

Vehicles - Supply Chain Benchmarking Report

Report for the Department of Infrastructure, Transport, Regional Development and Communications

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Executive Summary and Scope

EXECUTIVE SUMMARY

The vehicle supply chain manages the movement of all sub-categories of vehicles including passenger vehicles as well as light and heavy commercial vehicles. Vehicles are categorised as 'new' or 'used' and are ultimately destined for either private or business customers. This report focuses on the movement of new passenger vehicles for both private and business customers (henceforth referred to simply as vehicles unless where contrasting with other types of vehicles is required).

The vehicle supply chain can be segmented into two routes (referred to as 'flows' in this report):

- The first flow consists of movements of vehicles from port to car dealerships.
- The second flow consists of movements of vehicles to customer premises (either commercial or private customers).





Australia is an import-only vehicle market. In 2019, Australia imported and sold c.1.1 million new vehicles. Australia imports the majority of its vehicles from Japan, Thailand, Germany, and Korea.

Australia's total vehicle freight task moves c.1.8 million tonnes annually (c.1.1 m vehicles), the vast majority of which are moved by road. Vehicle freight in Australia travels an average distance of c.170km with a cost per car of AUD c.\$240, with longer interstate road trips (600-700km) costing AUD c.\$540. Most new vehicle imports arrive at either Port Kembla or Port of Melbourne.

The U.K. and the E.U. have been selected as comparative regions for Australia's vehicle supply chain. While they both have significant domestic manufacturing, they also import significant volumes of vehicles each year. Total car imports in 2019 equated to 2.1 million in the U.K and 4.5 million in the E.U.. To benchmark the passenger vehicle import supply chain in the E.U., the report has examined imports into the Port of Zeebrugge, the Port of Antwerp and the Port of Bremmerhaven (collectively importing c.2.7 million vehicles) which mainly serve Germany, France, the Netherlands and Belgium. In this report, the vehicle import supply chains assessed in the E.U. has been limited to the subset of countries and ports described above.

Most car imports in the U.K come from Germany, Spain, the Czech Republic, France or Japan. The UK's total freight task for imported passenger vehicles movement is c.3.2 million tonnes annually (the majority (c.95%) of which is undertaken by road. Rail is infrequently used to transport vehicles over longer distances. In the U.K, vehicle imports typically travel an average distance of 200-250km from port to their destination. The cost of transporting a car c.200-250km is AUD c.\$250, while a c.600-700km journey costs AUD c.\$320-400. Longer journeys are more efficient than in Australia, as the U.K.'s supply chain benefits from higher backhaul utilisation due to onshore manufacturing.

While Europe is a large manufacturer and exporter of vehicles, it still imports a significant number of vehicles. New passenger non-European vehicles registered in the E.U. are predominantly Korean, Japanese and American brands. Zeebrugge (Belgium), Antwerp (Belgium), and Bremerhaven (Germany) receive c.60% of total vehicle imports in Europe. The E.U.'s vehicle import supply chain moves 7.4 million tonnes annually. Shorter trips (c.200-250kms), similar to those in the U.K. and Australia are predominantly undertaken by road. Rail is used to transport vehicles longer distances (c.>500kms). The cost of transporting a passenger vehicle is approximately the same as in the U.K., with a c.200-250km journey costing AUD c.\$250 and a c.600-700km road journey costing AUD \$320-\$400.

Scope

This report covers the movement of new finished passenger vehicles (cars, SUVs and light commercial vehicle) from point of importation to delivery to customer or vehicle dealership. Heavy commercial vehicle imports are not captured in this report.

KEY FINDINGS & AREAS FOR FURTHER INVESTIGATION

- Australia's vehicle freight rates are higher than the E.U. and the U.K as both E.U. and U.K. benefit from higher backhaul utilisation due to onshore manufacturing.
- The E.U moves substantially more vehicle imports than Australia (in both volume and weight), enabling economical utilisation of rail over longer distances.

