SHORT AND LONG-TERM SUPPLY CHAIN TRENDS

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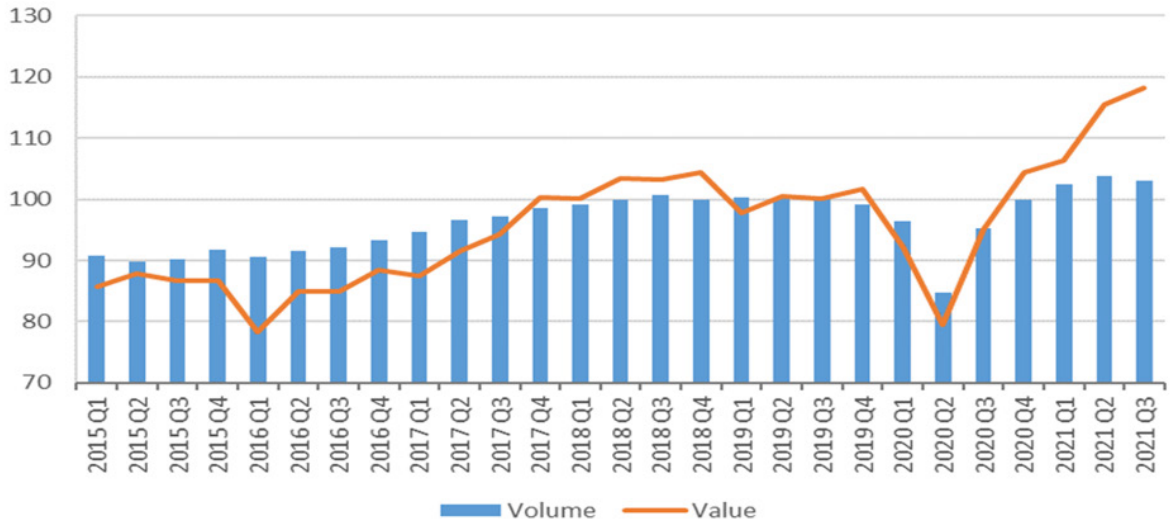
Globalisation seems to still be going strong. The latest numbers from the WTO shows a slightly confused picture. Trade measured by volume has been disrupted by COVID-19 measures and problems at ports, however, trade by value is climbing very strongly.

World merchandise trade volume and value, 2015Q1 - 2021Q3 (Index, 2019 = 100).



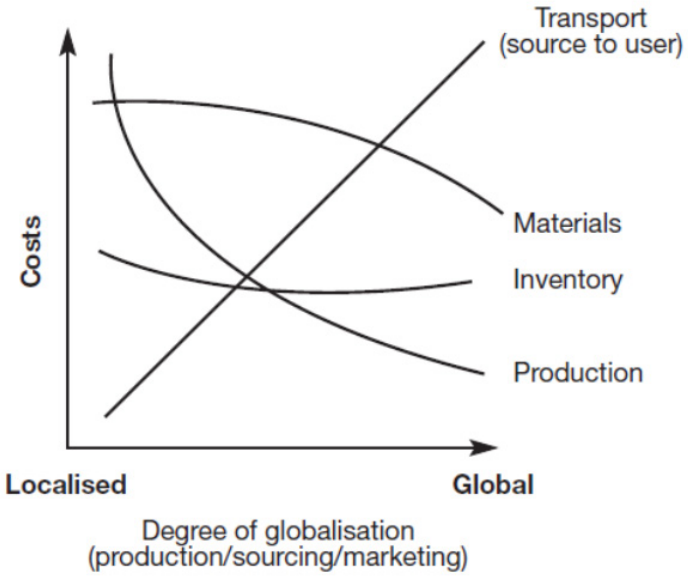
Source: WTO

Yet, so much present hyperbole concerns itself with the threats to global trade patterns. Such threats include political tensions and logistics infrastructure congestion. However, they seem not to be having much effect judging by the numbers. And much of the talk about 're-shoring' neglects the powerful logic underlying globalised supply chains. It should be strongly noted that there are powerful macro-economic forces behind globalisation, especially around issues such as currency flows. However, here we are looking at the microeconomic forces, that is the forces exerted at the company level.

WHAT DRIVES SUPPLY CHAIN ARCHITECTURE?

