

SHIFTING GEARS

An Economic Geography Analysis of Australia's Downstream Automotive Sector

Research Report for Industry

January 2025



Andrew Warren

E: awarren@uow.edu.au

I pay respect to the past, present and future Traditional Custodians of this nation. I acknowledge the continuation of cultural, spiritual, and educational practices of Aboriginal and Torres Strait Islander peoples.

Table of Contents



01 Project overview



An outline of the research project
..... pp. 2-3

02 Shifting Gears



The restructuring of Australia’s auto sector..... pp. 4-6

03 Dataset 1



Market characteristics of Australia’s auto economy
..... pp. 7-17

04 Dataset 2



Automobiles as complex, evolving technologies
..... pp. 18-24

05 Dataset 3



The consumer-product relationship
..... pp. 25-37

06 Dataset 4



Workforce insights and struggles over skills
..... pp. 38-47

07 The Road Ahead



Forward-looking insights on Australia’s post-production auto sector
..... p. 48-49

08 References



A list of references used in this report
..... p. 50



01 *Project overview*

An outline of the research project

This report presents data collected from primary and secondary research on a multi-year project titled '**Economic geographies of transition: beyond Australian automotive production**'. The research project was funded by the Australia Research Council (ARC) under the 'Discovery Early Career Research Award (DECRA)' scheme.

The DECRA project (DE180100492) examined the spatial and economic aspects of restructuring unfolding in Australia's automotive sector, specifically so-called secondary, 'aftermarket services'. The focus on **aftermarket services** was deliberate. In October 2017, the last new passenger cars made in Australia rolled off assembly lines in GM-Holden's Elizabeth factory on the outskirts of Adelaide. Over the previous 12 months, Ford (Broadmeadows, Geelong) and Toyota (Altona) also ceased making new cars domestically, ending a high-value manufacturing industry that had provided well-paid, unionised jobs and been a source of national pride for close to a century (see McDonagh 2011).

A range of factors explained the closure of new car manufacturing in Australia. These factors included Australia being a small, geographically isolated market; a dramatic shift in consumer preferences from large family sedans to SUVs and dual-cab utes; the comparatively high costs of manufacturing vehicles domestically; increased competition from newly industrialised countries, and Australia's removal of import tariffs and government assistance that had spurred a classic 'branch-plant' spatial arrangement to new car production.

Mirroring the United States, in the post-war period Australia's settlement pattern became characterised by detached housing in suburban areas (urban sprawl) closely associated with new road infrastructure and rising car dependency. By 2020, there were roughly **775 vehicles per 1,000 residents in Australia**, a 31% increase in ownership rates from 1990.

While new production has ended, costing around 30,000 full-time equivalent jobs, Australia's high levels of car dependency continue to support a large, spatially dispersed aftermarket economy. This aftermarket is underpinned by technical services and products that maintain the safe and reliable use of vehicles alongside their second-hand value (Warren and Gibson 2021). Importantly, while car manufacturing and assembly are **spatially mobile and increasingly fragmented across global production networks (GPNs)**, aftermarket services require geographical proximity to cities and towns where car ownership levels and dependency are high.

Aftermarket commercial services are connected to the production and consumption of motor vehicles, forming a considerable economic enterprise in their own right (Warren and Gibson 2021). Aftermarket activities include specialised services and products such as maintenance and repair (M&R), aftermarket accessories, spare parts, materials recycling, insurance and financial products, and the sale of user-generated data, such as that now captured via telematics technology.

Responding to a lack of research on product aftermarkets, including for Australia's automotive sector, the DECRA Project aimed to develop an evidence base and analytical framework to offer new insights into aspects of industrial change that have major implications for the national economy and a spatially mobile society.

Integrating insights from more than 60 semi-structured interviews, quantitative data sets, and ethnography in auto servicing shops, the project traced structural changes in aftermarket industries and documented transition experiences among place-based auto businesses. Conceptually, a relational economic geography framework was deployed to help interpret emerging technical and competitive dynamics among auto repair and maintenance businesses. These place-based firms service an increasingly complex and information-rich consumer product manufactured by globally-networked brands and multinational corporations.

Through an immersive research process, the project was also able to examine the changing skill requirements among a traditionally male-dominated 'blue-collar' workforce. In light of struggles identified within downstream auto businesses to fill vacant positions with suitably skilled and experienced workers, the report concludes by making three recommendations for industry groups and policy-makers. These recommendations are intended to assist in reproducing a skilled and valued workforce well-equipped for the future. In addition to this report, a series of academic publications are connected to the research and can be accessed via the Reference List contained on page 50.

Importantly, the data sets presented in this report help to illustrate how the causes of industrial transformation involve a combination of factors. In the auto sector, the multi-scale factors driving change include the effects of government laws and policies (e.g. US Clean Air Act 1999; Inflation Reduction Act 2022), evolving technologies and intellectual property rights, changes to production and retailing practices, the reliance on cars for mobile everyday life, and struggles to reproduce a workforce skilled at keeping cars in reliable working order. A key objective of the report is to offer policy-relevant insights as new forms of regulation emerge globally around the sharing of technical and proprietary information among industry actors; so-called 'right-to-repair' laws.

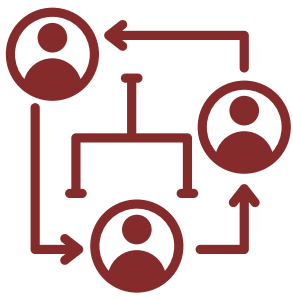
The chief investigator on the project was Dr **Andrew Warren**, an economic and labour geographer based in the Australian Centre for Culture, Environment, Society, and Space (ACCESS) at the University of Wollongong (UOW). A broader groups of researchers also contributed to the project, including:

- **Dr Chris Gibson**, Senior Professor, ACCESS, UOW
- **Dr Pauline McGuirk**, Senior Professor and Director, ACCESS, UOW
- **Mallee Smith**, Research Assistant, School of Geography & Sustainable Communities, UOW
- **Craig Lyons**, Research Assistant, ACCESS, UOW
- **Rebecca Vaartjes**, Research Assistant, ACCESS, UOW
- **Dr Ren Hu**, Lecturer, School of Commerce, Jiangsu University of Science and Technology

For further information on the project contact Dr **Andrew Warren**, E: awarren@uow.edu.au



Australian Government
Australian Research Council



02 *Shifting Gears*

The restructuring of Australia's auto sector

Restructuring has been a near-permanent feature of advanced industrial economies since the early 1970s (Warren 2019). The auto sector has been an emblematic example of such transformation. Writing about the deindustrialisation of America's economy four decades ago, Bluestone and Harrison (1982: 114) pointed out that “*no single product with its extensive linkages to other economic sectors... has ever so dominated the imagination of the population, or base of a national economy as did the car*”. The auto sector is deeply interconnected with a range of other commercial functions and activities: road and infrastructure works; urban planning and suburbanised housing developments; corporate finance and personal credit markets; legislative and regulatory approaches spanning trade policy to environmental protection; personal mobility and lifestyles; regional economic development; technological and organisational change, employment and skilled labour markets (Pavlinek 2020; Pollard et al. 2021; Warren and Gibson 2021). In the 1960s, across advanced economies, up to one in six jobs were indirectly connected to the automobile (Bluestone and Harrison 1982).

By the 1970s, cars had become a quintessential product of globalising capitalism. With a drive for greater efficiency and returns on investment, auto brands increasingly segmented and dispersed production among tiers of original equipment manufacturers (OEMs) and subcontractors (Sturgeon et al. 2008; Rutherford and Holmes 2014).

Then, in 1990s, amendments to the U.S. Clean Air Act required all cars sold in the country to be fitted with On-Board Diagnostic (OBD) technology. The goal was to reduce urban air pollution by improving fuel efficiency and lowering exhaust emissions. More sophisticated generation II OBD technologies were mandated from 1996 onwards. The EU followed suit in 1999 and regulated the compulsory installation of diagnostic technologies (Directive 1999/96/EC, Art. 4).

Meanwhile, Australia lagged. Amendments to the Motor Vehicles Standards Act (1989) only occurred in 2006. U.S. and EU regulation precipitated a range of innovations in auto design and manufacturing. Whilst couched in an environmental agenda, technological changes were accelerated by automakers in the 2000s and 2010s as part of targeted marketing strategies aimed at selling more new vehicles (Vinsel 2019).

Also important to the story of industrial restructuring was the changing preferences of consumers, a reminder that end-users co-create successful brands. In markets such as Australia large family sedans were top-sellers for several decades e.g. the Ford Falcon, Holden Commodore, and Toyota Camry. These were also designs being manufactured onshore. Yet, by the 2010s, an increasing portion of the new car market favoured small hatchbacks, SUVs, and 4WDs. Hatchbacks offered greater fuel economy and convenience for inner-city driving. SUVs and 4WDs, including dual-cab utes, offered a raised drive height and greater flexibility in use for ‘trades’ workers and busy families alike.

By the 2020s, the highest-selling car models in Australia were the Toyota Hilux and Ford Ranger, both diesel-powered 4WDs with significant towing and off-road capabilities. This collection of factors help to explain the restructuring of the auto industrial complex, which took on a distinctive character in Australia (cf. Warren 2019).

As auto plants were shuttered in Melbourne, Geelong, and Adelaide, Australia became an import-only car market. As mentioned, the significance of the plant closures included the loss of 30,000 well-paid jobs across industrial, working-class communities (Beer 2018). More broadly, the nation's industrial capacity was also negatively impacted.

Multinational automakers pointed to a range of factors in deciding to divest from Australian branch plant production: comparatively high production costs; competition among global firms; constrained economies of scale in a small, geographically isolated region; falling levels of state support; low import tariffs amid free trade agreements with major auto exporting nations (e.g. China, Japan, South Korea), and an **increasingly segmented new car market**.

A Federal Senate Economics Committee Inquiry (2015) preceded the plant closures and focused on mapping the future of a post-production 'auto economy'. The inquiry noted that "the downstream sectors will account for around 95 per cent of all activity within the Australian automotive industry after 2017" (SECI 2015: 4). By February 2023, post-production activities such as car retailing (sales), servicing and repair, accessories and spare parts trade contributed around 350,000 jobs nationwide. Auto repair and maintenance was the single largest industry, **comprising 153,600 jobs or 44% of auto industry employment** (ABS 2023).

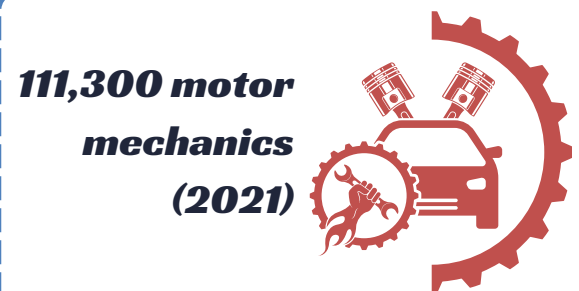
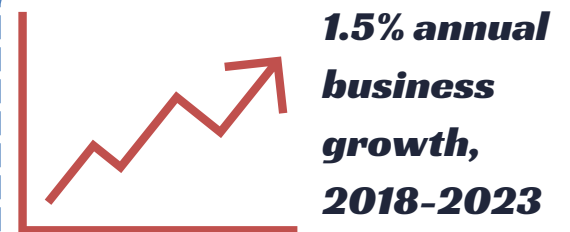
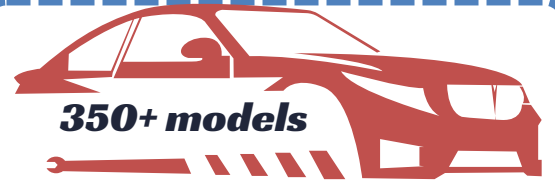
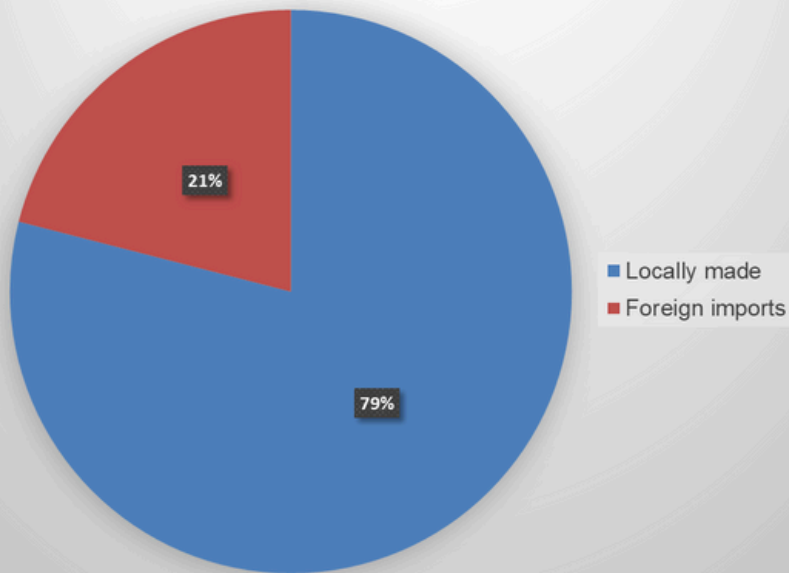
High vehicle ownership rates, rapid technological change, and the inability to self-service an elaborate machine have deepened the reliance of Australian consumers on buying after-sales services from specialised businesses. With the end of new car production, historically celebrated in the national economic imaginary, downstream activities such as maintenance and repair were recognised as crucial to sustaining the working condition of motor vehicles. Today, cars are products not only crucial to personal mobility but also the ability for many households to access life opportunities (Warren and Gibson 2023).

Contrasting macroscale indicators pointing to growing aggregate demand for downstream services, a granular view suggested local auto businesses were facing a specific set of challenges. During the Senate Inquiry, the Motor Trades Association of Australia (MTAA 2015: 11) reported that downstream auto businesses were enduring "a period of unprecedented restructuring and economic upheaval". **Brand-aligned dealerships** were facing declining margins on new car sales and strict franchise conditions pushed by powerful automakers. Spatially dispersed independent mechanic shops, comprising 90% of the business count, were losing aftermarket share and closing at an alarming rate. Meanwhile, industry groups reported a looming skills shortage among an undervalued workforce that faced new training and upskilling requirements.

Across **hierarchical production networks**, established automakers continued to wield multidirectional power (Sturgeon et al. 2008; Pavlinek 2020). Such power infiltrated post-production services and auto shops via the control of retailing practices and flows of informational content associated with a complex, evolving consumer product.

The Senate Inquiry's final report noted a structurally uneven downstream auto sector and emphasised the need for exploring strategies to effectively regulate business practices. Research presented in this report commenced amid ongoing industry upheaval and uncertainty about the future of auto-related aftermarket services.

Figure 1: The proportion of new car sales manufactured locally vs. foreign imports, 1998.



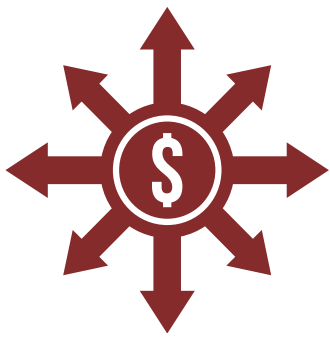
10.6 years = the average age of the national fleet



780 registered vehicles per 1,000 people (2023)

EVs and Hybrids = 12% of new car sales in 2023





03 Dataset 1

Market characteristics of Australia's auto economy

Table 1: Australian new car sales and market share of major brands, 2023.
Source: FCAI 2023.

Auto brand	Australian sales, 2023	Market share (%), 2023	Sales change (%), 2019-2023	Global HQ	Australian HQ
1. Toyota	215,240	17.7	[^] 4.6%	Toyota City	Melbourne
2. Mazda	100,008	8.2	[^] 2.4%	Fuchū, Hiroshima	Melbourne
3. Ford	87,800	7.2	[^] 38.7%	Dearborn, Detroit	Melbourne
4. Kia	76,120	6.3	[^] 23.8%	Seoul, South Korea	Adelaide
5. Hyundai	75,183	6.2	[^] -12.7%	Seoul, South Korea	Sydney
6. Mitsubishi	63,511	5.2	[^] -23.7%	Minato City, Japan	Melbourne
7. MG	58,346	4.8	[^] 600.8%	Shanghai, China	Sydney
8. Tesla	46,116	3.8	[^] 1,463%	Austin, Texas	Sydney
9. Subaru	46,114	3.8	[^] 15.3%	Tokyo, Japan	Brisbane
10. Isuzu Ute	45,341	3.7	[^] 79.3%	Yokohama, Japan	Melbourne
Other brands	403,001	33.1	[^] 10.8%		
Total sales	1,216,780	-	[^] 1.8%		

Figure 3: Motor vehicle registrations by state/territory. Source: ABS 2021.

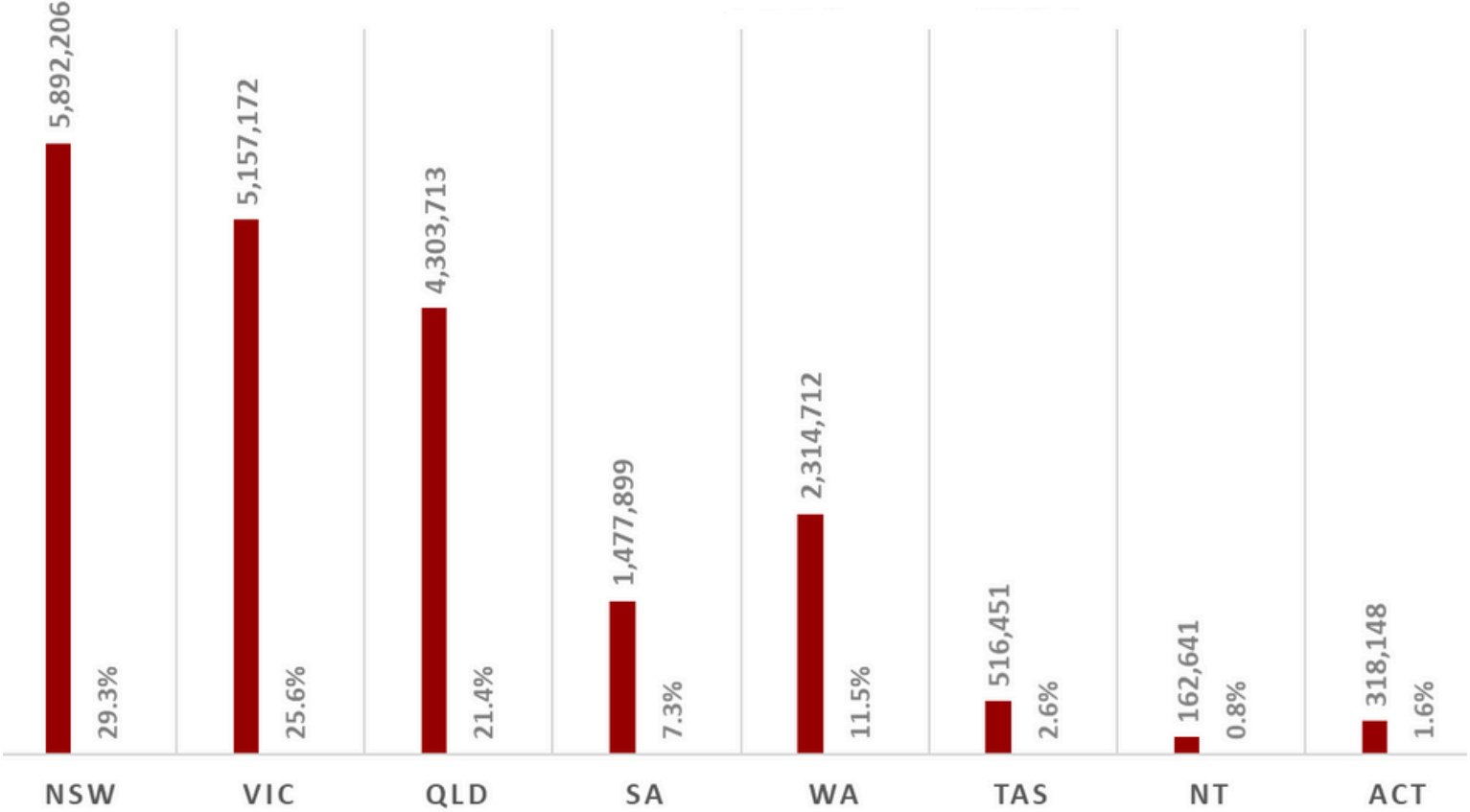


Figure 4: The best selling vehicles (brand/model) in Australia, 2023. Source: VFACTS 2024.

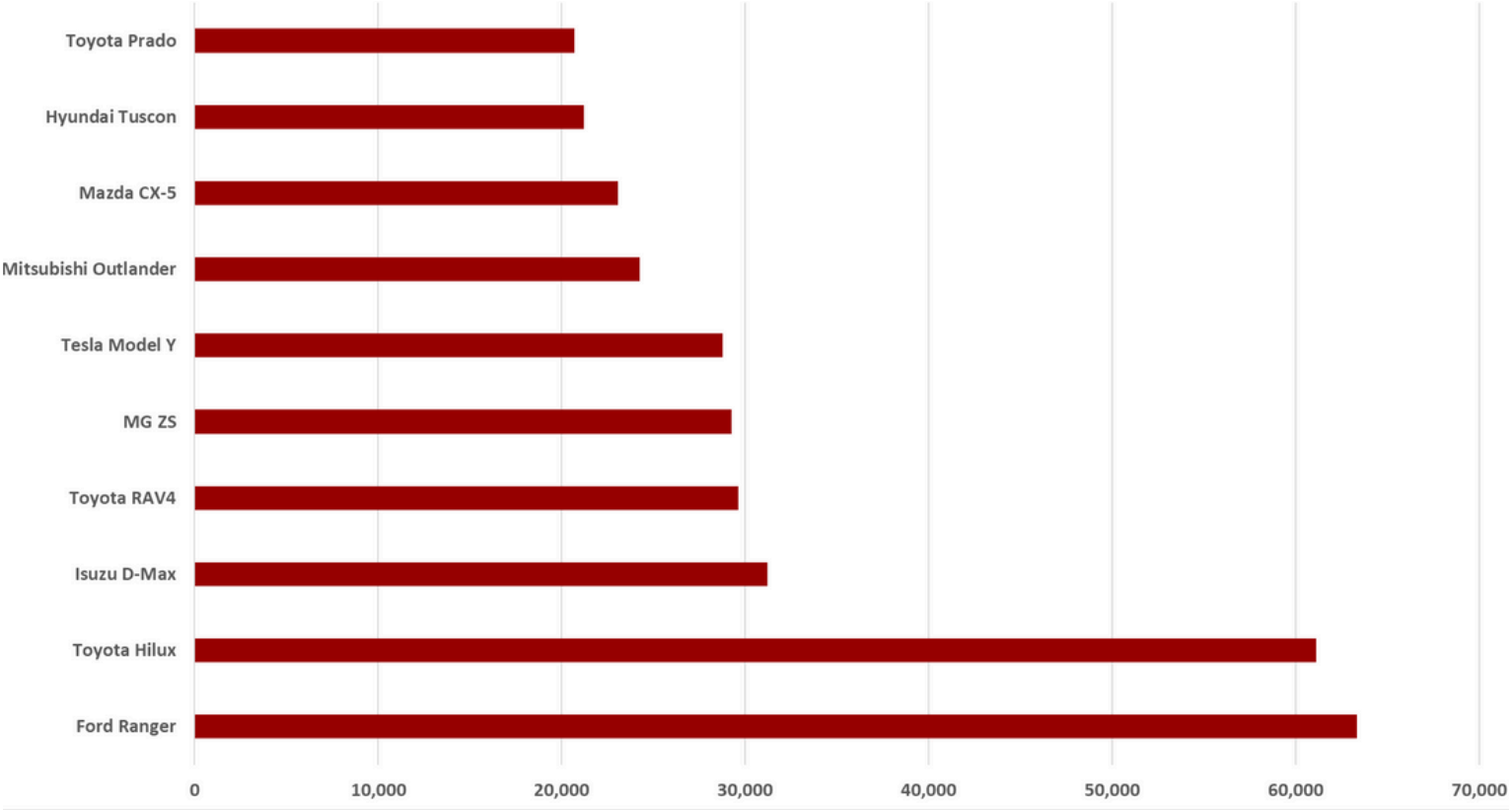


Figure 5: The share of motor vehicle sales by segment, 2012 vs 2022. Source: Author’s analysis of VFACTS annual reports.

