How General are Generational Trends in Vehicle

Ownership and Use?

Stephen Jarvis^{*}

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Abstract

There are longstanding debates about the differences between generations. This includes claims that Millennials have fundamentally different preferences for driving and vehicle ownership when compared to prior generations. Using data on the United Kingdom I do indeed find large observed differences in driving habits and vehicle ownership between Millennials and prior generations. However, once certain confounding factors are controlled for these differences largely disappear. These results confirm findings from related work that looked at the United States, indicating that generational trends in driving habits are likely a fairly general phenomenon.

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Keywords: Vehicle ownership, Driving, Generational changes

^{*}Dr Stephen Jarvis: Department of Geography and Environment, London School of Economics and Political Science. Email: s.jarvis@lse.ac.uk. Disclaimer: I am a Millenial who has never owned a car and didn't get their license until age 25.

1 Introduction

Much ink has been spilled on the changing preferences of younger generations, and Millenials are no exception. There is also some empirical evidence to support some of the claims, with studies showing that Millenials are more likely than older generations to be living at home with their parents or delaying getting married and starting a family (Astone and Peters, 2014, 2015; Fry, 2015; Amanda Barroso and Bennett, 2020). The question of whether Millenials are less likely than older generations to engage in prosocial activities like charitable giving has also been explored, with Koczanski and Rosen (2019) finding some evidence to support this hypothesis. Other research indicates these kinds of generational preferences may be in part shaped by the economic environment that different cohorts have grown up in (Cotofan et al., 2021).

One area where it has been suggested that Millenials may fundamentally differ from prior generations is in their choices about transportation and driving. A preference for urban living, public transport, ride-hailing apps and making greener choices have all been raised as reasons why Millenial's might be in the process of leaving behind the car-centered lives of their predecessors (Buchholz and Buchholz, 2012; Badger, 2013; Caelainn Barr and Jones, 2016; Dias, 2019; Eliot, 2019). However, the precise role of changes in preferences remains unclear, not least because it is difficult to disentangle from the role played by other changes in life circumstances experienced by younger generations, such as economic conditions and living situations (Chatterjee et al., 2018). A study by Knittel and Murphy (2019) challenges the narrative that Millenials have fundamentally different preferences for driving and vehicle ownership. Using data on the United States they find little difference in preferences between Millennials and prior generations once confounding factors are controlled for.

In this paper I replicate the analysis undertaken by Knittel and Murphy (2019) with similar data for the United Kingdom. Using data from surveys spanning 1985 to 2020, I am able to compare individuals at similar life stages across generations. I focus on three variables of interest: whether a person has a driving license, a person's vehicle miles travelled, and the number of cars in a person's household. I find that the results for the UK are broadly consistent with those for the US; average differences between Millenials and prior generations can be accounted for by observable factors beyond their control, rather than any fundamental change in preferences.

2 Data

The data used in this study is from the UK's National Travel Survey. This is a household survey covering topics related to personal travel and transport policy. Individuals in sampled households are interviewed face-to-face to collect personal information, such as age, gender, working status, car access and driving licence holding. They are also asked to complete a seven day travel diary and provide details of trips undertaken, including purpose, method of travel, time of day and trip length.

The earliest data used here is from the 1985/6 survey, and then annual surveys from 1988 to $2020.^{1}$ This provides observations spanning more than three decades which is critical to

 $^{^{1}}$ The first NTS survey was commissioned by the Ministry of Transport in 1965. However, the structure of the survey has changed over time and the data is more readily integrated from 1985 onwards.

being able to examine the generational comparisons of interest. Most importantly, gathering observations over this long time period means the sample has overlap between the Baby Boomer and Millenial generations, with observations for 26 to 39 year olds within both cohorts. The definitions of the birth years for each generation can be found in Table 1.

[Table 1 about here.]

The main variables used to understand driving and vehicle ownership preferences are: (1) whether an individual has a license; (2) the number of cars in a household; and (3) the number of vehicle miles travelled for each individual. A number of control variables are also used and these are shown in Table 2.

[Table 2 about here.]