The design of supply chains does have a logic. It is underpinned by powerful micro-economic forces that result in lower costs and greater competitiveness for those who embrace it. The graph below illustrates these drivers and their relationship with each other.

Trade-offs in global logistics



Source: Martin Christopher. Logistics & Supply Chain Management. Fourth edition 2011. Pearson Education Limited.

It illustrates that the reason behind 'globalisation' in terms of sourcing is a fall in major cost drivers such as production costs and material costs. The exception to this is transport costs. Yet transport might be characterised as an enabler of lower costs in the other categories.

The consequence of this dynamic is that despite obstacles, 'globalisation' exerts a powerful attraction on the structures of companies' supply chains.

Yet there are other forces at play. Forces that are more easily recognised than the cost drivers identified above. So, what are some of these forces that shape supply chains at present?

POLITICS

In the real economy, politics always intrudes. This is very much the case with supply chain management. Whilst the underlying economics of supply chains still have a powerful influence on global trade, politics also is an influence. The relationship between the two forces shapes the supply chain in real life.

China is central to this issue. Many supply chains have been transformed by the use of China as a location for certain operations within supply chains. This has generally had two expressions:

• Investment in production facilities in China

• Purchase of products from Chinese producers.

The latter has changed remarkably over the past ten years. The Chinese private sector was the vanguard of the globalisation of the Chinese economy. The southern province of Shenzhen accounted for two-thirds of the Chinese economy in 2000. This was driven by western corporations using Chinese-owned private sector suppliers based in Shenzhen. However, this pattern of sourcing has changed. The role of the private sector in China has shrunk considerably.

Over at least the past decade the Chinese economy has been characterised by the rise of the 'State-Owned Enterprise'. These, as the name implies, are organisations owned by the Chinese state, usually at the regional or city level but also at the national level. They come in a variety of forms, with many of the larger companies having private sector equity but with the organisation essentially controlled by the state. These have been the platform for an aggressive 'industrial policy' of expanding production in certain sectors which have had a strong effect on supply chains globally.

These organisations have been characterised by a strategic marketing policy of gaining market share through undercutting the prices of competitors in the short-term. This has been facilitated by access to capital resources from the state banking system and other state-controlled resources such as land and energy.

The result is that Chinese SOEs now have strong positions in many sectors. To take a few examples:

• Tank containers: Almost all tank containers (90% +) are manufactured in China and those that are not being manufactured in China are made by companies owned by Chinese SOEs. For the past twenty years, Chinese SOEs specialising in industrial materials handling equipment have used access to cheap steel and the ability to feed containers into global shipping networks from Chinese ports to undercut competitors. Many of the SOEs manufacturing tank containers are financially stressed.

• Steel: China produces half of all global steel output. This has been facilitated through access to China's huge domestic market as well as preferential coal and capital resources. However, although China does export steel, the market for Chinese steel is dominated by domestic demand. Rationalisation has taken place in the Chinese steel sector, with smaller, less sophisticated producers being closed. However larger producers have expanded to compensate. Profit margins and return of capital are said to be low.

• Silk: Silk used in clothing is dominated by Chinese output. This has been facilitated both by access to the Chinese clothing sector but also the ability to undercut global competitors through access to economies of scale in turn facilitated by preferential access to capital. Again, many SOEs producing silk are financially distressed.

These sectors are characterised by:

• Lack of transparency over ownership and finances.

• Dependency on preferential access to capital and other resources.

• Leverage of Chinese domestic market.

These characteristics suggest that the viability and stability of the Chinese supplier base is mixed. It is very much an expression of the political priorities of the Chinese State and therefore competition with it is difficult.

The likelihood is that this politicisation of the Chinese supply chain will disrupt its functioning at the strategic level.

• States that perceive certain sectors as 'strategic' will seek to avoid dependence on Chinese suppliers in those sectors.

• Companies will seek to construct supply chains that rely on suppliers who are politically stable and reliable.

• Investment in assembly operations for servicing markets outside China will be increasingly located outside of China.

• Assembly operations in China will increasingly be dedicated to supplying the Chinese market.