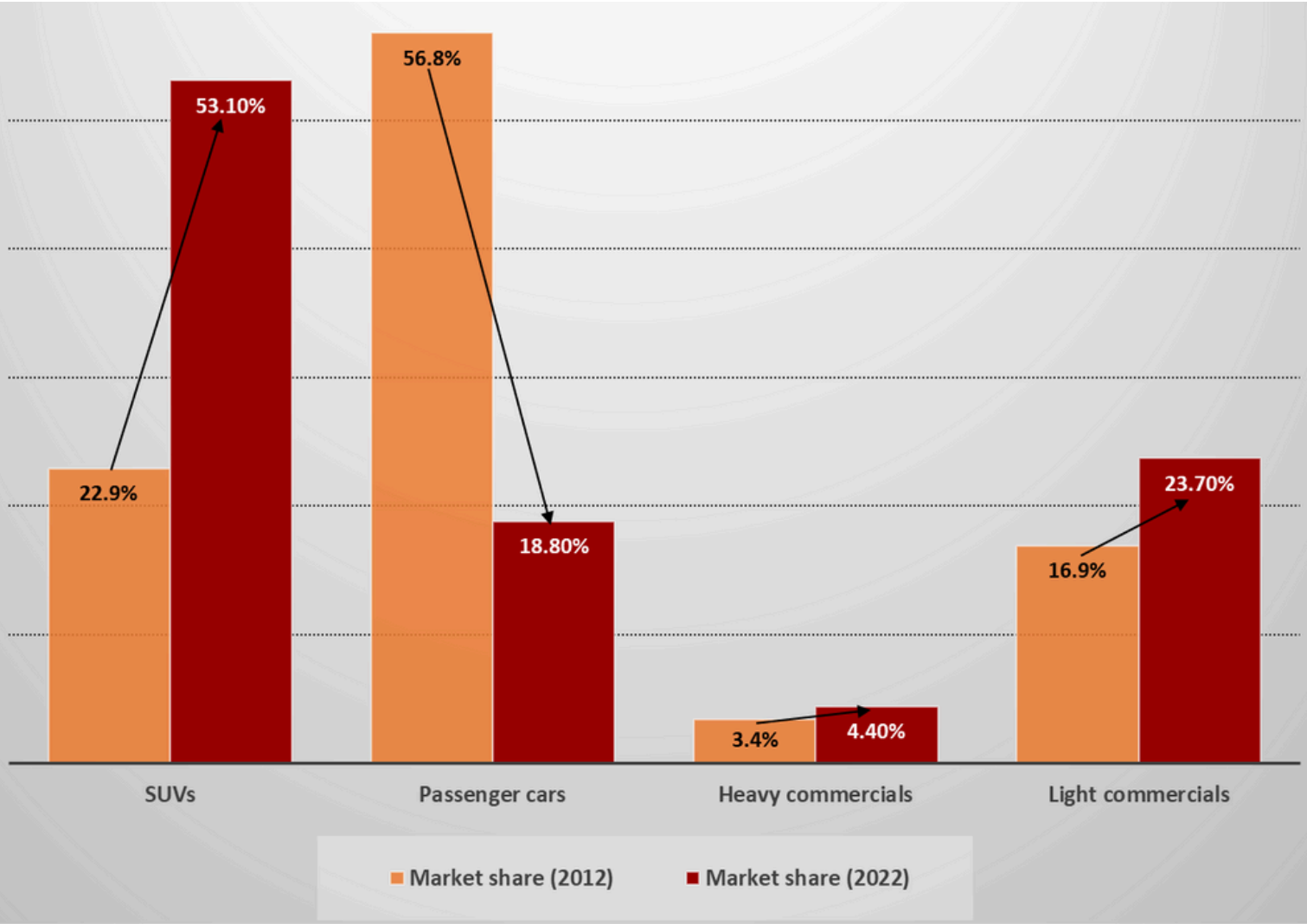


Figure 6: The age composition of Australia’s motor vehicle fleet 2016 vs. 2021. Source: Author’s analysis of ABS Motor Vehicle Census.

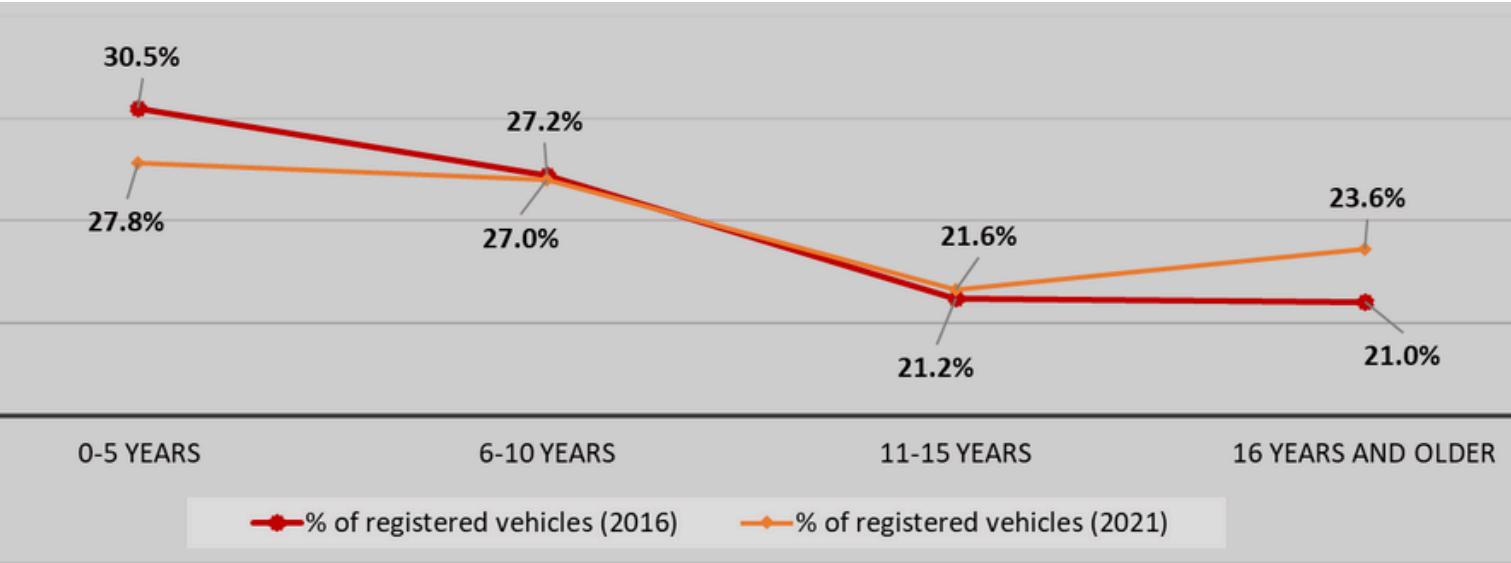


Figure 7: The business share of the downstream auto sector by number of employees, 2021. Source: Author’s analysis of ABS Motor Vehicle Census and ATO Business Registration data.

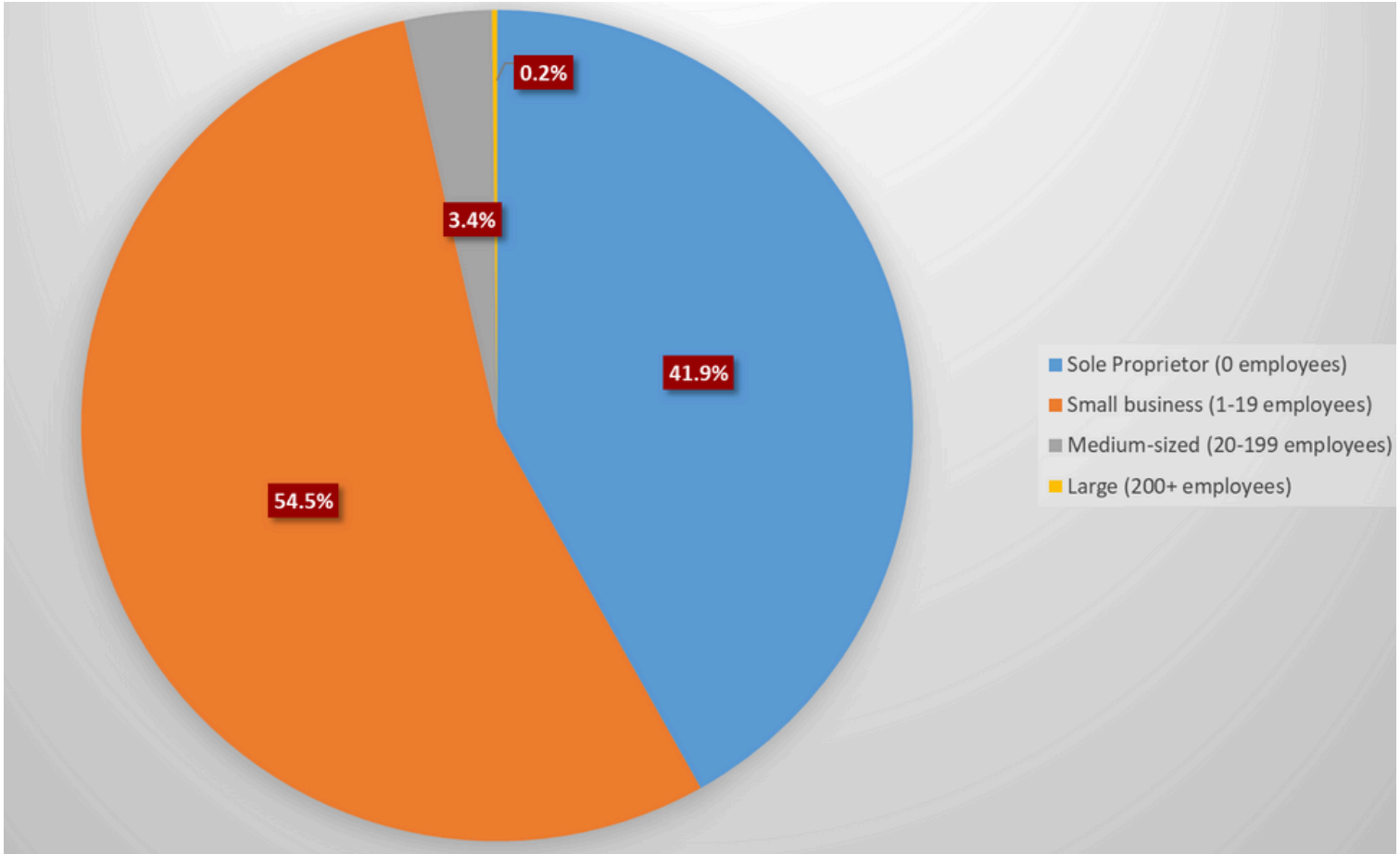


Figure 8: The business share of the downstream auto sector by annual turnover, 2021. Source: Author’s analysis of ABS Motor Vehicle Census and ATO Business Registration data.

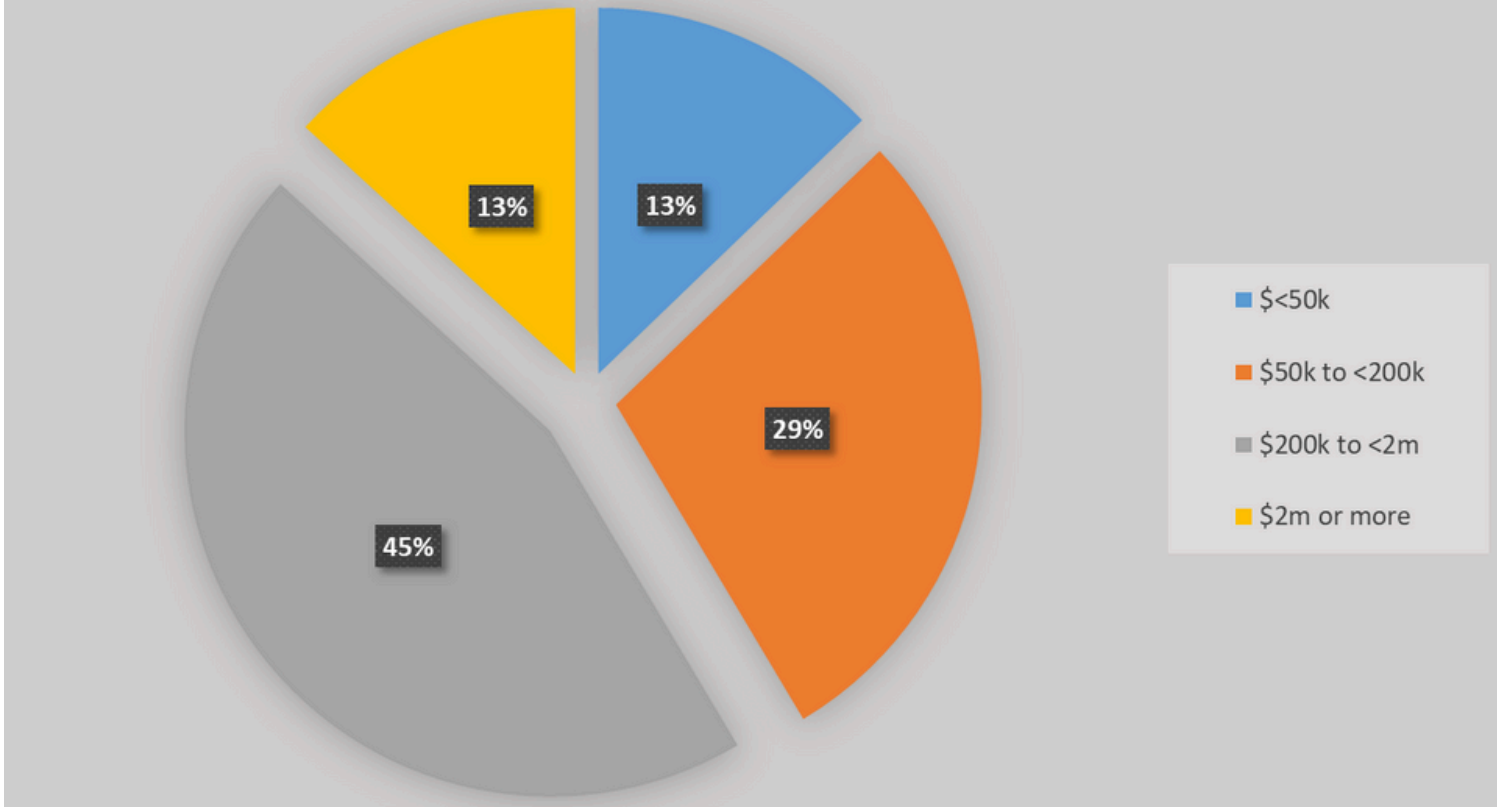


Figure 9: Motor vehicle sales and market share by type of buyer, 2022. Source: Author’s analysis of VFACTS annual reports.

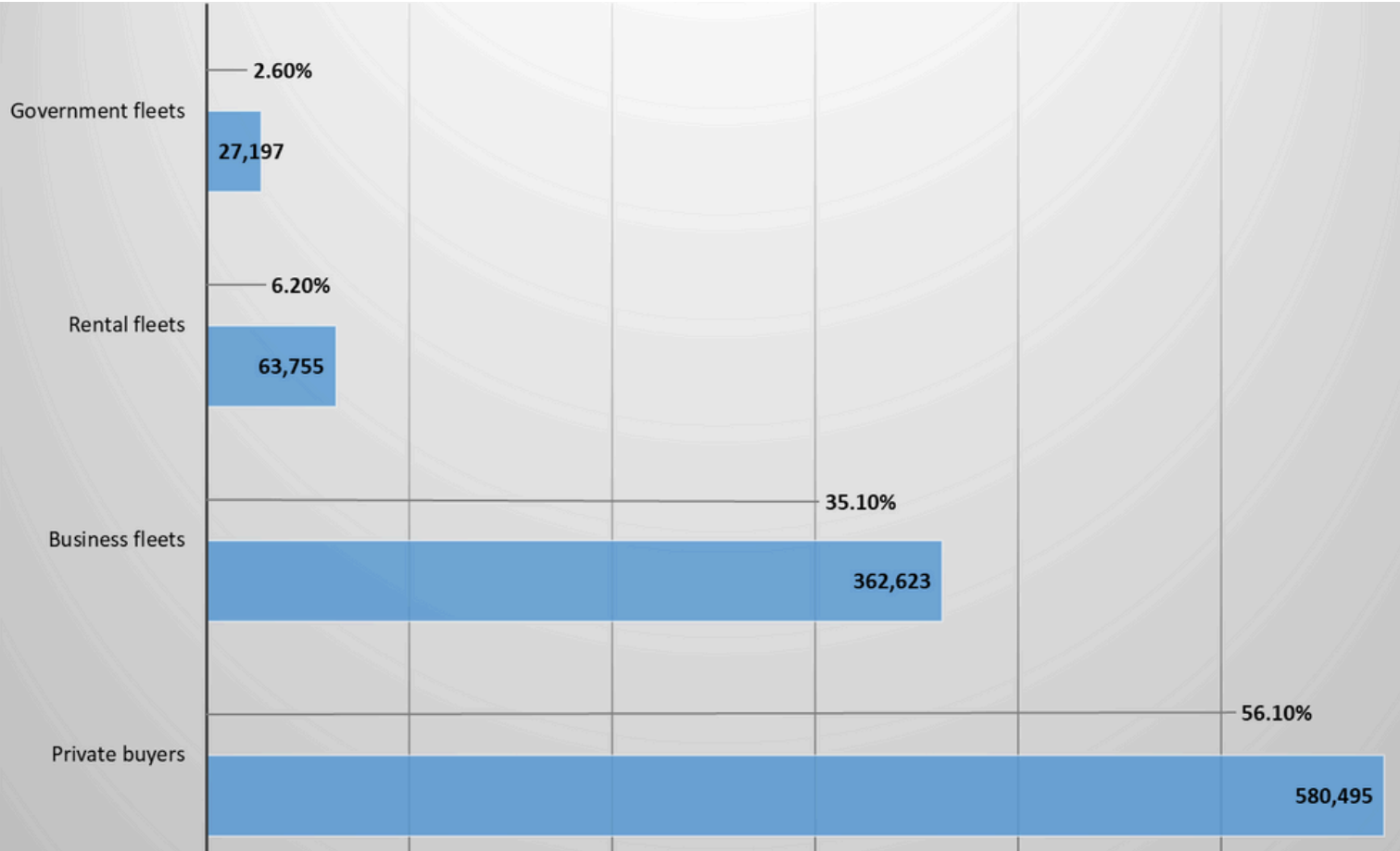
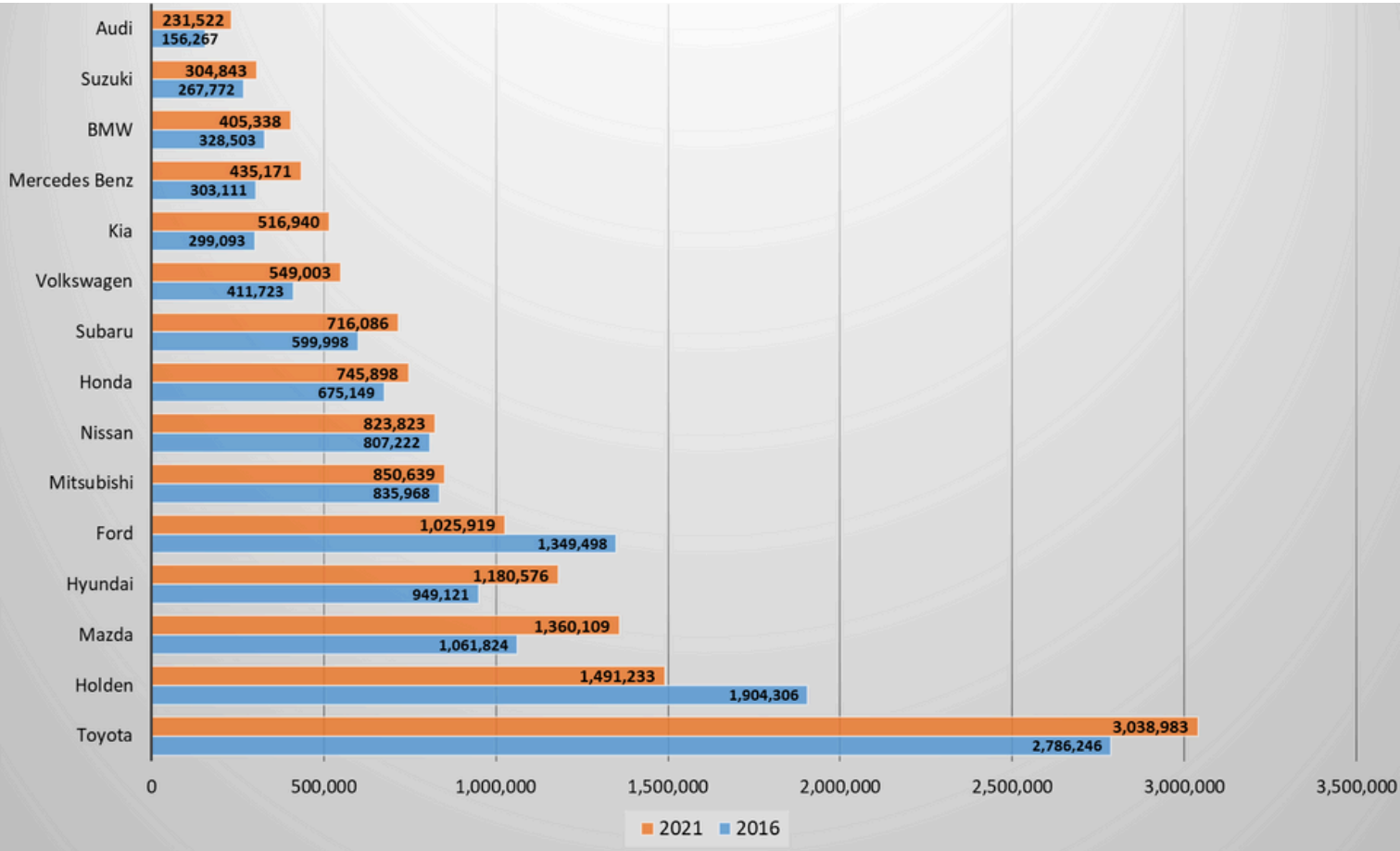


Figure 10: Motor vehicle registrations in Australia by major brand. Source: Author’s analysis of ABS Vehicle census 2021.



Australia's New Car Market

In 2023, new car sales in Australia topped 1.21 million. This represented a sales record, surpassing the previous high of 1.18 million new cars exchanged in 2017.

Some noticeable trends in the new car market included:

- **Shifting Geographies of Production:** In 2023, China overtook South Korea to become the third-highest source country for new vehicle imports in Australia, now only behind Japan and Thailand.
- **Market Competition:** Sales data highlights the significant competition for market share in Australia. Several less established marques and models (e.g. MG, Tesla, Isuzu) are capturing market share from established brands (e.g. Toyota, Hyundai). This trend in brand diversification indicates that Australian consumers are seeking out greater value for money.
- **A Record Year for EV sales:** More than 87k fully electric cars were sold in Australia during 2023. This volume of EVs equated to a record 7.2% of overall sales.
- **Electrification:** Including battery electrics (BEVs), plug-in hybrids (PHEV) and hybrids (HEV), nearly 200k electrified cars were sold across Australia in 2023. This volume of electrified vehicle sales represented 16.5% of total new sales nationally.
- **The Tesla Brand:** For the first time, Tesla entered the top 10 for sales by brand. Tesla continued to have Australia's two highest-selling electrified cars: the Model Y and Model 3. These two models achieved more than 46k sales in 2023.



Map 1: The Top 5 Source Countries for Australia’s Imported Motor Vehicles, 2019.
Source: Author’s Research



Map 2: The Top 5 Source Countries for Australia’s Imported Motor Vehicles, 2023.
Source: Author’s Research

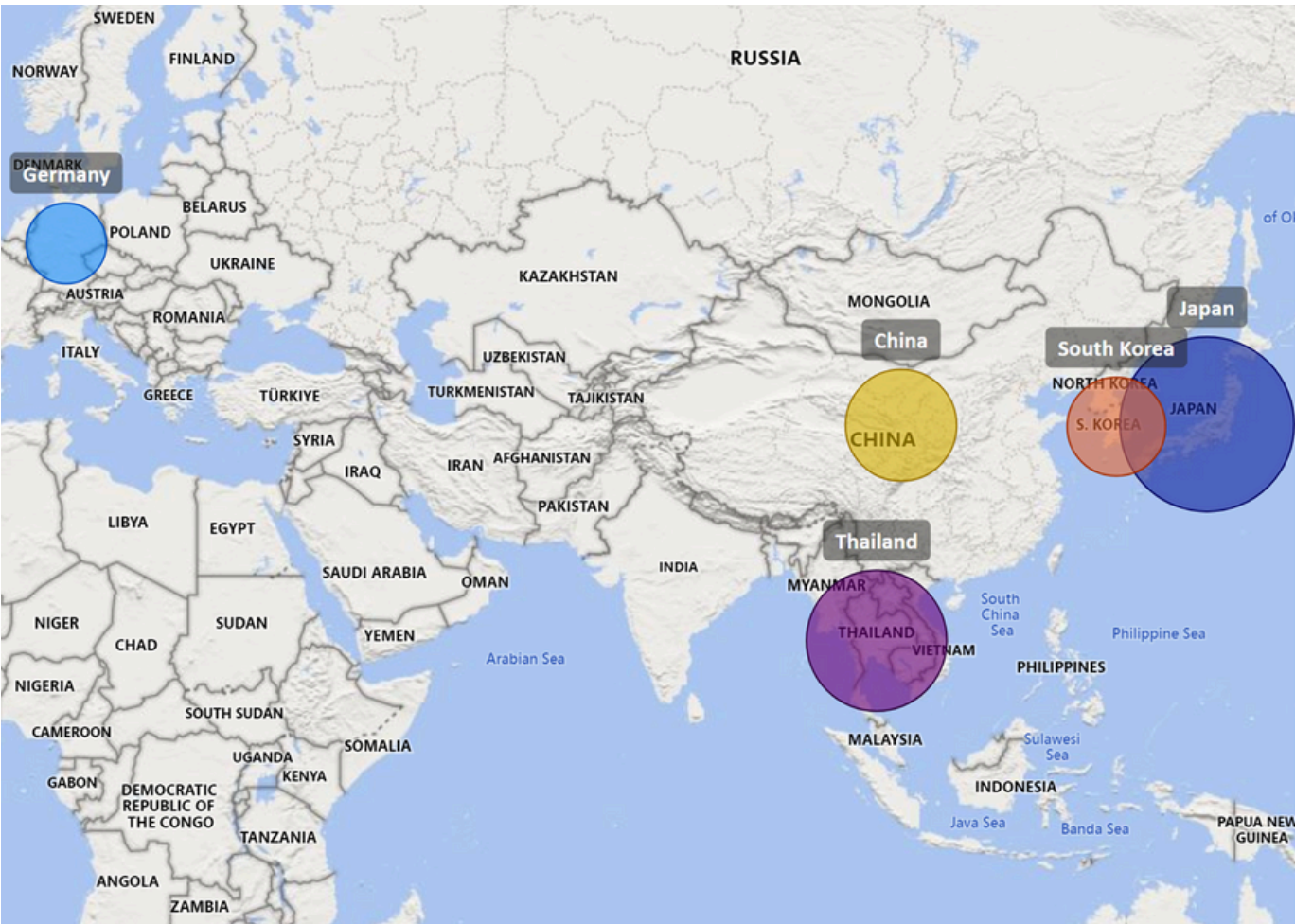


Figure 11: A comparison of Australia’s motor vehicle imports by Country of Origin (Top 5, value A\$ Billions) for 2019 and 2023. Source: Author’s Research.

