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Underestimation of the costs of owning and running a car

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Non-Technical Summary

Cars are expensive to own and use, but once people get one, they rarely give it up or reduce how much they drive, even when costs rise or incomes fall. This is a problem because high levels of car use and ownership have negative consequences for individuals, communities and the environment. One possible reason for people continuing to own and use cars at high levels is that many underestimate how much their car actually costs to own and run. The aim of this research was to investigate how much it costs to own and use a car in Ireland, and whether motorists' beliefs about these costs are accurate.

We surveyed over 800 motorists. First, we asked them how much they think it cost them to own and use their car for the past year, giving a measure of their general intuition of costs. Next, we took them through a detailed list of specific cost categories (e.g., fuel, insurance, parking). For each one, we asked if they paid it and how much. We designed the questions to help people recall as accurately as possible, and then added the costs together to estimate each person's actual annual motoring costs.

On average, motorists thought they spent €2000 on their car over the past year (not including purchase price or depreciation). This differed by engine type, ranging from diesel drivers who estimated the most (€2500) to EV drivers who estimated the least (€800).

Their actual reported costs were significantly higher. Across the sample, they averaged just over €2900. Again, diesel drivers had the highest costs (~€3500) and EV drivers had the lowest (~€1,500). More than 70% of motorists underestimated how much they spent.

We also looked at what predicts motorist's intuitive and actual costs, and how accurate they are. Actual costs varied in expected ways: EV drivers spent less, older people spent less and those who drove more spent more. However, very few factors predicted intuitive cost estimates or accuracy. The only notable exception was that respondents with children were slightly less likely to underestimate, possibly because managing a household budget increases cost awareness. Even so, most parents still underestimated.

These findings suggest that most motorists underestimate the true costs of driving, which helps explain why car ownership and use remain persistent and why price-only policies (like fuel taxes) may not shift behaviour as much as expected. Making costs more visible and easier to add up could help. Policies that increase per-trip costs by changing incentives *and* by making costs clearer (e.g., congestion pricing, workplace parking levies, distance-based insurance) may have stronger effects. Importantly, choices are constrained for many people by public transport availability, so more accurate cost perceptions alone are unlikely to change behaviour.

Introduction

Private cars provide multiple benefits including flexibility, comfort, self-expression, and access to economic opportunity and higher living standards (Ellaway et al., 2003; Kent, 2014; 2015; Smart & Klein, 2020; Steg, 2005). For many households, cars are indispensable, especially where public transport does not reliably meet needs (Carroll et al., 2021). At the same time, widespread ownership and use have negative implications for individuals and wider society: reduced physical activity (Anderson et al., 2019; Mackay et al., 2019; Panter et al., 2018), emissions and air pollution (Lyons et al., 2024; SEAI, 2024; Smith et al., 2017; Tobías et al., 2015; Zhang & Batterman, 2013), congestion-related productivity losses (Hymel, 2009; Park & Yi, 2024; Sweet, 2011; Weisbrod et al., 2003) and road traffic collisions (European Commission, 2024).

These trade-offs have led policymakers to explore demand management and modal shift where possible, especially for short trips that could conceivably be made by walking, cycling or public transport. In Ireland, for instance, roughly half of car journeys take 15 minutes or less, and cars are the most common mode used even for trips under 2km (CSO, 2019; NTA, 2024). In Dublin city and suburbs, despite 98% of residents living within a 15-minute walk of a bus stop and 78% within a 15-minute walk of a supermarket, over half of all trips are made by car (NTA, 2024). This context underscores the importance of understanding behavioural drivers of car ownership and use.

Beyond environmental and health considerations, driving has significant financial implications. Cars are expensive. The full economic costs include costs associated with having a car (e.g., insurance, motor tax), and variable costs dependent on use (e.g., fuel/charging, parking, tolls, maintenance). Throughout this paper, we refer to these as *ownership and running costs.*

A rational economic view would suggest that households retain ownership only when the net benefits of use exceed these total costs, with ownership and use responding as prices, income and incentives to use alternatives change. Empirically, however, when individuals acquire a car, ownership tends to be "sticky" and shows asymmetric responsiveness: households are more likely to buy and use a car when incomes rise (or costs fall) than dispose of a car or reduce use when incomes fall (or costs rise) (e.g., Dargay, 2007; Eakins, 2015; Goodwin et al., 2004; Morton & Ali, 2025; Nolan, 2010). While car dependency is linked to societal-level factors such as land use and transport infrastructure (e.g., OECD, 2022), this asymmetry is likely also explained in part by lifestyle adaptation and habit formation, creating non-monetary value and routine use that is difficult to reverse (Domarchi et al., 2008; Moody et al., 2021; Ramos et al., 2020).

A complementary but underexplored explanation is cost misperception. Issues of cost salience and mental accounting are well established in behavioural economics. One mechanism is "recall bias": while consumers can estimate and recall regular, recent and salient spending reasonably well, they tend to forget infrequent, temporally distant or low-value payments (Ameriks et al., 2004; Jonker & Kosse, 2013; Schmidt, 2014). Car ownership combines both types of costs. Fuel purchases are regular and vivid, whereas insurance, tax, tolls and maintenance are paid irregularly or are of lower subjective value, making them more susceptible to omissions in memory (Battistin, 2003).

A related second mechanism is salience bias, which affects not necessarily whether a cost is remembered but the weight it receives in judgement. Individuals systematically overweight costs that are perceptually prominent or more cognitively available, and underweight those that are less visible but equally relevant. For example, business managers tend to underestimate ancillary business costs while overweighting core costs, and consumers underweight long-term running costs of appliances (Alcocer & Torres, 2024; Tiefenbeck et al., 2018).

These memory and attention processes are further compounded by how people typically evaluate expenses. Even within cost categories, atypical and typical expenses are treated as separate mental accounts, resulting in different behavioural responses (Heath & Soll, 1996). Moreover, when estimating global costs, consumers tend to form a single holistic estimate, rather than summing cost categories systematically (Augenblick et al., 2023).

Finally, even in cases of perfect recall and weighting, consumers may still underestimate total expenditure due to 'undersum' bias, the systematic underestimation of the sum of multiple components (Goswami et al., 2021; McGowan et al., 2023). This could manifest, for instance, in inaccurate estimates of annual fuel costs or parking space rental.