Alternatives to China

Whilst this varies from sector to sector, at the microeconomic level there are already significant signs that global supply chains are becoming less dependent on China. Indeed, the dynamic of the politically driven movement of supply chains away from China has been underway for some time in certain sectors. The clearest example of this is the expansion of significant assembly operations in Southeast Asia by South Korean and Japanese electronics manufacturers. LG and Samsung have continued to invest in Vietnam, with smartphone assembly being moved by both companies out of South Korea and China to existing facilities around Hanoi. Sony is continuing to develop its presence in Thailand. To a lesser extent, there are alternatives in the Philippines and Malaysia that remain attractive.

As this happens China is continuing to develop its own electronics supply chain, with an emphasis on increasing value-add by producing higher-margin components. It is difficult to know the trajectory is this capability, with the implication being it is designed to support Chinese assembly operation and Chinese electronics brands.

That such moves are taking place in the electronics sector is significant. Although there are still major global electronics manufacturers sourcing from China, notably Apple, the clear implication is that there are viable alternatives to China. An objection to this argument is that component sourcing is harder in regions without the depth of suppliers that China has. However, this was not a problem in China when that country did not have a well-developed electronics supply chain. Minor components are straightforward to import although, of course, that incurs logistics cost and adds complexity.

Implications for logistics

The implications for logistics markets of the changing position of China in the global trading system are very significant. The emergence of China as a trading nation in the 1990s saw a transformation in the operational patterns of the shipping sector and airfreight sector, along with an enormous expansion in container port capacity. It had a similar effect on air freight.

Any lessening of the proportion of sourcing out of China will have a major effect on the demand for container shipping in particular. Still, in 2022, trades out of China account for approximately 70% of all container volumes. In addition, the largest container ports are situated on the Chinese coastline. To a lesser extent, this is true about airfreight as well. If exports fall out of China the implications will be:

- Lower service intensity into Chinese ports
- More balanced trade volumes
- Different types of goods moved, including a higher proportion of finished goods
- Change in the pattern of destinations/origins, with a consequent change in the profile of routes.

As important are the implications for alternative sourcing locations. These are:

- Expansion of port capacity and related land-side transport
- Expansion of container services to these locations
- Expansion of forwarders, warehousing, road freight provision at these locations
- Airfreight expansion including landside infrastructure.

Conclusion: China will become less central to global supply with a greater balance between Chinese domestic demand and supply. Other regions of the world will become of greater importance in supply chains at a global level. This will increase levels of global trade.

FUEL COSTS

To add to the complexity of supply chain policies, the price of fuel is set to become even more unpredictable in the short-to-medium term. The implications for logistics generally and freight transport, in particular, are substantial.

Two factors are driving this uncertainty:

• The instability in the oil market resulting from the lower investment and uncertain future demand for oil products.

• Adoption of new propulsion technologies in shipping, air transport and road freight.

What the implications for supply chains are, is an even more complex question. The major effect will be on transport. As discussed above, transport is a key variable in any supply chain design and a sustained oil price increase, and thus sustained a higher price of transport, will have a strong effect on sourcing location decisions and inventory policy.

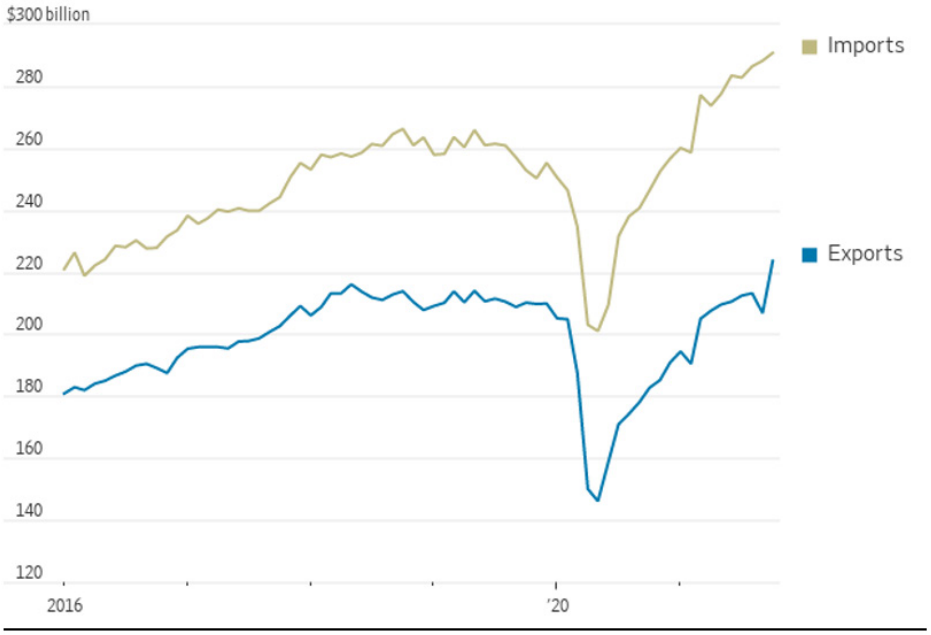
However, it should be noted that transport has become much more efficient in terms of fuel usage over the past twenty years. For example, on a per-container basis, ships have reduced fuel consumption by 80%. The situation is not quite as extreme in airfreight, however, fuel usually accounts for around 15-30% of aircraft operating costs and around 20% of total ownership costs (this obviously varies with fuel price; source: IATA, Boeing). Therefore, the impact of fuel price rises will be less than in the past. Indeed, the impact of other costs, notably airport operating costs and taxes, are now comparable with those of fuel.

