated by manufacturers such as Procter & Gamble and Unilever) supply chains are far more **regionalised**.
- **Global** supply chains exist where the production emphasis is on cheap labour. Goods falling into this category include toys and other durable goods (including consumer electronics).

## 14.3.1 Consumer packaged goods (CPG) sector



- The CPG market is highly fragmented, comprising many different product lines requiring different distribution chains.
- The products falling within this sector include food (ambient, chilled and frozen), dairy products, beverages (dry and wet), healthcare (soaps, deodorants, etc.), household products (cleaning products, often hazardous) and cosmetics.
- Amongst the traditional leaders in the sector – e.g. Procter & Gamble and Unilever – there has been a clear shift towards products with greater complexity and added value.
- There has been a shift away from:
  - Products dependent on access to basic raw materials, such as fats.
  - Products very dependent on low-cost / high-volume production.
  - Products wholly dependent on access to large distribution capabilities.
- And a move to:
  - High-value added products with an aspect that strengthens the brand – for example, beauty products.
  - Complex products such as ‘over-the-counter’ pharmaceuticals or razors.
- CPG supply chains are now beginning to change:
  - Their relationship with the customer has changed as the sophistication and power of retailers has increased.
  - Their products have changed, especially their dependence on fat-based staple food and cleaning products.
- A key imperative is to ‘get closer to the customer’.
- This means customising marketing activities at a national level, as most market idiosyncrasies are expressed nationally.

## 14.3.2 Regionalisation of supply chain geographies



- Originally, the supply chains of CPG companies were dominated by the need to obtain raw materials for their products.
- Consequently, manufacturing facilities were often located near ports.
- This is now changing. Inbound logistics is less important. Rather, 'outbound' logistics (the management of finished product) is now the main concern.
- The dominant feature of the CPG supply chain is the focus on retailing.
- This combined with the high-volume, low-value nature of most of products sold, means that production and inventory management locations cannot be too far from the consumer.
- The major companies are creating larger warehousing complexes serving national and regional markets.

### 14.3.3 Durable goods supply chains



- Whilst CPG companies largely utilise regional supply chains, durable goods are mainly manufactured in Asia and moved by ship to consumer markets in Western Europe and North America.
- These are often stored in European distribution centres before being moved to retailers' warehouses.
- The bulk of consumer goods are bought for sale by the major retailers working through purchasing companies.
- Full container loads are often booked direct by the retailer with the shipping company.
- Less-than-container loads originating in Asia are consolidated (often by freight forwarders) from multiple suppliers to make up full container loads.
- Consolidating shipments into a single unitised load reduces the overall transportation cost per unit, as well as increasing efficiency.
- The element of control that consolidating at origin provides shippers is also useful in balancing supply with demand and quality.
- This is becoming an increasingly important strategy, not least because of the proliferation of products that retailers are importing.
- Some importers have also implemented so-called distribution centre (DC) by-pass programmes, which avoid the use of a DC in the end-user market.

## 14.3.4 Retail supply chain trends



- The consolidation of the retailing sector has had a fundamental influence on the development of the associated consumer goods industry, which has become more regionalised / globalised as a result.
- National retail markets have been transformed in many developed countries over the past 30 years.
- The large grocery multiples – such as Tesco, Carrefour or Walmart – have driven consolidation in the market through highly efficient distribution channels.
- In 1982 the Institute of Grocery Distribution in the UK estimated that retailers were responsible for about 32% of final deliveries to stores – this is now close to 100%.
- Adopting Just-in-Time deliveries allowed retailers to eliminate in-store stock holding, maximising display space and reducing inventory.
- More recently supermarkets introduced factory gate pricing (FGP), whereby the retailer

collects the goods at the ‘factory gates’ of the suppliers instead of allowing the manufacturer to deliver them. FGP was able to:

- Reduce product cost and inventory.
- Achieve supply chain visibility and control in vehicle planning, scheduling and utilisation through enterprise-compatible systems throughout the product supply chain.
- Reduce waiting time at supply and delivery locations.
- Decrease empty running through backhaul capacity.
- Improve vehicle performance in time, load and distance.
- Increase product visibility through the supply chain.
- Utilise buying power and supply chain knowledge.
- Reduce carbon emissions.

## 14.3.5 Diversification of retailer product offering



- Growth in the supermarket sector across Europe is being driven not by sales of food, but rather by the ever-widening range of non-food goods.
- The growth of non-food sales has been driven by a number of developments, including:
  - The growth of the hypermarket format.
  - The drive to make space in supermarkets work harder.
  - The development of non-food dedicated store formats.
- Healthcare, toiletries and household products are as important to a supermarket's core offer as food.
- The expansion of the range of products being offered by the major supermarket chains has created opportunities for logistics service providers to bid for major new contracts with existing clients.
- The larger players generally benefit from consolidation within the retail sector, with the supermarkets taking market share from the more fragmented high street stores.

## 14.4 High-tech supply chains



- The global high-tech market is undergoing a vast change.
- Globalisation has given rise to increases in competition and new products, both of which have had profound effects upon the high-tech supply chain.
- Companies within this market compete on tight margins resulting in many turning to their supply chains for a competitive edge.
- As a result of the industry's quest for cost management and operational efficiency, manufacturing has moved away from the mature markets such as the United States and Europe, and into Asia.
- The typical high-tech supply chain is highly complex, characterised by fragmented distribution channels and remote manufacturing locations.
- An original equipment manufacturer (OEM), such as Hewlett-Packard or Acer, is likely to outsource production to an electronic contract manufacturer (ECM), which may well be located in a remote, low labour-cost market.
- Given the short product lifecycles that are typical in the market (new releases and developments come out continuously throughout the year), it is critical that for a supply chain to remain competitive, information and product must flow seamlessly as possible.