Consumer perceptions of car costs have received little empirical attention, but available evidence supports systematic underestimation. In a sample of commuters, Shiftan & Bekhor (2002) found that self-estimated commuting costs were almost 50% lower than industry cost reports (which estimate cost per kilometre based on vehicle age and size). Commuters almost universally factored fuel into estimates but omitted other major categories (e.g., insurance, maintenance). Andor et al. (2020) extended this methodology by first asking participants to generate a general estimate of their driving costs, and then asking what proportion of their estimate, if any, came from each of the following cost categories: fuel, depreciation, insurance/taxes, repairs. This design allowed analysis of forgetfulness and accuracy for each cost type. While 96% reported considering fuel (and most did so with reasonable accuracy) just 15% considered all four categories. Even with this more comprehensive subsample, industry reports of costs were 53% higher than participants' estimates (at €161/month).

These findings are consistent with a broader literature showing that people tend to underestimate complex quantities when asked to provide global judgements. Research on "cost unpacking" and "expense partitioning" demonstrates that decomposing a broad judgement into its constituent components increases the retrieval of relevant information and generally produces more accurate estimates (Tversky & Koehler, 1994). Similarly, when survey respondents answer expenditure questions, they tend to retrieve accessible episodes from memory before constructing an overall estimate, making broad expenditure questions susceptible to omissions or biased towards salient expenses (Tourangeau, Rips & Rasinki, 2000). Asking survey respondents to report expenditure instead across disaggregated spending categories substantially increases accuracy relative to asking for a single global estimate, largely because respondents are less likely to overlook relevant costs (Comerford, Delaney & Harmon, 2009; Hurd & Rohwedder, 2012).

We build on the evidence for car cost misperceptions in several ways. First, rather than comparing respondents' estimates with industry benchmarks, we elicit individual-level expenditure across a comprehensive set of fixed (e.g., tax, insurance) and variable (e.g., fuel/charging, parking) costs, using a structured expenditure protocol to maximise accuracy.

Second, we elicit motorists' global intuitive cost estimates before recording these itemised costs, enabling within-person analysis of misperception that accounts for individual variation in costs (e.g., maintenance frequency). This design directly tests whether underestimation persists when the comparison is tailored to the individual's detailed spend report.

Our method, in which we compare a global, intuitive estimate of costs to a structured, walk-through of costs, is consistent with dual process theories of cognition, which distinguish fast, intuitive and heuristic-based "System 1" thinking from slower, more deliberate "System 2" thinking (e.g., Kahneman, 2003). Whereas global estimates are likely to rely on salient heuristics and incomplete retrieval, structured itemisation encourages more systematic search of memory and consideration of less accessible expenditure categories. Although the resulting itemised estimates cannot be regarded as objective measures of true expenditure, which would require comprehensive transaction-level data across all spending categories, they are grounded in established methods for improving expenditure measurement through retrieval cues and expenditure decomposition (Comerford et al., 2009; Hurd & Rohwedder, 2015; Tourangeau et al., 2000; Sudman & Ferber, 1971). Consequently, they provide a theoretically motivated benchmark against which to evaluate intuitive perceptions of the costs of driving.

Third, given fuel's dominant role in cost perceptions and generally lower costs for electric vehicle (EV) charging relative to fuel expenditure for internal combustion engine (ICE) cars, we examine heterogeneity in costs and misperceptions across engine types. We do the same for vehicle size. Many of the negative externalities associated with high car use are compounded by larger SUV-type vehicles which are heavier, more emitting and pose greater risk to other road users (IEA, 2024; Monfort & Mueller, 2023; Tyndall, 2021).

Fourth, we examine whether costs and accuracy are associated with a range of socio-demographic characteristics, including age, income, educational attainment, urban/rural residence, household composition (i.e., number of children), and with driving intensity, as recorded in a separate driving diary. These characteristics have been shown to be associated with spending levels and spending estimate accuracy in other domains (e.g., Perry, 2008; Rohwedder et al., 2022) or directly with driving intensity (e.g., Andor et al., 2020; Chakrabarti & Joh, 2019; Pucher et al., 2005) and may help to inform targeting of intervention to improve accuracy.

Our study offers both empirical and methodological contributions. Empirically, it provides, to our knowledge, the first nationally representative, individual-level comparison of motorists' intuitive global estimates of driving costs with structured itemised expenditure estimates, decomposed by cost category and vehicle type. Methodologically, it extends previous benchmark-comparison approaches by integrating insights from the behavioural economics literature on unpacking, survey response and expenditure elicitation to develop an individual-level protocol designed to maximise the completeness and accuracy of reported driving costs.

Research Questions and Hypothesis

Given the above, we pre-registered two primary research questions (RQs) on the Open Science Framework (OSF: https://osf.io/yte5q/):

RQ1: How much does it cost to own and run a car?

RQ2: How accurate are intuitions of these costs?

We hypothesised that:

H1: Intuitions will underestimate costs of ownership and use compared to itemised costs provided by each owner/user.

As secondary analyses, we explore how misperceptions vary by engine type (ICE vs. EV), vehicle size and socio-demographic characteristics.

Methods

Participants

Participants (n = 1,048) were randomly selected from a larger transport survey (N = 2,000) to complete an expenditure survey. They were recruited by two market research agencies[1] to be nationally representative of the adult population in Ireland by age, gender, location and socio-economic status (see Table 1). Of selected participants, we excluded 155 who had no driving licence, 71 with a licence but no access to a car, 13 whose main car was a company car, six who did not know their engine type and two with incomplete car ownership data, leaving a final sample of 801 drivers. Note we retained those with a licence who have access to a car but may not legally own one, such as a car legally owned by a spouse or parent (hereafter "non-owners").

Table 1. Sample Socio-Demographics.

		n	%	CSO Estimate
Gender	Men	506	48.28	49.0
	Women	539	51.43	51.0
	Non-Binary/PNTS	3	.29	-
Age	18-39 years	415	39.6	36.8
	40-59 years	360	34.35	36.5
	60+ years	273	26.05	26.7
Education	Below Degree	595	56.77	63.9
	Degree or above	453	43.23	36.1
Region	Leinster (incl. Dublin)	584	55.73	55.7
	Munster	294	28.05	26.6
	Connacht/Ulster	170	16.22	17.6

Note: The Census does not record non-binary as a gender or socio-economic status. To compensate for the latter, we compare our sample on educational attainment. The small discrepancy between our sample and the Census on educational attainment is likely driven by there being few individuals over 80 in our sample, given Ireland's strong age-education gradient and lower representation of over 80s in online studies

Participants were paid €4 for completing the full study, which took a median time of 21 minutes. The study received approval from the ESRI Research Ethics Committee on 13th May 2025, and data were collected over two weeks in early July 2025.