Implications for Logistics

The price of fuel will be very volatile over the next ten years but this will not prevent the demand for freight transport from remaining high.

INFRASTRUCTURE & CONGESTION

US monthly trade in goods and services



Source: US Census Bureau

A major problem over 2020 and 2021 has been congestion in certain types of logistics infrastructure. In particular, the US has seen congestion centred around its west coast container ports. The origins of this are not immediately apparent as container volumes worldwide have increased only modestly, by around 4% on an annualised basis. However, what has changed is the balance of trade volumes.

The US in particular has seen a marked increase in imports due to the stimulation and evolution of its consumer sector. As mentioned above, e-retailing has drawn into the US economy huge volumes of products manufactured in China but also in Vietnam, Thailand, other parts of Southeast Asia and Bangladesh. Although exports have grown as well, imports have grown more quickly. The result has been that the balance of goods flows has changed, in turn resulting in changes in the distribution of containers. Essentially this is a mal-distribution of containers, with over-supply in destinations and under-supply in origin locations. This is causing congestion in ports and other logistics hubs. The higher levels of ship utilisation is slowing the relocation of containers. All of this is a major driver of congestion. Therefore, it can be said that changes in trade patterns are a cause of congestion.

Other reasons are more transitory. In particular, the effects of Covid-19 quarantine measures have been very significant over the short-term. Whole regions have been disrupted, with China being an extreme example. Once the Covid-19 problem is dealt with this aspect of congestion will disappear.

A longer-term issue is that of labour availability. Areas of the logistics economy with a record of poor pay and conditions have, unsurprisingly, encountered labour constraints. A good example is road freight, particularly in developed markets in Europe and North America. This issue is solvable through market mechanisms, namely better pay and conditions. As ever, though, both employers (and note many drivers

are owner/operators) and customers will be resistant to this. There are also labour constraints in other areas of the transport sector caused by similar economic dynamics. For example, airline pilots have experienced acute instability over the past several years. This is likely to have considerable effects on airfreight availability.

A not dissimilar dynamic occurs with capital assets. One of the reasons for shortages of capacity in shipping but also areas such as rail and road transport, has been the poor returns on investment that these assets have achieved historically. Indeed, in shipping, returns on capital have often been negative over the past ten years. This has triggered two reactions:

- Emphasis on high utilisation of assets
- Consolidation in the supplier base.

The consequence has been a shortage of capacity during periods of even slightly higher demand and high price increases whenever the market presents the opportunity. These aspects of the present market may be regarded as the consequence of the former depressed market conditions.

Implications for Logistics The longer-term reaction is very likely to be a stimulation of investment in new capacity in these markets. However, it would be unwise to assume that prices will fall back to previous levels as markets in many areas have consolidated in order to sustain returns. Despite this supply chains will continue to globalise and thus demand more logistics services.

EXAMPLES OF CONTEMPORARY SUPPLY CHAIN STRUCTURES

SEMICONDUCTORS: AN EXAMPLE OF A 21ST CENTURY SUPPLY CHAIN.