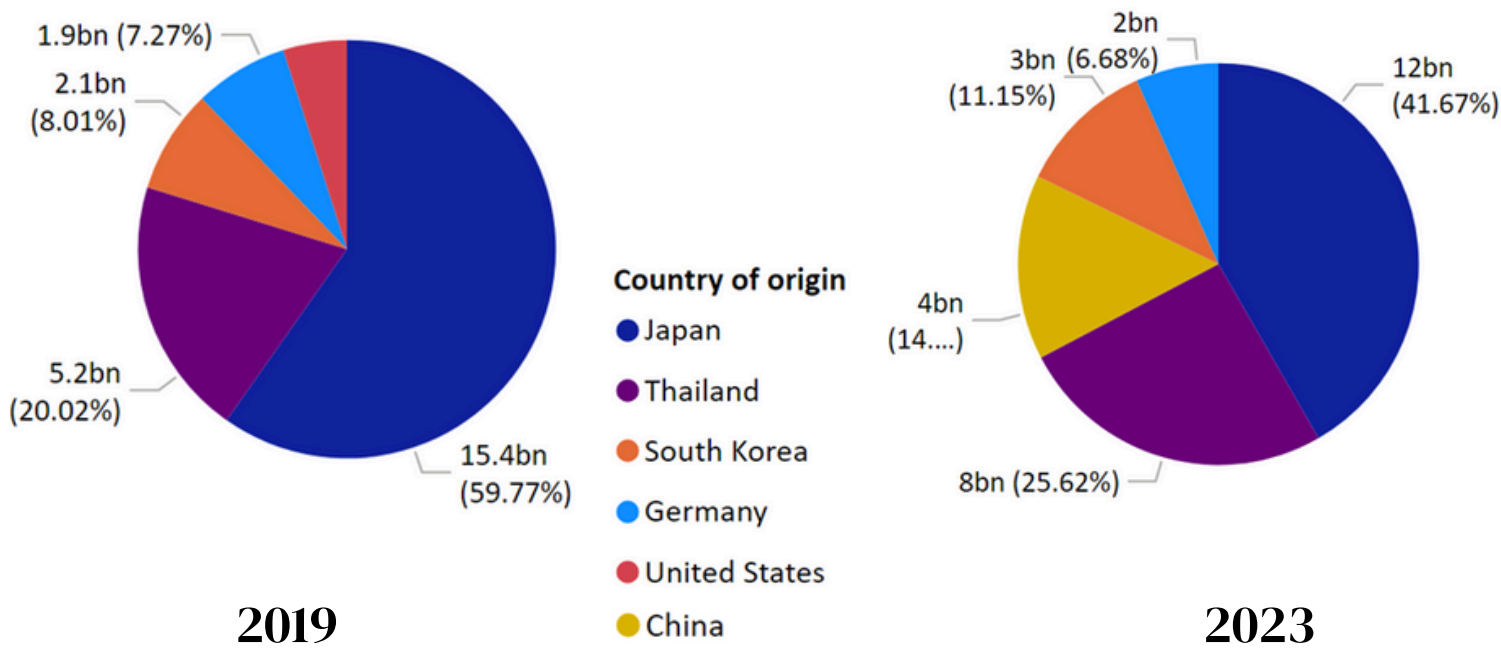


Figure 12: Top-selling car model, total sales, and market share (%) by brand in 2023. Source: Author’s research.

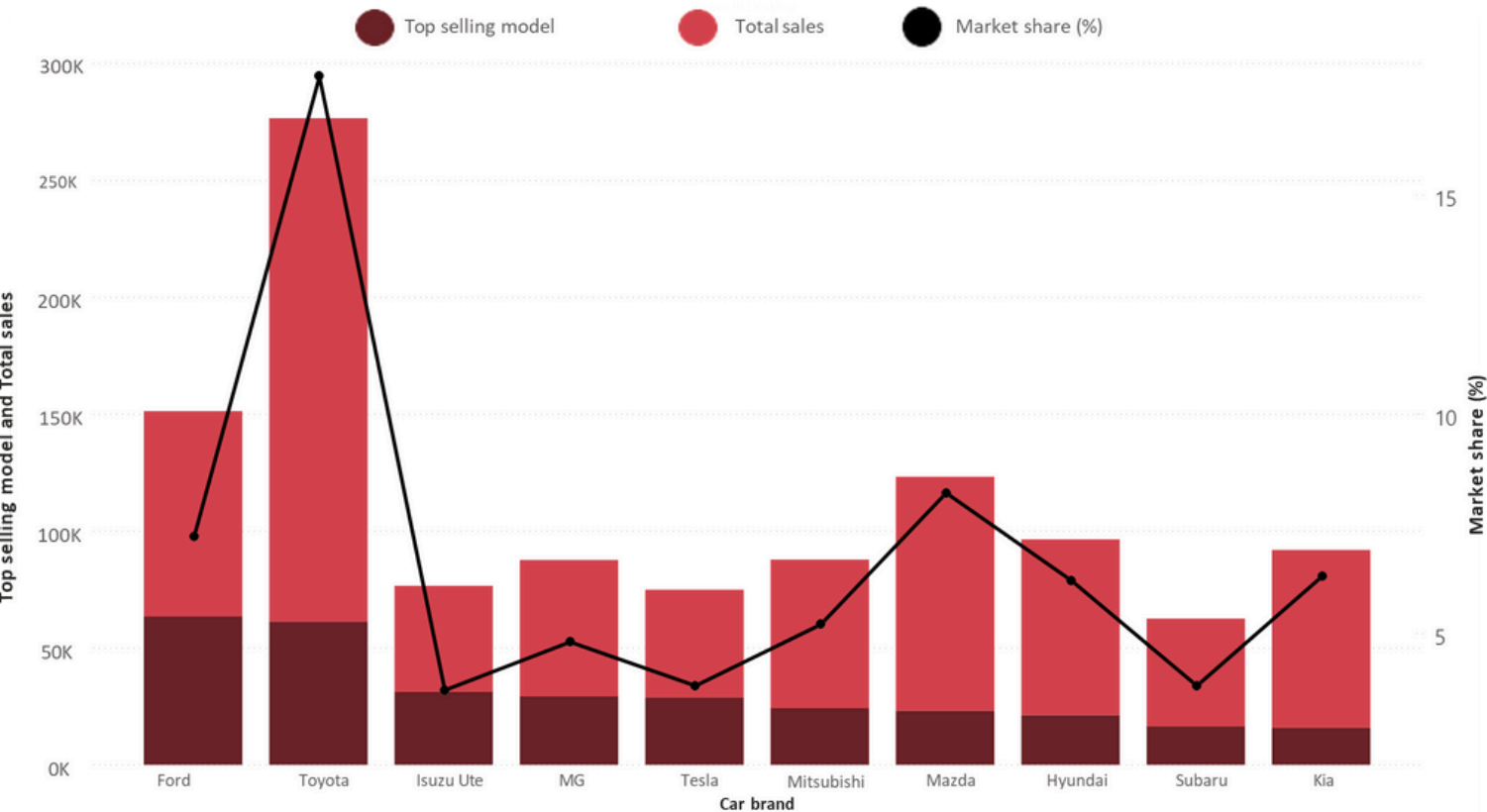


Figure 13a: The average contribution (%) from commercial activities to the revenue of auto servicing shops. Source: Author’s primary research with five integrated car dealerships, 2019 to 2023.

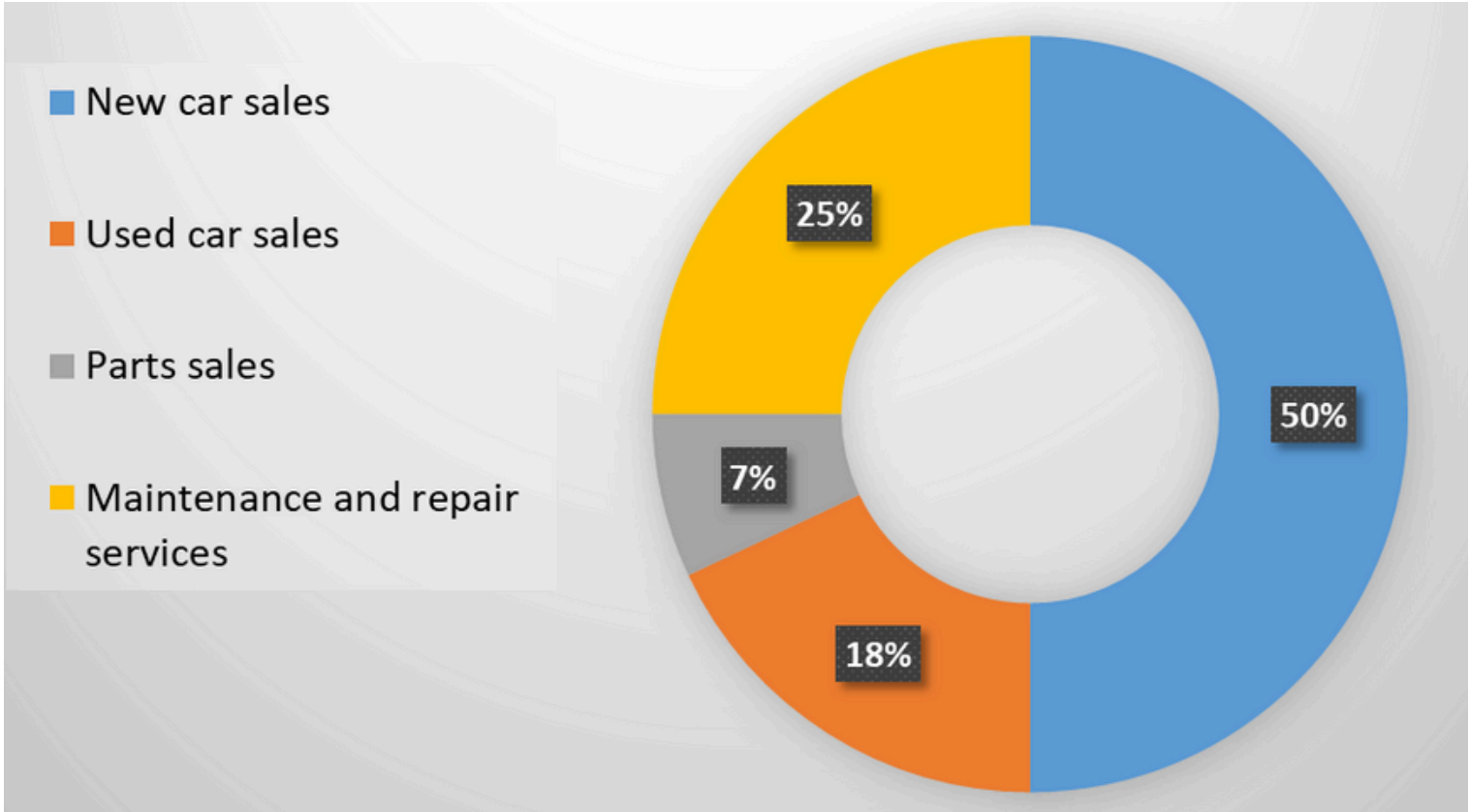
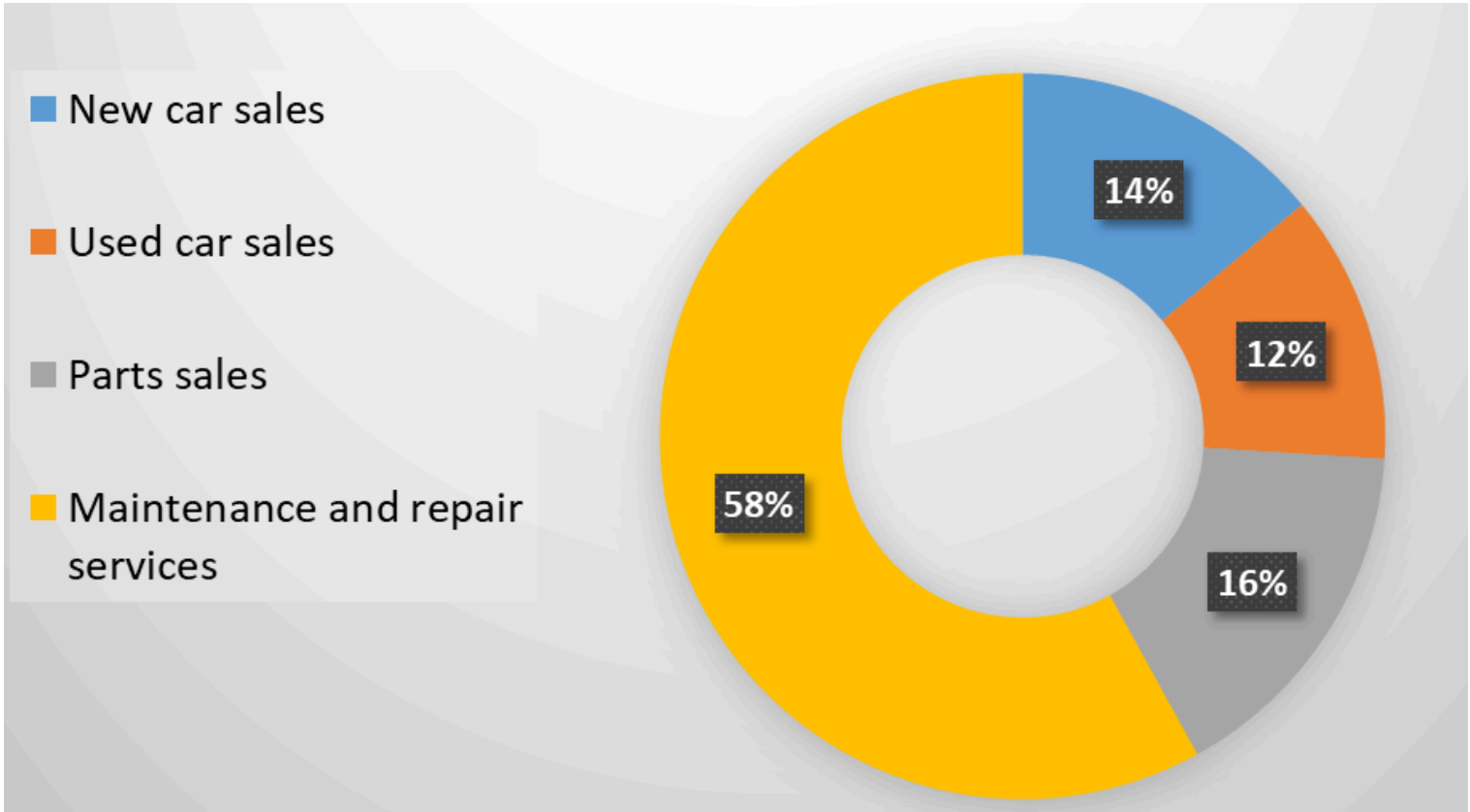


Figure 13b: The average contribution (%) from different commercial activities to the net profitability of car dealerships. Source: Author’s primary research with five integrated car dealerships, 2019 to 2023.



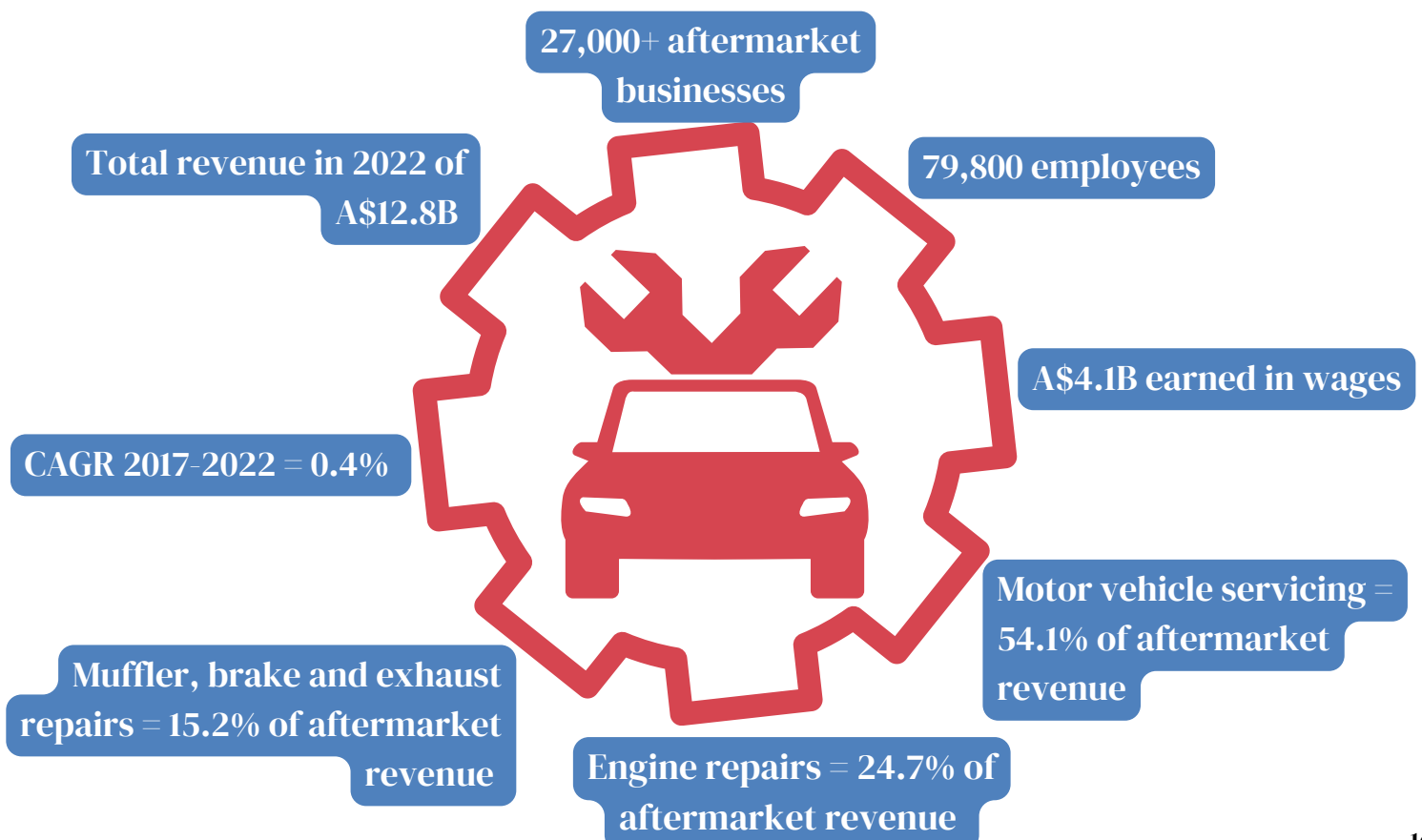
What are aftermarkets?

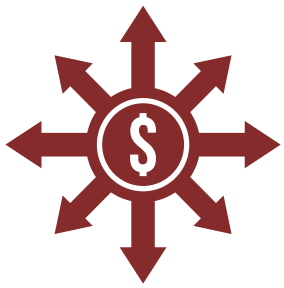
An aftermarket includes the secondary commercial transactions linked to the consumption and ongoing circulation of primary commodities. For durable consumer products, such as cars, computers, personal electronics, equipment, and household appliances, a significant amount of economic activity now occurs in aftermarkets. Such commercial activity includes specialised, technical services (e.g. repair of a faulty transmission) and brand-specific products (e.g. spare parts that require calibration).

Expanding design complexity, intellectual property claims, regulatory conditions, financial obligations, safety, and sustainability concerns mean that consumers must now engage the services of aftermarket businesses rather than conduct DIY repairs or maintenance as was common in an earlier era of automobility.

Auto mechanic workshops are a prime example of an aftermarket business. Australia's auto repair and maintenance industry (ANZSIC S9419) includes a range of aftermarket services that are directly linked to motor vehicles and their day-to-day use, including:

- General mechanical repairs and logbook servicing (maintenance)
- Smash repair (panel beating, spray painting)
- Cooling system and radiator repairs
- Engine repairs and reconditioning work
- Exhaust system or muffler repairs
- Gearbox and transmission repairs
- Commercial and fleet vehicle repairs and maintenance





03 Dataset 1

Summary: Market characteristics of Australia's auto economy

The tables, figures, and maps presented in Dataset 1 explored some of the key dynamics of Australia's auto markets: both the primary 'new' car market and downstream 'aftermarket' activities. **Table 1** illustrates the popularity of different auto brands. In 2023, Toyota enjoyed the highest share of the new car market with 17.7% of all sales. This figure represented a significant drop from 21% in 2022. Future results will give a better indication of any trend. Following Toyota, Mazda enjoyed a new market share of 8.2% with Ford (7.2%) in third place, boosted by sales from two models: the Ranger and Everest.

When compared to other advanced, car-dependent economies, Australia now has one of the world's most segmented markets. New car sales per brand are roughly 14 times greater in the U.S. and eight times more concentrated in the UK. Market diversification has created opportunities and challenges for car dealerships and aftermarket businesses.

The research behind this report found that very few franchise dealerships (outside of Toyota dealers) can now sustain profitability as single-brand outfits. The vast majority of Australia's 3,500+ dealerships now offer 3-5 different marques to ensure consumer foot traffic. Likewise, the research found that for independent mechanic shops, a diversifying market requires becoming familiar with how to fix a bigger range of brand-related technologies with design variations, different driving platforms, and idiosyncrasies.

Equally significant for aftermarket services is that SUVs and 4WDs now dominate Australia's car market. **Figures 3 and 4** show that consumers have a strong preference for larger dual cab utes and high-riding SUVs with no family sedan in the top 10 for sales in 2023. By contrast, just a decade ago nearly 60% of all new car sales were family-oriented passenger vehicles. In 2023, 56% of new car sales in Australia were SUVs, up from 22.9% in 2012.

Of note, sales of BEVs, PHEVs and HEVs continue to grow in Australia, with Tesla breaking into the top 10 for sales in 2023. While the uptake of electric technologies is expanding, evidence collected from the research underscores the reality that a full transition of the nation's fleet from internal combustion engines (ICE) to an EV-dominant market **will take decades**. The speed of the transition is explained by a range of factors, further explored in Section 5 of this report.

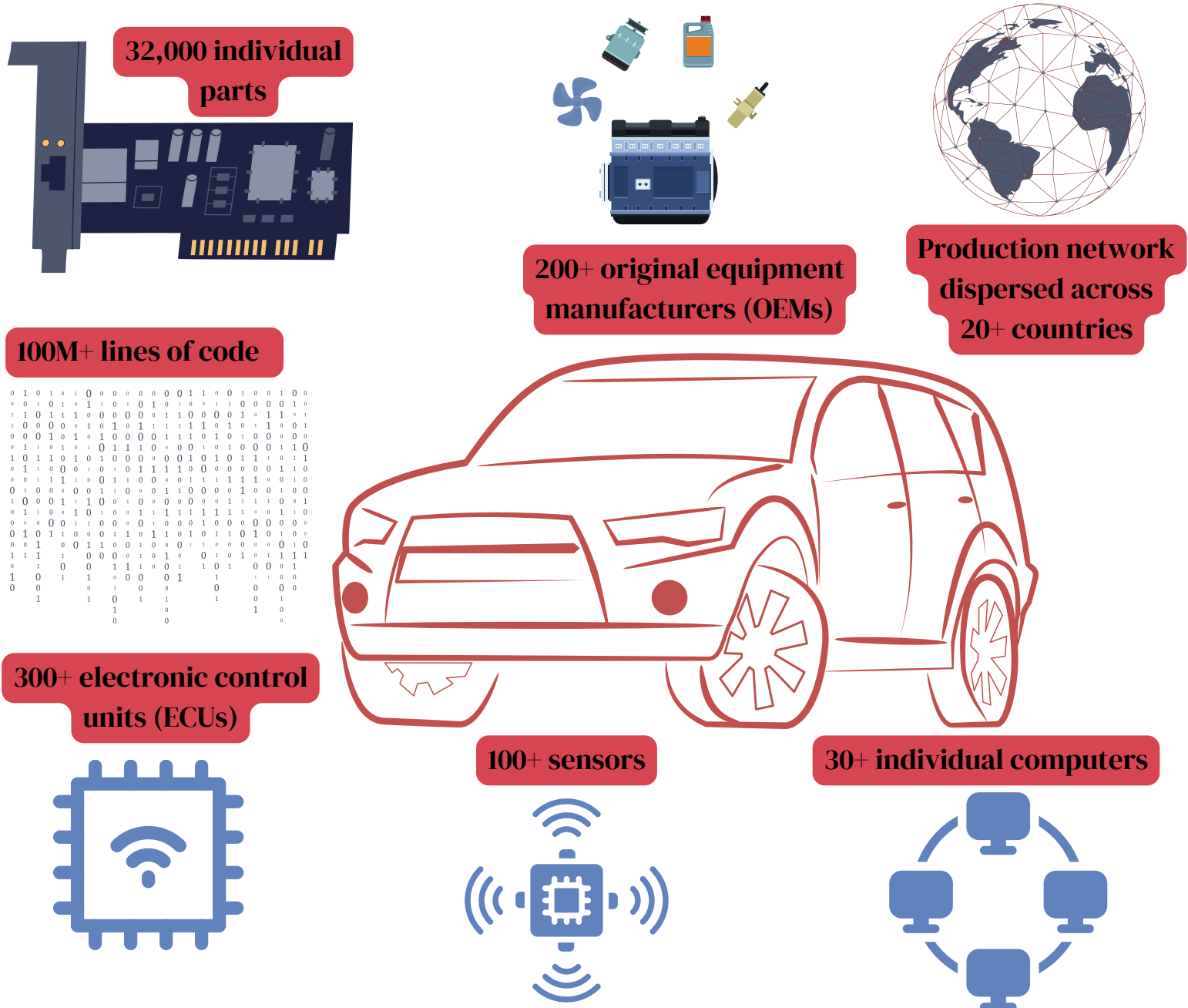
Finally, a series of useful insights emerge from the data regarding aftermarket services. **Figures 13a and 13b** were compiled from research with five franchise dealerships (2019 to 2023). These dealerships were based in the city of Wollongong, Australia, 70 kms south of Sydney. Interviews with dealership managers and staff showed that while new car sales contributed around 50% to business revenue, margins on new cars averaged just 3%. By contrast, **aftermarket maintenance and repair services averaged 25% of annual revenue** but had a net profit margin of 19%. In total, the contribution of aftermarket services to dealership profits averaged nearly 60%. While the new car market shifted during 2021/2022 following the effects of the global pandemic, supply chain disruptions, and inflation, by mid-2023 business trends had returned to near pre-COVID norms.