[1] RedC Live (https://www.redclive.ie/) and Pureprofile (https://pureprofile.com/).

Materials and Design

Full materials are available in the Appendix and on the project's Open Science Framework page (osf.io/kqmh5). To avoid selection effects, participants were initially informed that the study concerned a number of topics, including household behaviours. The survey was programmed using Gorilla Experiment Builder and was laptop, tablet and mobile compatible (Anwyl-Irvine et al., 2020). Below is an overview of the survey questions relevant for this paper.

1. Household Composition and Car Ownership

Participants reported their household size, number of licensed drivers and car ownership details. For each car, they provided the make, model, engine type and year of registration and assigned ownership to household members (including an option for company car) and permissions to drive. Where multiple cars were available, participants identified the one they drove most frequently; this car was the focus of subsequent cost questions. For those with ownership/permission to drive a single car, this car was taken as the focus of the cost questions.

2. Intuitive Cost Estimates

Participants gave their "best guess" for the total cost to them to own and run their main car for the past 12 months (or since acquisition if obtained less than 12 months ago). We asked that they include all costs, with two qualifiers. First, they were instructed to exclude purchase or finance (e.g., loan repayments). Our reasoning was because of the variation in purchase possibilities: some pay upfront, concentrating cost in a single year; while others finance or lease the vehicle, smoothing cost of time in ways that depend on interest rates or contract terms, with variation between financing options that consumers are known to misunderstand (e.g., McElvaney, Lunn & McGowan, 2018). This heterogeneity makes purchase costs difficult to compare on an annual basis and thus outside the scope of the expenditure we aimed to measure. Second, we asked that they only include amounts they personally pay and to "not include contributions made by other individuals/vehicle users to the cost". This means we estimate the cost to the individual and not the total cost of the car, to capture intuitive perceptions of annual costs while minimising ambiguity and the need to guess the expenditure of others (see Comerford et al., 2009). The survey flow prevented participants from returning to this estimate, meaning they could not adjust it after responding to subsequent questions.

3. Itemised Costs

Next, participants reported expenditure across sixteen specific categories: insurance, breakdown assistance, motor tax, fuel/charging, routine maintenance (e.g., servicing), emergency maintenance (e.g., crash repairs), tyre replacement, cleaning, tolls, toll tags, parking (home rental, work rental, short-term), fines and penalties, costs of any financing (where applicable), and any other costs not already covered. These categories were informed by a pilot study to ensure comprehensive coverage of costs faced by motorists. Finance was included here for completeness, but we exclude it from analyses since it was excluded from the intuitive cost estimates. To improve accuracy, questions were as disaggregated as possible (Comerford et al., 2009); for example, maintenance was covered in three categories (tyres, routine maintenance and emergency maintenance). They were also tailored to the shortest feasible time frame. For example, fuel/charging expenditure was elicited on a weekly, monthly or yearly basis, depending on participant preference, and tailored to the engine type (ICE, hybrid, plug-in hybrid (PHEV) or EV). For example, participants were asked "What is easiest for you, to estimate your fuel costs weekly or monthly?" with a follow-up "How much do you typically pay each week / month in total?" As with the intuitive cost, participants were instructed to only include amounts they personally pay.

4. Other Measures

Participants also completed socio-demographic questions (age, income, educational attainment, household composition, living area) and additional travel-related items, including the distance driven on the most recent weekday. The most recent weekday was selected to minimise recall error and survey burden (e.g., from aggregation) (Angrisani, Kapteyn & Schuh, 2014; Comerford et al., 2009).

Results

For 740 of the 801 participants (92.4%), the car they drove the most was one they personally owned. A minority (120; 15.0%) owned their car for less than a full year, meaning estimates were extrapolated as necessary. Engine types broadly reflected the national fleet (SIMI, 2025): petrol (43.8%), diesel (43.6%), conventional hybrid (6.5%), EV (4.9%) and PHEV (1.3%). The most common year of registration was 2016.

Response distributions for costs showed evidence of strong skew, particularly for intuitive estimates. As such, to reduce the influence of extreme outliers, we excluded observations appearing in the top 5% of intuitive or itemised cost estimates (n = 67) and report medians for all analyses (following Andor et al., 2020).[2]

A. Intuitive Estimates

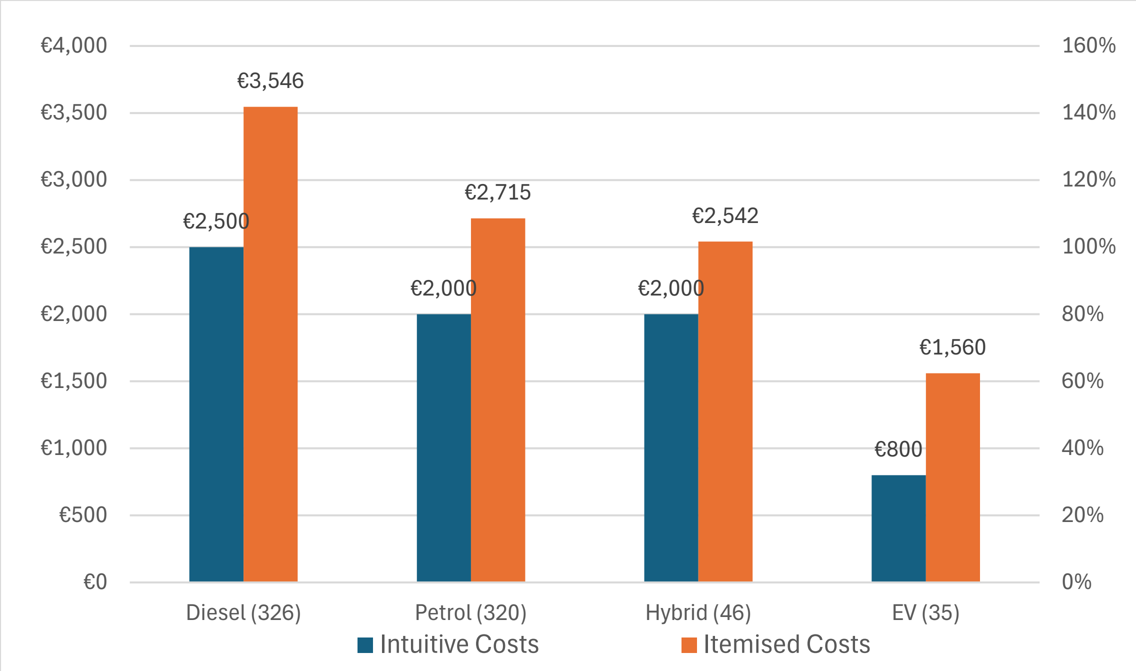
The median intuitive annual cost estimate was €2,000 (n = 734; M = €3,187.01, SD = €3837.38).[3] Estimates varied by engine type, with diesel drivers estimating the highest median cost (€2,500) and EV drivers estimating the lowest (€800; see Figure 1, blue bars).[4] For engine comparisons, we excluded PHEVs due to the very small sample size (n = 7).