Australian Supply Chain Overview

AUSTRALIAN SUPPLY CHAIN OVERVIEW

Generic vehicle supply chain



Figure 1: Vehicle supply chain (import country agnostic)

Passenger vehicles (not including heavy commercial vehicles) are globally traded items. In 2019, all vehicle exports totalled USD c.\$777 billion (AUD c.\$1,060 billion).¹ The world's largest passenger vehicle exporters were Germany, Japan and the United States of America (U.S). Some countries, such as Australia, do not have domestic passenger vehicle manufacturing and are therefore classified as "import-only" markets. Some countries with onshore manufacturing, like the U.K., also import a high number of vehicles while exporting most of the vehicles that they produce.

Vehicles are predominantly moved between countries on ships, using a "roll-on/roll-off" ("ro-ro") method where the vehicle is "rolled on" to the vessel at its port of origin and "rolled off" at the destination port. Vehicles are then held on-port at an automotive terminal until customs clearance. Some ports are equipped with facilities to undertake post-production operations (e.g., electric work, detailing, polishing) and pre-delivery inspections for damaging before heading to dealerships. In rare circumstances, particularly high value passenger vehicles, may be containerised rather than imported on a ro-ro vessel.

The vehicle supply chain can be segmented into two routes (referred to as 'flows' in this report):

- The first flow describes the dealership model in which vehicles are delivered straight from port to car dealership or from port to car dealership via a compound.
- The second flow describes the movements of vehicles not purchased through the traditional dealership model, but rather delivered directly to end customers.

¹ Observatory of Economic Complexity (OEC) 2019

It is worth noting that the sales model within the automotive industry could change over time, which could affect the overall supply chain structure. For example, an Accenture study² predicts a long-term trend whereby OEM's will move to an 'agent' sales model. These trends could affect the proportion of sales between flows 1 and 2 by changing how vehicles reach customers.

Vehicles in Australia

Australia is an import only vehicle market due to the recent closure of its remaining automotive manufacturing in 2018. In 2019, Australia imported 1.1 million vehicles into Australian ports. Key automotive ports in Australia are Port Kembla and Port of Melbourne, receiving 33% and 32% of vehicle imports respectively in 2019 (refer figure 2).³





Figure 2: Australian ports with motor vehicle throughput 2019 and sales by state (source: Ports Australia and Federal Chamber of Automotive Industries). Note: *other ports include minor ports: Townsville, Darwin, Mackay and Thursday Island

The top exporters of vehicles to Australia are Japan (27.5%), Thailand (22.6%), Germany (9.8%) and Korea (8.1%). Two of Australia's most popular

³ Ports Australia Statistics

² The future of automotive sales, Accenture

vehicles, the Toyota Hilux and Ford Ranger, are manufactured in Thailand.

In 2019, SUVs were the most popular vehicle purchase making up 45.5% of the 1.1 million vehicle sales, followed by other passenger vehicles (30%), light commercial (21%) and heavy commercial vehicles (4%).⁴



Figure 3: Sales of vehicles in Australia 2019 (source: Federal Chamber of Automotive Industries).

Key supply chain flows

Ninety-eight per cent of vehicles arrive in Australia through major ports on ro-ro vessels (refer figure 4).⁵ Australia's main automotive ports, Port of Melbourne and Port Kembla, have berths with on-site ro-ro and automotive terminals. Webb Dock West in Melbourne can hold 14,500 vehicles and has a 920m berth that can accommodate 3 vessels at a time.⁶



Figure 4: Australian Port with motor vehicle throughput 2019 (source: Ports Australia)

Australian vehicle logistics providers handle orders for car dealerships, commercial fleets and individuals.⁷

Vehicles are moved mostly by road in Australia, as the average distance travelled is insufficient to justify the logistical difficulty of loading and unloading vehicles more than once for a multi-modal journey.

Flow 1: Vehicle imports to dealers

From ports, vehicles are typically transferred to compounds for postproduction operations. Vehicles are transported to compounds on large trailers with capacity to hold c.8-10 vehicles at a time. Vehicles are typically moved within the same state, with an average trip distance of c.170km.