The full dataset contains just over 500,000 observations. For the analysis I restrict the sample to individuals that are 17 years old or older based on the legal driving age in the UK. This reduces the sample to just under 400,000 observations. I did also consider further restricting the sample to individuals classed as the head of household or household reference person in line with the approach taken by Knittel and Murphy (2019). However, this would entail effectively halving the sample size to around 200,000. Moreover, this would effectively drop an interesting portion of the sample; namely Millenials that still live with their parents or in shared accommodation without family members. Because these characteristics can be adequately captured by the inclusion of certain controls, the less restrictive sample was maintained throughout.²

²Importantly though, when running the same analysis on the same more restricted head-of-household

In many respects the data used here is similar to that used by Knittel and Murphy (2019), and in a more recent study by Zhang and Li (2022). In their case they use data from the US Department of Transportation's National Household Transportation Survey and the American (NHTS) for the years 1990, 1995, 2001, 2009, and 2017. Where necessary they supplement this with additional data from the US Census and American Community Survey (ACS) over the same time period. Relative to their data, my sample spans a period that is seven years longer. Also, for almost the entire period the UK data has annual survey waves, while the NHTS is generally conducted every five to six years. This is valuable as it facilitates identifying changing trends in a smoother manner.

3 Empirical Strategy

The core empirical strategy is a fairly straightforward regression design and mirrors the approach taken by Knittel and Murphy (2019). In all specifications I regress the dependent variable of interest on indicator variables for a person's generation. The omitted category is the Baby Boomer generation, and so the resulting coefficients capture how preferences for driving and vehicle ownership differ from Baby Boomers across generations. I then include sample used by Knittel and Murphy (2019) I did not find there was a meaningful impact on the overall results.

various additional controls depending on the specification.

$$y_{it} = \beta_0 + \beta_1 I_i^{Silent} + \beta_2 I_i^{Greatest} + \beta_3 I_i^{GenX} + \beta_4 I_i^{Millenial} + \beta_5 I_i^{GenZ} + \sum_k^K \beta_k X_{kit} + \epsilon_{it}$$
(1)

My first specification only controls for year fixed effects to account for general trends in transportation costs, economic growth, survey specific factors, and so on. The second specification adds a control for age to account for the distribution of ages observed for the people in each generation in the sample. The third specification then adds a wide range of demographic controls, including sex, marital status, household size and structure, income, employment status, household property type, housing tenure, geographic region and urban classification. Despite controlling for age, we may still be concerned that the individuals that belong to each generation are still at sufficiently different life stages during our sample period. The fourth, fifth and sixth specifications therefore repeat the first three, but now restricting the sample to ages 26 to 39 where there is common support between Baby Boomers and Millenials. This has the benefit of allowing a comparison of individuals of similar ages across generations. One potential limitation though is that this does entail comparing younger Baby Boomers born in the 1960s with older Millenials born in the 1980s. This may tend to attenuate any differences relative to comparing the average individual in each generation.

4 Results

4.1 Main Specifications

Table 3 shows the results based on whether an individual has a drivers license. The first specification clearly shows that there are indeed large differences across generations. 82% of Baby Boomers have a driving license. By comparison, younger generations are less likely to have a driving license, with only 56% of Millenials having one; a difference of 26%. A similar decline relative to Baby Boomers can also be seen for older generations.

It seems plausible though that these differences across generations just reflect age effects. The individuals in the sample from the Millenial or Gen Z generations will be relatively young and so it is not unsurprising that many of them have not yet gotten their licenses while still in their late teens or early twenties. Similarly the individuals in the sample from the Greatest and Silent generations will be relatively old and so many may have since surrendered their license, or even grown up before the era of mass car ownership. The second specification therefore controls for age, which does indeed reduce the observed effects, particularly for the youngest and oldest generations. Even so, sizeable differences remain. Millenials are still 15% less likely to have a driving license than Baby Boomers, conditional on age.

However, it may still be the case that much of this difference can be explained by other factors besides the fundamental tastes and preferences of each generation towards driving. For instance, the Baby Boomers in our sample may be wealthier than other generations, or be more likely to be married and have children. Other generations may simply have similar preferences for driving conditional on endowments, and any observed differences are merely a function of differences in endowments. To examine this the third specification now adds controls for important economic and demographic factors. The observed effects are now reduced even further. Millenials are now only 10% less likely to have a driving license than Baby Boomers, conditional on age and endowments.