## 14.4.1 Transport of high-tech goods



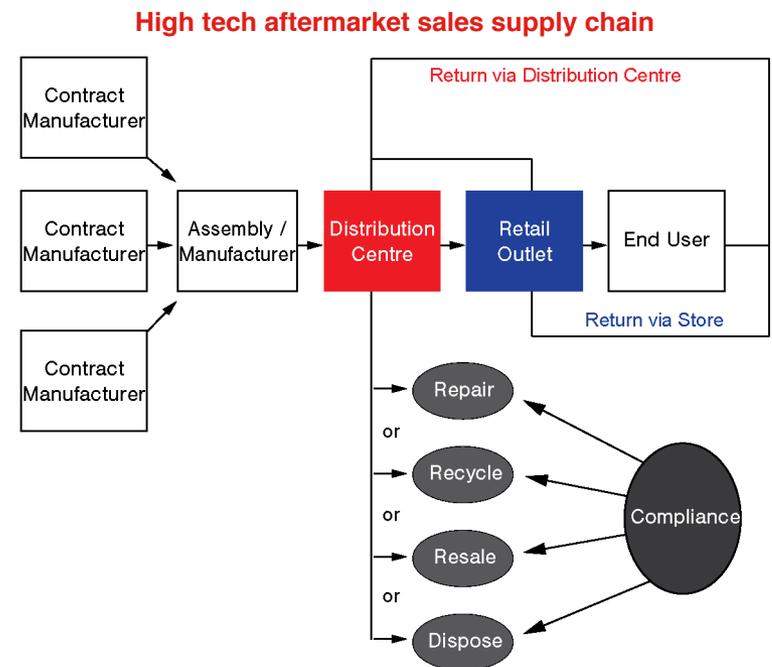
- Air freight has tended to be the transportation mode of choice for manufacturers to ship high-value, high-demand goods.
- However, more recently, as a result of the high costs associated with air freight, OEMs are turning more towards ocean freight.
- According to some industry estimates, based on value, 60% of computers and related components are flown by air and 40% move by ocean (despite longer transit times).
- This is a response to a market maturing and the effects of global price deflation in the technology sector.
- Companies successfully utilising an ocean shipment strategy have had a different supply chain strategy.
- Longer lead times are coped with by:
  - Building to a forecast.
  - Maintaining a finished goods inventory.
  - Having a large distribution network.
  - By offering very little customisation.
- The increasing need to cut costs, but also to get products to markets as quickly as possible, resulted in new transportation methods
- These include shipping computers by rail via Chongqing in China, through Kazakhstan, Russia, Belarus and Poland, and into Germany.
- This takes 18 to 20 days, undercutting sea freight by about 7-10 days. Though it costs more, it is still cheaper than shipping by air.

- Besides the traditional warehousing and distribution services offered, such as kitting, labelling and repackaging, a growing number of logistics providers are expanding their capabilities into aftermarket services.

### Aftermarket

- Long known as a way to promote a positive customer experience, aftermarket services also provide revenue streams for OEMs and logistics providers.
- 'After sales' is also known by a variety of other terms such as 'reverse logistics' and 'returns / services management'.
- A host of components play into this service, including returns, repairs, recycle, disposition, all of which are increasingly dependent on growing regulatory compliance.
- As a whole, the electronics industry spends more than US\$19bn on returns every year.
- Warranty claims and repairs are a major part of the reverse logistics process, requiring varying methods for receiving, tracking, processing, repairing and ultimately redelivering the product to the consumer.

- In the electronics industry, the average return rate on sales is 8%, although it is estimated that the non-defective rate for consumer electronics is around 65% of total goods returned.
- Screening the products and returning those with No-Fault-Found (NFF) to the supply chain is an important logistics service.



Source: Ti

## 14.5 Field services & spare parts logistics



- A challenge for companies is stocking enough spare parts at all times.
- For those companies that need to service customers in the field, this is especially a concern, particularly as contracts often dictate short lead times to dispatch a technician and / or required part for replacement.
- Warehousing not only involves storage and handling in central or regional facilities, but it also involves storage and time-critical handling in strategic stock locations in order to get the part to its final destination in as short amount of time as possible.
- Logistics providers such as UPS, FedEx, DHL and CEVA all offer solutions for this market.
- Typically, they manage a network of strategic stocking locations that manage the delivery of 'mission critical' and scheduled parts to customers, field engineers or pick-up and drop-off (PUDO) points.

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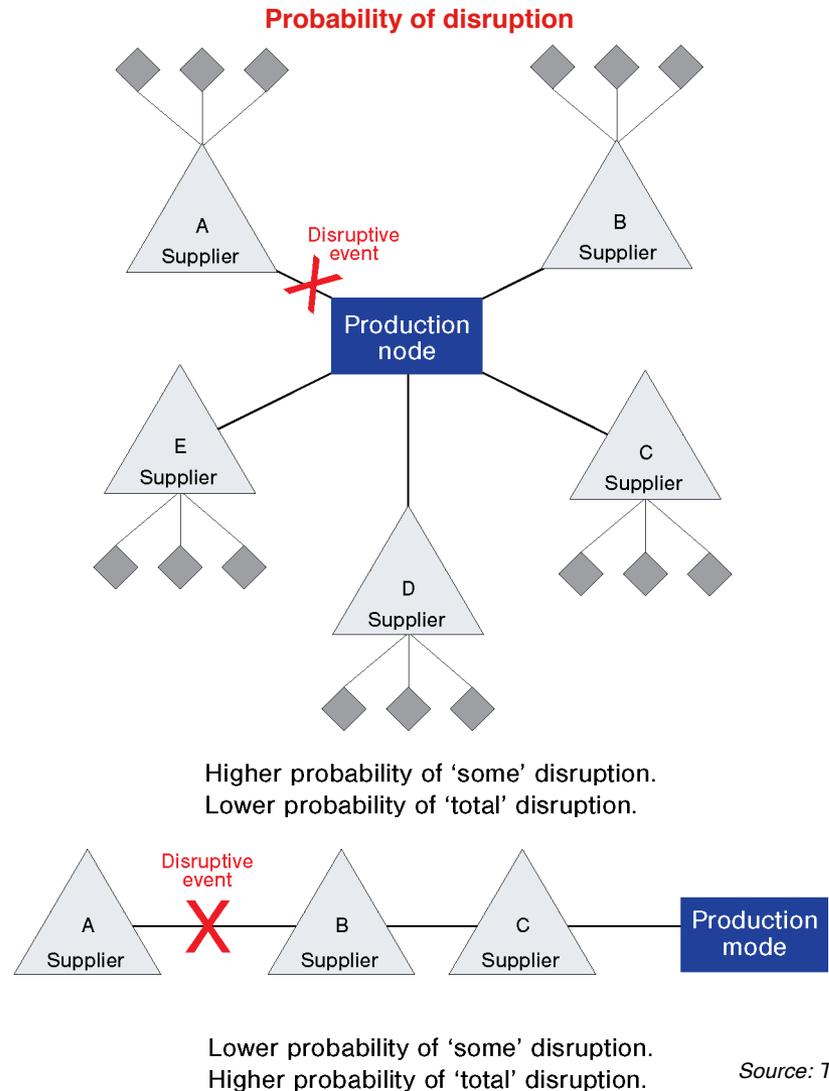
## 15.1 Rebalancing 'external' and 'internal' risks



- External threats to supply chains have received considerable attention following the well-publicised natural disasters in Japan and Thailand in 2011.
- One survey, undertaken for the World Economic Forum, found that 30% of respondents estimated losses of 5% of annual revenue from supply chain disruption.
- The evolving supply chain and production strategies of the major global manufacturers have changed, leading to a rebalancing of the risks inherent within various parts of the supply chain.
- One distinction that can be made is between 'internal' and 'external' risks.
- Traditional integrated manufacturing results in high levels of internal risk due to high levels of capital outlay and inventory holding.
- Since the 1970s, new business models have been developed, which allow manufacturers to focus on design and marketing, and let their suppliers bear the risk of production.
- 'Internal' risks were transformed into 'external', that is those that are inherent in extended supply chains, often involving remote manufacturing.

