Conference or Workshop Item:

Insights on vehicle life history from a large data set of used car sales

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Introduction

The second-hand car market typically makes up around 80% of car sales in the UK, and for many people is the only way they buy a car. The car fleet in the UK needs to go through a radical change to decarbonise. This has resulted in much research and speculation about the sale of new Battery Electric Vehicles (BEVs). However, the existing fleet and the second-hand market have gone comparatively understudied.

To better understand what is happening in the used car market, an ongoing project of web-scraping a popular second-hand car sales website has been undertaken since October 2023. The sales listings collected provide data such as date, asking price, and detailed vehicle characteristics. More limited information is available on the seller (e.g. private or trade) and approximate location. Thus, this dataset provides insights into the spatiotemporal changes in the composition of the second-hand car fleet.

This paper presents initial findings from four million second-hand car listings across the UK. We explore how the types, ages, and prices of cars for sale vary across the UK, highlighting where differences signal challenges and opportunities for transport policy in the future, such as differing rates of depreciation for BEV and Internal Combustion Engine (ICE) vehicles.

Methods

Web-scraped data has some notable limitations, such as only publicly visible information being collected and each listing is collected only once. Therefore, we cannot track changes to the listing over time (e.g., reduced asking price) or track vehicles that have been removed and relisted. It also means we do not know if the car was sold, merely that it was advertised for sale. Nevertheless, a significant volume of data (~150 variables) can be collected about each vehicle. As the location of private listings is not provided on the website, an approximate location is trilaterated using multiple searches, which give the distance to the vehicle from the searcher's location. This method estimates the vehicle's location +/- about one mile. The website provides a precise location for cars sold by dealerships. Figure 1 illustrates the level of geographic detail within the dataset.

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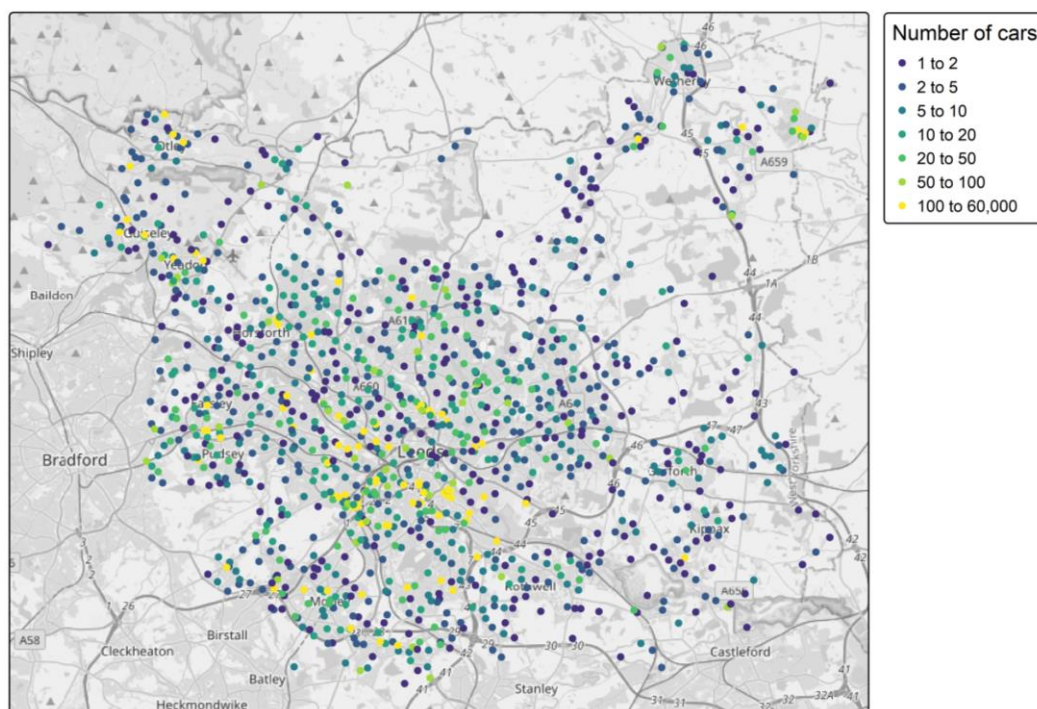*Dublin & Trinity*
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Figure 1: Extract of cars for sale in Leeds October 2023 – April 2025. Locations in yellow with more than 100 cars listed are dealerships, while other locations are the approximate locations of private sellers. Due to the way private sellers' locations are estimated, nearby sellers are snapped to the same point.