Finally, specifications four, five and six repeat the first three specifications with the sample limited to individuals age 26 to 39. This causes the Gen Z generation to drop out as they have no individuals in the sample 26 or older. Similarly the Greatest and Silent generations also drop out as they have no individuals in the sample 39 or younger. The remaining generations now exhibit no significant difference relative to Baby Boomers in their likelihood of having a driving license. This is most clearly the case after controlling for both age and then endowments.

[Table 3 about here.]

Table 4 sets out the results for vehicle miles travelled using the same six specifications. The findings largely mirror those for the analysis of driving licenses. The average differences between generations are initially very large. Baby Boomers drive an average of 6691 miles per year. Millenials drive 2777 miles per year less, which is a 42% reduction. Controlling for age cuts the difference substantially. Controlling for endowments further closes the gap across all generations, leaving a difference of 704 miles per year for Millenials, which is an 11% reduction. Finally, limiting the sample to 26 to 39 year olds and including age and endowment controls eliminates any remaining differences across generations, with the resulting coefficients now very small and statistically indistinguishable from zero.

[Table 4 about here.]

The third and final variable I look at is vehicle ownership. Table 5 sets out the results for the number of cars in a household using the same six specifications. Looking at the initial effects in the first specification, Baby Boomers live in households that have an average of 1.31 cars. Older generations live in households with significantly fewer cars. Interesting younger generations live in households with similar numbers of cars to Baby Boomers. Millenial households have an average of 0.03 fewer cars, which is a 2% reduction and not statistically significant. Notably Gen Z individuals live in households with 0.22 more cars than Baby Boomers, which is a 17% increase. While this may seem strange, what is likely going on here is that the number of cars is measured here at the household level. As such an individual may live in a household with one or more cars even if they do not actually drive. This seems perfectly consistent with the observed effects for younger generations, many of whom may still be living with their parents. Adding in the full set of age and endowment controls largely removes any statistically significant differences. Finally, limiting the sample to 26 to 39 year olds and including age and endowment controls also serves to eliminate the remaining differences even further, with the resulting coefficients statistically indistinguishable from zero.

[Table 5 about here.]

4.2 Endogenous Life Choices

An important caveat to the analysis conducted thus far is that some of the demographic and socioeconomic variables being used as controls may themselves be endogenous choices made by different generations. For instance, there is evidence that younger generations are more likely to still be living at home with their parents, or are delaying getting married and starting a family (Astone and Peters, 2014, 2015; Fry, 2015; Amanda Barroso and Bennett, 2020). Some of these decisions may be due to economic realities beyond their control, but plausibly some of these represent active choices that reflect different preferences to earlier generations. Where this is the case simply controlling for characteristics, like marital status, may result in the earlier analysis leading us to be to rule out generational changes in preferences toward driving too quickly. To examine this possibility I modify the analysis in the following manner. First. I determine which of the control variables are to be treated as endogenous (married, head-of-household, employed, high income, children, homeowner, north and rural) and which are to be treated as exogenous (age, sex and survey year). To do this I also simplify several of the control variables by converting those that have multiple categories to dummy variables that capture the main groupings of interest.³ Doing so does not qualitatively change the impact of the controls seen in the earlier regressions.

Second, I regress each of the driving outcome variables (license, vehicle miles travelled and cars in household) on the generation dummies and both the endogenous and exogenous

³Marital status becomes a dummy for married; head-of-household relation becomes a dummy for head-of-household; employment status becomes a dummy for employed; property type becomes a dummy for house; income quintile becomes a dummy for high-income; household structure becomes a dummy for whether the household has any children; property tenure becomes a dummy for homeowner; geographic region becomes a dummy for living in the north of the UK; and area type becomes a dummy for rural.

controls. These results effectively replicate those found in the earlier analysis.