# 15.1 Rebalancing 'external' and 'internal' risks (continued)

- The 'unbundling' of various production processes has led many OEMs to evolve into what are, in effect, managers of integrated and complex networks of remote but interlinked suppliers.
- In some cases this has produced greater levels of risk and in others it has had the opposite effect.
- Extended supply chains are more vulnerable to external threats, but on the other hand such networks have also dispersed risks to a number of markets by reducing centralisation.
- A small supply chain, for instance, with a single production facility is highly vulnerable to external events, whereas a large, complex supply chain with multiple supplier options has the potential to be much more robust.
- The move towards more complex supply chains has its own risks related to a reduction of visibility and the development of suboptimal networks.



## 15.2 Quantifying supply chain risk



- Manufacturers usually adopt one of three strategies when dealing with risk:
  - Inventory management – build up buffer stock.
  - Sourcing – developing contingency strategies for specific suppliers or supply chain links.
  - ‘Acceptance’ – doing nothing as costs of mitigation outweigh benefits.
- Deciding on which strategy to adopt relies on understanding the cost implications of each approach.
- Modelling exercises also need to take into account the length of disruption, as well as the probability.
- Another factor that impacts significantly on the extent of disruption is the location of the event within the supply chain.
- The further upstream it occurs, the longer the disruption to supply. The reason for this is that downstream processing locations act as bottlenecks and take time to fulfil backorders once upstream supply is switched back on.
- Effective supply chain management depends on the trade-off of one set of risks against another.
- Lean supply chains can be counterproductive.
- Whilst they are working efficiently they can reduce inventory levels at the same time as maintaining / improving customer service.
- However, they are less resilient to external shocks, as they do not provide a safety net when supply chains break down.
- Inventory levels have been used as ‘insurance’ against risk.

## 15.3 Types of supply chain risk



- The relation between external and internal risk is very close.
- For example, increasing inventory levels increases 'internal' risks (redundancy, wastage, financing, etc.), but mitigates external risks (the impact of a disruptive event on supply).
- One piece of research suggests that when outsourcing production (and risk), only 10% of manufacturers undertake any sort of risk assessment.
- Where external events have had most impact this has been due to insufficient risk assessment. One such example was the floods in Thailand.
- Here the risk of centralisation (which can occur in any geography) was transplanted to a remote region where risk was not fully understood.

Supply chain internal and external characteristics		
Supply chain characteristic	Internal risk	External risk
High stock levels	High	Low
Lean supply chains	Low	High
'Bundled' in-house production	High	Low
'Unbundled' outsourced production	Low	High
Globalised sourcing	Low	High

*Source: Ti*

## 15.4 External threats to supply chains



- **Environmental**
  - These include a wide range of events including extreme weather, earthquakes, tsunamis, floods and even volcanic eruptions.
  - The economic cost of natural disasters was estimated by insurance company Swiss Re at US\$194bn in 2010.
  - The supply chain consequences are derived from not only the disruption of production, but also the impact on transportation services and infrastructure.
- **Geopolitical**
  - Tensions in the Middle East are a considerable source of risk for supply chains, especially affecting transit routes such as the Straits of Hormuz and the Suez Canal.
  - Terrorism also falls into this category, the most obvious example being the events of 11 September 2001 in New York.
  - A more recent example relates to bombs placed in packages originating from Yemen.
- **Economic**
  - One of the most pressing supply chain risks from an economic perspective is what can be termed 'demand shocks'.
  - An example of this is the disruption caused by the company failure of suppliers following the 2008 recession.
  - 'Supply shocks' are less obvious, but a material threat all the same. The volatile nature of shipping rates could fall into this category.
- **Technological**
  - Technology failure / outage is a major concern to shippers, although as yet there have been few significant incidents.
  - A lot of money has been spent by agencies, such as the Pentagon, in assessing and planning for a 'cyber terrorist' attack.

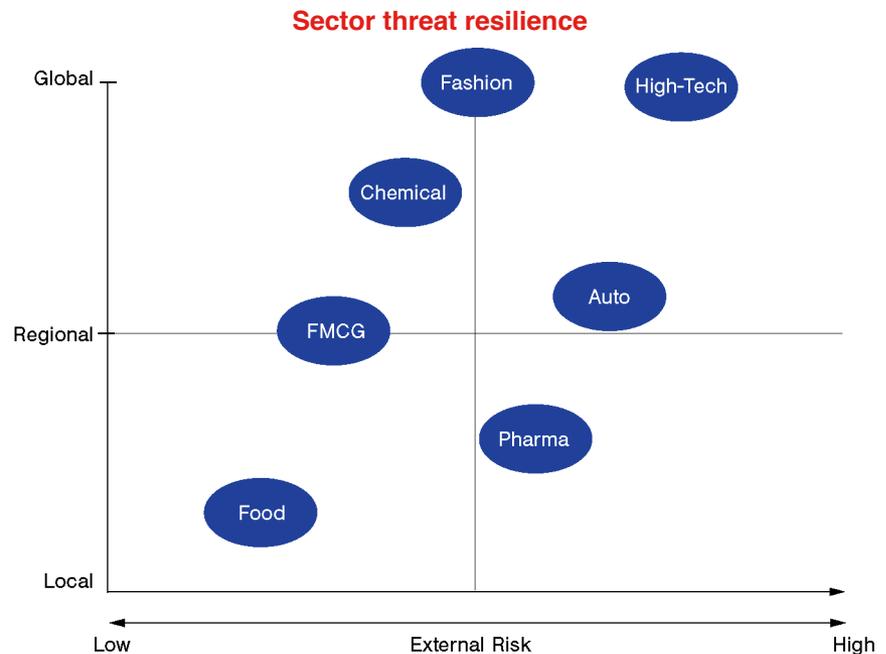
## 15.5 Unknown unknowns...