Analysis

BEVs comprise a comparatively small share of the second-hand market. Only 3.7% of listings were for BEVs, while 84.4% of listings were ICE only, and the rest were hybrids and other fuel types. Figure 2 shows the growth in the second-hand BEV market. Care must be taken when interpreting cars less than one year old, as some dealerships post single listings saying they have multiple new cars for sale rather than individual listings for each vehicle, which is more common for second-hand cars. Figure 2 also highlights the immature nature of the BEV market, with listing for vehicles younger than five years old significantly outnumbering vehicles older than five, while the reverse is true for ICE vehicles.

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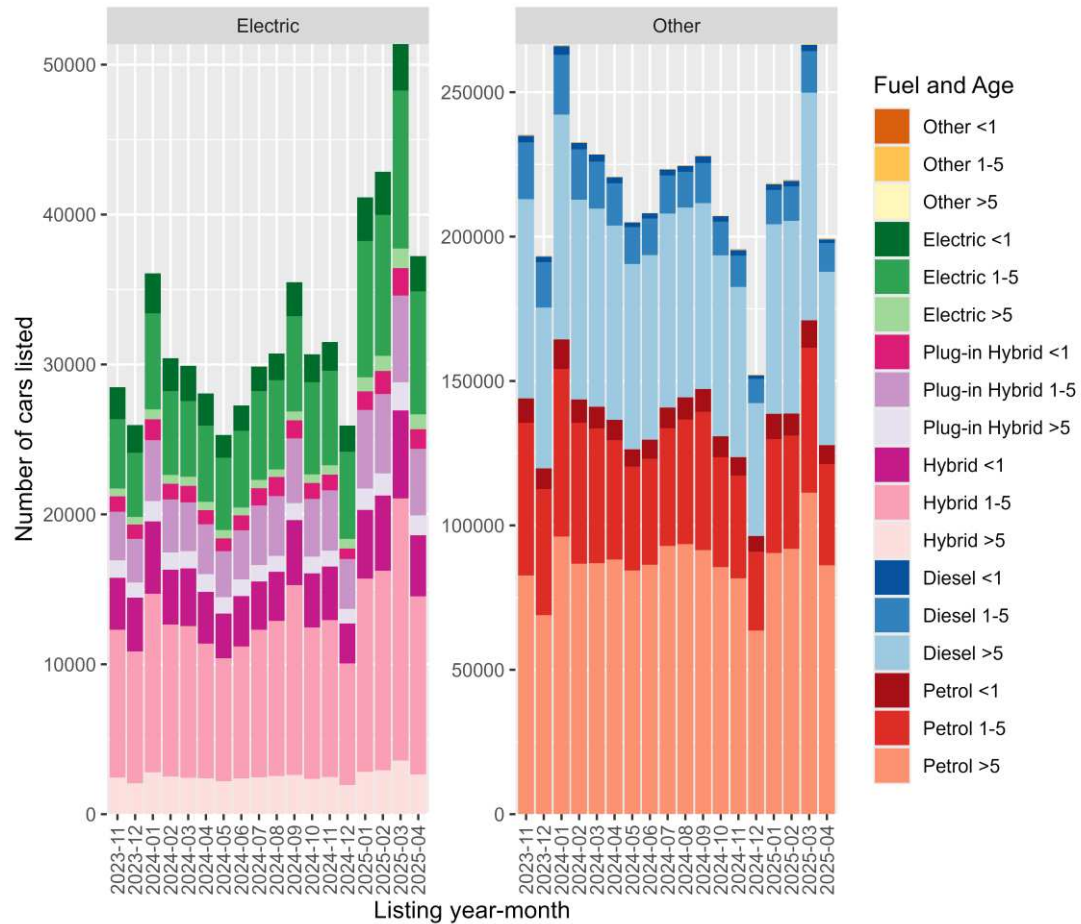**Morgan, Philips, Wadud: Used car life history**

Figure 2: Number of listings per month for Electric (left) and non-electric (right) vehicles. For each fuel type, sales are split into three vehicle age bands (< one year, 1-5 years, and > 5 years).