$$y_{it} = \beta_0 + \beta_1 I_i^{Silent} + \beta_2 I_i^{Greatest} + \beta_3 I_i^{GenX} + \beta_4 I_i^{Millenial} + \beta_5 I_i^{GenZ} + \sum_m^M \beta_m X_{mit}^{endog} + \sum_k^K \beta_k X_{kit}^{exog} + \epsilon_{it}$$

$$(2)$$

Third, I regress each of the endogenous controls on the generation dummies and any remaining exogenous controls, which in this case are age, sex and survey year.

$$x_{mit}^{endog} = \alpha_{0m} + \alpha_{1m}I_i^{Silent} + \alpha_{2m}I_i^{Greatest} + \alpha_{3m}I_i^{GenX} + \alpha_{4m}I_i^{Millenial} + \alpha_{5m}I_i^{GenZ} + \sum_{k}^{K} \alpha_{km}X_{kit}^{exog} + v_{it}$$

$$(3)$$

Fourth, I take the coefficients from these two sets of regressions and calculate the effect of each generation by combining the main effect with the portion of the effect from the endogenous variable that can be explained by generational differences. So for Millenials the combined effect would be:

$$\beta_4 + \sum_m^M (\beta_m \times \alpha_{4m}) \tag{4}$$

The resulting effects should give an upper bound on the overall potential effect that can be attributed to generational differences.

Table 6 presents the results of this analysis. Specifications one and two are results for license,

three and four are results for vehicle miles travelled and five and six are results for number of cars in the household. The difference between odd and even specifications are whether they limit the sample to 26 to 39 year olds. The top panel of the table shows the main effects for the generation coefficients. These largely mirror those seen in the earlier analysis. The coefficients printed in the bottom panel are the combined effects as calculated using Equation $4.^4$

[Table 6 about here.]

The first thing to note from these results is that the combined effects are generally larger than the main effects, particularly when focusing on the license and vehicle miles travelled variables. This makes sense given the nature of the endogenous variables and their respective direct effects on driving habits. For instance, individuals that are married, have children and own their home are all more likely to have a license and more vehicle miles travelled, even after controlling for exogenous factors. However, Millenials are less likely to be married, less likely to have children and less likely to own their home, even after controlling for exogenous factors. If we view marriage, having children and owning your home as endogenous choices, we would expect the combined effect of being a Millenial to be larger than the main effect. However, it is once again important to note that if we limit the sample to the more comparable set of 26 to 39 year olds, these larger differences still disappear. This brings us back to our earlier conclusion that even after accounting for endogenous choices it is possible to find no significant differences in driving preferences across generations.

 $^{^{4}}$ Note that the combined coefficients do not include significance stars even where they are statistically significant.

5 Conclusion

There are large average differences between generations in the prevalence driving licenses, vehicle miles travelled and rates of vehicle ownership. However, this paper shows that a large part of these differences can be explained by variations in age and endowments, suggesting that younger generations do not appear to have radically different preferences for driving and vehicle ownership when being compared at a similar life stage. Any meaningful differences seem to disappear entirely when comparing a narrower group of 26 to 39 year old Baby Boomers with Millenials of the same age. Accounting for choices that may be endogenous to different generations, such as the decision to marry or have children, does offer some scope for greater differences across generations. However, these changes still disappear again when limiting to the more comparable 26 to 39 year old cohorts. Overall, the analysis presented here points to a lack of significant evidence to support the view that younger generations have fundamentally different attitudes toward driving and car ownership than their parents. Instead it seems that external factors play a much larger part in shaping the extent to which they get behind the wheel. Interestingly, previous research on this question had looked at the United States, where driving and car ownership is particularly high compared to many other developed countries (Knittel and Murphy, 2019). Using data from the United Kingdom, this paper demonstrates that the stability of generational preferences for driving and vehicle ownership is likely a fairly general phenomenon.