[2] Results are closely similar using the full sample albeit with larger variance. Median intuitive estimates are €2180 (M = €5702.02, SD = €15,696.89) and median itemised costs are €3033.80 (M = €150,356.10, SD = €4,027,818.00) giving a median difference of €661.00 (M = €144,864.10, SD = €4,027,977.00). 69.9% underestimated their itemised costs, with a median underestimation of €1167.00 (M = €211,304.00, SD = €4,027,977.00).

[3] Median tests indicate that owners reported higher median intuitive estimates ($\chi^2(1, N = 734) = 10.48, p = .001$).

[4] Median tests indicate that intuitive costs for diesel were significantly higher than for petrol vehicles ($\chi^2(1, N = 646) = 7.60, p = .006$), but there were no differences between diesel and hybrid vehicles ($\chi^2(1, N = 372) = .988, p = .32$), or petrol and hybrid vehicles ($\chi^2(1, N = 366) = .027, p = .87$). Intuitive costs for electric vehicles were significantly lower than diesel ($\chi^2(1, N = 361) = 22.25, p < .001$), petrol ($\chi^2(1, N = 355) = 14.144, p < .001$), and hybrid vehicles ($\chi^2(1, N = 81) = 14.32, p < .001$).

Figure 1. Median Costs by Engine Type



B. Itemised Costs

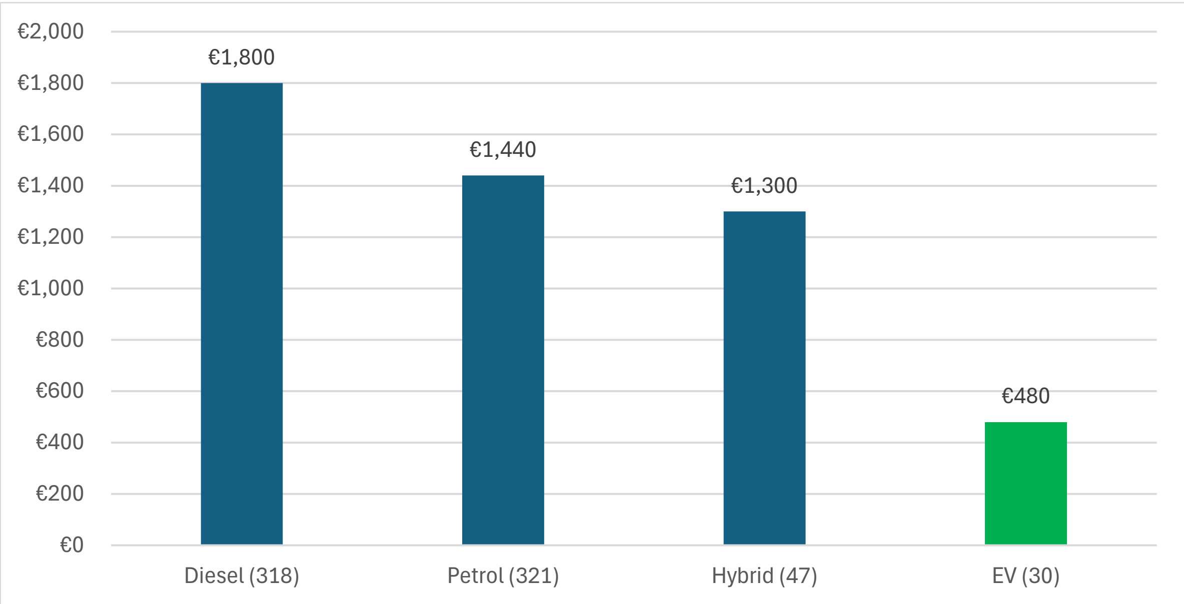
Table 2 shows a summary of itemised costs. Insurance and tax were the most commonly reported cost, while fuel was the largest, with a median annual cost of €1560. Recall that participants reported only the costs they personally paid; those paid for by other users of the same car are not included.

Table 2. Summary of Itemised Costs

Cost	*Median*	*Mean*	*SD*	*N*
Fuel	€1,560	€1,770.05	€1,053.51	694
Insurance	€500	€575.44	€275.84	717
Charging	€480	€1,377.19	€2,687.68	37
Emergency Maintenance	€400	€583.18	€557.87	112
Routine Maintenance	€220	€285.96	€208.41	423
Tax	€210	€268.95	€134.93	686
Tyres	€200	€250.17	€131.75	257
Fines/penalties	€120	€116.93	€90.60	28
Long-term parking at home	€105	€310.75	€468.64	12
Long-term parking elsewhere	€104	€2,566.12	€9,246.58	17
Cleaning	€113	€185.46	€233.95	334
Breakdown assist	€115	€261.89	€315.22	132
Short-term parking	€54	€110.90	€130.54	477
Tolls	€50	€117.86	€195.23	461
Toll tags	€31.20	€100.22	€133.44	139

Comparing fuel and charging costs across engine types (Figure 2), diesel drivers reported the highest median fuel costs, followed by petrol and conventional hybrids. This pattern aligns with evidence that, although petrol has a higher cost per 100km than diesel, diesel cars tend to be driven further (CSO, 2021; SEAI, 2026). Battery EV charging costs were significantly lower, with a median just over one-quarter of the diesel cost.[5]

Figure 2. Median Fuel/Charge Costs by Engine Type



To calculate total annual costs of ownership and use (RQ1), we summed all reported costs for each participant, excluding finance but including other costs generated by respondents (see Appendix A for details). The median combined annual cost was €2923.20 (M = €3306.66, SD = €1781.81). Compared by engine type, the same pattern emerges as with the intuitive estimates, with median diesel costs highest and EV lowest (see Figure 1, orange bars).[6]

[5] Median tests indicate median diesel fuel costs were significantly higher than petrol vehicles ($\chi^2(1, N = 639) = 13.01, p < .001$), hybrid vehicles ($\chi^2(1, N = 365) = 8.00, p = .005$), and charging costs for electric vehicles ($\chi^2(1, N = 348) = 19.26, p < .001$). Median costs did not differ significantly between petrol and hybrid vehicles ($\chi^2(1, N = 368) = .66, p = .415$), while electric vehicle charge costs were lower than fuel costs for petrol ($\chi^2(1, N = 351) = 19.40, p < .001$), and hybrid vehicles ($\chi^2(1, N = 77) = 16.94, p < .001$).