One long-discussed barrier to BEV adoption has been the high purchase cost of BEVs, yet recent data suggests that BEVs are now competitive, typically priced between petrol and diesel vehicles. Figure 3 (right) highlights an interesting pattern in BEV values, suggesting they initially depreciate quickly compared to ICE vehicles but then depreciate more slowly. This may reflect that BEVs are regarded as more reliable long-term. However, very few BEVs have done more than 50,000 miles, so we must be careful not to overinterpret any nascent trends.
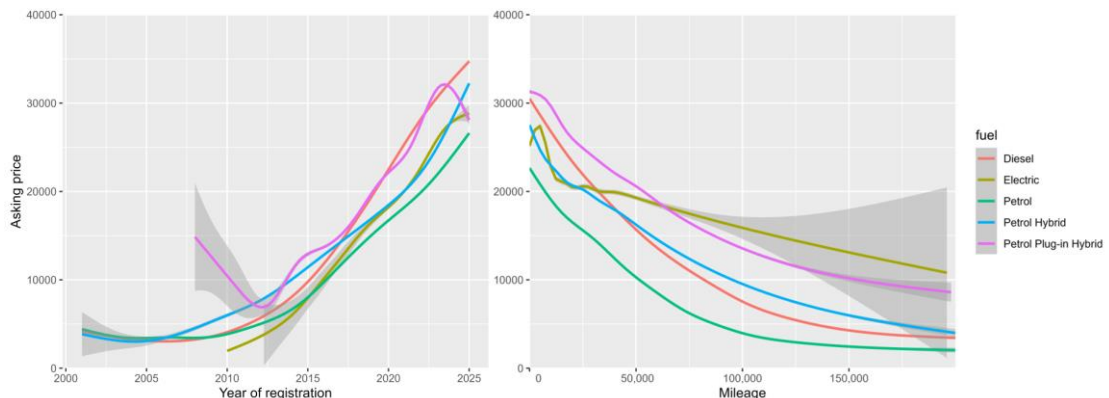

Figure 3: Average asking prices for vehicles by fuel type. Shows two well-known relationships: older cars are less valuable (left), and cars that have driven more miles are less valuable (right).

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Recent news articles have indicated that the price of BEVs has been falling in the second-hand market due to increased supply (Mortimer, 2025). Figure 4 shows that BEV prices are declining slightly but remain higher than those of similarly aged petrol vehicles. Diesel prices rise slightly and remain more expensive than similarly aged BEVs.
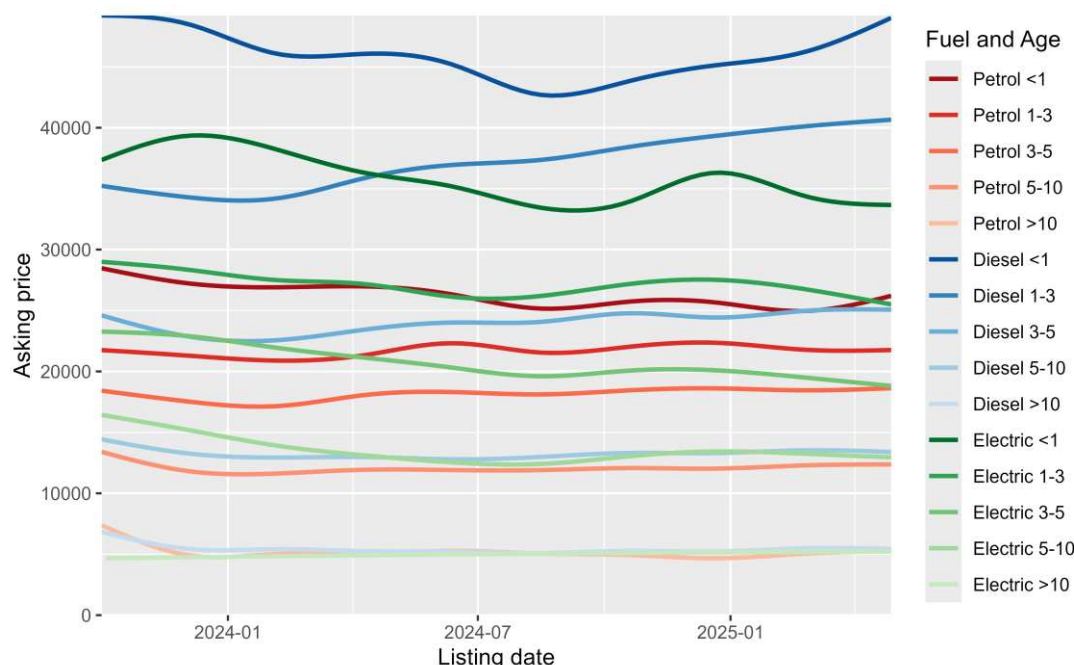