04 Dataset 2

Automobiles as complex,
evolving technologies

Figure 14: Insights into the complexity of new model cars (non-EVs).



‘We tell customers: “Your car, is like a spaceship on wheels”. They experience the technology by pushing buttons, using cameras, setting temperatures, connecting Bluetooth. Behind all that is advanced tech, especially in a product that’s driven all over the place in all types of conditions. Parts, sensors, materials, and computers in our cars make travel comfortable. But on the other side, it’s created problems for us. We deal with the faulty, worn out, and broken side of things. We have to keep the spaceship on wheels working’.

(Auto mechanic, Interview excerpt)

Figure 15: Passenger car recalls in Australia by model and variant, 1993-2023. Source: Author's analysis of Department of Infrastructure and Transport data.

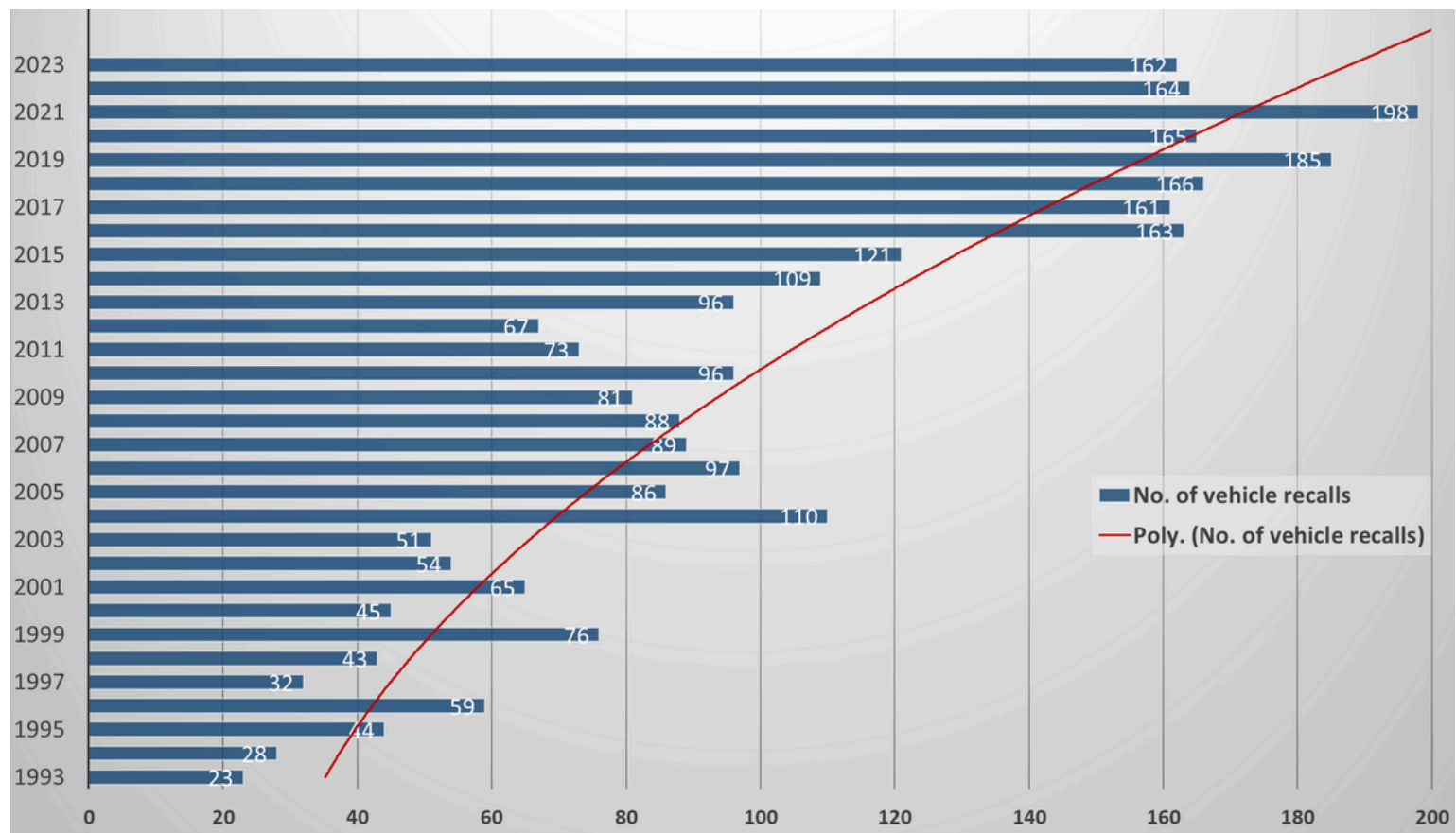
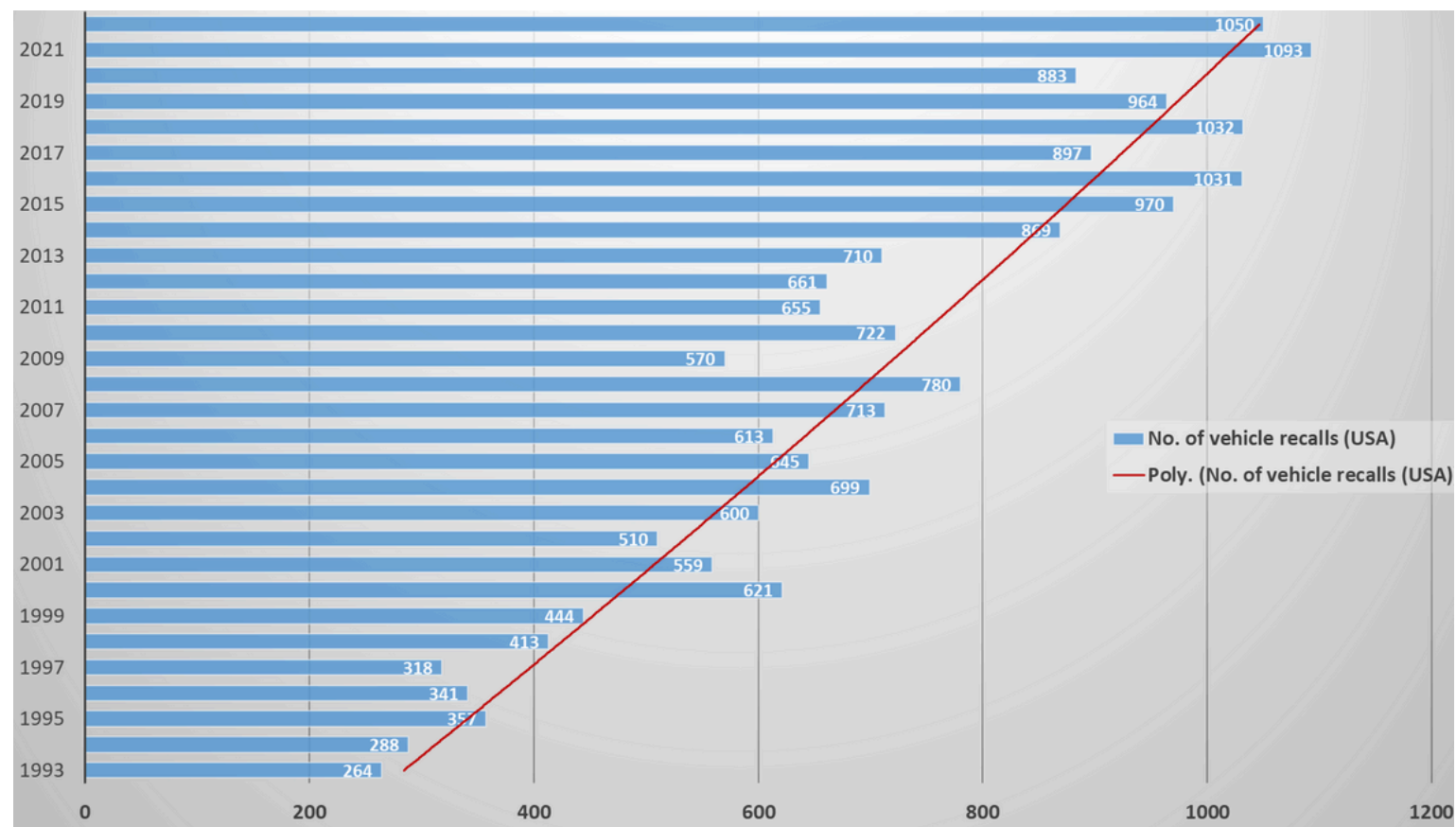
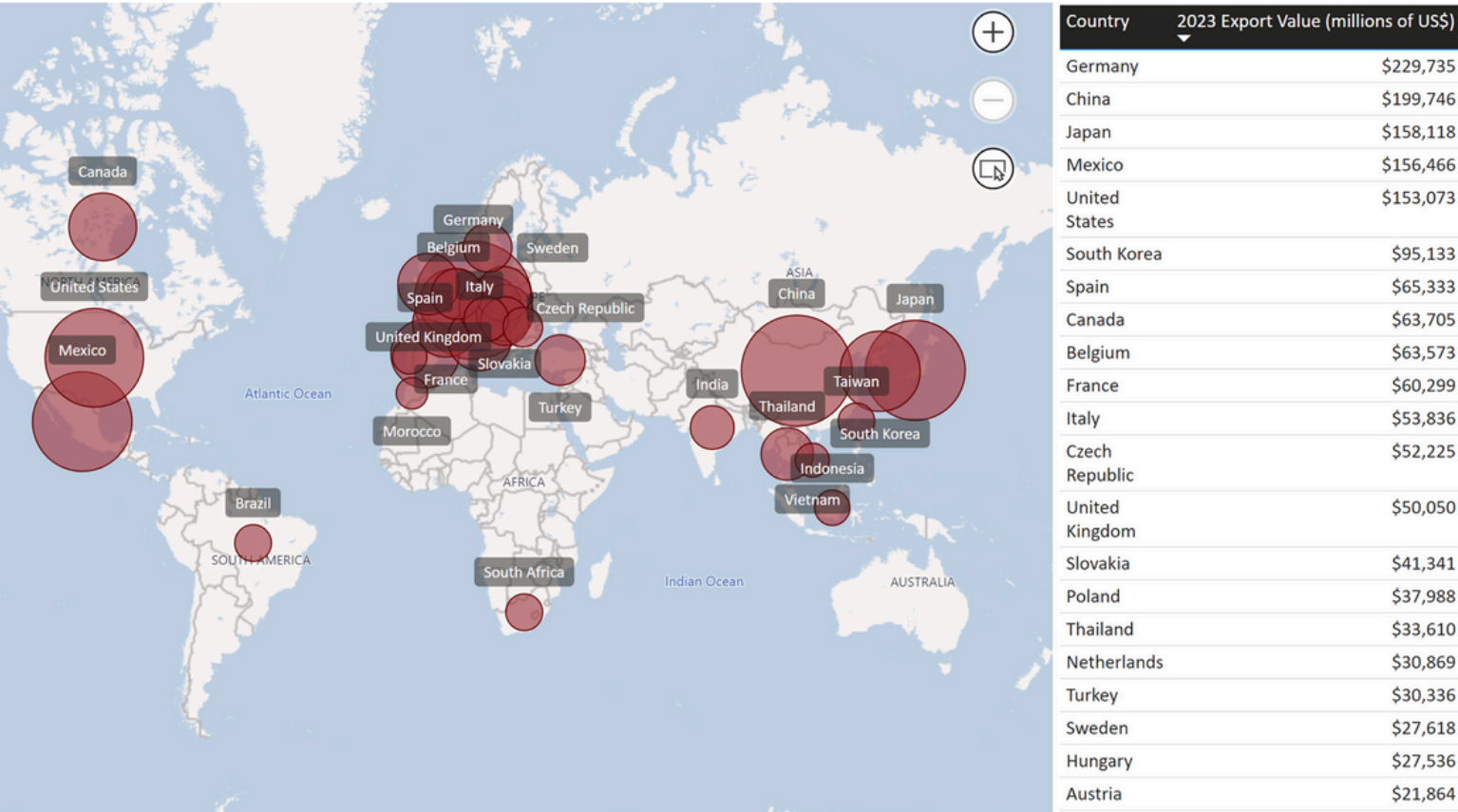


Figure 16: Passenger car recalls in the United States by model and variant, 1993-2022. Source: Author's analysis of National Highway Safety Administration data.



Map 3: The top 20 exporters of motor vehicles by value (millions of US\$), 2023. Source: Author's analysis of WTO and UN Comtrade data.



Map 4: The top 10 exporters of motor vehicle parts and accessories by value (millions of US\$), 2023. Source: Author's analysis of WTO and UN Comtrade data.

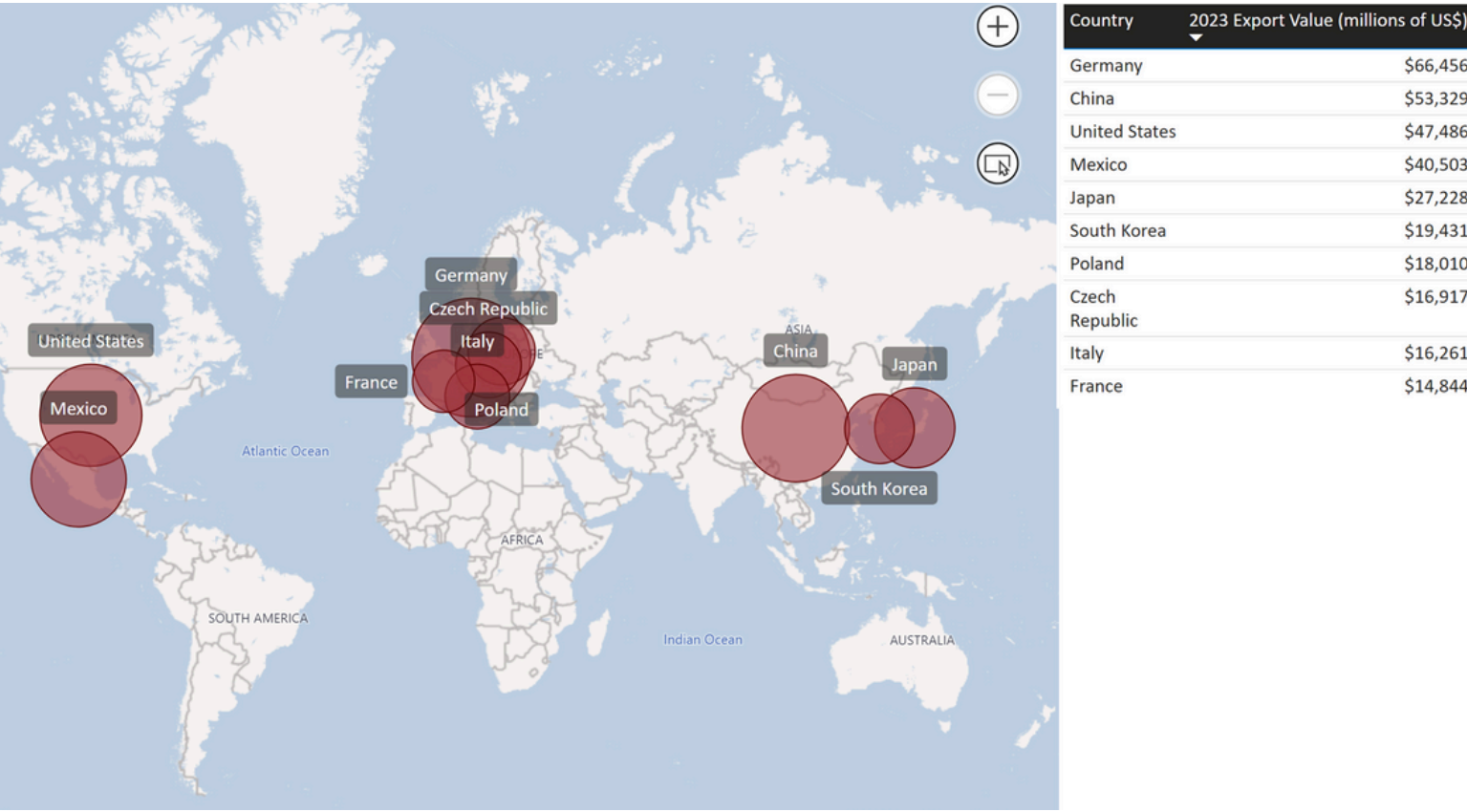


Figure 17: Revenue from semi-conductor sales to the global auto industry, 2012-2023.
Source: Author's analysis of WTO and UN Comtrade data.

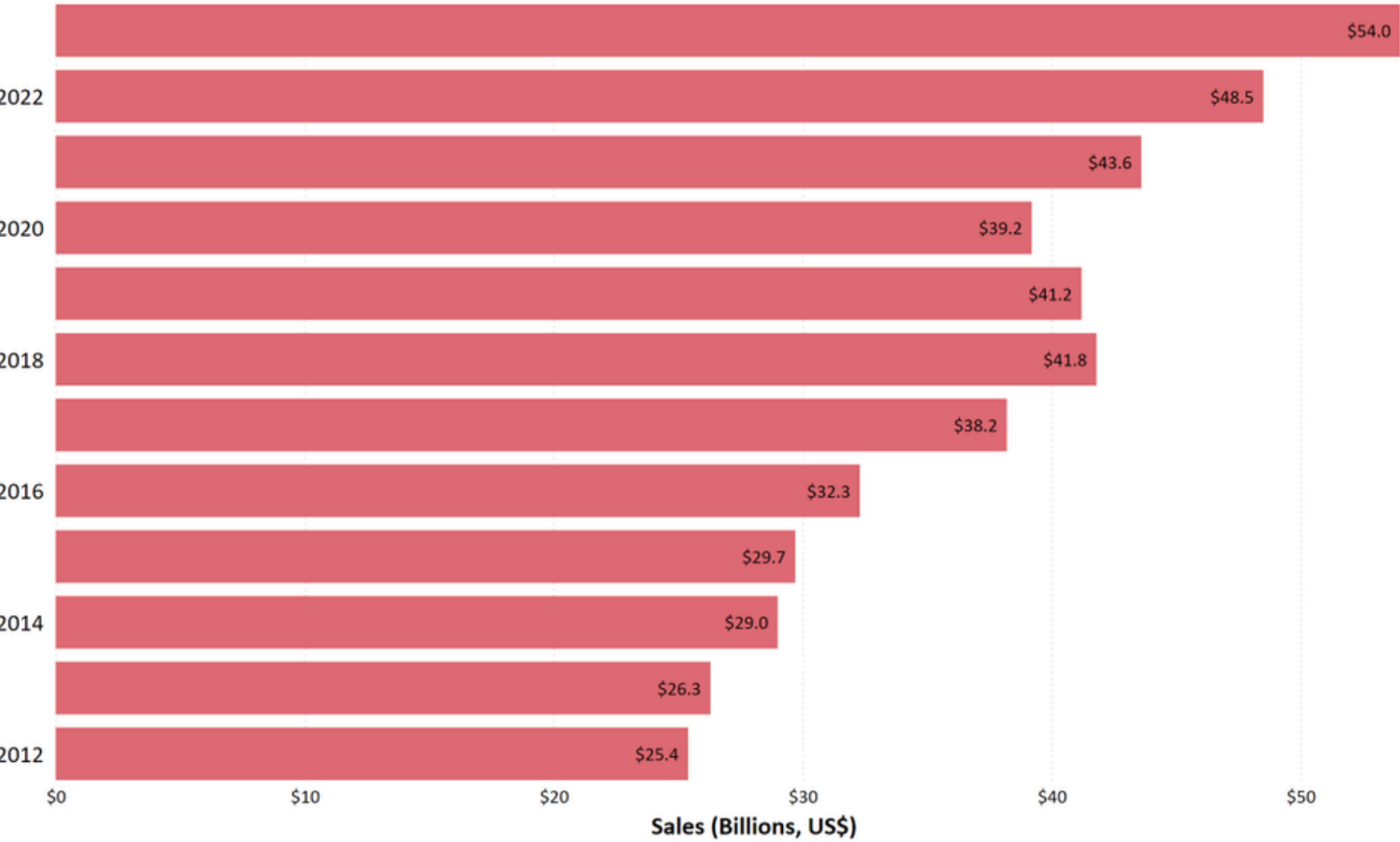
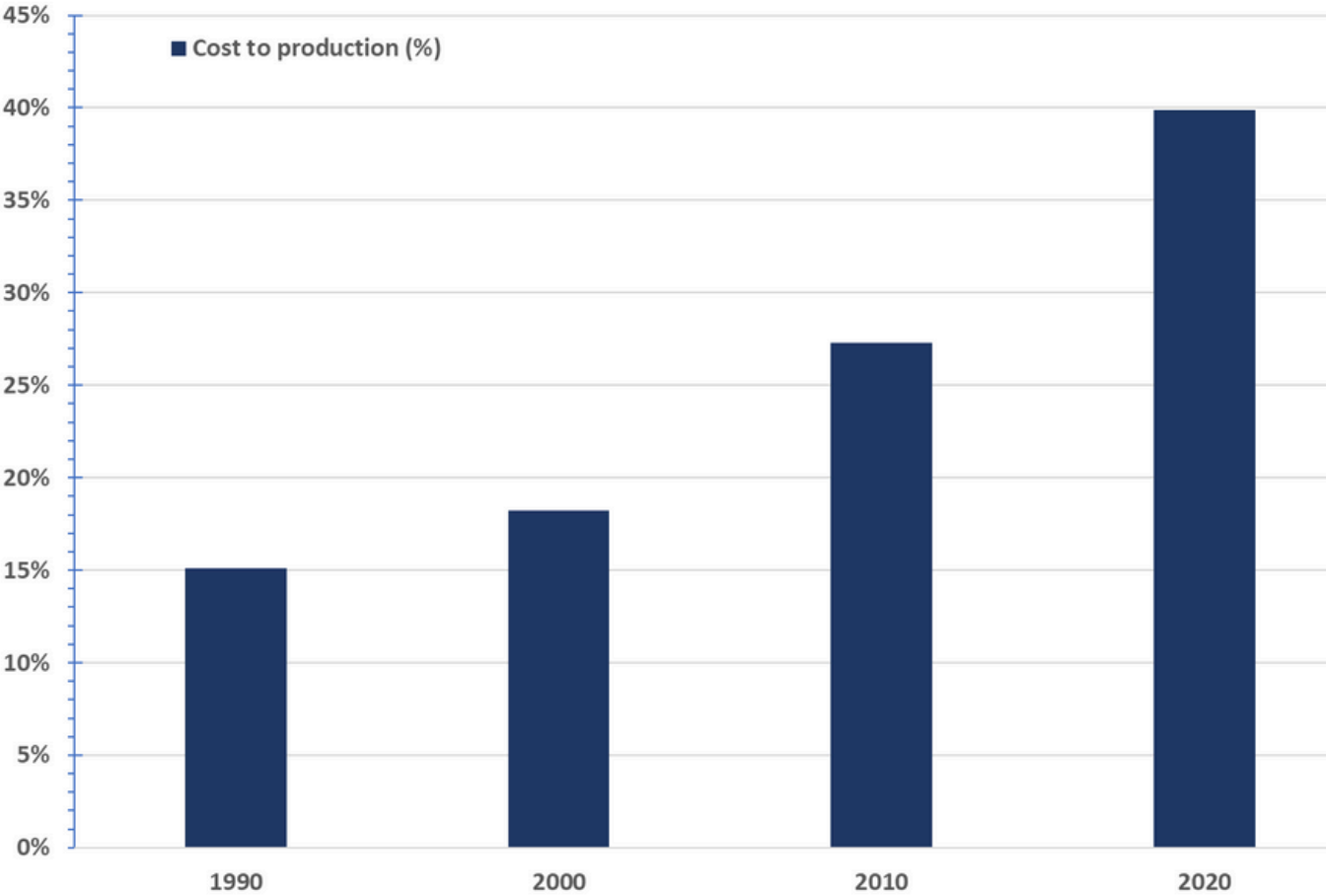
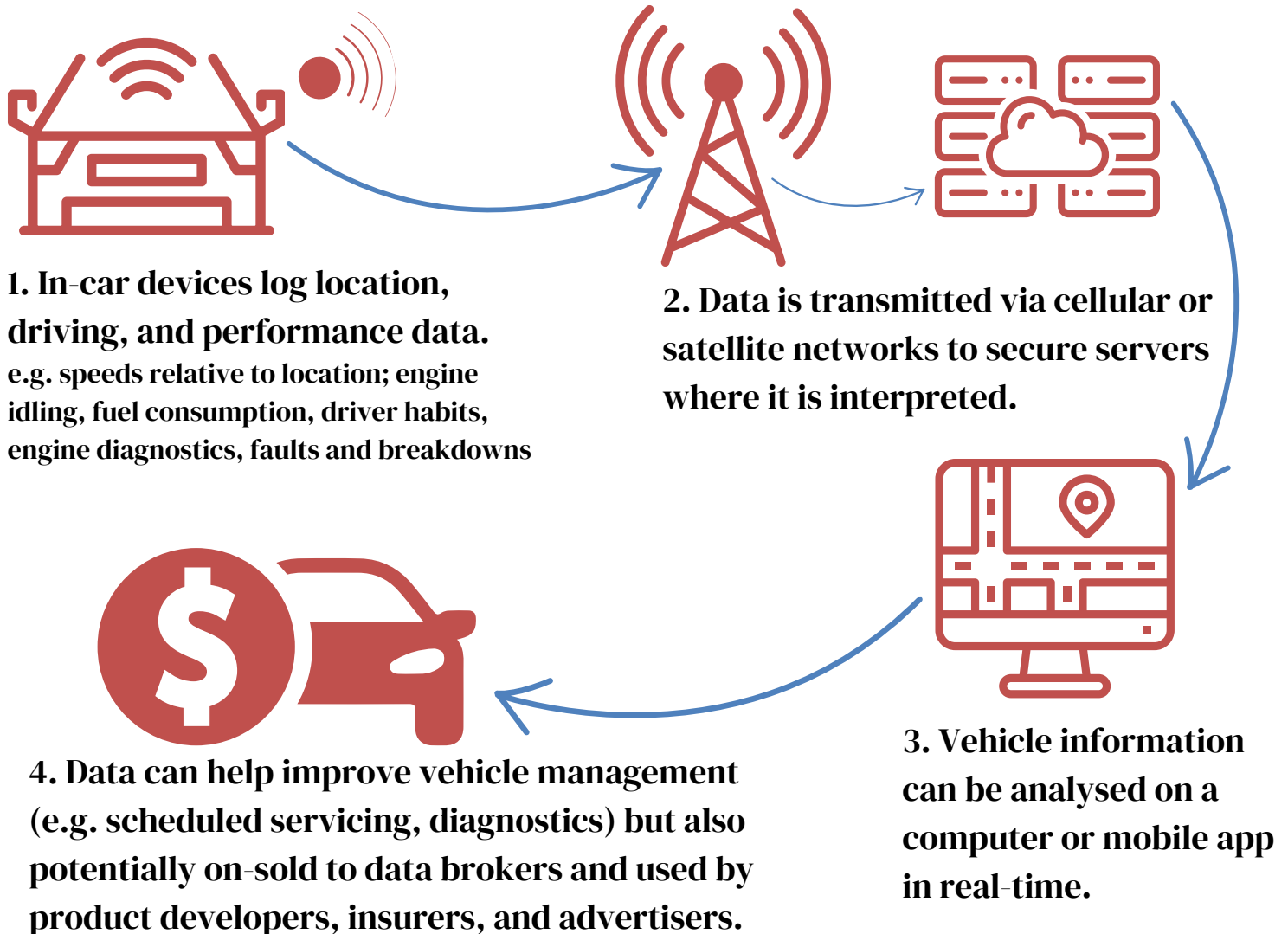