[6] Median tests indicate that itemised costs for diesel were significantly higher than for petrol vehicles ($\chi^2(1, N = 646) = 19.42, p < .001$), hybrid vehicles ($\chi^2(1, N = 372) = 8.04, p = .005$), and electric vehicles ($\chi^2(1, N = 361) = 21.23, p < .001$). Median itemised costs were not significantly different between petrol and hybrid vehicles (χ^2(1,

C. Comparing Intuitive and Itemised Costs

To assess misperceptions (RQ2), we compared each participant's intuitive estimate to their itemised costs, again excluding anyone in the top 5% of either measure.

The median difference was €665.60 (M = €119.65, SD = €3769.11), meaning that, on average, itemised costs were 33.3% higher than respondents intuited. Most participants (71.7%; 526 of the 734) underestimated their itemised costs while 27.8% (204) overestimated. A very small proportion (0.5%; $n = 4$) reported intuitive and itemised costs as 0. Among underestimators, the median shortfall was €1,106.30 (M = €1,491.45; SD = €1372.30); 1.6 times higher than intuitive estimates.[7] A one-sided sign test confirmed that median intuitive costs are significantly lower than intuitive estimates (negative sign for 526/734 observations vs. an expected 365, $p < .001$), supporting H1.[8]

A median test revealed no significant differences in underestimation between non-owners (Mdn = €1,343; $n = 40$) and owners (Mdn = €1,102; $n = 486$) ($\chi^2(1, N = 526) = .108$, $p = .742$). Nominal underestimation (among those underestimating) was broadly similar across engine types. Median tests revealed) than all other engine types (petrol: €956; hybrid: €1,042; EV: €1,004),[9] though there were no significant differences between the other types ($p > .05$ for all).

D. Predictors of Costs Underestimation

Column 1 in Table 3 presents an OLS regression of $\log_{10}$-transformed intuitive cost estimates from participant-level characteristics (income, educational attainment, gender, region, age, living area and number of children in their household) and driving-specific characteristics (car ownership, engine type, car size and distance driven on most recent weekday). Results confirm that car owners intuited higher costs than non-owners ($p = .044$), and EV drivers intuited significantly lower estimates than diesel ($p < .001$), petrol (test for equality of coefficients: $F(1, 597) = 32.48$, $p < .001$) and hybrid ($F(1, 597) = 19.63$, $p < .001$) vehicles. Otherwise, intuitive costs appear to be unrelated to sociodemographic characteristics, except for small marginal effects of education and age.

Column 2 presents the same model of $\log_{10}$-transformed itemised cost. Women reported lower costs than men ($p = .013$), and those aged over 60 generated lower itemised costs compared to the under 40s ($p < .001$) and the 40-60 age group ($F(1, 600) = 18.47$, $p < .001$). Owners also reported higher estimates ($p < .001$). Those who drove the most on the most recent weekday (31km +) reported higher costs than those who drove less (0km: $p < .001$; 1-10km: F(1, 600)

$N = 366) = 1.59$, $p = .207$), but electric vehicle costs were lower than for petrol ($\chi^2(1, N = 355) = 13.85$, $p < .001$), and hybrid vehicles ($\chi^2(1, N = 81) = 17.35$, $p < .001$).

[7] This effect size estimate excludes twelve individuals who gave an intuitive estimate of 0. Their itemised costs totalled a median of €275 (M = €591.08, SD = €858.14).

[8] We pre-registered a t-test for this analysis, but opt here to use a sign test given the skewed distribution of intuitive costs. Nonetheless, a one-sided paired samples t-test performed on log transformed intuitive and itemised costs does support the hypothesis that the former are significantly lower, $t(712) = -9.11$, $p < .001$.

[9] Diesel and petrol vehicles: ($\chi^2(1, N = 469) = 4.317$, $p = .038$); diesel and hybrid vehicles ($\chi^2(1, N = 265) = 4.3269$, $p = .038$); and diesel and electric vehicles ($\chi^2(1, N = 255) = 4.1268$, $p = .042$).

= 10.45, $p = .001$; 11-30km: $F(1, 600) = 4.6$, $p = .032$), implying that those with greater usage have greater costs, as would be expected. Again, EV drivers reported lower costs compared to all other engine types: diesel ($p < .001$); petrol ($F(1, 600) = 31.73$, $p < .001$); hybrid ($F(1, 600) = 18.45$, $p < .001$). Petrol vehicles were associated with lower costs than diesel ($p = .027$), but did not differ from hybrids ($p = .581$).

Column 3 models the nominal difference between $\log_{10}$-transformed itemised and intuitive costs (i.e., a measure of inaccuracy). We find no significant predictors of accuracy, except for a small, marginal effect for SUV drivers.

Finally, Column 4 is a binary logistic regression (coefficients are odds ratios) modelling whether the participant underestimated costs. Those with one ($p = .048$) or two or more ($p = .001$) children in the household were less likely than those with no children in the household to underestimate their itemised costs. Using predicted probabilities, childless households have a 77.7% likelihood of doing so, falling to 68.4% and 60.9% for those with one and two or more, respectively. Notably, no other socio-demographic characteristics or driving-specific characteristics were associated with underestimating.