It is hard to exaggerate the importance of semiconductors to the contemporary economy. They are fundamental to all digital technology. Therefore, their supply chain is critical to almost all economic activity.

The production of semiconductors has a distinct structure. From the 1990s onwards the sector has moved away from vertical integration and towards a business model favouring specialisation in specific locations on the supply chain.

It is characterised by a high level of 'intellectual property' that accounts for a large proportion of the value of semiconductors. The dominant players on semiconductors are generally Western-based designers, notably Intel, Nvidia, ARM, Graphcore. Although Intel has traditionally been vertically integrated, its competitors have not. Rather they have concentrated on the overall architecture of semiconductor design and application. There are smaller companies that focus on specific 'chip designs' for specific applications, such as smartphones. Examples are Qualcom, Broadcom, AMD and possibly Nvidia, although Nvidia has become so large it is comparable to the system architecture companies. The sector of the market that remains vertically integrated is in areas such as memory chips where the South Korean manufacturers Samsung and LG operate.

The company that has changed the structure of the semiconductor industry has been Taiwan Semiconductor Manufacturing Company (TSMC). It has established a business model based around economies of scale and strength in manufacturing competence. It offers the semiconductor architecture designers access to competitive manufacturing, enabling them to concentrate both their management structure and their capital on product development. This has enabled companies such as ARM to achieve leadership in applications such as mobile technology, overtaking the vertically integrated Intel which previously dominated consumer applications. There are other independent semiconductor foundry companies but TSMC has half of the market.

The geography of this supply chain is also distinct. Whilst design capabilities are generally located in the US or the UK, with specific capabilities in South Korea or Japan, foundry capacity is hugely focussed on Taiwan, with the US, China and South Korea being other leading locations. It is not that regions such as Europe or Southeast Asia do not have production capabilities, though measured in terms of volume they are modest.

Therefore, we are presented with the profile of a globalised supply chain.

- Intellectual property underpinning the value chain
- Intellectual property being a major expression of globalisation
- Highly centralised economies of scale, in this case in Taiwan, serving global markets
- Other production locations are secondary as much as competing.

RETAILING

The revolution in retailing has become obvious over the past two years. Its effects on supply chain structures have also become obvious.

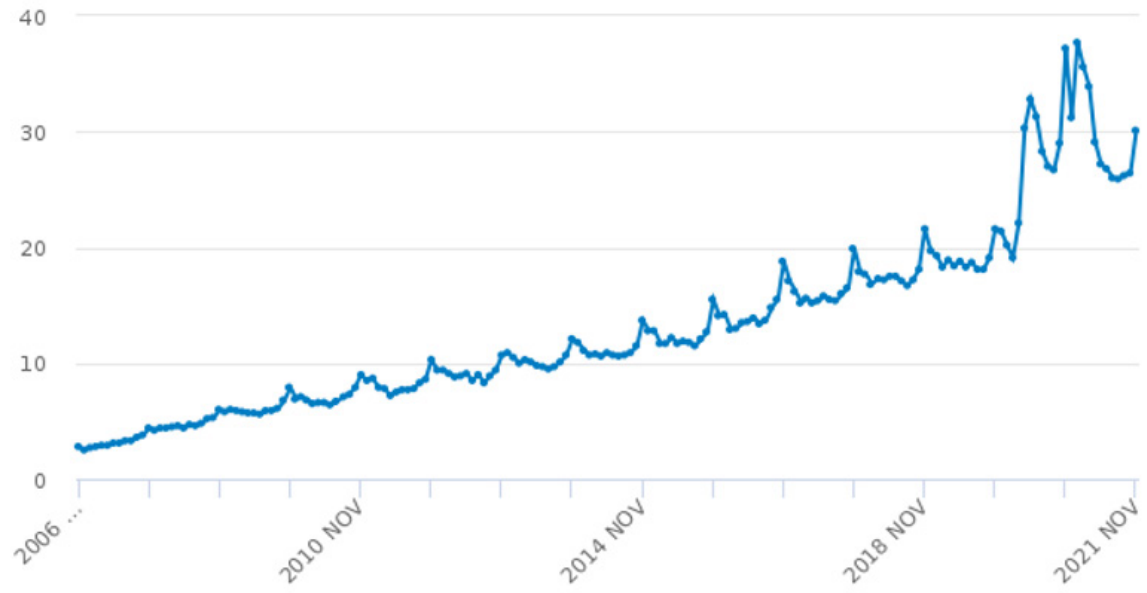
E-retailing has increased hugely both as a proportion of sales and in gross volume terms. In certain economies e-retailing accounts for approximately 25-30% of retail spend, with spikes in demand seen during exceptional conditions. In the US, UK and Scandinavia it represents a very large part of overall spending, including grocery retailing which has grown remarkably rapidly. In other economies, including in Western Europe, the proportion is much less. However, the direction of travel is for e-retailing to continue to increase, with advanced economies looking at proportions of around 30%+ of spending to be internet-based in the medium-term.