Figure 18: The changing contribution of electronic componentry to the cost of new car production. Source: Author's analysis of WTO, UN Comtrade and S&P World custom data.



Evolving automotive technologies:

Telematics are an evolving technology for sending, receiving, and storing data on vehicle performance, driving habits, and locational information via telecommunication devices that plug into onboard diagnostic or controller area network ports. Telematic devices use a SIM card and onboard modem to enable communication through mobile networks.



According to Berg Insight (2023), 47.2 million aftermarket telematics hardware devices were sold globally in 2022 with a market value of A\$4B



04 *Dataset 2*

Summary: Automobiles as complex, evolving technologies

The figures, tables, and maps presented in Dataset 2 share insights into the evolving, complex technologies that comprise modern automobiles. The technological architecture of cars shapes aftermarket services directly, including fault diagnosis, repair processes, maintenance scheduling, new parts sourcing, access to brand-specific equipment, workforce training, and upskilling. With cars being the primary mode of transport for most Australian households, a breakdown or delay in a repair has a major impact on mobility and daily lives. As outlined in **Figure 14**, motor vehicles are now the world's most high-tech consumer product.

However, despite the integration of complex, networked and evolving digital technologies, cars remain prone to unexpected breakdowns. Vehicles require ongoing expenditure on repair and maintenance services to ensure good working order. Importantly, as indicated in **Figures 15 and 16**, the increasing complexity of cars also corresponds with an increasing number of annual recalls across different marques, models, and variants. For example, between 2019 and 2023, Australian motorists experienced an average of 175 car-based recalls per annum, as registered with the Department of Transport and Infrastructure. This level of product recall represented a 111% increase compared to the period 2009-2013 and a 370% increase compared to the period 1993-1997.

Whilst the overall size of Australia's motor vehicle fleet increased by 29% between 2010 and 2023, the more dramatic increase in the rate of vehicle recalls suggests that the increasing technological complexity of cars is correlated to an increasing number of faults requiring remediation by qualified technicians. Repair work related to a vehicle recall is usually covered by the manufacturer but often represents a safety or disruption risk to a consumer using a car with an identified fault.

As visually represented by **Maps 3 and 4** (page 20), an increasing number of vehicles are now exported from newly industrialised countries such as China, Thailand, India, the Czech Republic, Slovakia, Mexico, and Brazil. In 2023 China became the world's largest manufacturer and exporter of finished automobiles on a unit basis and sat second to Germany in terms of export value (US\$). When focused on export markets, Germany remains at the top of the global value chain but is likely to experience increased competition for market share and earnings amid the transition to electrified cars.

The global geography of auto manufacturing is a significant factor for local aftermarket businesses and consumers who will require access to brand-specific technical information, proprietary software, and equipment to access and deliver affordable, timely repair and maintenance services. Indeed, the research found that in 2023 a growing proportion of repair jobs in mechanic shops (20-25%) required access to brand-specific technical data, diagnostics and/or design schematics. This proportion of jobs is double the 10% figure formally reported by the Federal Government in 2021.

Following the maps, **Figures 17 and 18** provide further insights into the expanding technological complexity of modern automobiles. **Figure 17** shows the growing revenues earned by semiconductor manufacturers from the sale of microchips to auto brands and OEMs. Indeed, the CAGR in the trade between automakers and ‘chip’ manufacturers was 10.5% between 2013 and 2023. Automakers purchased US\$54 billion worth of microchips in 2023 alone with most analysts predicting strong forward growth as digital technologies, including artificial intelligence(AI) become an ever more important feature in selling vehicles.

Figure 18 illustrates the contribution of electronic componentry to the overall cost of manufacturing a motor vehicle. The material costs from electronic componentry have grown from 18.2% of overall production in 2000 to more than 40% in 2022.

The **infographic on page 22** describes perhaps the most controversial technological development unfolding within the automotive sector: telematics. The ability to capture, transmit, interpret, and on-sell **user-generated data** has become the backbone of the tech sector. Through everyday driving practices, motorists are now deeply implicated in the generation of an enormous volume of data related to driving habits, geographical mobility, vehicle performance, and fault diagnosis.

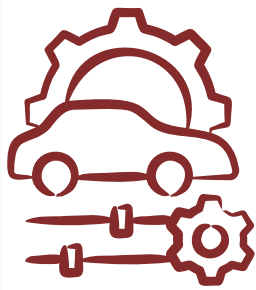
There are a range of ways in which accurate data on car use and performance can be beneficial for motorists and carmakers. These potential benefits include the ability to more efficiently repair vehicles and improve overall reliability.

Equally, there are considerations for **regulators and policy-makers** regarding the privacy and rights of consumers who may not consent to having aspects of their personal lives shared with data brokers, product developers, or advertisers. In addition, the increased digital connectivity of vehicles is also raising cyber-security concerns as the risk of having personal data stolen by hackers grows.

Perhaps more than any other **mass-produced consumer technology**, cars illustrate the increasingly complex and stretched-out relationships between economic actors: global brands, OEMs/manufacturers, shippers, retailers, credit providers, repairers, parts wholesalers and distributors, market regulators, policy-makers, *and* final consumers who rely on their car to go about busy, mobile lives.

The research behind this report shows that there is still much to resolve around the informational politics of complex, technology-rich products.





05

Dataset 3

The consumer-product relationship

Consumption = the exchange of goods and services to meet needs and wants. Crucially, these needs and wants are socially mediated and change over time and space.

Australia has one of the highest rates of car ownership, per capita fuel consumption, and vehicle-related travel distance, of any country. The factors that explain Australia's car dependency are multiple, including urban settlement patterns, government policy (industrial, transport, taxation), cultural views that link cars to ideas of freedom, personal choice, comfort and flexibility, and economic factors spanning job creation to financial investments in road infrastructure.

For many Australian households and families, car ownership has enabled a mobile lifestyle. Cars support trips to places of work, small business and commercial activities, attendance at social or community events, family holidays, and road trips. Increasingly, however, car ownership is a major cost burden. The costs of running a car relate to credit-backed purchasing, insurance premiums, and fuel costs. Motor vehicles also continue to make a significant contribution to Australia's annual greenhouse gas emissions, air and noise pollution.

While expensive and environmentally damaging, car ownership often remains socially necessary. Without access to a vehicle, the majority of Australians would be **unable to easily access places** of work, education, health and childcare, social activities, grocery stores, and other essential services. For these reasons, cars remain important to access what Pollard et al. (2023) refer to as 'life opportunities'.

What the research project set out to investigate was the modern-day experience of car use and ownership, including how consumers access aftermarket servicing and repairs. Hence, in this section of the report, results are presented that highlight key trends, consumer-facing problems, and potential policy mechanisms that may support competitive aftermarket auto industries while improving the overall ownership experience for Australians.

In addition to interview material, participant observation at shops, and ABS data, this section also draws from a **comparative analysis conducted of emergent policy responses in Australia, the U.S. and the EU**. Such policy measures aim to address issues of inequitable and unfair access to proprietary information for delivering aftermarket services on increasingly complex vehicles. Such legislative and regulatory frameworks are commonly referred to as '**Right-to-Repair**' bills.

When the research commenced in 2019, Australia did not have formal, mandatory 'Right-to-Repair' legislation covering aftermarket servicing of consumer goods. However, the situation shifted mid-way through the project, providing an opportunity to examine if new legislative actions taken by Government had their intended impact.

Figure 19: Trends in transport modes for travel from place of residence to place of paid work. Source: Author’s analysis of ABS Census and Time Series Data.

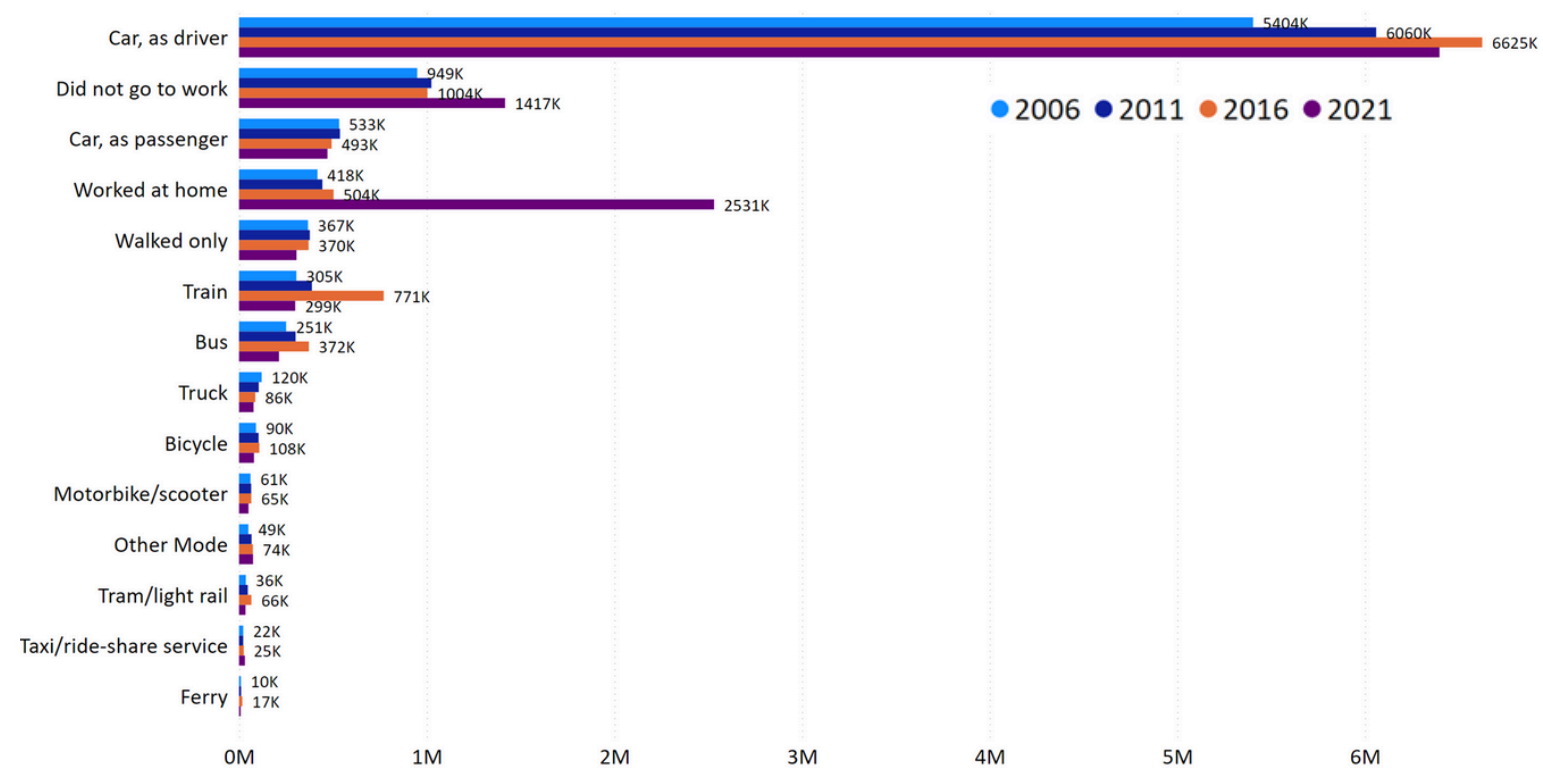


Figure 20: A comparison of transport modes for travel from place of residence to place of paid work, 2006 to 2021. Source: Author’s analysis of ABS Census and Time Series Data.

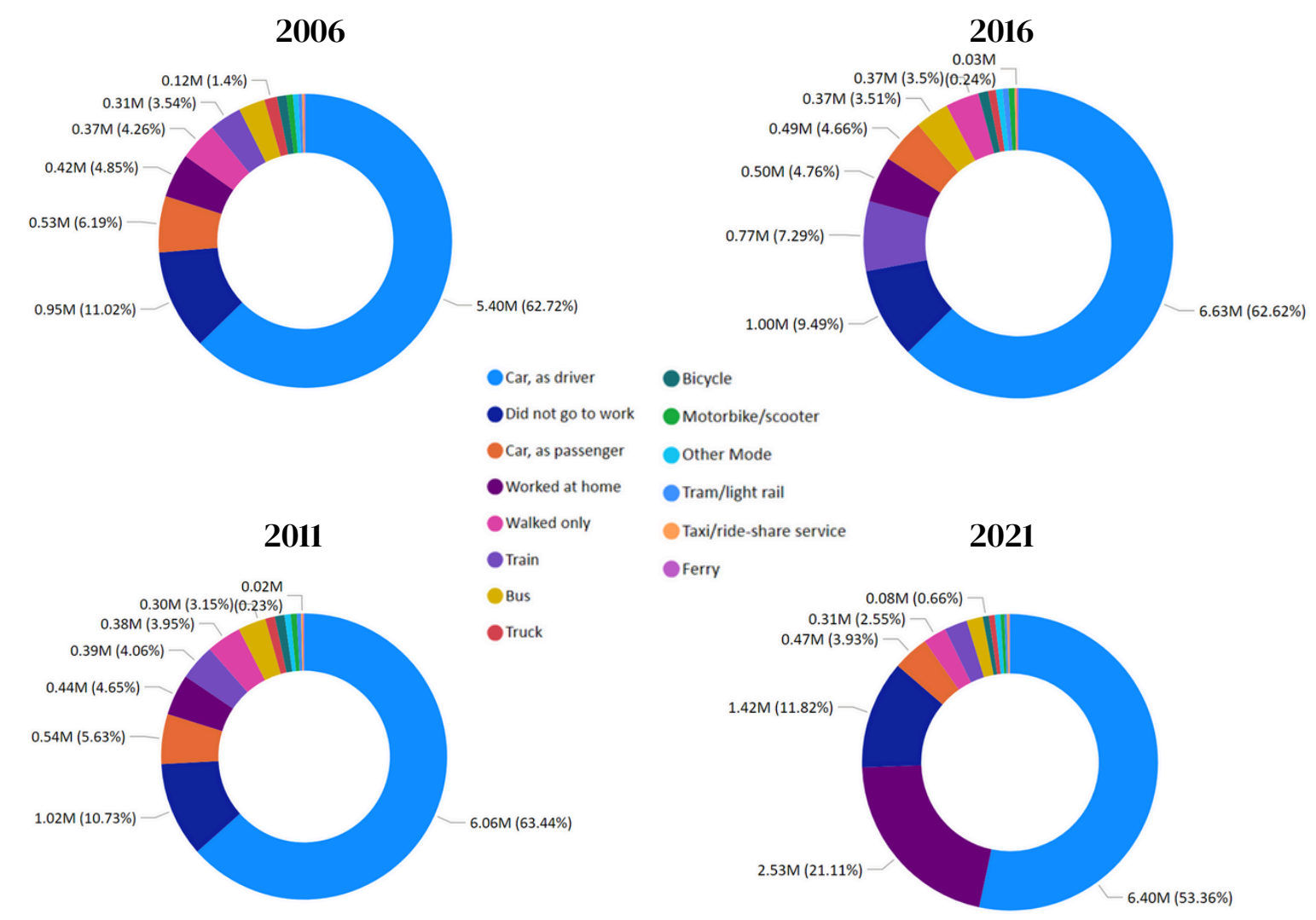
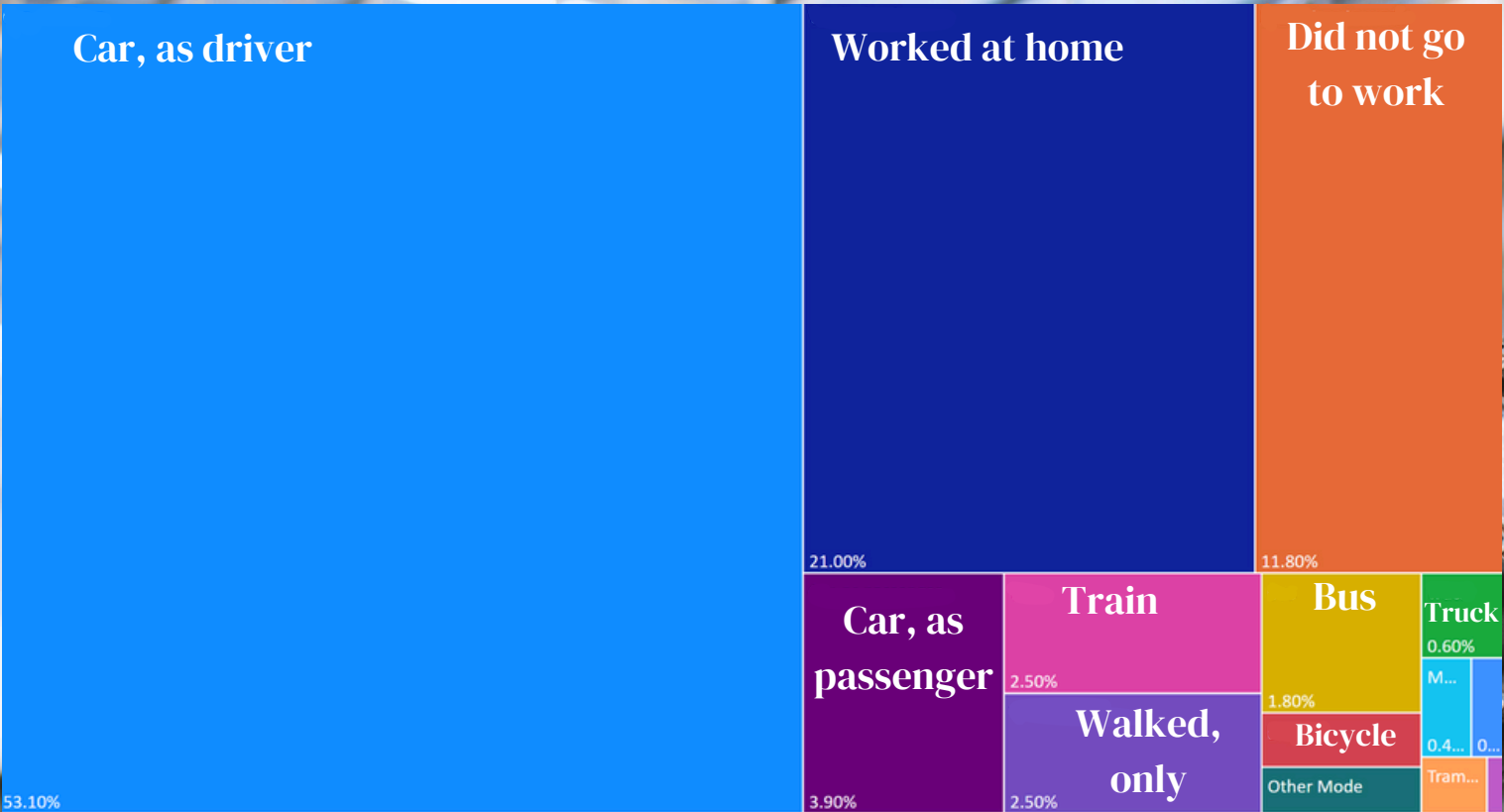


Figure 21: The most popular modes of travel to work in 2021. Source: Author’s analysis of ABS Census and Time Series Data.