The majority of vehicles are delivered to metropolitan compounds, located close to the port, which serve metropolitan dealerships. The remaining vehicles may be transported to regional compounds, further distance from ports, serving dealerships in regional communities.⁸ Vehicles are stored for some time in compounds on behalf of car dealerships. Upon request, vehicles are transported a short distance to the dealership via road.⁹ For example, Prixcar, has terminals located near ports in major cities, as well as partnership satellite depots in regional locations



(refer figure 5).

Figure 5: Prixcar compound locations – example of compound distribution across Australia (source: Prixcar website)

A limited number of vehicles travel longer distances inter-state to their destination. For example, vehicles are transported from the port of Melbourne to Tasmania for sale.

Flow 2: Direct travel from port to customer

Despite the industry greatly favouring the purchase of vehicles from a dealership location, vehicles can be

- ⁸ Prixcar website
- ⁹ Prixcar website

⁴ Federal Chamber of Automotive Industries

⁵ Ports Australia

⁶ <u>Melbourne International RoRo and Auto Terminal (MIRRAT)</u> website

⁷ Company websites

delivered outside the dealership channel, particularly for commercial fleet orders. From ports, these vehicles are delivered to metro or regional depots (whichever is closer to the end destination). From depots, vehicles are then delivered via road to a specific address, via carrier, for customer collection.¹⁰

¹⁰ Prixcar and Autocare website



Basis for International Comparison

BASIS FOR INTERNATIONAL COMPARISON

The U.K. and the E.U. have been chosen as suitable comparative regions for Australia's vehicle import supply chain as they each import a significant volume of vehicles each year. In addition, like Australia, the E.U. and the U.K. receive the majority of their vehicle imports via seaports.

The U.K.

The vehicle import supply chains in the U.K. and Australia have the following similar features:

- Both countries import a significant number of vehicles. Over 80% of vehicles purchased in the U.K. are imports, compared to 100% of vehicles purchased in Australia.
- As island nations, both Australia and the U.K. have a water border, meaning that vehicles must be imported into both countries via seaport, using ro-ro (or containerised) freight facilities.

While Australia and the U.K.'s vehicle import supply chains are similar, there are a number of notable distinctions that need to be considered when interpreting the data in this report:

- The U.K. has previously been part of the E.U., which may impact the nature of trade flows.
- While the U.K. exports most of its vehicles and relies on imports to serve domestic markets, the existence of a local manufacturing industry may benefit the overall import supply chain. For example, backhaul movements can subsidise the overall journey cost by increasing total carrier utilisation.
- The U.K. has a smaller landmass than Australia, meaning that the average distance travelled is lower.

The E.U.

In order to examine the passenger vehicle import supply chain in the E.U., this report has examined imports into the Port of Zeebrugge, the Port of Antwerp and the Port of Bremmerhaven that travel medium and large distances, with a focus on deliveries to Germany, France, the Netherlands and Belgium. The vehicle import supply chains in the E.U. (restricted to the subset of countries and ports described above) and Australia have the following similar features:

- The E.U. and Australia import a significant number of vehicles.
- A large proportion of vehicle imports into the E.U. arrive by seaport, suggesting a similarly high reliance on ro-ro (or containerised) freight facilities to Australia.

While Australia and the E.U.'s vehicle import supply chains are similar, there are a number of notable distinctions that need to be considered when interpreting the data in this report:

- The E.U., particularly Germany, is a very large manufacturer of vehicles. While many of these vehicles are sent offshore, local manufacturing benefits the overall import supply chain.
- The E.U. relies more heavily on rail as a mode of transportation than Australia and the U.K. and reducing the overall cost of supply chain movements.
- Vehicles in E.U. are often moving across borders (e.g., from the Netherlands to Germany). While there is largely free travel within the European Union, there are inevitable regulatory discrepancies between specific member states such as speed limits which can impact the otherwise optimal flow of goods through the supply chain.
- The E.U. has a greater number of large population centres away from the coastline than Australia.



U.K. Comparison

U.K. SUPPLY CHAIN

Passenger vehicles in the U.K.

The U.K. manufactured c.1.3 million passenger vehicles in 2019.¹¹ However, c.80% of the U.K.'s passenger vehicles are exported. As a result, the domestic market is largely serviced by imports. According to the Society of Motor Manufacturers and Traders, imports represented c.88.6% of all U.K. passenger vehicle registrations in 2019.