Figure 4: Latest trends (October 2023 – April 2025) in the asking price (GBP) of Petrol (reds), Diesel (blues) and BEV (greens) vehicles for different age bands.

Taking Figures 3 and 4 together, it is clear that new and second-hand BEVs are now price-competitive with ICE vehicles. However, there is a limited supply of older BEVs for people looking for a car in the sub-£10,000 price bracket. This is significant as the listing data suggest that many people buy 5 to 10-year-old cars, so most cannot access a BEV for another 5-10 years. Furthermore, as only 19.6% of UK new car registrations in 2024 were BEVs (SMMT, 2024a), it suggests that BEVs will still constitute a minority of the second-hand market well into the 2030s.

Figure 5 highlights regional trends in listings, prices, and vehicle age. Notably, there are still many local authorities where no BEVs have been listed for sale in over a year, including much of Northern Ireland and Wales and some London boroughs. While places with many listings (Tonbridge and Malling, Glasgow, Renfrewshire) show no evident pattern. Average prices for ICE cars are consistently lower across the country than for BEVs and Hybrids; however, this also reflects that the average ICE car listed is much older.

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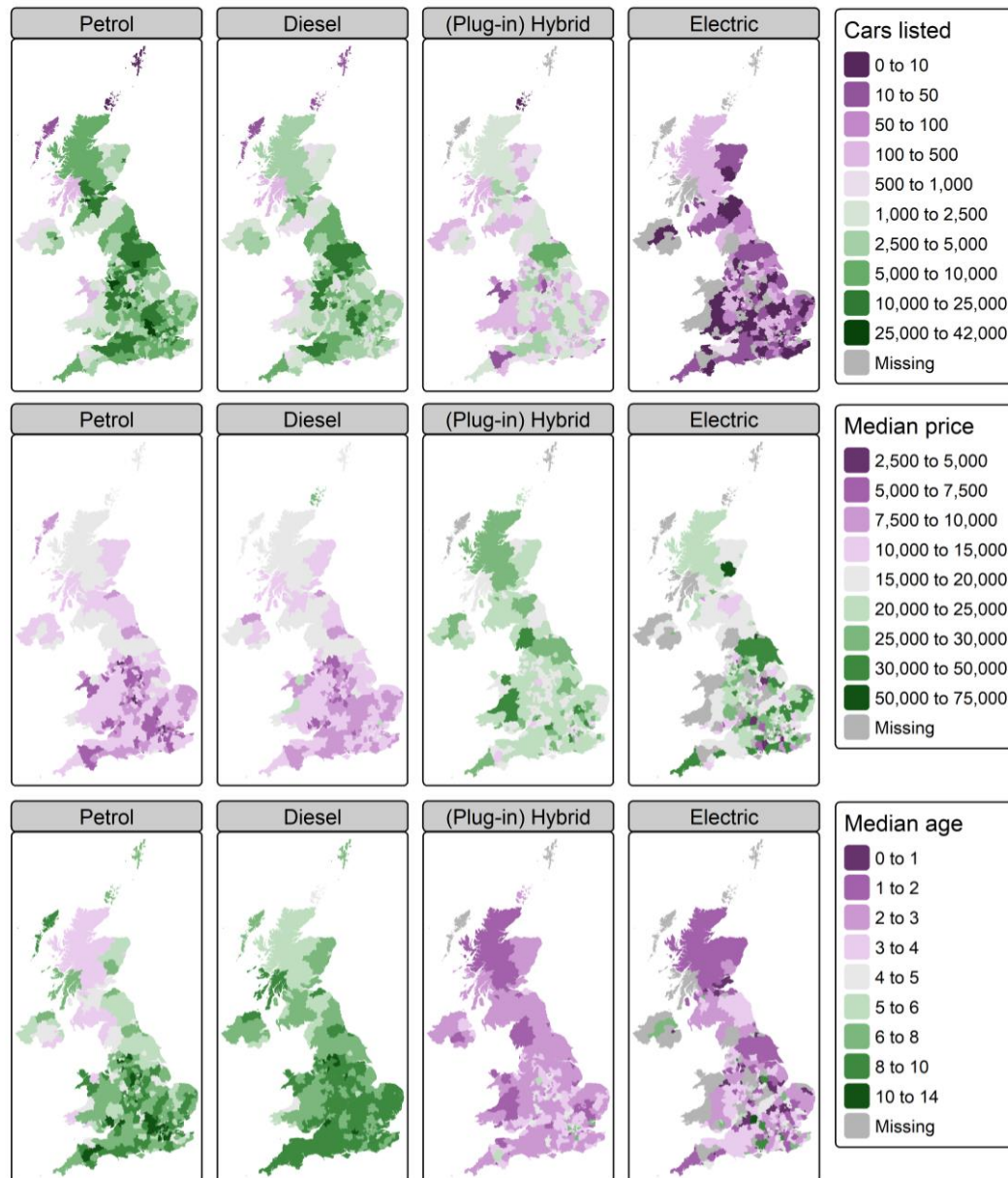**Morgan, Philips, Wadud: Used car life history**