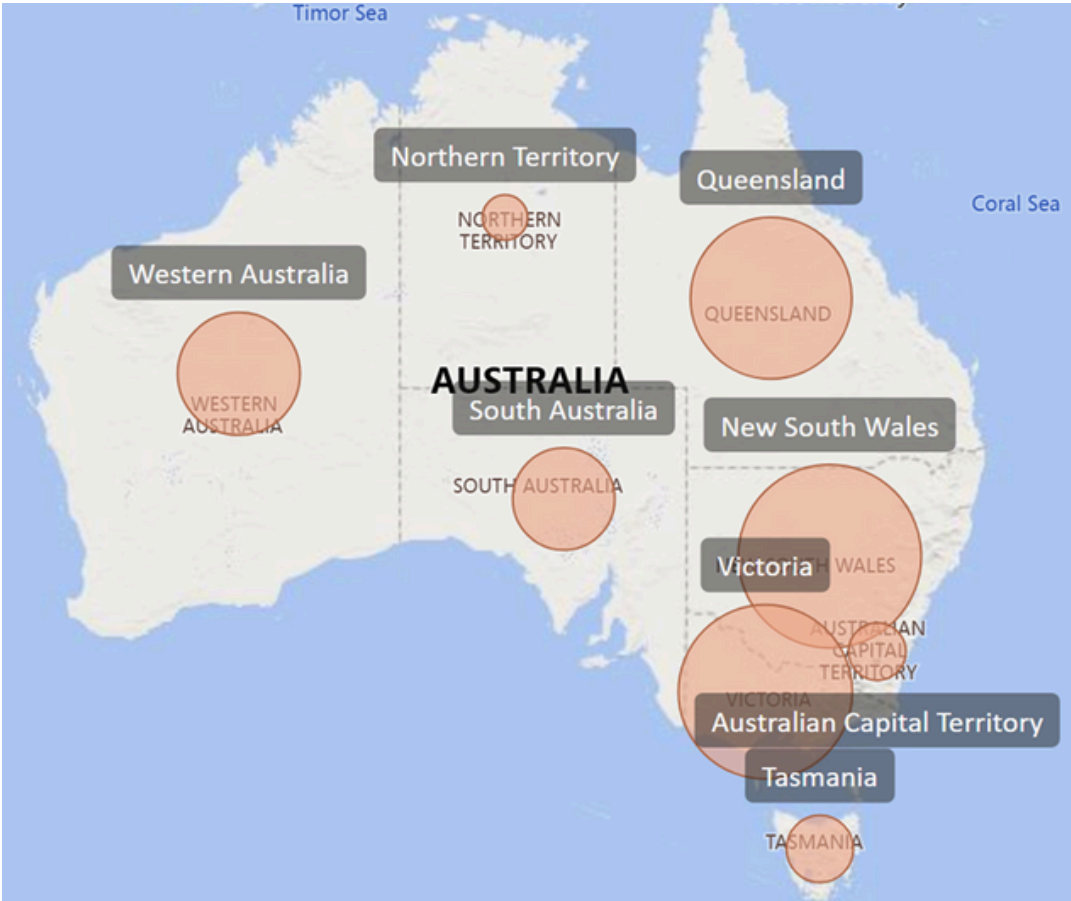
“You’re certainly very aware when you run a mechanic shop that many people *really* rely on their car. They need their car to go about their busy lives. So, no car for a week is very disruptive and can mean they have no way to get around for work, for kids’ sports, for all the other things we need to do”. (Owner/Manager of an Independent shop)

“I have a love-hate relationship with my car (laughs). I love the freedom and flexibility I get from owning a car. I can go places I couldn’t get to on the train or bus. But I hate the amount of money it costs me. The petrol costs, repaying a loan, filling it with petrol, even servicing it. It’s literally tens of thousands a year when you sit and work it all out. That’s a lot”. (Customer of a multi-brand dealer0based service centre)

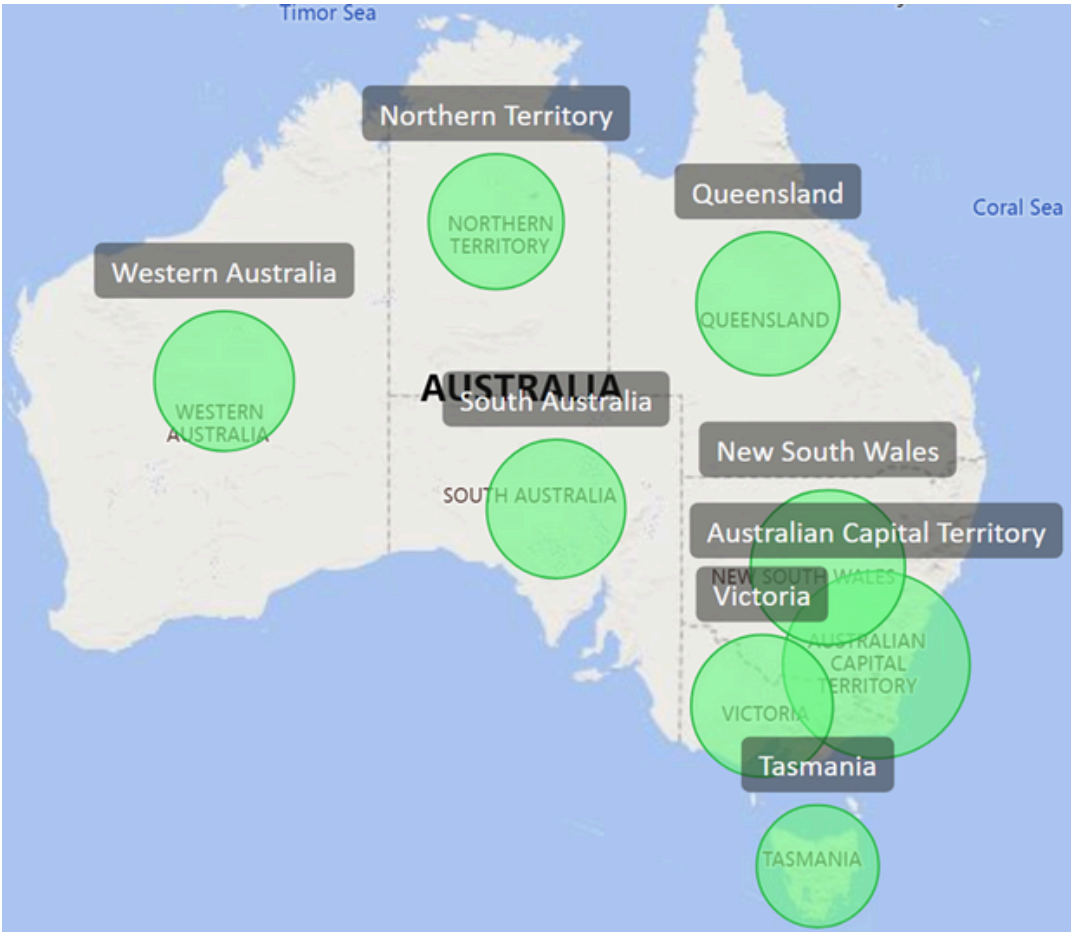
“One of the rules we have in the service centre is that cars and customers are worked on and fixed together. Usually a car off the road means someone’s life is being disrupted, and that leads to frustration”. (Owner/Manager of an Independent shop)

“Oh, where we live [suburban Sydney], and with our family, we don’t have any real option but to run two cars. Whether it’s getting to work or running three kids around for different things. There’s just no way I can get to places I need to go without my car. Simple as that”. (Customer of an independent mechanic shop)

Map 5: Total motor vehicle registrations by Australian state and territory.
Source: Author's analysis of Australian Automobile Association data



Map 6: Electric vehicle registrations as a % of total vehicles by Australian state and territory. Source: Author's analysis of Australian Automobile Association data.



Consumer Insights: What are the servicing needs of EVs, Plug-in hybrid vehicles (PHEVs) and hybrid vehicles?

As the share of electric-powered vehicles increases, consumer-related questions have focused on the aftermarket servicing and repair needs of EVs e.g. battery packs, motors, suspension, braking systems, remote software updates, and over-the-air servicing.

Leaving aside petrol-related savings, some reports, including by Yale's School of the Environment, suggest that scheduled maintenance and repair costs on EVs will be reduced by up to 40% over traditional ICE vehicles. Cost-savings are explained by the reduced need for the expert labour of mechanics and the ability to utilise networked digital technologies for remote, over-the-air software updates, diagnostic reports, and rapid identification of servicing needs. Broadly speaking, consumers may visit mechanic shops less often and be empowered to handle system updates from home or organise maintenance only when instructed by a vehicle's 'smart' operating systems.

On the flipside, however, other evidence uncovered through the course of the research project indicated that any savings made in scheduled servicing are offset by higher upfront costs (retail), lower resale value, and increased aftermarket costs related to more frequent replacement of tyres, malfunctioning battery packs, expensive parts/componentry, and higher insurance premiums.

For example, several interviews with auto technicians who had worked on EVs uncovered expensive issues with traditionally 'minor' repairs such as replacing headlights and shock absorbers. In these instances, the time to complete repairs, including recalibration, added 40-50% to the cost for similar work on an ICE vehicle. Likewise, according to technicians the additional weight of EVs over ICE equivalents (typically 20% heavier) and instant torque means the lifespan of tyres is reduced by up to a quarter.

Table 2: A comparison of registered vehicle types by Australian state and territory, 2024.

Source: Author's analysis of Australian Automobile Association data, 2024

State	ICE vehicles	Battery EVs	Plug-in Evs	% EVs 2024	% EVs 2021
New South Wales	5,464,456	49,768	161,980	3.73%	1.43%
Victoria	4,907,595	41,546	114,127	3.07%	1.10%
Queensland	4,148,122	34,495	95,697	3.14%	1.10%
South Australia	1,424,754	7,624	33,841	2.91%	1.14%
Western Australia	2,199,707	15,801	49,411	2.96%	1.02%
Tasmania	483,043	3,139	7,550	2.16%	0.77%
Northern Territory	147,188	464	3,681	2.74%	0.93%
Australian Capital Territory	300,249	6,467	11,768	5.73%	2.20%

Consumer Insights: What are the servicing needs of EVs, Plug-in hybrid vehicles (PHEVs) and hybrid vehicles?

Perhaps most significantly, the research found that EVs are considerably more expensive to comprehensively insure while value depreciation is also currently greater than for comparable ICE models.

For instance, from interviews with two different smash repairers it was revealed that typical owners of Model Y and Model 3 Tesla's paid around \$2,700 p.a. to insure. By comparison, insurance costs for an ICE-powered Toyota Rav 4 or Mitsubishi Outlander, with the same providers, averaged \$1,250 per annum, a 116% reduction. Higher insurance costs are related to the difficulties in repairing expensive battery packs compromised in an accident, the high costs of imported parts, and small number of businesses certified to do repair work on rapidly evolving technologies.

In terms of resale value, EVs also currently stack-up poorly compared to ICE cars. The table below is derived from data captured in December 2023 by the Australian Automotive Dealers Association and AutoGrab. It shows a significant difference in resale value between EVs and ICE cars. Factors that help to explain the difference in resale value include the relatively higher price of EVs to begin with, the smaller used market for EVs, consumer uncertainty regarding the technology, and the rapid speed of technological change surrounding EVs.

Table 3: A comparison of value depreciation rates for electric vehicles (EVs) and internal combustion engine (ICE) vehicles. Source: Author's analysis of Australian Automobile Association data, 2024

Vehicle Age	EV % of original value	ICE % of original value	EV to ICE % diff. in depreciation and (\$ value diff. assuming vehicle cost of \$70k)
0-2 years	82.8%	95.5%	- 14.2% (-\$8,890) 
3-4 years	57.6%	85.9%	- 39.4% (-\$19,810) 
5-6 years	24.1%	68.8%	- 96.2% (-\$31,290) 

Table 4: A general classification of maintenance and repair (M&R) services provided to motoring consumers by Australian auto mechanical shops. Source: Author's research.

Type of M&R	Description of services and contribution to shop revenue
Product recalls	Recalls are common in the auto industry and are made by either a manufacturer voluntarily or ordered by a consumer authority/law owing to a critical or safety fault with a car's operation that requires immediate repair. The costs of new parts and labour are covered by brands/ OEMs. E.g. 2017 global recall of Takata airbags; 2018 recall of Toyota HiLux utes due to faulty DPFs; 2021-2023 Ford Everest recall for faulty batteries; 2021-2022 BMW iX recall due to a software malfunction. See: https://www.vehicle recalls.gov.au/recalls/browse-all-recalls
Warranty repairs	M&R work completed to remedy a fault or systems problem impacting the use and/or safety of the vehicle. The costs of parts and labour are covered under the manufacturer-backed warranty or, in some cases, through an extended warranty sold to consumers by dealerships (often on behalf of a third-party). E.g. replacing a faulty part or component on a car. Warranty repairs constitute 10-15% of servicing revenue at dealerships.
Breakdown repairs	M&R work outside of a warranty period completed on a vehicle that has broken down and cannot under normal circumstances, continue to be driven safely. The costs of towage, parts and labour are born by the owner/consumer. E.g. repairs to a blown radiator or transmission failure. Breakdown repairs constitute 15-20% of servicing revenue at dealerships and independent shops.
Logbook servicing	The general M&R work performed on a car according to the recommended schedule set by the manufacturer. The costs of this work are born by the owner/consumer, with many newer model cars covered by a 'capped price' program that coincides with the warranty period. E.g. filter and fluid changes, brake pads, timing belt replacements, suspension bushes etc. Logbook servicing constitutes ~60% of M&R revenue at dealerships and >75% at independent shops.



Timeline: Consumer-facing aftermarket regulation

* **Prior to 2014:** Aftermarket car servicing in Australia is provided by brand-aligned, integrated dealerships, franchise service centres (e.g. Ultra Tune, Midas), or independent mechanical shops. Dealerships have contractual relationships with one or more brands while independents usually have no contractual alignment to brands/OEMs.

- Broadly, more than **90% of consumers** with newer model cars still under a manufacturer warranty use a dealership to service their vehicle.
- Independents dominate aftermarket share for older vehicles (>5 years) not covered by a warranty. Here servicing needs are set out in a logbook provided by the manufacturer.

* **2014-2015:** As vehicles become increasingly complex machines with advanced systems, concerns and complaints grow to the ACCC and State-based Fair Trading Agencies over whether independent shops are being unfairly treated by manufacturers, favouring their dealership network in terms of information sharing, access to technical specifications, and mechanic training programs.

- Globally, other nations begin to roll-out so-called '**Right-to-Repair**' (RTR) laws that aim to make access to repair-relevant information fair and equitable between brand-aligned dealerships and independent shops.

* **2016:** The Australian Government rolls out a voluntary information-sharing scheme for the motor vehicle servicing industry.

- The voluntary scheme aims to ensure that schematic, diagnostic, parts, and recalibration information is shared between automakers (OEMs) and aftermarket service shops, particularly independents.

* **2021:** Only three of the 15 highest-selling carmakers in Australia are openly providing independent mechanic shops with access to the same information as dealerships.

- Carmakers cite protection of proprietary information, safety, security and lack of training as reasons for withholding or censoring information from independents.

* **July 2022:** Australia's first RTR bill is introduced, the Motor Vehicle Information Scheme (MVIS), explicitly for the auto sector.

- The MVIS aims to help ensure independents can access the same codified information as dealerships for "a price (scheme price) that does not exceed the fair market value of the information" (MVIS 2022, p. 11).

Figure 21: National household expenditure on transport, \$ per week. Source: Author’s analysis of Australian Automobile Association data, 2024.

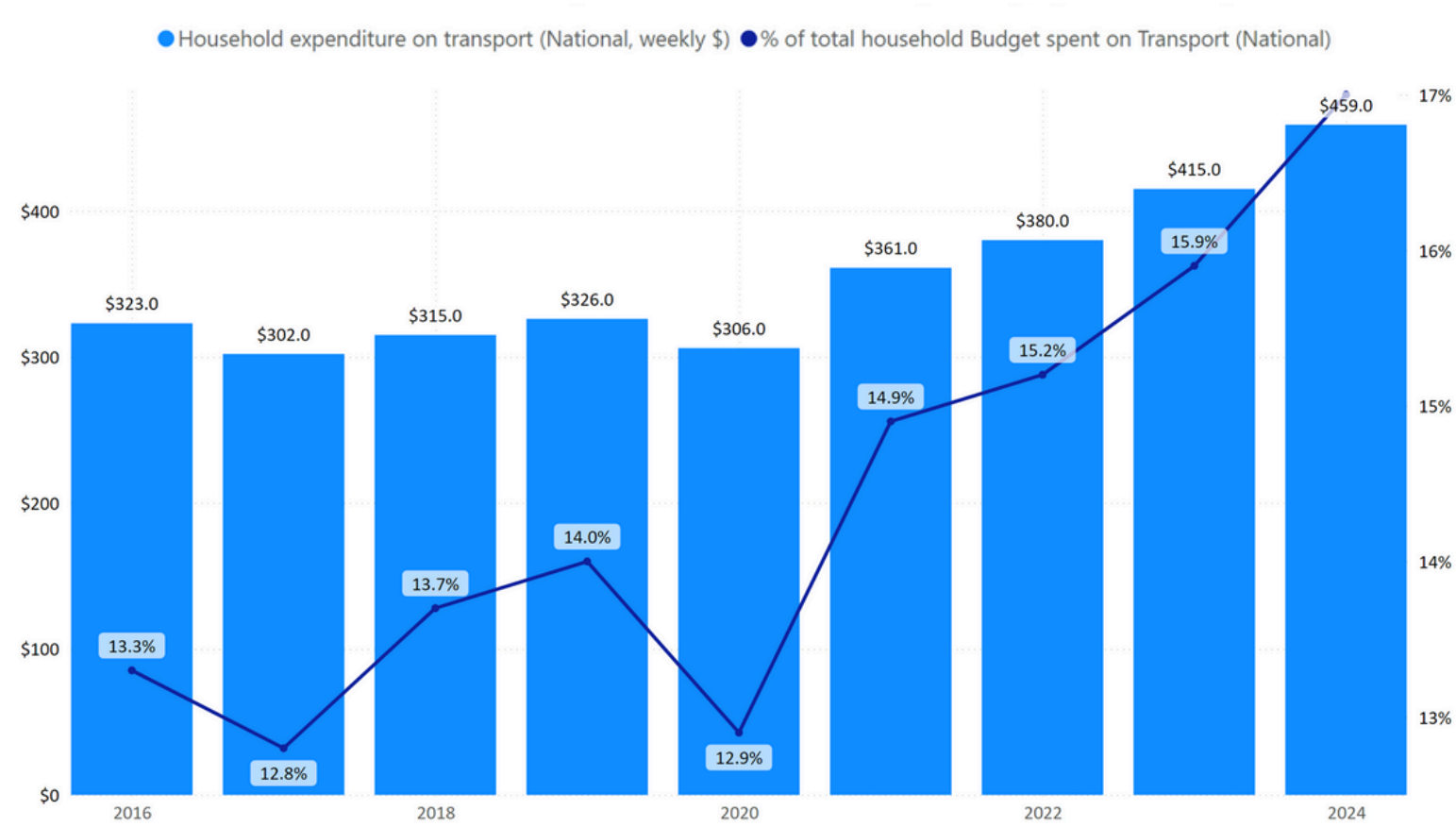


Figure 22: National household expenditure on auto maintenance and repair, \$ per week. Source: Author’s analysis of Australian Automobile Association data, 2024.

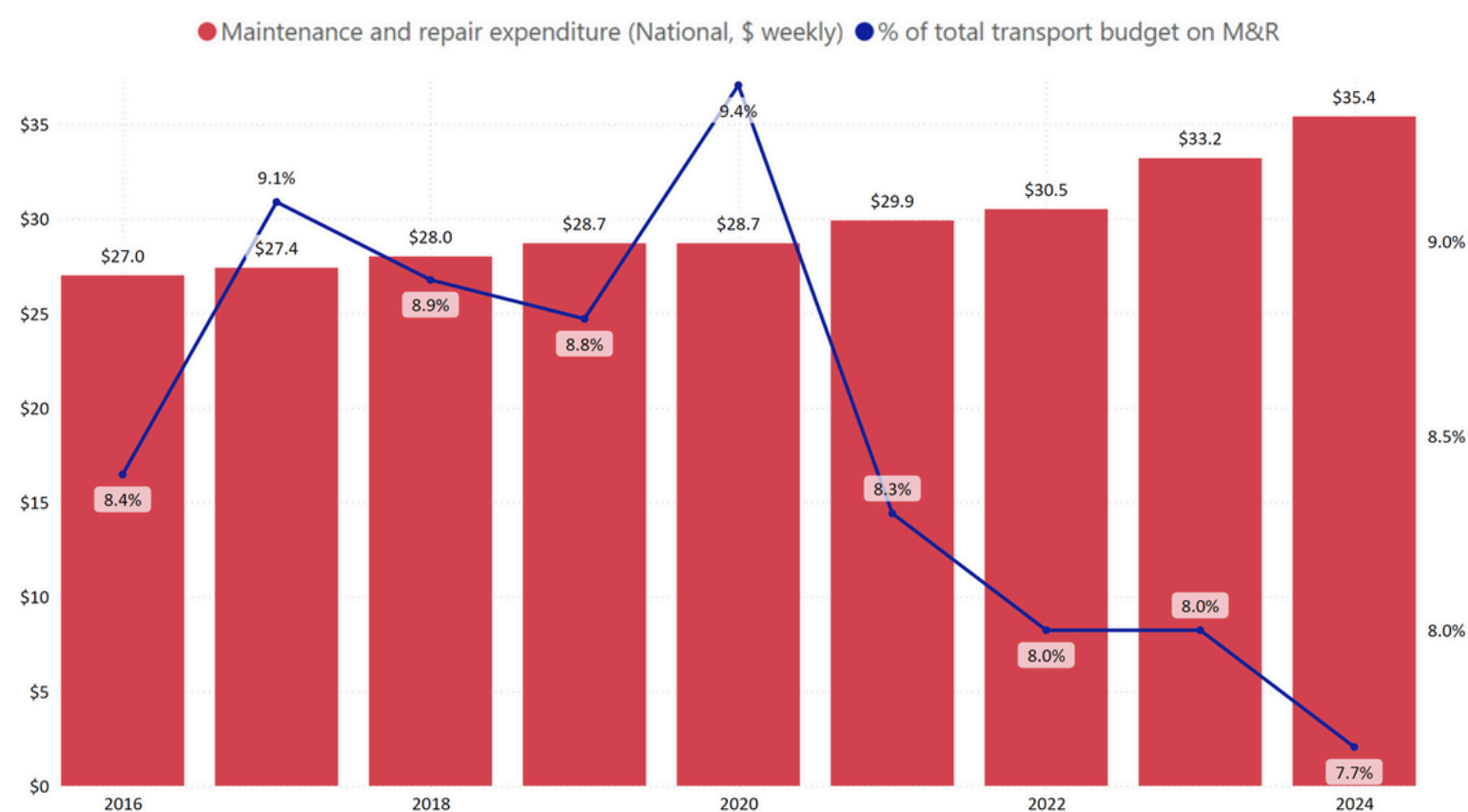


Figure 23: Transport-related expenditure for Australian households, 2016 to 2024 (\$ per week). Source: Author’s analysis of Australian Automobile Association data, 2024.

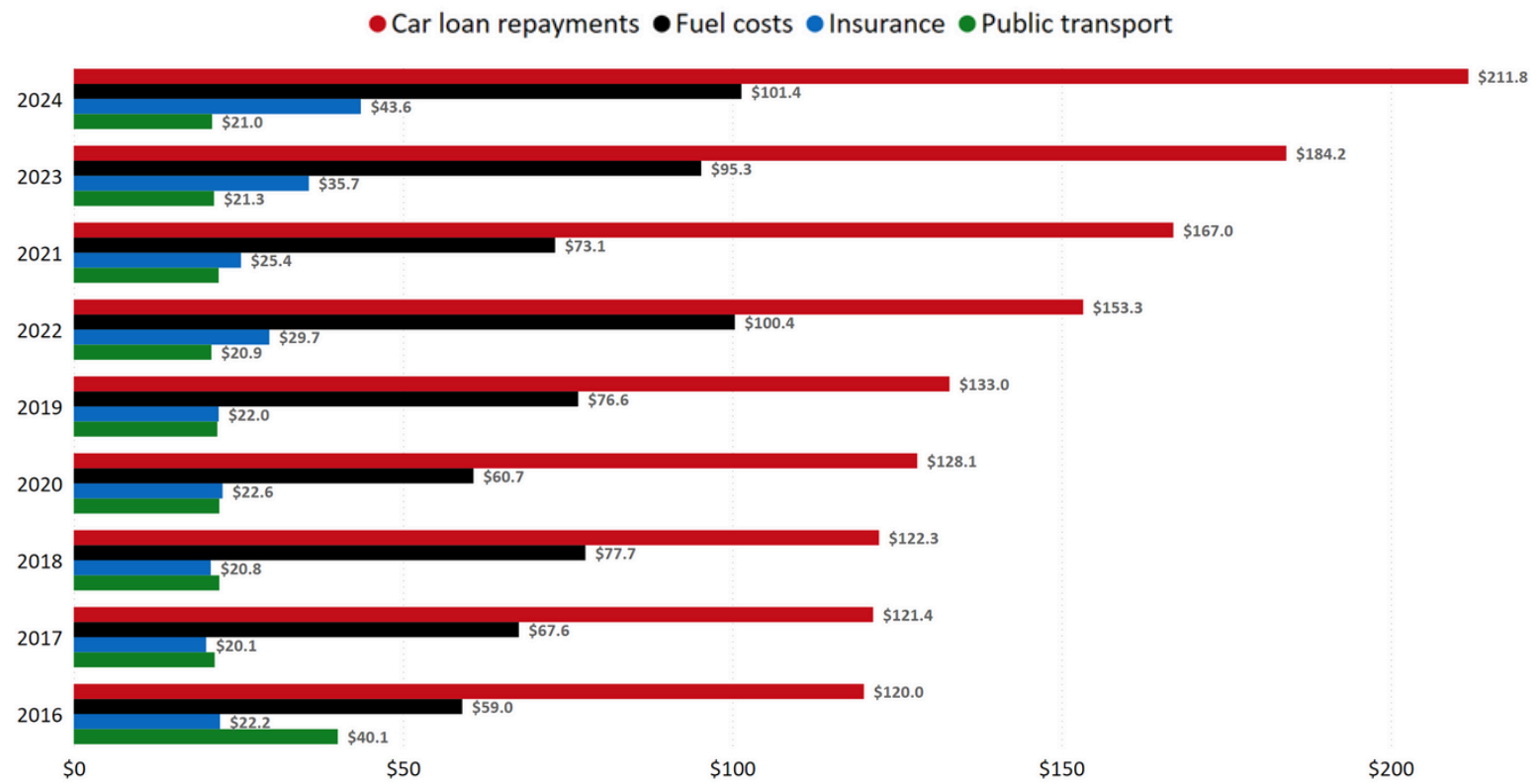
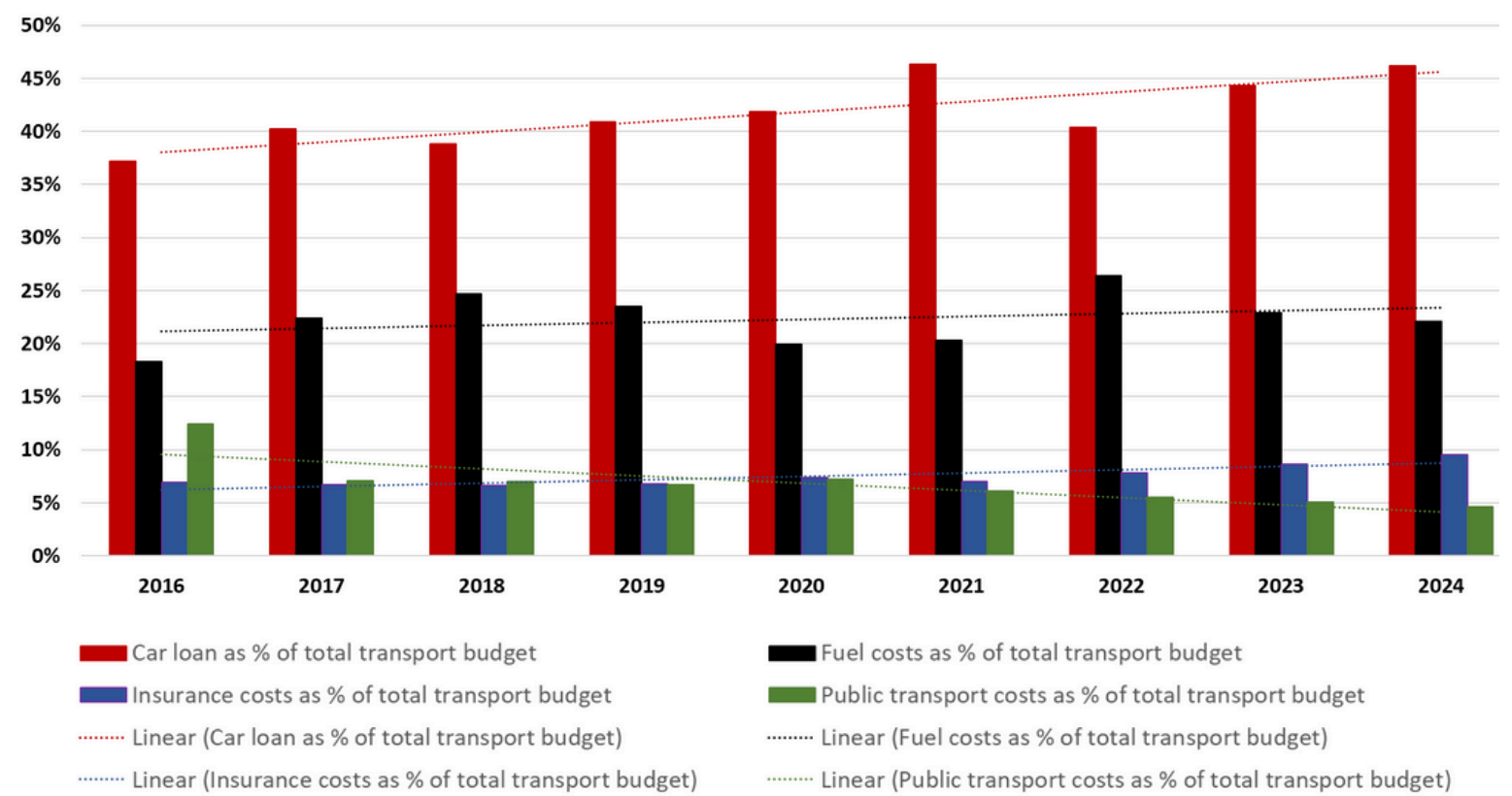
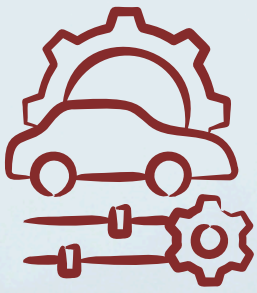


Figure 24: Expenditure of Australian households, 2016 to 2024 as a % of total transport costs. Source: Author’s analysis of Australian Automobile Association data, 2024.