- The most disruptive supply chain events are those which have not or cannot be planned for.
- Therefore, it is more useful, rather than look at past events in order to gain some insight into the future, to identify weaknesses in supply chains instead.
- The World Economic Forum's Supply Chain and Transport Risk Survey 2011 identified the least effectively managed supply chain components as:
  - Reliance on oil.
  - Shared information.
  - Fragmentation along the value chain.
  - Extensive subcontracting.
  - Supplier visibility.
- Three of these components relate to visibility and control. Improvements in technology can mitigate this type of risk. For example:
  - Development of supplier / buyer communities and the use of social media technologies within
    - supply chain communities could be one way in which risks can be reduced.
  - 'Sense and respond' technologies allow for greater awareness of the location of products in the supply chain and hence enable better decision-making / re-routing.
- The development of information technologies will play an important role in the mitigation of supply chain threats.
- However, the adoption of more technology will also play a role in increasing risks by leaving supply chains open to 'cyber attacks' or even accidental outages.

## 15.6 Sector resilience to threats

- The characteristics of some supply chains make them more vulnerable to supply chain threats than others.
- The high-tech sector, for example, relies heavily on global supply chains that are typically high-value, lean and unbundled / outsourced.
- Food supply chains can be local, characterised by low product value and, in most cases, have low levels of risks attached.
- However, the horsemeat scandal in Europe in 2013 showed, for processed foods at least, that the sector was not immune to corruption and criminality involving wide scale substitution.
- Food supply chains were shown to be complex and lacking in transparency, which ultimately created issues of security and process integrity.



Source: Ti

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- One of the biggest trends to impact on the global logistics industry over the past 10 years has been the emergence of e-commerce.
- Whilst the retail sector in the developed world has stagnated due to the economic situation, e-retailers have seen volumes grow.
- Being able to adapt to a changing retail industry and respond to these changes with a flexible, agile supply chain is now a necessity for retailers to survive.
- As an increasing number of 'brick-and-mortar' retailers embrace e-commerce they will need to bolster their supply chain to provide a successful multi-channel experience.
- Logistics providers and postal services have responded, to some extent, to the needs of retailers, pure-play and brick-and-mortar alike, to compete effectively in the market.
- Many have tailored solutions for transport, fulfilment and returns, and also additional value-added services.
- However, although mail, express and logistics companies are benefiting from the growth of e-commerce, a large proportion of logistics functions are still not outsourced.
- Many retailers believe they are better positioned to undertake logistics themselves.
- The term e-commerce can have a very broad meaning overall and refer to many different aspects of business. These models include:
  - Business-to-business or B2B – B2B e-commerce involves the buying and selling of physical goods between businesses.
  - Business-to-consumer or B2C – The most common type of e-commerce: many large electronic retailers or 'e-tailers' fit this model, including Amazon.
  - Consumer-to-consumer or C2C – In this model, the online platform serves as a connection between two individual consumers who wish to make an exchange. Currently, the leader in C2C commerce is online auction site eBay.com.

### Warehousing and fulfilment

- e-retailers require distribution systems that often are more complex than traditional ones.
- Besides the need to manage an increasing number of suppliers and varying inventory, the management of multiple delivery options, such as home delivery, in-store pick-up, lockbox or elsewhere, also becomes more difficult.
- e-fulfilment centres tend to be highly automated with service offerings including:
  - Basic order management.
  - Storage.
  - Pick and pack.
  - Returns handling.
  - Monogramming.
  - Gift wrapping.
  - Garment hanging services.
- Speed is very important: the quicker a company is to fulfil and deliver an order, the greater the likelihood of a returning customer.
- The size of these facilities also varies greatly. While Amazon operates warehouses that average 62,000 sq m, other companies use smaller facilities located within urban areas.
- In the European and North American market many retailers are keeping warehousing and fulfilment in-house instead of outsourcing to logistics providers.
- This is due to the complex distribution requirements and limited supply of facilities, as well as the still undeveloped range of services currently available by LSPs.

- The rate of online returns can average anywhere between 25 and 50%.
- According to some retailers, customers are becoming more sophisticated in their online shopping: in the past they bought one item, now they buy two and return the one they do not like.
- Other problems include regulations specific to online sales, such as those relating to distance selling in the EU.
- Handling returns is expensive and difficult for retailers to manage.
- Logistics solutions involve the gathering of returned items, determining if the items can be resold or disposed and then submitting the items into the proper channel of distribution.
- Due to varying individual country laws and regulations, much of this handling is done in the country in which the returns occur.

### **Courier, express and parcels sector (CEP)**

- The parcel segment has witnessed an impressive increase in volumes due to the rise in e-commerce.
- The industry's limited capacity for home delivery, as well as the increased handling of returns amongst parcel carriers has allowed for the creation of new services.
- Convenience and prompt delivery is expected. The increasing demand for such delivery services has put a strain on parcel delivery companies and led to the greater use of self-employed drivers.

## 16.4 Delivery points



- As new delivery services increase, delivery points are also on the increase. Convenience and timing of deliveries are important to consumers when ordering online.
- Lockers
  - With its successful introduction of lockers to the United States, Amazon introduced its locker pick-up service to the UK market in 2011.
  - Lockers are now evident at stations, car parks, garages and many high street locations.
- Parcel shops
  - UPS, FedEx, GLS, DPD, DHL and many more parcel delivery companies have established parcel shops across Europe, as a means for customers to drop off or pick up packages.
  - Many of these shops are within other shops, whilst others are stand-alone facilities.
  - One of the attractions of convenience stores providing parcel services is that B2C parcels are converted into B2B parcels by parcel shops, meaning a more efficient delivery model.
- Click & collect
  - Brick-and-mortar retailers, such as John Lewis, are now allowing customers the option to buy online and pick up at its stores.
  - This benefits the customer by providing convenience, as well as increasing the footfall in the retail outlet.

## 16.5 Logistics costs for online retailers



- Logistics cost burden here means ‘logistics costs as a proportion of online sales’, not just logistics costs. Of course, as an online retailer expands, its logistics costs are bound to increase over time as it processes higher volumes which obviously incurs greater costs.
- The logistics burden for an array of companies is not definitively rising over time, as shown in the table to the right, despite increasing consumer demands for faster delivery or alternative delivery, as well as the rise in returns.
  - Amazon’s logistics burden is clearly increasing since 2010.
  - Of the years when their logistics burden has fallen, Chinese players such as JD, Vipshop, Dangdang and Jumei have cited economies of scale and switching towards regional or local couriers as reasons driving down their cost burden.
- The logistics burden is typically much lower for Chinese players compared to e-tailers operating in developed economies – thanks largely to relatively lower labour costs both in

terms of staffing warehouses and effecting deliveries.