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Table 1: Generation Definitions

Generation	Birth Years
Greatest	1901-1927
Silent	1928-1945
Baby Boomer	1946-1964
${\rm Gen}\ {\rm X}$	1965-1980
Millenial	1981-1996
Gen Z	1997-2012

Variable	Type	Details
Age	Categorical (21)	18, 19, 20, 21-25,, 80-84, 85+
Sex	Categorical (2)	
Marital Status	Categorical (2)	
Employment Status	Categorical (7)	Full-time, student, retired etc.
Number of Adults in Household	Number	
Number of Children in Household	Number	
Household Structure	Categorical (6)	Groupings of adults/children
Household Income Quintile	Categorical (5)	Within survey year incomes
Property Address Type	Categorical (7)	House, Flat/Maisonette etc.
Property Tenure Type	Categorical (3)	Owner, Renter or Other
Geographic Region	Categorical (11)	Government Office Regions
Geographic Area Type	Categorical (7)	Rural to urban classifications
Survey Year	Categorical (33)	

 Table 2: Demographic and Endowment Variables

	(1)	(2)	(3)	(4)	(5)	(6)
Greatest	-0.394***	-0.180***	-0.104***			
	(0.0188)	(0.0248)	(0.0160)			
Silent	-0.128***	-0.0403**	-0.0263***			
	(0.0170)	(0.0128)	(0.00721)			
Baby Boomer	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
Gen X	-0.0430***	-0.0413***	-0.0203**	-0.0439***	0.0273^{***}	0.0166^{*}
	(0.00916)	(0.0112)	(0.00686)	(0.00483)	(0.00658)	(0.00808)
Millennial	-0.258^{***}	-0.153***	-0.0964^{***}	-0.136***	0.00713	0.0121
	(0.0187)	(0.0211)	(0.0132)	(0.00636)	(0.0118)	(0.0111)
Gen Z	-0.558^{***}	-0.219^{***}	-0.153***			
	(0.0363)	(0.0285)	(0.0198)			
Observations	392673	392673	388256	92496	92496	91407
R^2	0.088	0.167	0.311	0.007	0.027	0.226
Age Control	No	Yes	Yes	No	Yes	Yes
Other Controls	No	No	Yes	No	No	Yes
Ages 26-39	No	No	No	Yes	Yes	Yes
Sample Mean	0.82	0.82	0.82	0.78	0.78	0.79

Table 3: Regression Results for Has License

Notes: This table shows the regression results with the dependent variable as whether an individual has a driving license. Baby Boomers are the omitted category. All regressions limit the sample to individuals that are 17 years or older. Limits on the sample and any included controls vary by specification as described in the bottom rows. Coefficients on controls are not shown.

	(1)	(2)	(3)	(4)	(5)	(6)
Greatest	-5318.8***	-1655.3***	-750.6***			
	(177.8)	(248.1)	(149.7)			
Silent	-2639.9***	-742.5^{***}	-453.4***			
	(248.4)	(154.8)	(85.33)			
Baby Boomer	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
Gen X	-319.3	-387.2**	-222.0*	-653.9***	371.6^{**}	98.20
	(171.3)	(141.6)	(106.5)	(65.36)	(116.9)	(84.30)
Millennial	-2776.7***	-1404.1***	-704.4^{***}	-2009.2***	62.79	-1.291
	(226.6)	(227.8)	(157.8)	(76.28)	(200.8)	(161.9)
$\operatorname{Gen} Z$	-4949.1***	-1423.4***	-438.6			
	(281.7)	(305.7)	(223.9)			
Observations	392673	392673	388256	92496	92496	91407
R^2	0.053	0.132	0.258	0.008	0.053	0.195
Age Control	No	Yes	Yes	No	Yes	Yes
Other Controls	No	No	Yes	No	No	Yes
Ages 26-39	No	No	No	Yes	Yes	Yes
Sample Mean	$6,\!691.07$	$6,\!691.07$	$6,\!697.85$	$6,\!695.32$	$6,\!695.32$	6,721.85

Table 4: Regression Results for Vehicle Miles Travelled

Notes: This table shows the regression results with the dependent variable as an individual's annual vehicle miles travelled. Baby Boomers are the omitted category. All regressions limit the sample to individuals that are 17 years or older. Limits on the sample and any included controls vary by specification as described in the bottom rows. Coefficients on controls are not shown.