05 *Dataset 3*

Summary: The consumer-product relationship

The figures, tables, participant quotes, and descriptions presented in Dataset 3 illustrate changing patterns of motor vehicle use among Australian consumers. Focusing on the consumer-product relationship, the data shows that many Australians continue to rely on access to a motor vehicle for their day-to-day lives, though with some major changes regarding aspects of car usage for work-related trips.

Figures 19 and 20 reveal trends in car use related to accessing places of paid work. The proportion of work-related trips involving use of a motor vehicle, as a driver or passenger, declined sharply from 67.3% in 2016 to 56.3% at the 2021 Census. The biggest explanatory factor in the decline of car-related trips to work was the COVID-19 pandemic. The pandemic caused major disruptions to the typical geographical patterns of paid work. Throughout 2024, many Australians continued to work from home (WFH) during part of their working week. Despite some employers mandating a return to centralised workplaces (e.g. CBD-based office spaces), many employees in service industries continue to seek out opportunities for hybrid and flexible patterns of work that incorporate work from home.

Of note, public transport usage **between 2016 and 2021** trended downwards, also likely due to social distancing norms following public health measures during the pandemic response of 2020 and 2021. Increasing public transport usage remains a major challenge for policy-makers, particularly as growth areas in Australia's largest cities tend to follow greenfield land releases accompanied by urban sprawl. Many large residential developments are dislocated from public transport infrastructure such as rail lines with the result being a stubborn car dependency for personal mobility.

Big shifts in the geography of paid work and thus work-related travel are further illustrated in **Figure 20** on page 26. The figure reveals how 21% of Australian workers engaged in WFH on Census day in 2021, a substantial rise from the three previous Census periods where less than 5% of employees worked from home.

Despite recent changes in car use for work-related travel, the series of quotes from research participants, shown on page 27, underscore the close and enduring relationship between Australians and their cars. As a young parent and customer at an independent mechanic shop explained when asked about their car use: "There's just no way I can get to places I need to go without my car".

Following the series of quotes from participants in the study, **Maps 5 and 6** provide a visual representation of car registrations across Australia's states and territories. The level of vehicle registrations closely maps to the population size of states/territories and the settlement patterns of major cities and towns.

Table 2 highlights growth in the proportion of electric-powered vehicles, as registered by state and territory. As of mid-2024, the ACT (5.73%) and NSW (3.73%) had the highest rates of EV ownership. NSW alone now has more 211k registered battery electric and plug-in hybrid vehicles, increasing from 81k in 2021. Meanwhile, Tasmania (2.16%) and the Northern Territory (2.74%) have the lowest rates of uptake in electrified vehicles.

The insights provided on page 30 and via **Table 3** shed light on a much-publicised debate over the costs of EV ownership relative to conventional ICE-powered vehicles. Some initial studies, including by researchers at Stanford University, have suggested that EV servicing costs will be considerably lower than comparable ICE models. Such studies emphasise the ability to conduct over-the-air software updates, systems checks, and diagnostic tests, negating the need to take a vehicle to a service centre.

However, there is also emerging evidence that the story of aftermarket cost savings for consumers is not so clear-cut.

While the general servicing costs of EVs may be lower compared to ICE cars, consumers may find they are paying higher insurance premiums, replacing tyres more frequently (EVs are ~20% heavier than ICE cars, on average), and requiring access to specialised technicians when it comes to recalibrating electrical parts and componentry.

Another important consideration for many car buyers is resale or second-hand value. Again, EVs significantly underperform in terms of value depreciation compared to traditional ICE vehicles. While still a relatively 'new' consumer technology, the value of EVs 3-4 years old averages 39% less than similar ICE models. The following scenario is instructive.

If two families are in the market for a mid-sized SUV in the range of \$70,000, the electric model could be worth up to \$19,800 less than the ICE variant after 3-4 years. At 5-6 years of age, current resale data suggests that EVs hold just a quarter of their original new car value. This compares to ICE vehicles that retain around 68% of their value after 5-6 years.

Table 4 on page 31 then outlines four broad, general categories of car maintenance and repair identified through the research: **1. product recalls, 2. warranty repairs, 3. breakdown repairs, and 4. logbook servicing**, equivalent to scheduled maintenance. These four categories of maintenance and repair reflect both the service needs of car owners alongside the specific type of work provided by auto aftermarket businesses.

While product recalls and warranty repair costs are usually covered by manufacturers, breakdown repairs and scheduled logbook servicing are usually the responsibility of car owners/users.

For consumers, breakdowns are particularly disruptive as they are often unexpected, meaning any resulting disruption is not planned for. Scheduled maintenance, however, can be planned around personal schedules and family routines. In this way, repair work can have very different spatial and temporal characteristics compared to maintenance.



In terms of consumer behaviour, rights and responsibilities, the **timeline** on page 32 accounts for some of the significant recent changes in Australia regarding auto aftermarket services and so-called ‘right-to-repair’ laws. In 2016, a voluntary code of practice was introduced nationally to encourage automakers to share service-relevant information with independent mechanic shops.

However, by 2020 only 3 of the 15 highest-selling brands in Australia were openly sharing information with independent shops, such as technical service bulletins (TSBs), calibration procedures, onboard diagnostics, and software upgrades. In response, the federal government passed legislation that resulted in the Motor Vehicle Information Scheme coming into effect on 1 July 2022.

The legislation now requires automakers selling cars to consumers in Australia to grant independents access to the same codified information as their dealerships. The technical information can be accessed by independents for “**a price (scheme price) that does not exceed the fair market value of the information**” (MVIS 2022, p. 11).

Regardless, the research heard from several independent shop owners and managers who described long wait times for repair-related information, including incomplete schematics, poor technical support, and high one-off fees that added substantial costs for small businesses and their customers. While viewed as a major step forward, some in the auto industry argued the regulation was proving “less effective than we had hoped for” (Manager, Independent auto shop).

Focusing on transport-related expenditure among Australian households, **Figures 21 to 24** over pages 33-34 offer insights into the growing costs of running a vehicle, including servicing car loans, paying for fuel, and insurance. For example, the average car loan repayment increased by 65.3% between 2020 and 2024, which is an annualised increase of 13.0%.

By the second quarter of 2024, the average weekly spend on a car loan stood at \$211.80 per week, or roughly 46% of a household’s weekly spend on transport. Likewise, fuel costs increased 67.1% (to \$101.40 by Q2 of 2024) while insurance expenses had risen 46.8% since 2020 to reach \$43.60 per week.

By contrast, the rate of increase for aftermarket auto servicing, including scheduled maintenance (e.g. logbook servicing) and running repairs, was a more modest 23.3%. When annualised, the increase of 4.7% p.a. is in close alignment with the rise of the consumer price index (CPI).

At the other end of the spectrum, expenditure on public transport declined by -5.0% between 2020 and 2024, averaging \$21.0 per week.

Overall, by mid-2024 the **average Australian household was spending a record \$459 each week on transport**, equivalent to 17.0% of median household income.



06 Dataset 4

Workforce insights and struggles over skills

A final collection of empirical insights derived from the research project focus on the skilled workforce in Australia providing auto-related maintenance and repair services. The post-production auto workforce not only helps to sustain the safe, reliable working order of vehicles but also the mobility of Australians, more broadly.

Two of the key workforce-related questions the research aimed to help answer were:

1. What are the training requirements and key skills needed by workers who maintain and repair complex modern vehicles?
2. What are the barriers to developing a skilled and valued auto maintenance and repair workforce?

In seeking to shed light on these questions, the research integrated both qualitative and quantitative data.

Qualitative methods encompassed several rounds of interviews spanning auto mechanics, customer care staff, shop managers, and dealer principals. Participant observation was also conducted in dealer service centres and independent shops to capture in-depth insights into the work of auto maintenance and repair.

Quantitative data was collected from ABS Census and custom data requests, alongside publicly available data sets published by industry groups such as the Motor Trades' Association Australia (MTAA) and Australian Automobile Association (AAA).

This section on workforce dynamics concludes with three recommendations, emerging from the wider research project. These recommendations aim to assist industry stakeholders, policy-makers, and training institutions to further develop a future workforce that is well-equipped to service complex vehicles, which help to keep Australians spatially mobile.

A crucial point the report emphasises is that reproducing a suitably trained and skilled workforce will require a clear understanding of the labour process behind maintaining and repairing new model motor vehicles, and for the skills of workers in such downstream industries to be appropriately valued.

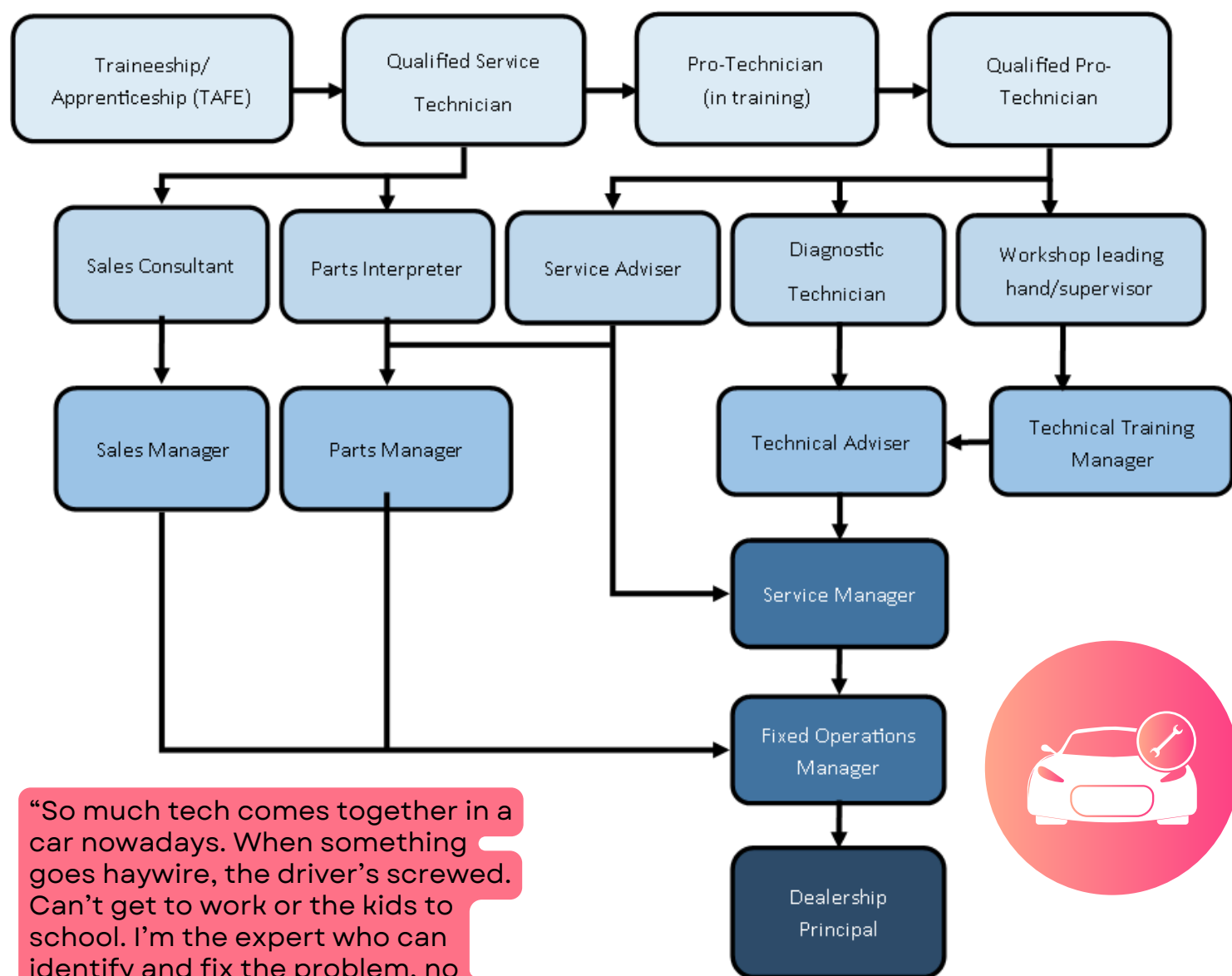
Figure 25: An overview of the workforce dynamics for dealership-based and independent auto servicing shops. Source: Author’s research.



“I started in 96’ when you plugged in a one-directional scanner to get a fault code. There were 80-odd codes. A fix procedure was one-page. Today, there’s a thousand codes, and my laptop scans 25 internal computers for one car. Diagnostic books for engines can be 1,500 pages. Just the engine. We have to calibrate radars, read schematics, interpret software. We have to be professionals and not [appear] dirty and grubby”.

(Auto mechanic, Dealership)

Figure 26: A general overview of career pathways for auto mechanics/technicians employed in brand-aligned dealer shops. Currently, around 99% of mechanics/ technicians are men. The vast majority of auto shop employees are from working-class backgrounds routed into the industry from high school. The research found that for many early career workers entering the industry there was a significant disconnect between initial understandings of the work demands and the realities of their day-to-day role. Source: Author's research.



“So much tech comes together in a car nowadays. When something goes haywire, the driver’s screwed. Can’t get to work or the kids to school. I’m the expert who can identify and fix the problem, no matter how long it takes. It’s what I love about my job. Working out causes of problems. Just me, some fancy-looking tools, and the car. With every car different, it keeps the work interesting. ... You have to be precise about it, too. There’s no half-arsed approach. I see it like, “I’m going to get this fixed. Solve the puzzle.” It’s a job that’s getting appreciated more, I think”.
(Mike, 50s, dealer-based supervisor technician, 30+ years’ experience)

“How we work on cars has totally changed. The licensing means investing in new equipment, tools, reprogramming systems, and tech training. Cars will break down. Technology always fails at some point. When it happens nowadays, the problems are usually complicated to fix. The technology has magnified everything: getting the diagnosis right; ordering and refitting parts; recalibrating them; annoyed customers. ...Every aspect of our job is a new technology or computer program. All the problems, fix procedures, digital tools, parts, fitting, it keeps moving. You gotta keep up”.
(Dan, 30s, Pro-technician, 15+ years’ experience)

Figure 27: An overview of minimum training completed by auto technicians and customer care staff employed in servicing shops. Source: Author’s research.

Auto technicians	Customer care staff*
Qualification/Study details:	Qualifications/Study details:
Certificate III in Light Vehicle Mechanical Technology (AUR30620); 20 core units + 16 elective units	Certificate III in Automotive Administration (AUR30116); 10 core units + 8 elective units
Illustrative ANZSCO Identifier:	Illustrative ANZSCO Identifier:
“Motor Mechanic – General” (321211)	“General Clerk” (531111)
ASCED Qualification:	ASCED Qualification:
“Automotive Engineering & Technology” (0305)	“Office Studies” (0809)
Core Units of Study:	Core Units of Study:
- Follow environmental and sustainability best practice in an auto workplace - Follow safe working practices in an auto workplace - Test and repair basic electrical circuits - Diagnose, repair spark ignition engine management systems - Test, charge and replace batteries and jump-start vehicles - Diagnose, repair charging systems - Diagnose, repair starting systems - Diagnose, repair ignition systems - Diagnose, repair light vehicle steering systems - Diagnose, repair light vehicle hydraulic braking systems - Diagnose, repair light vehicle suspension systems - Diagnose, repair light vehicle engines - Diagnose, repair light vehicle emission control systems - Carry out servicing operations - Develop and carry out diagnostic test strategies - Inspect and service braking systems - Diagnose, repair cooling systems - Inspect, service engines - Inspect, service petrol fuel systems - Use and maintain tools/equipment in the workplace	- Work in an automotive administration role - Respond to customer needs in an auto workplace - Build customer relations in an auto workplace - Follow environmental and sustainability best practice in an auto workplace - Communicate effectively in an auto workplace - Use information technology systems - Adapt work processes to new technologies in an automotive workplace - Maintain business image in an automotive workplace - Maintain quality processes in an automotive workplace - Follow safe working practices in the workplace
	Examples of Elective Units of Study: - Manage complex customer requirements in an automotive workplace - Read, respond to automotive workplace information - Resolve routine problems in an automotive workplace - Write routine texts in an automotive workplace - Work effectively with others in an auto workplace - Process customer complaints in an auto workplace - Maintain customer aftermarket relations - Sell automotive products and services - Promote automotive products and services - Conduct online transactions in an automotive workplace - Comply with legal requirements when selling auto products and services - Process accounts payable and receivable - Handle mail - Use business technology - Engage the customer - Use numbers in an auto workplace - Communicate business information in an auto workplace
Examples of elective units of study:	
- Diagnose, repair electronically controlled systems - Depower, re-initialise hybrid electric vehicles - Service electrical components in hybrid electric vehicles - Inspect, maintain battery electric vehicles - Diagnose, repair network electronic control systems - Diagnose, repair vehicle dynamic control systems - Diagnose, repair instruments and warning systems - Apply knowledge of ADAS technology to vehicle pre-repair scans - Diagnose, repair electronically controlled suspension - Select, install performance enhanced suspension products - Diagnose, repair light vehicle mechanical fuel systems - Diagnose, repair light vehicle automatic transmissions - Assemble, fit braking system components - Inspect damaged systems and recommend repairs	

Note: AUR= Automotive Retail, Service and Repair Training Package (updated June 2022); ANZSCO= Australian and New Zealand Standard Classification of Occupation; ASCED= Australian Standard Classification of Education. Insights shared by research participants.

Figure 28: Total workers in Australia’s post-production auto-economy and the % share for each occupational category. Source: Author’s analysis of ABS Census 2021.

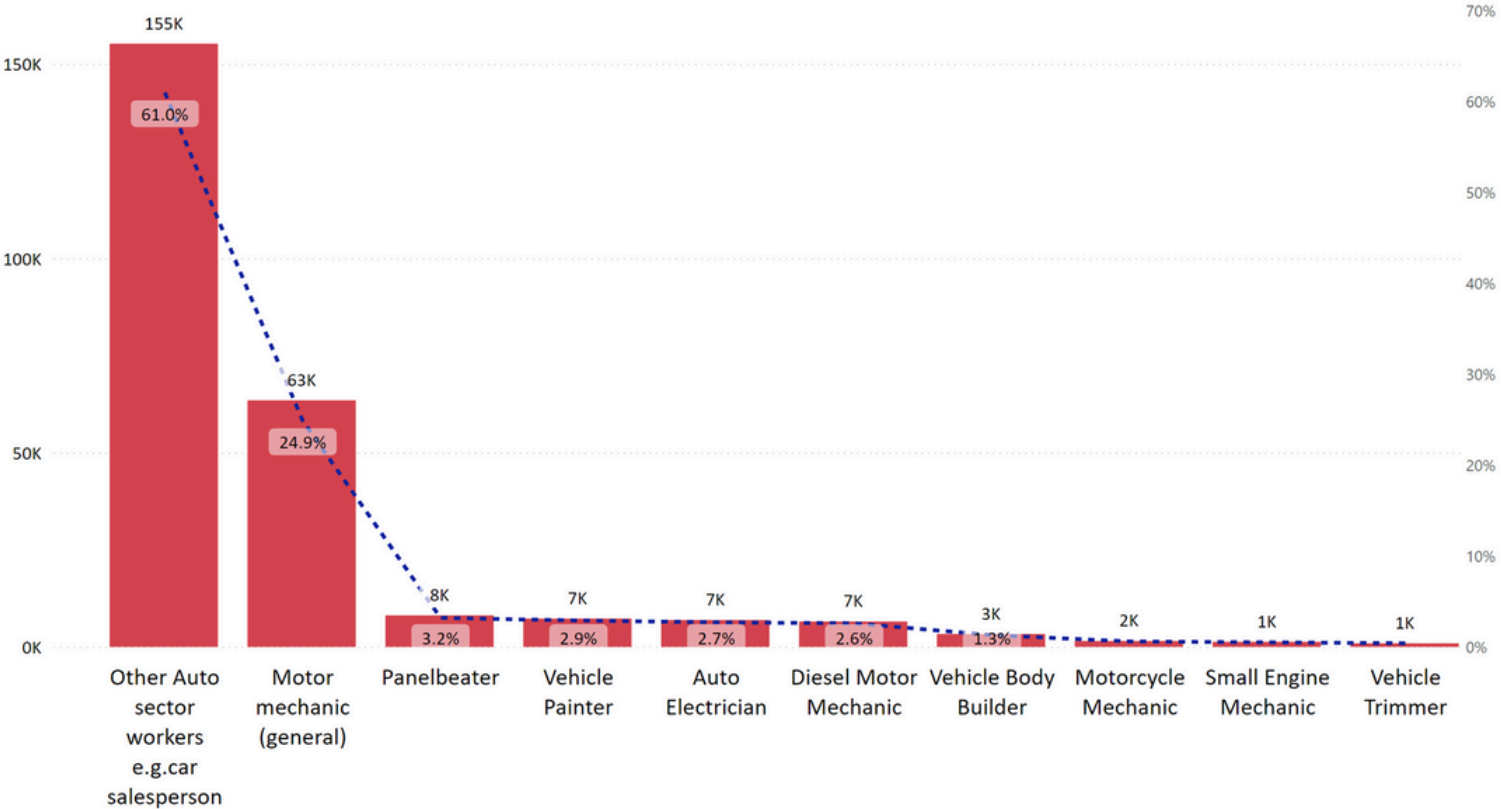


Figure 29: The % share of occupations in Australia’s overall auto sector. Source: Author’s analysis of ABS Census 2021.