Figure 5: Map of the number of cars listed (top), price (middle), and age (bottom) in each Local Authority District by fuel type from October 2023 to April 2025.

Discussion

One of the challenges with this data is that it is unclear how to account for sampling bias. The data only lists cars people wish to sell on a single website. Thus, it is not a representative sample of the car fleet as a whole or the second-hand car market. However, it is a large sample; 3 million out of the 7.6 million second-hand cars sold in 2024 (SMMT, 2024b), so it may be reasonable to assume that the data somewhat reflects the UK's second-hand market.

A second difficulty is that the data is for adverts rather than sales. This probably means prices are over-estimated, as some sellers will drop the price after listing. Furthermore, some cars are delisted and relisted in another place or time. Tracking duplicate listings is not straightforward, as a unique vehicle ID is unavailable, and only about 40% of vehicles are successfully identified with ANPR. Other issues exist, too. For example, a Blue Hyundai was listed in Bognor Regis 734 times, as the listings are almost identical; it may be a technical error or some attempt to game the search algorithm to promote the car as a "new"

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listing. Further validation work is needed to detect these kinds of anomalies. However, they affect less than 0.1% of the dataset.

A final area of uncertainty is the quality of the location data, which raises two key questions. First, do the listed locations accurately reflect where the car has been used and thus can be utilised as a proxy for the composition and use of the local car fleet? Second, people can travel significant distances to purchase a car. Do car characteristics at a dealership mean anything