	(1)	(2)	(3)	(4)	(5)	(6)
Greatest	-0.766***	-0.202***	-0.0433*			
	(0.0296)	(0.0327)	(0.0180)			
Silent	-0.302***	-0.0497*	-0.0359***			
	(0.0336)	(0.0217)	(0.00930)			
Baby Boomer	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
Gen X	-0.0855***	-0.0855***	-0.0267**	-0.0572***	-0.0286	-0.0265
	(0.0105)	(0.0188)	(0.00981)	(0.0104)	(0.0196)	(0.0157)
Millennial	-0.0302	-0.126^{***}	-0.0322	-0.0680***	-0.0106	-0.0224
	(0.0233)	(0.0321)	(0.0192)	(0.0137)	(0.0363)	(0.0259)
$\operatorname{Gen} Z$	0.221^{***}	-0.0688	0.0447			
	(0.0315)	(0.0444)	(0.0265)			
Observations	392636	392636	388223	92484	92484	91396
R^2	0.062	0.084	0.403	0.006	0.006	0.328
Age Control	No	Yes	Yes	No	Yes	Yes
Other Controls	No	No	Yes	No	No	Yes
Ages 26-39	No	No	No	Yes	Yes	Yes
Sample Mean	1.31	1.31	1.32	1.09	1.09	1.10

Table 5: Regression Results for Cars in Household

Notes: This table shows the regression results with the dependent variable as the number of cars in the household. Baby Boomers are the omitted category. All regressions limit the sample to individuals that are 17 years or older. Limits on the sample and any included controls vary by specification as described in the bottom rows. Coefficients on controls are not shown.

	(1)	(2)	(3)	(4)	(5)	(6)
Greatest	-0.113***		-812.8***		-0.0262	
	(0.0166)		(168.7)		(0.0205)	
Silent	-0.0277***	:	-504.6***		-0.0322**	
	(0.00771)		(98.17)		(0.0118)	
Baby Boomer	0	0	0	0	0	0
	(.)	(.)	(.)	(.)	(.)	(.)
Gen X	-0.0212**	0.0157	-191.3	124.3	-0.0242	-0.0421*
	(0.00698)	(0.00854)	(109.4)	(85.74)	(0.0123)	(0.0180)
Millennial	-0.0995***	0.0104	-754.2***	30.13	0.00189	-0.0156
	(0.0136)	(0.0115)	(167.5)	(162.2)	(0.0258)	(0.0330)
$\operatorname{Gen} Z$	-0.150***		-456.7		0.0853^{*}	
	(0.0202)		(236.8)		(0.0327)	
Observations	392673	92496	392673	92496	392636	92484
R^2	0.286	0.199	0.231	0.164	0.305	0.251
Silent	151		-1466.746		13	
-	(.021)		(234.382)		(.025)	
Greatest	039		-750.759		047	
-	(.011)		(144.136)		(.017)	
Baby Boomer	0	0	0	0	0	0
-	(0)	(0)	(0)	(0)	(0)	(0)
Gen X	033	.026	-340.549	400.027	066	026
-	(.01)	(.007)	(136.53)	(112.062)	(.016)	(.02)
Millenial	13	.014	-1294.76	153.677	073	.01
-	(.018)	(.012)	(218.252)	(194.037)	(.028)	(.037)
$\operatorname{Gen} Z$	198		-1362.821		019	
-	(.025)		(290.57)		(.037)	
Dependent Variable	License	License	VMT	VMT	No. Cars	No. Cars
Age Control	Yes	Yes	Yes	Yes	Yes	Yes
Ages 26-39	No	Yes	No	Yes	No	Yes
Sample Mean	0.821	0.784	6691.1	6695.3	1.314	1.091

Table 6: Regression Results for Endogenous Response Analysis

Notes: This table shows the regression results for the analysis of endogenous choices. Specifications one and two are results for license, three and four are results for vehicle miles travelled and five and six are results for number of cars in the household. Baby Boomers are the omitted category. The top panel includes the main effects. The coefficients in the bottom rows are the combined effects. Note that the combined coefficients do not include significance stars even where they are statistically significant. All regressions limit the sample to individuals that are 17 years or older. Limits on the sample and any included controls vary by specification as described in the bottom rows. Coefficients on controls are not shown.