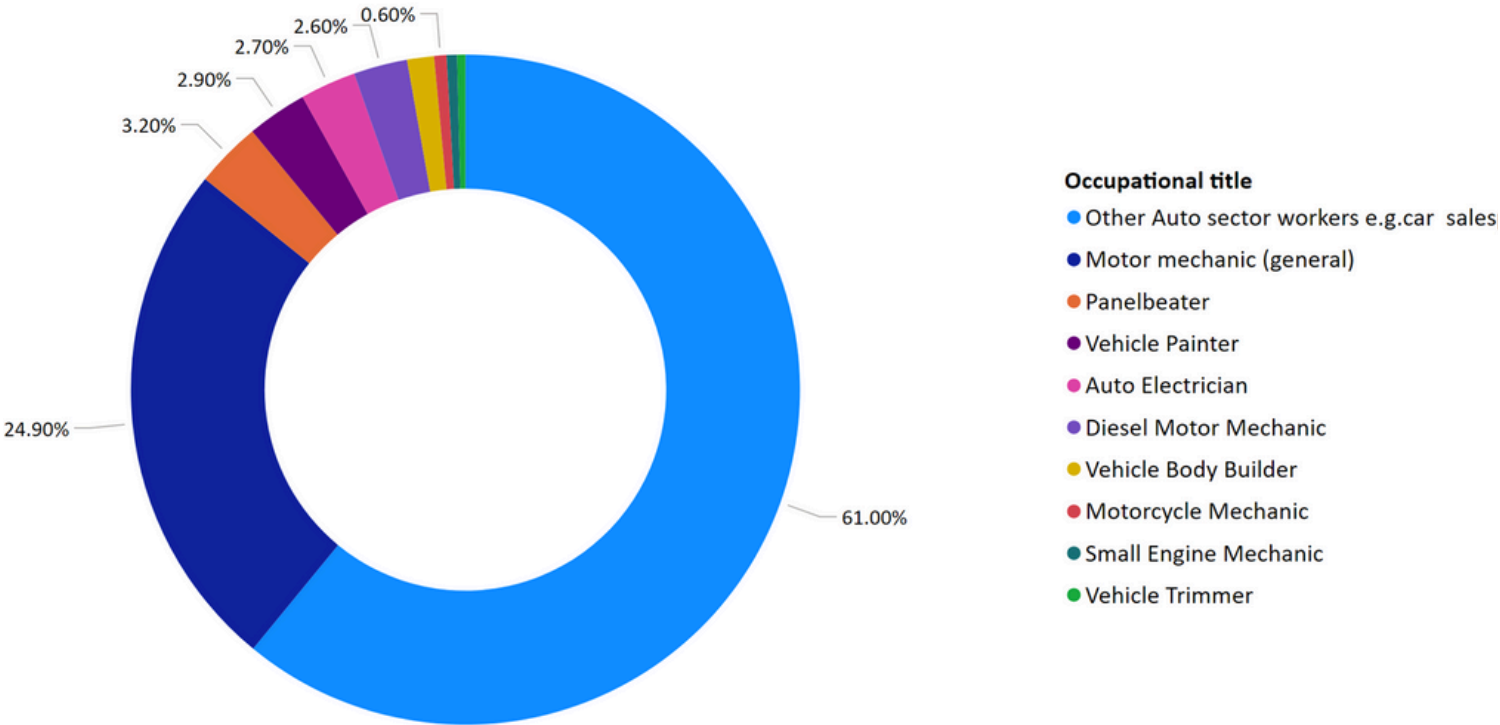
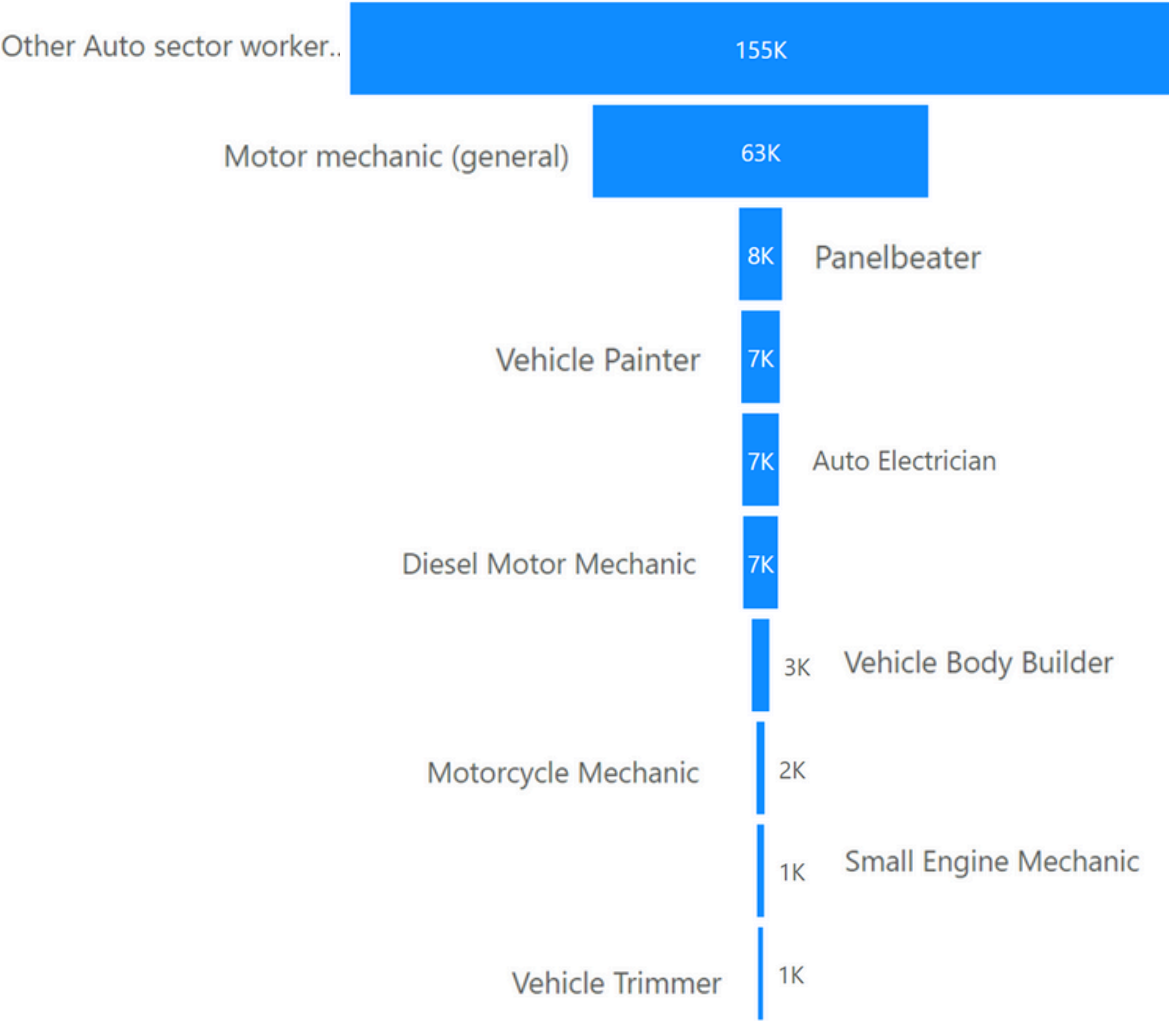
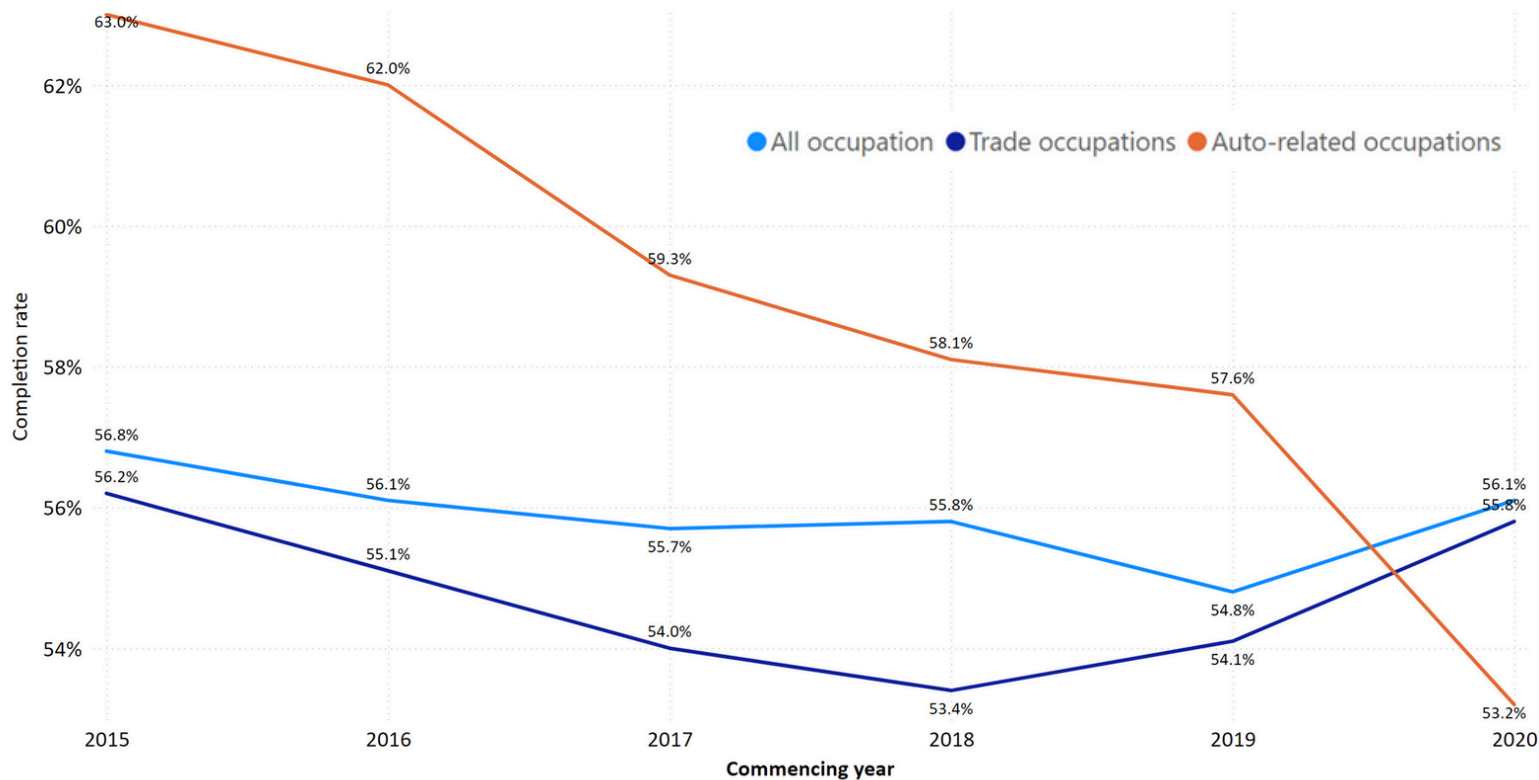


Figure 30 and Table 5: Auto-related employment by occupation type, 2022. Source: Author’s analysis of VFACTS annual report and NCEVR data 2024).



Occupational title	Total workers	Share of the Automotive sector
	▼	
Other Auto sector workers e.g.car salesperson	155226	61.0 %
Motor mechanic (general)	63446	24.9 %
Panelbeater	8116	3.2 %
Vehicle Painter	7288	2.9 %
Auto Electrician	6919	2.7 %
Diesel Motor Mechanic	6553	2.6 %
Vehicle Body Builder	3322	1.3 %
Motorcycle Mechanic	1522	0.6 %
Small Engine Mechanic	1328	0.5 %
Vehicle Trimmer	922	0.4 %

Figure 31: A comparison of apprenticeship completion rates for all occupations, trade-based occupations, and auto-related occupations. Total workers in Australia's post-production auto-economy and the % share for each occupational category. Of note, between 2012 and 2022 the number of auto apprenticeships completed in Australia fell by 67%. Source: Author's analysis of NCVER time series data 2024.



On the benefits of an auto mechanic trade:

“What really attracted me to becoming a mechanic was the fact you get to repair things that people need. Like, cars will always break down and need fixing. I’ll never get bored of the work and I’ll never be out of a job” (Auto mechanic, male, 40s, Independent shop)

What attracted you to work in the auto industry?

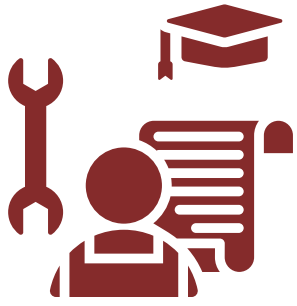
“Since high school I just had this fascination with cars, you know? How they work and how useful they are in your life. From the time you get your licence, your car gives you this new freedom to go places, hang out with friends, meet new people, and do things you can’t without a car. It sort of expands your world. You can even express yourself through your car and that’s a big part of why I like working in the industry to this day” (Customer Service Agent, female, 30s, Dealership).

On the upskilling demands of the industry:

“Oh, finishing my training at TAFE, I was a very green mechanic. It took me a good five years after my apprenticeship to feel really confident at diagnosing issues and being able to fix a problem, especially on new model cars. They are complicated machines”. (Auto mechanic, male, 20s, Dealership).

Advice for younger mechanics entering the auto industry:

“What I am really big on teaching to our younger mechanics is that they need a real commitment to learning on the job. Once they’ve finished their apprenticeship, they’ll still be updating and refining their skills throughout their career in the industry. But the job of an auto mechanic or technician, we say, is evolving with the car itself. No way can you sit still and stop doing training courses or learning new systems and tools. It makes the work interesting but also challenging”. (Service Manager, male, 50s, Dealership)



06 Dataset 4

Summary & Policy Recommendations: Workforce insights & struggles over skills

According to the **National Skills Commission (NSC, 2021, p. 1)** of 34 auto-related occupations assessed for the Skills Priority List (SPL), “**62% were found to be in shortage, compared with 19% for all occupations**”. Across occupations found to have significant shortages, there was a strong concentration in downstream auto M&R services, including mechanics, auto electricians, panel beaters, trimmers and painters.

During the project, the research uncovered a consistent story of local auto servicing shops experiencing problems recruiting suitably qualified and experienced staff to fill job vacancies. These results align closely to insights from labour market analysis conducted by the NSC and **Motor Trades Association Australia (MTAA)**. For example, the NSC (2021) reported that auto-sector employers filled just 47% of advertised vacancies in 2020/21, with an average of 1.8 suitable applicants per job vacancy. Alarmingly, 30% of employers received no suitable applicants for advertised positions. By comparison, employers outside the auto sector reported to the NSC that 61% of vacancies were filled in 2021 (NCS 2021)

In terms of workforce skills and expectations, the NSC (2021) found that 90% of employers required applicants to hold a formal qualification, typically a trade-level qualification (such as a Certificate III or IV). Where qualifications were specified, employers received an average of 3.8 qualified applicants per vacancy, but 50% of these were deemed unsuitable.

Overall, the main reasons why applicants were found unsuitable when applying for an automotive-related vacancy were twofold. **First**, 58% of employers noted applicants had a lack of general experience in the occupation. **Second**, 54% of employers reported to the NSC (2021, p. 4) that applicants had a “lack of qualifications”. Other reasons given for the worker shortage included “insufficient specific skills or experience (39%)” and “performing poorly at one or more stages of the recruitment process (38%)” (NCE 2021, p. 4).

In addition, there are discrepancies between urban and rural/regional areas when it comes to skill shortages in Australia’s auto sector. For instance, employers based in regional areas filled just 45% of their vacancies and received an average of 1.4 suitable applicants per vacancy.

The above figures compare to auto employers in urban locations who filled 50% of vacancies and had 2.2 suitable applicants per vacancy. Across all Australian employers, there was an average of 12.8 job applicants per vacancy with 2.9 suitable applicants per advertised position (NSC 2021).

The labour market data indicates that Australia's auto sector is facing a workforce crisis, indicated by a relatively low proportion of suitably qualified and experienced applicants for vacant jobs. If the skills shortage becomes ingrained, there will be significant negative impacts to both auto businesses that keep motor vehicles in good working order and consumers who rely on them for mobility and commerce.

In response to skill shortages and employer difficulties filling job vacancies, auto industry groups and associations have lobbied governments to shift policies and increase skilled migration quotas. The broad aim of such strategies is to attract a higher number of migrants with the technical skills and relevant experience to fill shortages in key industries.

In contrast to a focus on labour migration, this ARC-funded research makes three recommendations that focus on developing a suitably skilled and valued local workforce. The three recommendations are intended to support the development of a workforce to support the growth of the downstream auto sector and the safe mobility of all Australians.

Recommendation one is for auto groups, government policy-makers, and educational institutions (e.g. TAFE, secondary schools) to collectively **revisit how younger Australians are being recruited and trained for trade-based and technical careers, specifically in auto-related industries**. This recommendation responds to the finding that the work of mechanics, auto electricians, panel beaters, and painters has fundamentally transformed in the last decade. Such transformation is due to the combined effects of evolving auto technologies, new environmental regulations (e.g. emissions reduction targets), and consumer habits (e.g. favouring larger SUVs/4WDs).

Equally important is that skills are not merely attributes that an employer buys and deploys. Skills are context- and information-rich capacities developed in an ongoing social process. This social process includes learning in workplaces via on-the-job training and mentoring, alongside formal training institutions such as Australia's TAFE and university systems.



Recommendation two is for a **new evidence-based national strategy** to more accurately communicate what a job in the auto sector now involves. Such a marketing and educational campaign should include highlighting the career benefits of working in a fast-paced area of the economy, and the skills needed to work on/with automobiles and consumers who rely on them for their mobile daily lives. Emerging from interviews with auto shop employees, the project found that current routes into the sector poorly represent the importance of learning about aspects of automotive software, reading design schematics, fault diagnostics, creative problem-solving, and abstract analytical thinking.

It is no longer accurate to narrowly define auto work as ‘blue-collar’. A changing labour process - the social and technical aspects of work - necessitates shifting popular perceptions about what a job in the auto sector entails. A closer understanding of the work will also assist with better preparing automotive workers, including studying subjects such as maths and engineering at secondary school level.

Recommendation three is for employers and local businesses in the auto sector to adopt a strong internal focus on fostering workplace cultures that more equally value the skills mix within their workforce. Such a skills mix includes, for example, technical roles in repair and maintenance alongside customer care roles that are increasingly vital to the profitability and competitiveness of auto shops that need to maintain a high car count (through-put) and high levels of customer satisfaction, including through digital channels.

Recommendation three emerges from participant observation in auto shops, which revealed how workers in dealerships and independent auto shops often had uneven experiences of skills recognition related to managers’ perceptions of their ‘replaceability’ and contributions to the operations of a business.

In addition to recognising their processual qualities, skills are both a key mechanism by which workers express agency in workplaces and labour markets (Warren and Gibson 2023). Skills also underpin the success of auto businesses that must focus on servicing a complex technical product and serving customers who rely on their vehicles for daily life.





07 *The Road Ahead*

Forward-looking insights on Australia's post-production auto sector

As complex manufactured products, modern automobiles are both expensive and durable. Conventional market economics and government industrial policy tend to focus attention on the point of production where well-paid, unionised jobs are concentrated. **Downstream aspects** of product use, maintenance and repair tend to be comparatively neglected (Fine 2002). Going beyond a partial view of commodity relations, this ARC-funded research explicitly focused on Australia's post-production automotive sector, as the nation entered a new era of import-only automobility.

Amid climate change and emissions reduction goals, there is a growing focus among researchers, policy-makers, businesses, and institutions on second-hand markets, reuse practices, repairability and recycling to improve material circularity. The goal is to reduce wastefulness and create more opportunities for sustainable and inclusive economic growth.

In the auto sector, aftermarket activities now underpin **a process of extended profit-making** and accumulation entangled with the rhythms of mobile, day-to-day life (Pollard et al. 2021). This project has emphasised five key dynamics shaping Australia's downstream auto sector, which require future research and policy attention.

The **five inter-related dynamics** identified as being crucial to downstream automotive services include:

1. the relationship between a dispersed and diversified primary market and locally embedded aftermarket services such as auto maintenance and repair.
2. the influence of evolving technologies on value capture in downstream activities such as parts, data harvesting, servicing, and repair.
3. the politics of informational sharing and control, which will require a carefully coordinated regulatory approach.
4. consumer dependency on automobiles for accessing life opportunities in cities and regions, and
5. institutional struggles over the **reproduction of critical skills** needed in downstream industries such as maintenance and repair. An expert workforce is required to diagnose faults, repair complex problems (breakdowns), and maintain working order.

The results of the research project clearly show that amid the influence of complex and evolving technologies on branded consumer products, downstream services are an arena increasingly defined by contestation and struggle between different competing actors - corporate firms, brand-aligned dealerships/retailers, and independent service providers.

Modern cars are now ostensibly open-ended vehicles that support profit-seeking activities over a longer, consumptive cycle. Through entanglements with everyday life cars can be **theorised as unfinished commodities** (things of value) where opportunities to realise surplus value are calculated, coordinated, and competed over once they are being used.

As right-to-repair movements and regulating institutions target aspects of maintenance and repair, spare parts trade, and data transfer the informational control over complex and evolving products is a reminder that certain actors remain powerful forces in lucrative aftermarket domains.

The post-production and **post-sale lives of global commodities** encapsulate different relations and modes of power. The dispersed production networks typical of many manufactured consumer goods are **structured by hierarchical power relations** (Sturgeon et al. 2008; Coe and Yeung 2015).

This research has found that the power of global brands and OEMs is not restricted to the sphere of production or retailing. Manufacturing firms can exert power over the post-sale lives of products that become the legal property of others.

Moreover, despite recent regulatory efforts in Australia to support the open and fair sharing of technical and design information (e.g. **MVIS 2022 legislation**), struggles continue for many independent service providers in the timely and affordable access to informational content crucial for servicing and repair.

Such **informational content** includes access to software codes, design schematics, technical service bulletins, recalibration and fix procedures. Manufacturers can charge technological rents for technical information that is often incomplete, unsupported and slow in arriving to independent shops and customers.

A final message from this research is that researchers and policy-makers need to combine insights across production, distribution and consumption-related activities. Such insights are increasingly valuable in a world where consumer goods are mass-produced via stretched-out spatial networks and where access to affordable post-sale servicing is vital to ensure that people's social lives are not further disrupted.

Ultimately, incorporating activities such as maintenance and repair into economic analyses can help better account for the different experiences of owning, using, working on, and profiting from commodities that **continue to circulate in time and space** long after they leave the factory gates, retail store or distribution centre.





08

References

A list of reference cited in the report

- Australian Automobile Association. 2024. Transport Affordability Data Report. Available: <https://www.aaa.asn.au/research-data/>
- Australian Bureau of Statistics (ABS). 2021. General Community Profile: Wollongong, LGA18450. Available: <https://www.abs.gov.au/census/find-census-data/community-profiles/2021/LGA18450>
- ABS. 2021. Motor Vehicle Census, Australia. Available: [HERE](#)
- Australian Government. 2022. Motor Vehicle Information Scheme. Available: [HERE](#)
- Australian Government. 2024. Department of Infrastructure, Transport, Regional Development, Communications and the Arts data catalogue. Available: <https://catalogue.data.infrastructure.gov.au/>
- Beer, A. 2018. The closure of the Australian car manufacturing industry: Redundancy, policy and community impacts. *Australian Geographer* 49(3): 419-438.
- Berg Insight. 2023. Embedded car OEM telematics subscribers exceeded 200 million in 2022. Report Available: [HERE](#)
- Bluestone, B. and Harrison, B. 1982. *The Deindustrialization of America: Plant Closings, Community Abandonment, and the Dismantling of Basic Industry*. Basic Books.
- Coe, N. and Yeung, H.W.C. 2015. *Global production networks: Theorising economic development in an interconnected world*. Oxford University Press.
- Federal Chamber of Automotive Industries (FCAI). 2024. VFACTS: Annual Sales Reports. Available: <https://www.fc.ai.com.au/get-vfacts/>
- Fine, B. 2002. *The World of Consumption*. Routledge.
- McDonagh, G. 2011. *Historical overview of the collision repair industry in Australia and transfers of power through rationalization*. PhD dissertation, University of South Australia.
- Motor Trades Association of Australia (MTAA). 2015. Automotive Industry Senate Inquiry Submission. Available: <https://www.mtaa.com.au/submissions/archive>
- National Skills Commission (NSC). 2021. Skills Priority List Findings: Automotive and Engineering Trades Workers. Available: [HERE](#)
- Pavlinek, P. 2020. Restructuring and internationalisation of the European automotive industry. *Journal of Economic Geography* 20(2): 509-541
- Parliament of Australia. 2015. Future of Australia's automotive industry. Senate Economic Committee Inquiry. Final report available: https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Economics/Automotive_industry_2014
- Pollard, J., Blumenberg, E. and Brumbaugh, S. 2021. Driven to debt: Social reproduction and (auto)mobility in Los Angeles. *Annals of the American Association of Geographers* 111(5): 1445-1461.
- Rutherford, T.D. and Holmes, J. 2014. Manufacturing resiliency: economic restructuring and automotive manufacturing in the Great Lakes region. *Cambridge Journal of Regions, Economy and Society* 7(3): 359-378.
- Sturgeon, T., Van Biesebroeck, J. and Gereffi, G. 2008. Value chains, networks, and clusters: reframing the global automotive industry. *Journal of Economic Geography* 8(1): 1-25.
- Vinsel, L. 2019. *Moving Violations: Automobiles, Experts, and Regulations in the United States*. Johns Hopkins University Press
- United States Department of Transportation. 2024. *National Highway Traffic Safety Administration Data Catalogue*. Available: <https://www.nhtsa.gov/data>
- Warren, A. 2019. Labour Geographies of Workplace Restructuring: An Intra-labour Analysis. *Antipode* 51(2): 681-706.
- Warren, A. and Gibson, C. 2021. The commodity and its aftermarkets: Products as unfinished business. *Economic Geography* 97(4): 338-365.
- Warren, A. and Gibson, C. 2023. Struggles over skills: lived experiences of evolving technologies and gendered hierarchies at work. *Annals of the American Association of Geographers* 113(5): 1071-1091.



ACCESS
Australian Centre for
Culture, Environment,
Society & Space



UNIVERSITY
OF WOLLONGONG
AUSTRALIA



Australian Government
Australian Research Council



An Economic Geography Analysis of Australia's Downstream Automotive Sector

Warren, A. (2025). Shifting Gears: An Economic Geography Analysis of Australia's Downstream Automotive Sector. *Australian Centre for Culture, Environment, Society and Space (ACCESS)*. Research Report for Industry. [Please cite using the DOI].