- Once a company has an established operation, its logistics burden tends not to fluctuate too much year-on-year.

**Logistics costs as a % of online retail sales for selected e-tailers**

	2010	2011	2012	2013	2014	2015	2016
<b>Amazon</b>	16.5	18.4	19.7	21.6	23.4	25.4	<i>n/a</i>
<b>ASOS</b>	<i>n/a</i>	<i>n/a</i>	20.4	22.8	21.4	25.6	25.3
<b>Ocado</b>	25.8	25.4	25.0	25.2	26.7	27.9	28.8
<b>Zalando</b>	<i>n/a</i>	26.5	25.8	24.1	22.5	25.9	23.3
<b>Vipshop</b>	17.8	20.1	14.0	11.8	10.0	9.3	8.9
<b>Dangdang</b>	12.7	13.4	14.7	12.0	10.2	8.3	<i>n/a</i>
<b>Jumei</b>	<i>n/a</i>	<i>n/a</i>	13.8	14.3	13.0	13.3	12.5
<b>The Hut</b>	<i>n/a</i>	10.5	4.2	16.0	15.9	16.8	17.1
<b>boohoo.com</b>	23.2	24.0	23.1	20.2	22.1	23.3	23.0
<b>Fragrance Direct</b>	13.6	12.3	12.5	14.5	13.3	13.0	15.5
<b>HelloFresh GmbH Berlin</b>	<i>n/a</i>	<i>n/a</i>	51.1	39.1	33.2	39.9	39.9
<b>Yoox Net-a-Porter</b>	4.4	4.8	4.9	4.8	9.8	10.6	10.8

Source: Ti, figures derived from company reports and accounts

Data not in italics in the table is for companies whose logistics costs encompass both fulfilment costs and outbound shipping/last-mile costs. Like-for-like comparisons can be made across companies.

Data in italics are for companies which provide data for their ‘distribution costs’ or for some other measure which may not encompass the full range of e-commerce logistics costs

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## 17.1 The end of ‘business as usual’



- The first stage of the disruptive process involves the ‘**digitisation**’ of aspects of an industry sector.
- The most obvious impact has been the migration of letters to e-mail reducing the number of documents being sent.
- More transformative has been the digitisation of documents carrying the ‘meta-data’ accompanying goods throughout their storage or movement.
- This means that this ‘Big Data’ can be accessed more efficiently and used in ways that could never have been anticipated.
- For some companies this means making processes more efficient, for others it provides more exciting opportunities.
- This leads on to the second stage: that of ‘**disruption**’.
- In the transport industry one of the major problems has been the inefficiency of the market.
- The problem is that the transport industry is split into silos of unitised transport capacity: private fleets of vehicles.
- The allocation of these resources is only as good as the access of each individual company to demand.
- The development of platforms that can match supply and demand by providing a closer-to-perfect market than presently exists could deliver huge value, which presently lies latent.
- The third (and for transport companies most worrying) stage of the disruptive process is ‘**demonetisation**’.
- If disruptive technology providers are able to allow shippers to access the vast pool of owner-drivers that exists in every country in the world, they would be able to benefit from vastly lower costs.
- This would create the environment for the final stage of disruption – ‘**democratisation**’.

## 17.2 Supply chain and logistics: ripe for disruption

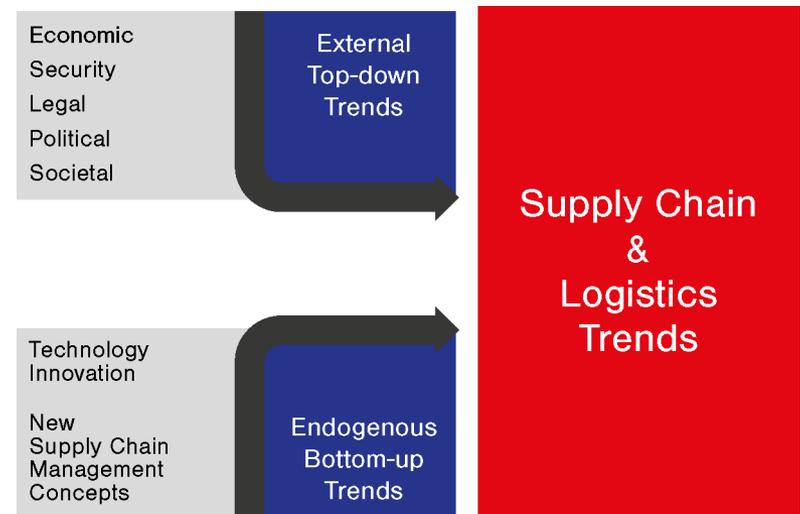


- The logistics and supply chain industry is at the nexus of a multitude of demand-side trends and disruptive technology innovations, which will create a transformation in the way products are shipped, stored and delivered.
- The term ‘innovation’ can be used to describe a wide range of new practices.
- Some will have an impact on a part of the logistics process. For example, improving efficiency within a warehouse.
- Others have the potential to be far more systemic.
- The impact which mobile apps (such as Uber) could have on the movement of parcels, through the use of cars, is one example.
- Economic, security, legal, political and societal trends are forcing top-down change upon the industry.
- At the same time, technological innovation is creating opportunities for logistics providers.
- No longer do very large computing companies

monopolise the development of software. Rather, everyone has the opportunity to conceive and develop new technology solutions, not least due to ubiquitous smartphones.

- In addition to software, smartphones also have scanning functionality, cameras and satellite positioning features.

### Driving forces behind supply chain and logistics innovation



Source: Ti

## 17.3 The ‘Internet of Things’



- Along with the distribution of computing power and hardware throughout the population there has been the generation of massive amounts of data.
- This has been brought about by the so-called ‘Internet of Things’.
- By 2020 Gartner, the technology consultancy, believes that there will be 20 billion objects or ‘things’ with some form of embedded computing device connected to the internet or ‘Cloud’.
- The amount of data (‘Big Data’) that is generated can inform decision-making opportunities, which can bring significant benefits: economic, safety, societal or environmental.
- In the transportation sector, not only can sensors provide information about the whereabouts of a vehicle, for instance, to a central database, but they can also interact with other vehicles around them.
- Another application involves fitting truck engines with multiple sensors that transmit large amounts of data about performance.
- The data can then be used to identify when the truck needs servicing or when a breakdown is likely.
- The proliferation of internet-connected devices that interact without human intervention is creating new possibilities in data gathering, predictive analytics and IT automation.