Table 3. Models of Costs and Cost Perceptions

	(1) Log_{10} Intuitive	(2) Log_{10} Itemised	(3) Nominal Difference (2 – 1)	(4) Underestimated N/Y
Income = €42,000 - €85,000	0.07	0.01	0.01	1.45
(*Ref.* = < €42,000)	[-0.13 - 0.27]	[-0.11 - 0.13]	[-0.12 - 0.14]	[0.93 - 2.25]
	p = .511	*p* = .864	*p* = .834	*p* = .101
Income = €85,000	0.07	-0.11	-0.03	1.14
	[-0.19 - 0.32]	[-0.26 - 0.03]	[-0.19 - 0.14]	[0.66 - 1.96]
	p = .599	*p* = .129	*p* = .759	*p* = .633
Education = Degree or above	0.16	0.09	-0.09	0.74
(R*ef.* = No degree)	[-0.02 - 0.33]	[-0.02 - 0.19]	[-0.21 - 0.02]	[0.50 - 1.09]
	p = .087	*p* = .100	*p* = .114	*p* = .125
Gender = Female	0.08	-0.13*	0.01	0.85
(*Ref.* = Male)	[-0.09 - 0.26]	[-0.23 - -0.03]	[-0.10 - 0.12]	[0.58 - 1.25]
	p = .351	*p* = .013	*p* = .873	*p* = .414
Region = Rest of Leinster	0.19	0.08	0.03	1.28
(*Ref.* = Dublin)	[-0.06 - 0.45]	[-0.07 - 0.23]	[-0.14 - 0.19]	[0.73 - 2.23]
	p = .142	*p* = .308	*p* = .767	*p* = .392
Region = Munster	0.07	-0.05	-0.02	0.67
	[-0.20 - 0.33]	[-0.20 - 0.11]	[-0.19 - 0.16]	[0.38 - 1.17]
	p = .630	*p* = .555	*p* = .837	*p* = .158
Region = Connacht/Ulster	-0.01	0.13	0.05	1.10
	[-0.30 - 0.29]	[-0.05 - 0.30]	[-0.14 - 0.24]	[0.57 - 2.10]
	p = .965	*p* = .148	*p* = .591	*p* = .776
Age = 40-59	0.01	-0.02	-0.06	0.96
(*Ref.* = < 40)	[-0.19 - 0.21]	[-0.14 - 0.10]	[-0.19 - 0.07]	[0.62 - 1.47]
	p = .906	*p* = .737	*p* = .396	*p* = .836
Age = 60+	-0.24	-0.32***	-0.02	1.11
	[-0.49 - 0.00]	[-0.46 - -0.17]	[-0.18 - 0.14]	[0.63 - 1.96]
	p = .055	*p* < .001	*p* = .805	*p* = .707
Location = Urban	0.03	0.04	-0.09	0.70
(*Ref.* = Rural)	[-0.16 - 0.21]	[-0.07 - 0.15]	[-0.21 - 0.03]	[0.47 - 1.05]
	p = .773	*p* = .444	*p* = .158	*p* = .084
N Children in Household = 1	0.15	0.09	-0.05	0.61*
(*Ref.* = None)	[-0.08 - 0.38]	[-0.04 - 0.23]	[-0.20 - 0.10]	[0.37 - 0.99]
	p = .194	*p* = .165	*p* = .519	*p* =.048
2+ Children	0.24	-0.04	-0.12	0.43**
	[-0.01 - 0.48]	[-0.18 - 0.10]	[-0.27 - 0.03]	[0.26 - 0.72]
	p = .055	*p* = .586	*p* = .127	*p* = .001
Ownership status = Owner	0.35*	0.37***	-0.17	0.82
(*Ref.* = Non-owner)	[0.01 - 0.70]	[0.18 - 0.57]	[-0.40 - 0.07]	[0.39 - 1.70]
	p = .044	*p* < .001	*p* = .165	*p* = .591
Weekday Driving = 0-10km	0.09	0.05	0.06	0.99
(*Ref.* = None)	[-0.14 - 0.32]	[-0.08 - 0.18]	[-0.08 - 0.21]	[0.60 - 1.62]
	p = .447	*p* = .462	*p* = .390	*p* = .961
11-30km	0.06	0.12	-0.03	0.90
	[-0.18 - 0.30]	[-0.02 - 0.26]	[-0.19 - 0.13]	[0.54 - 1.52]
	p = .641	*p* = .094	*p* = .687	0.702
31km+	0.12	0.28***	0.08	1.26
	[-0.12 - 0.35]	[0.14 - 0.42]	[-0.07 - 0.24]	[0.74 - 2.15]
	p = .339	*p* < .001	*p* = .288	*p* = .386
Engine = Hybrid	-0.18	-0.19	-0.18	0.57
(*Ref.* = Diesel)	[-0.55 - 0.18]	[-0.40 - 0.02]	[-0.41 - 0.06]	[0.27 - 1.23]

	p = .315	p = .083	p = .138	p = .151
Engine = EV	-1.39***	-0.88***	0.17	0.72
	[-1.84 - -0.95]	[-1.14 - -0.62]	[-0.14 - 0.48]	[0.29 - 1.78]
	p < .001	p < .001	p = .289	p = .478
Engine = Petrol	-0.09	-0.13*	-0.04	1.02
	[-0.29 - 0.10]	[-0.24 - -0.01]	[-0.16 - 0.09]	[0.66 - 1.57]
	p = .360	p = .027	p = .551	p = .942
Car size = Medium / Large	-0.03	-0.01	-0.06	0.87
(*Ref.* = Small Family Car)	[-0.28 - 0.23]	[-0.16 - 0.13]	[-0.22 - 0.11]	[0.50 - 1.52]
	p = .841	p = .860	p = .509	p = .623
SUV/MPV/Pickup/Van	0.10	0.05	-0.13*	0.77
	[-0.10 - 0.30]	[-0.07 - 0.17]	[-0.27 - -0.00]	[0.49 - 1.20]
	p = .339	p = .381	p = .046	0.242
Constant	7.06***	7.68***	0.62***	5.93**
	[6.56 - 7.57]	[7.39 - 7.96]	[0.28 - 0.95]	[2.00 - 17.56]
	p < .001	p < .001	p < .001	p =.001
Observations	619	622	602	629
R-squared	0.11	0.19	0.04	

Note: ***p < .001; **p < .01; *p < .05. 95% confidence intervals are in square brackets. Coefficients in model 4 are odds-ratios. Observations are lower than 734 for the following reasons: we omit PHEVs due to the small number in the sample (n = 7); certain independent variables have missing observations (e.g., more than 60 instances of "Prefer not to say or don't know" for the household income question, some missing data with respect to urban/rural and car size); and we are models 1-3 omit those with estimated costs of €0. Finally, for model 3 (nominal difference), we further trim the upper and lower 5% of values.

Discussion

This study provides new evidence on the costs of car ownership and use, and on the extent to which motorists accurately intuit these costs. Consistent with prior work (Andor et al., 2020; Shiftan & Bekhor, 2002), we find substantial and systematic underestimation of costs. We build on this work by providing a structured within-person comparison of global and disaggregated cost estimates, allowing us to quantify systematic differences in cost reporting across elicitation formats while accounting for variation in driving patterns and vehicle attributes.