Of new passenger vehicle registrations, business owned vehicles made up over half of the market in 2019, with the remaining registered for private use (refer figure 1).



Figure 6: New passenger vehicle registrations by sales type 2019 (source: Society of Motor Manufacturers and Traders)

The U.K. imported c.2.1m passenger vehicles worth AUD c.\$110bn in 2019. Most passenger vehicle imports (c.78%) come from the E.U., largely from Germany, Spain, the Czech Republic and France. Imports from Japan make up c.7% of total new passenger vehicle registrations (c.144k units).¹² Imports from the E.U. tend to arrive at Grimsby and Immingham, Bristol, London and Medway Ports. Imports from Asia tend to arrive at Port of Southampton.



Figure 7: Top 6 motor vehicle import ports, Great Britain (source: Department for Transport

Key supply chain flows

Flow 1: Vehicle imports to dealers

After a vessel arrives at the port, it must be unloaded within a four-hour window. An inspection of the vehicles is conducted at the first point of rest, to check for any damage that has occurred in transit. The vehicle is stored, typically at the port, for 20 days on average, depending on the particular model. Presale modifications can also be made at the port.

Once ready to be moved, vehicles are driven onto car carriers, which carry c.10 average sized passenger vehicles. The loading process can take up to an hour, as the vehicles need to be strapped in. Rarely, vehicles are loaded onto rail, with each train carrying c.100-115 vehicles. Rail is typically only used for longer distances (e.g., moving vehicles to Scotland) when a large number of vehicles need to be moved at the same time.

¹¹ Society of Motor Manufacturers and Traders (SMMT)



Figure 8: Imports of vehicles to top 6 ports and general movements

Vehicles then travel from the main ports to dealers. While the journey can be up to 800km (up to Scotland, for example), the typical journey is c.200-250km. An estimated c.70% of passenger vehicle sales are delivered to areas south of Birmingham.

A small percentage of the U.K.'s vehicles are containerised, rather than carried by ro-ro which has the advantage of a faster speed to market. However, this is typically only done for very high-end car imports. While it is technically possible to drive vehicles directly from the port to dealerships, this is uncommon as consumers expect a brand-new car to have as little mileage as possible.

Flow 2: Direct travel from port to customer

Depending on the commercial arrangements, vehicles can be delivered directly to a customer's premises (commercial or residential). Distances vary by destination, up to c.800km. Usually a similar car carrier will be used to move the vehicles as with direct to dealership trips.

In some cases, vehicles may travel to the Midlands as an intermediary step, where work can be carried out on the vehicle, as the cost of storage there is typically cheaper than at the port, particularly for longer stays.

Vehicle freight data in the U.K.

Industry participants have suggested that the cost of moving vehicles by road in the U.K. is approximately the same as the E.U. Very limited rail is used in the U.K. due to the difficulty getting sufficient volumes to fill a complete train and the relatively short distances travelled in the country.

Vehicle movement cost estimates (AUD)	Road
200-250km	c.\$250
600-700km	c.\$320-400

Table 1: Vehicle movement cost estimates (source: industry participants)



E.U. Comparison

E.U. SUPPLY CHAIN

Vehicles in the E.U.

The E.U. is a sizable passenger vehicle manufacturer, producing c.16.4m vehicles in 2019. Thirty-two per cent of E.U. manufactured vehicles were exported with the remainder sold in the domestic market.¹³ Imports of passenger vehicles typically supplement domestic demand.

In 2019, 4.5 million passenger vehicles were imported into the E.U.¹⁴ The key ports for vehicle imports include Zeebrugge in Belgium (c.1.5 million vehicles),¹⁵ followed by Bremerhaven (c.0.75 million vehicles),¹⁶ and Antwerp (c.0.45 million vehicles),¹⁷ collectively receiving c.60% of the E.U.'s passenger vehicle imports. These vehicles were imported from Turkey (23.3%), Japan (18.9%) and the U.S. (15.4%).