- Augmented reality (AR) has become widely adopted in a range of different environments since the application was first launched.
- Also known as ‘mixed reality’ (MR), the technology provides the user with ‘layers’ of real-time computer-generated data using either headsets, glasses, lenses, or in a car / aeroplane on the windscreen.
- The logistics industry has been quick to look at the benefits of using AR in the warehouse in order to increase efficiency of order picking.
- Usually picking schedules are driven by lists of orders that have been printed off in paper form.
- AR in the warehouse, or ‘Pick-by-Vision’ as its application in this environment is known, has several advantages:
  - The headsets or glasses being used allow for hands-free picking from warehouse racking.
  - The optimal route to the correct picking face can be calculated and displayed for the operative to follow.
- The recognition software can then tell whether the user is in the right location and picking the correct product and quantity, increasing accuracy.
- The Warehouse Management System (WMS) is updated automatically.
- Much less training is required, allowing labour to be used more flexibly.
- In theory, this allows the warehouse operation to become more efficient, with fewer errors and greater picking volumes being achieved in a shorter period of time.
- According to the companies involved in a test of the technology, efficiency savings of 25% were achieved, including zero errors.

- In December 2012 Amazon shocked the market through a proposal to deliver packages by drone or 'unmanned aerial vehicle' (UAV).
- Amazon is attempting to invent new processes for the rapid delivery of items, overcoming many of the problems related to the last mile.
- However, there are many challenges to overcome to make the technology viable:
  - The technology needed to navigate crowded urban skies will be expensive and complicated.
  - Substantial fleets of drones would be required to travel long distances from distribution centres.
  - Problems of security remain.
  - Questions of reliability, flight control and safety remain unanswered.
  - The economics of dedicated drone deliveries seem challenging.
  - Delivery to high rise apartments or office blocks seems problematic.
- There are some cases in which their use does make sense.
- These include the distribution of pharma products in Third World countries during seasons where conventional land transportation is impossible and the delivery of critical items in emergency repair situations, where time is of the essence.
- Delivery of spare parts to ships in harbour could also be another successful use of the technology.

- There can be no more disruptive technology to the global road freight industry than ‘autonomous driving’ or to give it its more usual term ‘driverless vehicles’.
- Whereas the headlines have mostly focused on cars, one of the world’s largest manufacturers of trucks, Daimler, recently revealed its own plans.
- However, at this stage removing drivers from trucks is still a very long way off.
- It will face huge challenges, not only from labour organisations, but also safety and regulatory bodies, and even the wider population.
- What are the key issues behind driverless vehicles?
  - Congestion: One of the key reasons for the investment in this technology is the potential for the increase in transport efficiency. With congestion forecast to rise substantially, there is a need to break the link between economic growth and vehicle movements.
  - Costs: in many countries in Europe, it is estimated that around 45% of total cost for road freight operators is related to the driver. Eventually, removing the driver would then have an enormous impact on road freight costs, profits and margins.
- Safety: Public perceptions will demand that absolute reliability must be proven before driverless vehicles become a reality.
- Insurance liability. If a driverless vehicle is involved in a collision with a pedestrian, who is to blame? These types of eventualities must be resolved.
- In summary, vehicle manufacturers believe that the benefits will be:
  - Reduced fuel consumption and emissions – the computer will drive the vehicle more fuel efficiently.
  - ‘Perfect’ route planning.
  - Diagnostic services, ensuring fewer breakdowns.
  - Emergency braking will ensure fewer accidents.
  - Less congestion.
  - Zero accidents caused by human error.

## 17.6.1 Autonomous transport in warehouses



- Already in the United States, Amazon is using robots in some of its distribution centres.
- In 2012 it bought robotics company Kiva Systems for US\$775m.
- Its robots bring product shelves to a human picker, rather than the human picker walking the aisles to identify products.
- According to the company, this increases productivity by three or four times.
- Its success has been based on the efficiencies it has been able to create, rather than using technology to replicate human work patterns within traditional operating environments.
- The benefits are:
  - Fast picking. A new pick face location is delivered to the picker once every six seconds. In addition, there is no walking required. Kiva claims that its pickers have twice the output of those working in conventional warehouses.
  - Pick accuracy is improved. Less human fatigue and a quieter picking environment aids human worker accuracy.
- The system, which works with multiple robots, has no single point of failure (unlike for instance, a conveyor). In theory this can bring about zero-downtime.
- Flexible systems. As the robots and 'pods' are mobile, they can be scaled up or down depending on volumes.
- Installation of a new system takes significantly less time than an automated alternative, which relies on traditional technology.
- Full cartons can be moved by robot to dock, onto conveyor and into the back of a truck with no human intervention.
- In addition to the ergonomic efficiencies that are delivered, there are obvious health and safety benefits from making the warehouse a 'human-free' zone.
- One of the major problems with the concept is the space that is required. It may work well in countries where rents are low and land is not a problem, but in Europe this is often not the case.

- ‘3D printing’, or ‘additive manufacturing’ as it is also known, has the potential to become the biggest single disruptive phenomenon to impact industry since assembly lines were introduced in early 20<sup>th</sup> century America.
- New technologies that are currently being developed could revolutionise production techniques, resulting in a significant proportion of manufacturing becoming automated.
- This would remove reliance on large and costly workforces and reduce the competitive advantage of markets such as China.
- 3D printing is already very good at producing products (even with moving parts) that previously would have required the assembly of multiple components.
- By eliminating assembly there will be savings for the manufacturer in terms of labour costs, but also potentially in the removal of storage, handling and distribution costs.
- This would reverse the trend towards globalisation, as production could return to being locally based.
- The implications of this new manufacturing technology for the logistics industry could be massive:
  - Potentially a proportion of goods that were previously produced in Asia could be re-shored to North America and Europe. This would reduce shipping and air cargo volumes.
  - The ‘mass customisation’ of products would mean that inventory levels fall, as goods are made to order. This would have the effect of reducing warehousing requirements.
  - There would be fewer opportunities for logistics suppliers in upstream supply chains, as manufacturing processes are increasingly rebundled within a single facility. Tiers of component suppliers are eliminated as is the need for supplier villages, line side supply, etc.
  - Downstream logistics would also be affected. Build-to-order production strategies could fundamentally impact the manufacturer-wholesaler-retailer relationship.