Our findings reveal substantial inaccuracies in motorists' intuitions of their annual motoring costs. Median itemised costs (€2,923) were almost 50% higher than median intuitive estimates (€2,000), excluding purchasing costs and depreciation; including depreciation brings the median itemised cost to €3,803 (see Appendix B for details).

The underestimation we observe is consistent with theories of cost salience, mental accounting, recall bias and dual process accounts of thinking. Consumers are more likely to recall and incorporate frequent, salient spending into cost estimates (e.g., Ameriks et al., 2004; Heath & Soll, 1996). In contrast, less frequent, more variable and less transparent costs, such as insurance, maintenance and parking and tolls are likely to be more prone to underweighting and recall failures (e.g., Schmidt, 2014; Tiefenbeck et al., 2018). The consistency of nominal underestimation across engine types, despite differences in itemised costs, supports the idea that certain types of costs are routinely forgotten. Indeed, this would be consistent with Andor et al. (2020) and Shiftan & Bekhor (2002), who show that non-fuel costs (i.e., the less-salient, non-core costs) are more frequently omitted. The findings are also consistent with evidence on cognitive undersumming – a bias displayed by two-thirds of participants in separate studies (Goswami et al., 2021; Timmons & McGowan, 2024). However, the underestimation that we report here is much larger than recorded by measures of undersum bias, suggesting that it can at most be a minor contributing factor.

We also provide novel evidence on the predictors of intuitive costs, itemised costs and misperceptions. While we find itemised costs vary predictably with factors such as ownership, recent usage, EV engines, we do not find clear associations between background characteristics and intuitive estimates or accuracy. Although factors such as usage are associated with highly salient costs, such as fuel, underestimation may persist due to continued underweighting of other costs, greater likelihood of irregular costs (e.g., maintenance, tyre replacement) and/or the persistence of cognitive aggregation errors cited above. The only notable exception is that respondents with children were less likely to underestimate, possibly reflecting a greater necessity for budgeting awareness (Bargain et al., 2010). However, the majority of parents still underestimate, and the overall absence of other significant predictors suggests that failure to appreciate costs is widespread across the population.

Implications

The asymmetry between itemised and perceived costs has several implications. Cost misperception may contribute to the "stickiness" of car ownership and use described in the literature (Dargay, 2007; Goodwin et al., 2004). If households underestimate the financial costs of motoring, they may be more likely to purchase a car and less sensitive to the potential savings from switching to alternative transport modes. Depending on the psychological mechanism behind cost underestimation, they may also be less sensitive to price signals intended to shift driving behaviour (e.g., fuel taxes, congestion charging). Further research investigating the link between underestimation and insensitivity to pricing mechanisms would be particularly insightful here.

Second, the finding that misperception is not strongly associated with driving-specific characteristics suggests that even high-usage drivers, who might benefit most from switching modes or purchasing cars with lower running costs (e.g., EVs), do not have more accurate cost perceptions. Similarly, the limited variation in misperception across socio-demographic groups, including education, suggests that formal educational attainment is not strongly associated with improved cost estimation. This pattern is consistent with a cost partitioning or retrieval-based account of error, in which global cost estimates rely on the selective retrieval of salient components (notably fuel), while less salient but substantial categories (e.g., depreciation, insurance, maintenance) are frequently omitted, in line with Andor et al. (2020). Thus, interventions that change the representation of costs, for example by prompting structured reflection across cost categories, may be more promising than information provision alone, as they directly target the retrieval process underlying global underestimation.

From a policy perspective, these results add to growing evidence on the limits in relying solely on price mechanisms to encourage modal shift (e.g., Andor et al., 2020). If many motorists systematically underestimate the true costs of driving, the perceived relative cost of alternatives (e.g., public transport, cycling, shared mobility) will be distorted. Information-based interventions that make costs more transparent or easier to aggregate (e.g., personalised cost calculators,[10] annual "mobility bills," app-based running-cost trackers) may therefore complement infrastructural and fiscal measures. Behavioural work suggests that increasing salience and improving aggregation can have meaningful effects on decision-making (Comerford et al., 2009; Han & Yu, 2025; Heath & Soll, 1996; McGowan, Lunn & Robertson, 2019; Timmons, Robertson & Lunn, 2022). Recent transport-specific research shows that exposure to cost savings information can increase uptake of car-sharing services (Ciccone & Wangsness, 2025) and willingness-to-pay for public transport (Andor et al., 2020), although further experimental evidence is needed.

A complementary policy approach would be to shift a greater share of motoring costs into forms that are better perceived. Prior evidence on cost misperception suggests that motorists are most accurate when estimating frequent, salient, per-use costs, especially fuel expenditure (e.g., Andor et al., 2020; Shiftan & Bekhor, 2002). In contrast, infrequent costs (insurance, tax, depreciation, annual servicing) tend to be much less visible and are typically underestimated or omitted. Redesigning elements of the cost structure for cars to increase the marginal cost of each trip may make the financial implications of driving more immediate

[10] (SEAI, n.d.)

and tangible. Examples include road tolls and distance-based insurance or tax. Evidence from cities implementing congestion pricing, workplace parking levies, or removing of free parking shows that these mechanisms reduce car use and ownership (Albalate & Gragera, 2020; Dale et al., 2019; Morton & Ali, 2025), though specific evidence on distance-based pricing mechanisms is lacking. Importantly, these interventions act not only through economic incentives but also by converting opaque or aggregated costs into more visible per-trip prices.

Finally, itemised costs appear substantially lower for EVs, meaning switching from ICE vehicles may not only help to reduce many of the heightened negative externalities they generate, but also help households reduce costs. However, the effect of lower running costs of EVs may be somewhat offset by their higher upfront (IEA, 2025); further research on how these lower itemised costs interact with the current price-premium for EVs would be welcome.

The above implications come with important caveats. Many people are compelled to own a car due to limited availability, reliability or coverage of public transport (Carroll et al., 2021; Mattioli, 2017; OECD, 2022). Even with perfect information, these constraints may leave motorists with few viable alternatives. Second, financial considerations are only one part of the value motorists derive from car ownership (Soza-Parra & Cats, 2024). Many motorists value the convenience and independence that cars provide (e.g., Moody et al., 2021; Timmons, Shier & Lunn, 2026). Safety concerns, such as those frequently reported by women travelling on public transport at night (Chowdhury & van Wee, 2020), may outweigh financial considerations. For such motorists, correcting cost misperceptions may have limited behavioural impact if their willingness to pay surpasses the true financial burden of ownership.