In 2019, 74% of new passenger vehicles registered in the EU28 were European brands, which are typically manufactured within the E.U.'s borders. Overseas brands, which are often manufactured offshore, constitute the remaining 26% at 3.9 million registrations. Of the 3.9 million overseas registrations, Hyundai Group from Korea, Ford (U.S) and Toyota (Japan) were the most popular overseas brands (refer figure 9).¹⁸



Figure 9: New passenger vehicle registration by origin (source: European Automobile Manufacturers Association)

A large proportion of European passenger vehicle imports are directed to Germany, with Germany receiving an estimated c.950,000 vehicles compared to c.450,000 in France and c.100,000 in Belgium (based on new passenger-vehicle registrations and sales of overseas brands).¹⁹ Zeebrugge and Antwerp ports service Germany, Central Europe, the Netherlands, France and Belgium alongside Bremerhaven. The vast majority of Bremerhaven's vehicle imports service Germany²⁰.

Journeys in the E.U. can be longer than in Australia, due to the population of E.U. states being more centrally concentrated. The freight between port of importation and France, Germany or Netherlands is usually 600km or less. Therefore, vehicles imported into those countries are frequently transported by road.

Key supply chain flows



Figure 10: Country destinations from Zeebrugge, Bremerhaven Antwerp ports (source: International Car Operators)

Flow 1: Vehicle imports to dealers

Approximately c.90% of vehicles in the E.U. are sold via dealers. Vehicles can be stored at the port where they undergo post-production-operations prior to being distributed to dealers via road on trailers that hold between 8-10 vehicles. Vehicles can also be transported to a depot, as an intermediary step, where the post-production work can be undertaken. The distance to dealership (or to depot and then to dealership) varies greatly by destination country with some indicative distances featured below (table 1).

²⁰ International Car Operators

¹³ EAMA, EU-UK Automobile trade: Fact and Figures 2020

¹⁴ EAMA, EU-UK Automobile trade: Fact and Figures 2020

¹⁵ Port of Zeebrugge, Global leading Automotive Port 2019

¹⁶ Ports of Bremen and Bremerhaven, Facts and Figures, 2019

¹⁷ Port of Antwerp, 2019 Facts and Figures – reported 1.2 million vehicles handled at port and assumed 36% were imported

¹⁸ European Automobile Manufacturers Association (EAMA)

¹⁹ Statista (Germany and Belgium); <u>Bestsellingcars.com</u> (France)

Destination (from Zeebrugge)	Approximate distance (km)
Amsterdam	250
Paris	300
Cologne	350
Frankfurt	500
Nuremberg	700
Munich	900

Table 2: Approximate journeys from Zeebrugge to common destinations (source: Google Maps)

The cost to transport a vehicle is AUD c.\$250 for a 200-250km journey and AUD c.\$320-\$400 for a 600-700km journey.²¹ Routes with sufficient volumes and distances, such as from Zeebrugge to inner Germany, are cheaper via rail. Rail can transport up to 220 vehicles at a time but is generally not economical over shorter distances, and usually requires the vehicles to be transferred onto a road trailer for last mile delivery to the dealer.



Figure 11: Illustrative trucking route direct-to-dealer



Figure 12: Illustrative route to depot in Nuremberg

²¹ CEO of a large vehicle logistics company, Europe

Flow 2: Direct travel from port to customer

Vehicles purchased through some commercial arrangements can be delivered to a specific location (e.g., a personal address or commercial premise).

From the port, vehicles undergo post-productionoperations at a depot either located on port or at depot located on route to the end location. Direct-tolocation trips from port are completed via similar road trailers used for dealer deliveries, carrying between 8-10 vehicles for bulk orders and 1-2 vehicles for small/individual orders. Trips via depots are completed via road or rail with end-destinations typically located further afield.

Vehicle freight data in the E.U.

According to industry participants, the cost of moving vehicles through the E.U. by road is approximately the same as the U.K.

Freight cost estimates, per vehicle (AUD)	Road	Rail (rail trip only, incl loading and unloading costs) ²²
200-250km	c.\$250	Not viable
600-700km	c.\$320-400	c.\$310
900km	Not viable	c.\$360

Table 3: Estimated freight costs per vehicle (Source: Industry participants)

²² Based on quotes from DB Cargo Logistics GmbH (August 2021). Rail portion only (including loading and unloading costs), excluding any last mile costs



Data comparison

DATA COMPARISON

A high-level summary of the key freight metrics for each country is shown in the table below.