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## 18.1 Profits, planet and people – the ‘triple’ advantage



- Supply chain management concepts were originally developed with one goal in mind: to optimise business value by ensuring that product reached the end user in the most effective way possible.
- However, the gains have not been completely without cost.
- Just-in-Time supply chains are heavy and inefficient users of transport services, owing to the trade-off between the high cost of inventory ownership and the low (financial) cost of transport.
- This can result in what could be described as suboptimal operational decisions, such as the more frequent use of smaller vehicles.
- This also does not take into account transport’s external costs, such as the effect of carbon emissions on the environment.
- A third factor that companies need to take into account if they are to create truly sustainable supply chains is the societal impact of their businesses.
- That the societal dimension is critical to supply chains has been evidenced by the huge reputational damage caused by catastrophes such as the Rana Plaza factory collapse in Bangladesh in 2013.
- This tripartite approach to supply chain management is critical: economic viability, environmental accountability and social responsibility.

## 18.1 Profits, planet and people – the ‘triple’ advantage (continued)



- The smartest companies see that there is much to be gained from adopting sustainable operational practices.
- For instance, companies that undertake driver training achieve a range of benefits. Vehicles are driven more efficiently, therefore cutting costs and increasing profits.
- A more economical driving style also reduces greenhouse gas emissions, is safer for driver and pedestrians or cyclists and, consequently, reduces the risk to a company’s brand, as well as insurance / litigation costs.
- However, the best-in-class companies go a step further and adopt a ‘holistic’ approach.
- Companies such as Unilever live and breathe sustainability and they are only willing to work with suppliers who take the same approach.



Source: Ti

- For many years, modern supply chain management concepts have been criticised owing to their supposed detrimental impact on the environment.
- ‘Just-in-Time’ (JIT) deliveries that take place on a more frequent basis than ‘just-in-case’ flows of goods have come under attack.
- The flexibility and reliability required by JIT has gravitated against the use of rail, which in terms of energy use and pollution is far more efficient than road.
- However, there is also evidence that modern supply chains are more efficient, not least due to the lower levels of embodied carbon due to lower levels of inventory.

### Summary of environmental impacts

#### ***Carbon dioxide emissions***

Greenhouse gas – climate change

#### ***Nitrogen oxide emissions***

Eutrophication, summer smog, eco-toxicity, human toxicity

#### ***Non-methane hydrocarbons***

Human toxicity, summer smog

#### ***Dust emissions***

Human toxicity, summer smog

#### ***Particulate soot emissions***

Human toxicity, summer smog

#### ***Sulphur dioxide emissions***

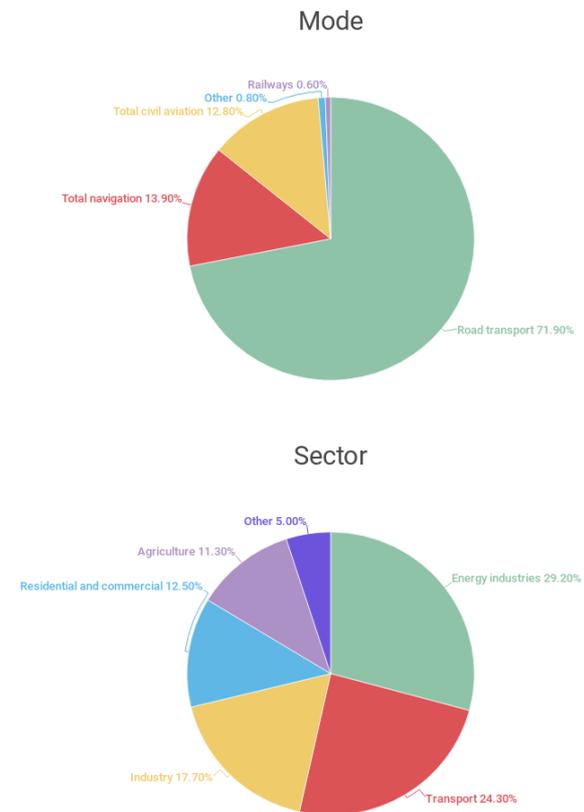
Acidification, eco-toxicity, human toxicity

## 18.3 Government policy and transport emissions

- Governments around the world take a keen interest in transport, owing to the level of emissions for which this sector is responsible.
- In the EU transport is only second to the energy sector, emitting 24.3% of greenhouse gas emissions compared with energy's 29.2%.
- Road transport is the dominant subsector, accounting for 72% of emissions, dwarfing those emanating from sea and air.
- The EU has put a range of policies in place to reduce emissions from the sector.
  - Aviation has been included in the EU Emissions Trading System (ETS).
  - A strategy is in place to reduce emissions from cars and vans.
  - A strategy for reducing heavy duty vehicle fuel consumption and CO2 emissions.
  - A target is in place to reduce the greenhouse gas intensity of fuels.
  - Rolling resistance limits and tyre labelling requirements have been introduced and tyre pressure monitors made mandatory.

- Public authorities are required to take account of lifetime energy use and CO2 emissions.

GHG emissions by mode and sector



Source: European Commission

- Despite the headline figures, trucks and buses are responsible for only about a quarter of CO2 emissions from road transport in the EU and for some 6% of total EU emissions.
- Average emissions of a new van sold in 2014 were 169.1 grams of carbon dioxide per kilometre, already below an EC 2017 target of 175 grams.
- Manufacturers still have to reduce emissions further to meet the target of 147 grams of CO2 per kilometre by 2020 for vans.
- The most recent regulations on engine efficiency are Euro 5 and 6 standards.
- The latest standard, Euro 6, came into force in 2014 and prevents the sale of new vehicles that do not conform to its provisions.
- Regulations are particularly aimed at reducing the levels of nitrogen oxides (NOx) and particulates.
- A so-called Euro 0 engine of 1991 origin had the same level of emissions as 34 Euro 4 equivalents.
- The European Commission aims to reduce CO2 emissions to around 60% of its 1990 level by 2050.
- Further improvements can be made through:
  - Technical improvements to engines and transmissions.
  - Improved aerodynamics.
  - Tyres.
  - Lighter construction materials.
- In addition, it believes that road freight operators have a role to play in reducing emissions through:
  - Improved fleet management.
  - Better driver training.
  - Better vehicle maintenance.
  - Improved capacity management through technology solutions.