about the neighbourhood/city/region around the dealership? For example, do dealers acquire and sell second-hand cars locally, or do they distribute stock to reflect local demand? This could significantly impair the interpretation of results. For example, in Figure 5, does a high number of second-hand ICE cars for sale indicate high demand for ICE cars or low demand because people are selling off their ICE cars to buy a new BEV? In future work, it may be possible to use literature on car purchase decision-making to construct a model of the sphere of influence of different types of listing to refine the understanding of the relationship between listing and where sold cars go.
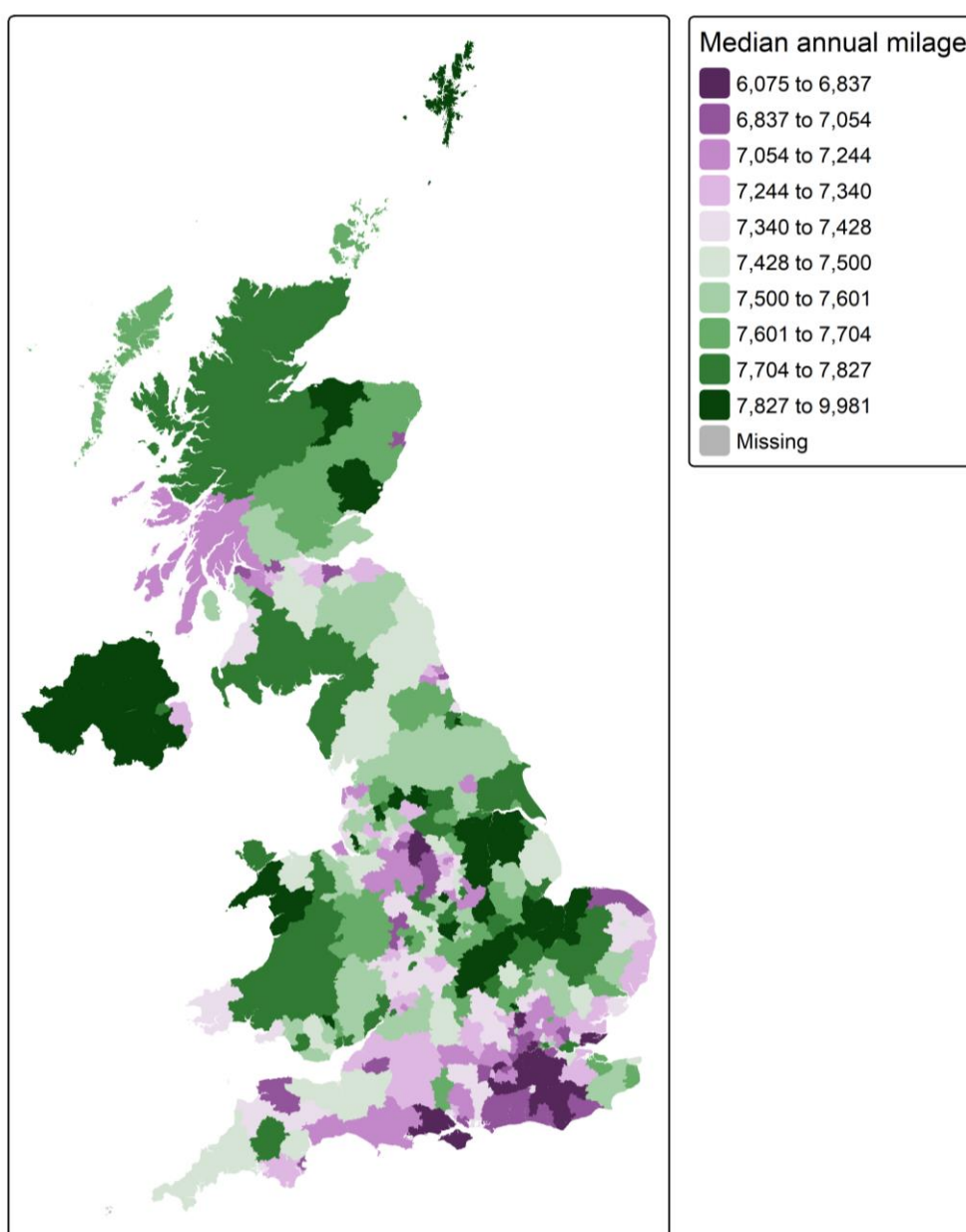

Figure 6: Median annual milage for 743,645 private owner listings across Local Authority Districts.

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Figure 6, shows a crude estimate of the annual mileage (total mileage / age) of private seller vehicles, which are more likely to be sold in the location they were previously used. This shows the expected pattern of lower mileage in urban areas compared to rural areas, suggesting that the data about listings somewhat reflects the area's characteristics. A fuller analysis could match listings with the MOT test history, via the number plate, to estimate the mileage driven in the last year, which may counteract the effect of cars changing ownership and location over time.

Conclusions

Collecting sales listings can provide valuable insights into the second-hand car market. However, it also raises many legal, ethical, and methodological questions. Further work is required to identify how this data can be used responsibly to provide policy-relevant insights without compromising the privacy of car owners.

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