Estimates	Australia (CSIRO and L.E.K. Analysis)	υ.к.	E.U.
Annual vehicles moves (c. millions)	1.1 (vehicles) ²³	2.1 (passenger vehicles) ²⁴	4.5 (passenger vehicles) ²⁵
Annual tonnes moved (c. millions)	1.8	3.2 ²⁶	7.4 ²⁷
Annual net tonne-km (c. millions)	305	c.642 ²⁸	c.1,500-5,200 (depending on average journey used) ²⁹
Annual trailers / shipments (c.000)	304	c.632 ³⁰	c.1,234 ³¹
Cost of movement (\$AUD / per vehicle	\$243 per vehicle (c.150- 200km trip metro trip) \$537 per vehicle (600- 700km trip)	\$250 for a c.200-250km journey ³² \$320-400 for a 600-700km journey	\$250 for a c.200-250km journey (road) ³³ \$320-400 for a 600-700km journey (road)
Total transport costs (c. AUD \$m)	\$267 ³⁴	\$530 ³⁵	c.\$1,150-1,800 ³⁶
Average trip distance (km) ³⁷	169 ³⁸	200-250km (short trip) 600-700 (longer trip)	200-250km (short trip) 600-700 (longer trip)
Average trip duration (c. hours) ³⁹	2-3 hours	2.5-3.5 (short trip) 7-8 hours (longer trip)	2.5-3.5 (short trip) 7-8 hours (longer trip)

²³ Ports Australia statistics

- ³¹ Total tonnage divided by CSIRO estimate of tonnes per trailer
- ³² Aggregate of interviews with industry participants ³³ Aggregate of interviews with industry participants
 - ³⁴ Quotes from PrixCar Australia

 - ³⁵ Cost of movement per vehicle * number of vehicles moved ³⁶ Cost of movement per vehicle * number of vehicles moved
 - ³⁷ Aggregate of interviews with industry participants
- ³⁸ Calculated by weighted average distance from port to centre of population in each state ³⁹ Aggregate of interviews with industry participants

 ²⁴ Society of Motor Manufacturers and Traders
 ²⁵ EAMA, EU-UK Automobile trade: Fact and Figures 2020

²⁶ Department for Transport Statistics

²⁷ EAMA, EU-UK Automobile trade: Fact and Figures 2020

²⁸ Calculated by: Annual tonnes moved * average trip distance of

c.200km ²⁹ Calculated by: Annual tonnes moved * average trip distance of c.200km and c.700km (range) ³⁰ Total tonnage divided by CSIRO estimate of tonnes per trailer

FREIGHT DATA COMPARISON SUMMARY

Passenger vehicles are an important consumer product, as a crucial mode of individual transportation. Australia's pre-covid passenger vehicle import volumes are relatively small, at c.1.1m (1.8Mt), compared to the U.K. (2.3m vehicles, 3.2Mt) and the E.U. (4.5m vehicles, 7.4Mt) in the same period. Average distances travelled in Australia are relatively low at c.170km, compared to c.200-250km in the U.K., though trips in the E.U., particularly beyond Germany can be significantly greater. This high average distance leads to a low freight task for Australia of c.0.3bn tonne-kilometre (tkm). compared to almost twice that (c.0.6bn tkm) of the U.K.

The cost of moving vehicles a short distance in the U.K., the E.U. is relatively similar, at AUD c.\$250 per vehicle for a 200-250km journey. This cost is relatively similar to Australia, at AUD c.\$240 per vehicle for a 150-200km metro trip. However, the U.K. and E.U. have lower rates for long journeys, at AUD c.\$320-400 per vehicle for a 600-700km journey, compared to \$540 for a 600-700km journey in Australia. Industry participants have suggested that this is likely to be caused by more efficient backhaul in the U.K. and the E.U., due to their domestic vehicle production and exports.

The figures presented in this report are from pre-covid period and may differ from those observed during the pandemic.

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