Limitations

The above implications should be considered along the study's limitations. First, although our itemisation protocol provides a more granular estimate of annual motoring costs than prior research, it still relies on self-reported expenditure data. Costs that are irregular, unexpected or paid in lump sums, such as major repairs, insurance premiums or annual servicing, may be especially prone to misreporting. While we applied techniques designed to improve recall accuracy (e.g., structured prompting, decomposition into cost categories), residual error is possible. We are reassured in our estimates given their alignment with detailed UK expenditure data. The Institute for Public Policy Research (IPPR) (2025) analysed ONS (UK) expenditure data and estimated annual running costs at £2,400 (€2864-€3126 when adjusted for inflation) per vehicle, closely aligning with our findings (a comparable figure for Ireland is, to our knowledge, not available). Moreover, error in our itemised estimate may not be random, if recall bias resulted in some costs being omitted. This would mean we produce lower bounds on the prevalence and scale of underestimations. Future research that compares intuitive estimates to objective individual-level spend (e.g., from banking data) would be important validation, though comprehensive data is unlikely to be feasible for most countries, given the volume of possible spend categories and widespread variation in expenditure horizons and payment methods (e.g., cash payments).

Second, the survey captured costs incurred directly by the respondent, excluding any payments made by other members of the household. This was a conscious design choice, as we reasoned that payments made by others would likely incorporate further noise into estimates. Importantly, our supplementary analyses found no significant differences between single-adult sole owners and other respondents (see Appendix C). However, unmeasured financial arrangements (e.g., shared insurance, informal transfers, employer contributions) may still introduce variability that the survey could not capture.

Third, our formula for itemised costs did not include depreciation or the cost of financing. As such, our figures represent cash-flow costs, not full economic costs of car ownership, meaning our itemised costs and thus the scale of underestimation we observe are likely underestimates themselves. As such, it omits opportunity costs associated with asset depreciation. In Appendix B, we provide an estimate that includes depreciation, using the market valuation of the make and model of the respondent's vehicle. Depreciation is estimated to add €800 or a further 27% to the cost of owning a car. Producing a complete and representative measure of total ownership costs, including finance charges, would require detailed information on purchase method and financing terms, which is beyond the scope of this paper.

Conclusion

For many, a private car offers flexibility and comfort while providing access to economic opportunity. Cars also generate negative externalities for public health and the environment. Our results provide evidence that the economic cost to drivers is underappreciated: over 70% of motorists underestimate their annual expenditure, typically by more than €1,000 (equating to almost 3% of the median annual salary). Improving cost transparency may be a useful complement to broader efforts, including investment in reliable alternatives, to support demand management and modal shift where it is both feasible and beneficial.

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Appendix A: "Other" Costs

The following is how we treat "Other costs"—two optional entries by participants for any costs missed by our survey. There were a total of 279 responses to the first of these questions, and 169 to the second. Quite a number of these entries were deemed illegitimate (e.g., the description being "NA" or "nothing"), while the remainder were a combination of costs already covered (e.g., the description being "fuel" or "tax"), and costs that are deemed to not have been covered / could arise from varying interpretations in the category (e.g., the description being "Non standard equipment installation" or "valeting", the latter of which could be interpreted by some as separate to cleaning costs). To factor in these costs, we apply the following rules: where the costs description provided is obviously related to a strict category already covered (e.g., fuel), we average the two entries provided, or replace if an earlier value had not been provided; where the cost appears to be the result of varying interpretations of category boundaries, we add these to the relevant category figure, or replace the value if one does not exist; for costs that we deem legitimate but cannot easily map onto our existing categories, we create a "Miscellaneous" category.

Appendix B: Inclusion of Depreciation

It was decided that depreciation costs would be calculated by the researchers, rather than elicited directly from participants, as the latter was unlikely to provide accurate estimates, particularly for older cars. To begin, we estimated the cost of each car when it was new. For this, we used the make, model and engine type provided and took the mean recommended retailer price for that year across all specifications.[11] For example, the July 2016 price guide lists three specifications of the petrol Nissan Qashqai, priced at €24,695, €25,995 and €29,795. Taking the mean of these prices, we assign a starting (new) price of €26,828 for all such vehicles. To calculate depreciation, we utilise the rule of thumb constructed by Andor et al. (2020) using a variety of information sources. This begins with a reduction in value of 25% in the first year and continues to a reduction of just 1% in the 16th year, after which depreciation is assume to be negligible (see appendix for full schedule). We use this rule to calculate the value of each car one year ago and the value of the car today, with the difference between both figures being the depreciation cost. We calculate age as 2025 minus the registration year; cars registered in 2025 are 0 years old, cars registered in 2024 are 1 year old, and so on. For a 2025 car, we estimate depreciation to be 25% of the selling price (the reduction in value that takes place in the first year). For a car registered in 2020, we calculate the value one year ago as the (selling price*.75*.75*.85*.9*.95), and the value today as the (selling price*.75*.75*.85*.9*.95*.95), with depreciation being the difference. Looking first to the cost of depreciation itself, among car owners in the restricted sample (i.e., those appearing in the cost comparison—n = 559), we find median annual depreciation costs of €368.84 (*M* = €984.43, *SD* = €2196.30). Combining there with objective cost estimates from before gives a median annual cost of ownership of €3803.20 (*M* = €4397.12, *SD* = €2606.58).

[11] We used Society of the Irish Motor Industry Recommended Price Guides (https://www.simi.ie/en/motorstats/recommended-price-guide), which provides monthly datasets of recommended prices for common cars in Ireland by make, model, spec and engine type. For consistency, we use the July guides each year. Unfortunately, the datasets are sometimes incomplete (e.g., certain makes or models are not featured), thus the prices on which the depreciation values are based may not be fully accurate.

Appendix C: Single Adult Owners Only

Our cost estimates pertained only to costs personally paid by the respondents; it could be the case that our results are thus underestimates, given that costs could be shared or paid entirely by others. To determine whether this is the case, we identify single adult owners, that is, respondents with no other adults in the household, and who report sole ownership of the vehicle in question (103/657 in the restricted sample; we maintain the same exclusion criteria as before). Single adult owners report a median intuitive estimate of €2000 (*M* = €2734.92, *SD* = €2364.75), and an itemised estimate of €2730.58 (*M* = €3334.43, *SD* = €1822.30).) Median tests comparing these figures with the rest of the sample revealed no significant differences: intuitive costs: ($\chi^2(1, N = 801) = .0127$, $p = .91$); itemised costs: ($\chi^2(1, N = 801) = 156$, $p = .21$). Much like the full sample, 71.9% of the single adult owners exhibit underestimation.