- Modern aircraft have high fuel efficiencies and manufacturers have made the most significant advances in fuel efficiency of any transport sector in order to drive down costs.
- Direct emissions from aviation account for about 3% of the EU's total greenhouse gas emissions, which is equivalent to 13% of GHG emissions of the transportation sector.
- But by 2020, global international aviation emissions are projected to be around 70% higher than they were in 2005, even if fuel efficiency improves.
- Some alternative fuels that are being considered include:
  - Synthetic liquid fuels – being manufactured in South Africa by SASOL.
  - Biojet fuel – a soya derivative.
  - Ethanol fuel – only useful for short haul flights.
  - Hydrogen – fuel cells are being integrated on the ground, gradually being developed for aircraft.
- Since 2012 emissions from all flights from, to and within the European Economic Area (EEA) have been subject to the EU Emissions Trading System (EU ETS).
  - EU ETS works on the 'cap and trade' principle, where a 'cap', or limit, is set on the total amount of greenhouse gases that can be emitted by an organisation.
  - An airline can buy 'emission allowances' or 'off-sets', which are generated by emission-saving projects around the world.

- Railways have the capacity to move large volumes of goods in one single journey, with significantly lower carbon emissions and fuel costs in comparison to movement by road.
- Consequently, it has been part of many governments' environmental strategy to encourage a road-to-rail migration of volumes.
- The European rail sector has been energised over the past decade by a series of market reforms, allowing access to private operators.
- A market that was previously dominated by state-owned incumbents has become increasingly competitive.
- However, many rail freight customers still believe that there is a long way to go before the railways offer an acceptable service.
- National rail operations in Europe are perceived to be more expensive, less flexible and unreliable, with a distinct lack of customer focus, which only the private sector will be able to provide.
- An opposing view, mainly held by the incumbent rail operators, is that attempts at liberalisation have brought no new volumes and have split existing business between more operators.
- In the United States, the rail and intermodal sector has many advantages over its European counterpart, as a single market exists.
- An intermodal train emits only 6.8 pounds of carbon emissions for every 100 ton miles, compared with a truck that emits 19.8 pounds.
- The Association of American Railroads asserts that one ton of goods can be moved 479 miles on a single gallon of fuel.

## 18.3.4 Shipping



- The World Shipping Council claims that sea freight is the world's most carbon-efficient mode of transport, requiring 10 grams of CO<sub>2</sub> to carry 1 tonne of cargo 1 kilometre.
- This compares with 21 grams for rail and 59 grams for road.
- Shipping accounts for approximately just 2.1% of the world's CO<sub>2</sub> emissions and liner shipping accounts for around a quarter of the total.
- However, in the past, the shipping industry has gained a very bad reputation for polluting both the air and sea.
- Until regulations came into force in the 2000s, highly noxious heavy bunker fuels were used to power ships, resulting in high levels of emissions including sulphur oxides (SO<sub>x</sub>), oxides of nitrogen (NO<sub>x</sub>), particulate matter (PM) and carbon dioxide (CO<sub>2</sub>).
- Emission levels have been helped by the trend to much larger shipping vessels.
- Shipping Consultants, Drewry, asserted that average ship sizes have increased by 40% in the five years up to 2013, resulting in a 35% drop in round-voyage emissions on a per slot basis.
- Some governments have wanted to impose tighter restrictions on shipping lines, establishing, for example, annual fuel consumption limits or operational energy efficiency standards.
- However, these have been actively opposed by many parties in the industry.

- As green logistics becomes a top public policy issue around the world, governments have begun enacting environmental standards for logistics property development.
- Initiatives include:
  - Using solar panels and wind turbines.
  - Reducing waste in construction.
  - Using environmentally friendly, recyclable materials.
  - Reducing CO2 emissions.
  - Reducing water usage and use of rainwater ('grey water').
  - Reducing pollutants.
  - Increasing biodiversity and enhancing local habitats.
  - Increasing energy and resource efficiency.
  - Storm water collection and use of permeable paving.
  - Energy efficient lighting.
  - 'Green' roofs.
- In order to incentivise developers to work towards best environmental practice, governments have established initiatives that can measure and accredit the sustainability of warehousing projects.
- Another way of looking at these initiatives is that for many businesses a 20% cut in energy costs represents the same bottom line benefit as a 5% increase in sales.
- But considerable challenges to green innovations have also been identified:
  - Lack of management and staff engagement.
  - The need to communicate policy clearly to staff.
  - No defined responsibility for energy use or performance monitoring.
  - Lack of technical knowledge resulting in like-for-like replacement.
  - Lack of expertise to build the business case.
  - A financial structure that works against improvement.
  - Maintenance or capital investment budget.

- Multinational manufacturers, retailers and logistics companies have come under sustained criticism for undertaking practices that would seem unethical or environmentally harmful in their home markets.
  - Outsourcing of production has had many benefits in terms of value creation for these OEMs.
  - However, it has also meant that controls and management of the manufacturing process have moved to external companies and become more opaque and limited.
  - There are four main areas of concern:
    - In upstream supply chains, in particular those related to the extraction and processing of raw materials.
    - In the downstream manufacturing and assembly of components.
    - In the way in which the product is dealt with at the end of its life.
    - The transportation needed to move the product from its raw state, through the supply chain to the consumer and in some cases back again.
- ### Upstream supply chain issues
- Some of the worst environmental and societal problems exist in the mining or extraction of raw materials.
  - The worst examples are prevalent in Africa, Asia and Latin America where there is little oversight of bad practices.
  - In many regions the use of child labour is frequent and there are no health and safety regulations in place.
  - Some mines (for example, in the DRC) are run for rebel organisations fighting the lawful government.
  - Water is fundamental to many upstream manufacturing processes. This can lead to large amounts of chemical pollutants being released untreated into river systems.

- It is believed that about three-quarters of consumer electronics is outsourced to third-party companies.
- These contractors have come under intense scrutiny and criticism for both their labour and environmental practices.
- The issue of labour practices goes to the very root of supply chain management concepts.
- Cyclical and seasonal demand means that flexible workforces are required to meet the peaks and troughs of demand.
- Hence low levels of pay are augmented by very high levels of overtime.
- Employees are likely to be on short-term contracts or temporary work arrangements.
- The fashion industry's supply chain has a poor reputation.
- An example of this is the Rana Plaza incident in 2013 where more than 1,300 workers died when the building in which they were working collapsed.

### End-of-life reverse logistics

- When a product reaches the end of its life in the West it is sometimes refurbished and sent on to secondary markets such as Africa.
- This can be a legitimate use of a product, which is in the best interests of the environment and helps societies develop.
- Recycling and processing facilities in Asia, Africa and elsewhere are often unregulated, putting at risk the workers and local communities, as well as the wider environment.
- Computers and electronic equipment can contain lead and mercury, and the uncontrolled burning of cabling can result in the emission of dioxins.



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