E-commerce has different characteristics from conventional retailing:

• The logistics requirements are quite different, most obviously the requirement for 'last-mile' home delivery

• The geography of the supply chain is often different due in great part to the changed type of retailers present in e-retailing.

Internet sales as % of total retail sales the UK



Source: UK Office for National Statistics

What the world's economy is looking at is a transformation in the largest segment of economic activity. It represents what might be called the 'globalisation of retailing'. It is generally assumed that globalisation has already taken place within retailing, with most major retailers sourcing products outside of their home economies. Whilst this is true, retailers themselves remain overwhelmingly 'national' businesses. Whilst global groups are operating global brands, such as Walmart, Carrefour, Inditex or Aeon, these are a collection of nationally based retail companies selling into a national market. For example, a Zara store in

Belgium is not selling to customers in Canada. The market footprint of conventional retail is firmly national. Internet retailing changes that. What an e-retailer can do is 'display its wares' to anyone in the world with an internet connection.

Amazon illustrates this. Although the stock of its 'merchants' may be stored in a specific country, it is generally available for purchase by customers in another country.

The impact of this on supply chain structures has been violently demonstrated in the US. A shift to online purchases during 2020 led to an increase in the sale of furniture manufactured in Vietnam. This contributed to substantial congestion within the relevant logistics infrastructure.

Therefore, new retailing structures result in:

• New trade patterns

• New logistics services

What will these patterns look like? Undoubtedly, they will be more globalised. Sourcing of products into what might be crudely called 'manufacturing' may remain roughly at the same trajectory as at present, with a gradually broadening geography. There are important exceptions to this, however as certain retailers look to source on an increased global level, with the best example being Alibaba, which is aspiring at least to source a higher proportion of its products from non-Chinese sources and sell them to its Chinese customers.

However, in the rest of the world, the movement of products from retailer to customer will be transformed, with an increasing flow of goods being either continental or global. By 2022 this process has only progressed partially. Although e-retail volumes have increased enormously, most e-retailing is sourced from companies operating at a national or, at most, continental/regional level. This is in great part due to logistics constraints. It is hard to move products from global inventory locations to 'local' fulfilment centres. Yet the economic incentive of economies of scale in production and inventory make the incentives for globalisation very great.

Implications for logistics

The implications for logistics provision are significant. Retail is the single largest sector of any developed, or even developing economy. It is a huge consumer of logistics services. Therefore, any change, even in just a part of the sector, will result in very substantial demand for logistics services. Globalised retail services will:

• Emphasise speed and the ability to manage inventory at a global level

o This will imply an increase in the use of airfreight but also trans-continental road freight

• Globally centralised inventory and fulfilment capabilities.

o And a complementary network of localised fulfilment centres capable of interfacing with global freight.

• An information systems architecture capable of pulling together a global retail operation on a global level. This might be characterised as the 'backend' of any retail website.

Indeed, the beginning of these trends is already evident in the Express market, where the leading player's global networks are being boosted by the demand for e-retail services.

CONCLUSION

The period 2020-2022 is seeing a change in the structures of the supply chain at an unprecedented level. Both short-term and long-term changes are violent and profound, all the more so for being largely unanticipated.

Short-term changes are driven by a mixture of unusually high fiscal and monetary stimulation in the face of previously subdued markets. This has been combined with exceptional disruption due to quarantine policies. The latter ought to end within months, the latter will take several years to pass through the economy.

The longer-term changes have, perhaps, been obscured by the exceptional nature of the short-term emergency. However, they will have more profound implications for the structure of supply chains. These are already becoming more intensive and more globalised.

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