Navigating Change: Residential Relocations and Commuting Behaviour

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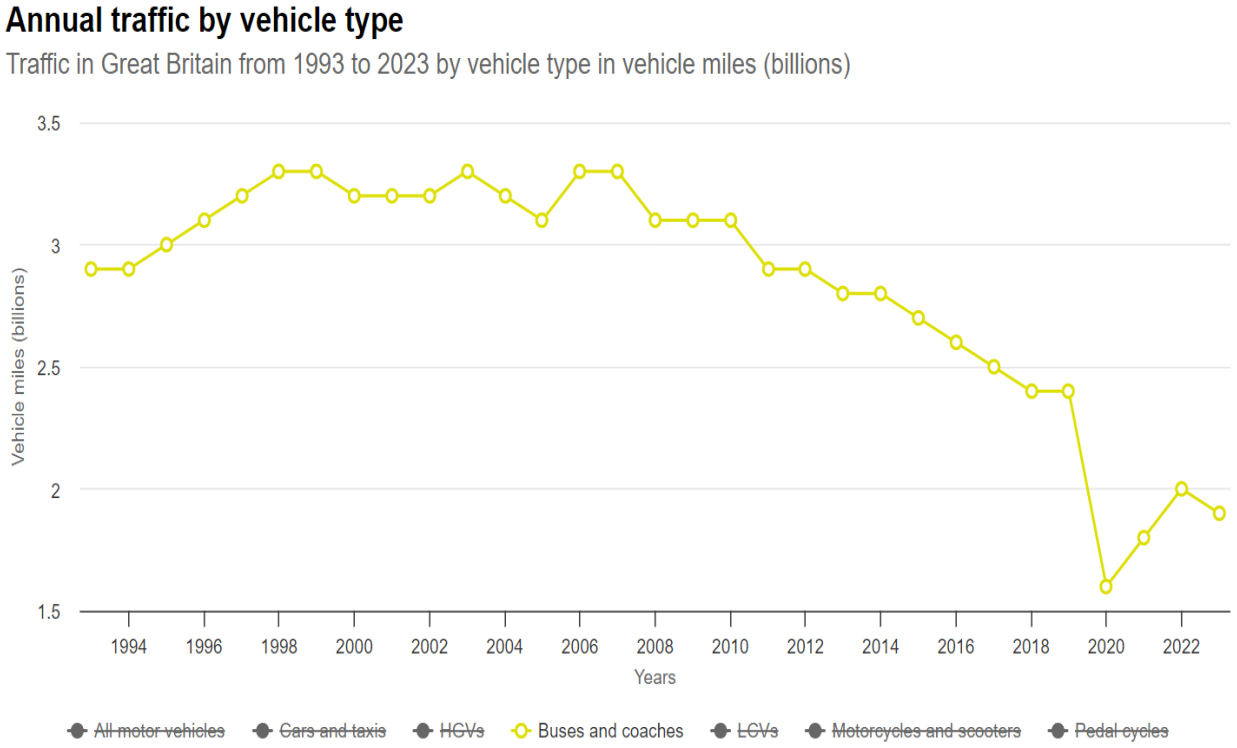
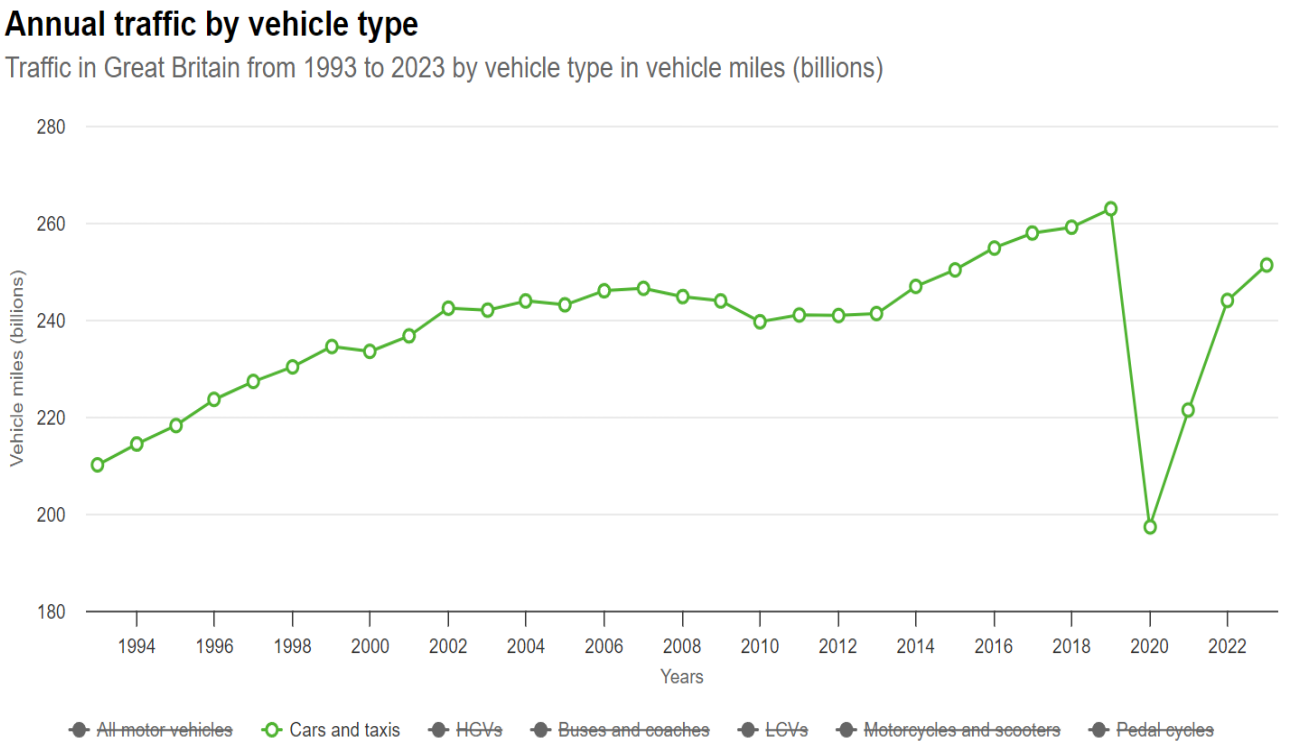
Introduction and Motivation 1.0

- Nine months ago, I moved to the Netherlands.
- Prior to which, I had not ridden a bike in maybe 5-10 years.
- Now I ride a bike every single day.
- What were the factors that prompted this sudden shift?
  - Built Environments?
  - A Major Life Event Disrupting Old (And Creating New) Habits?
  - “Because Everyone Else Is Doing It”

Introduction and Motivation 2.0

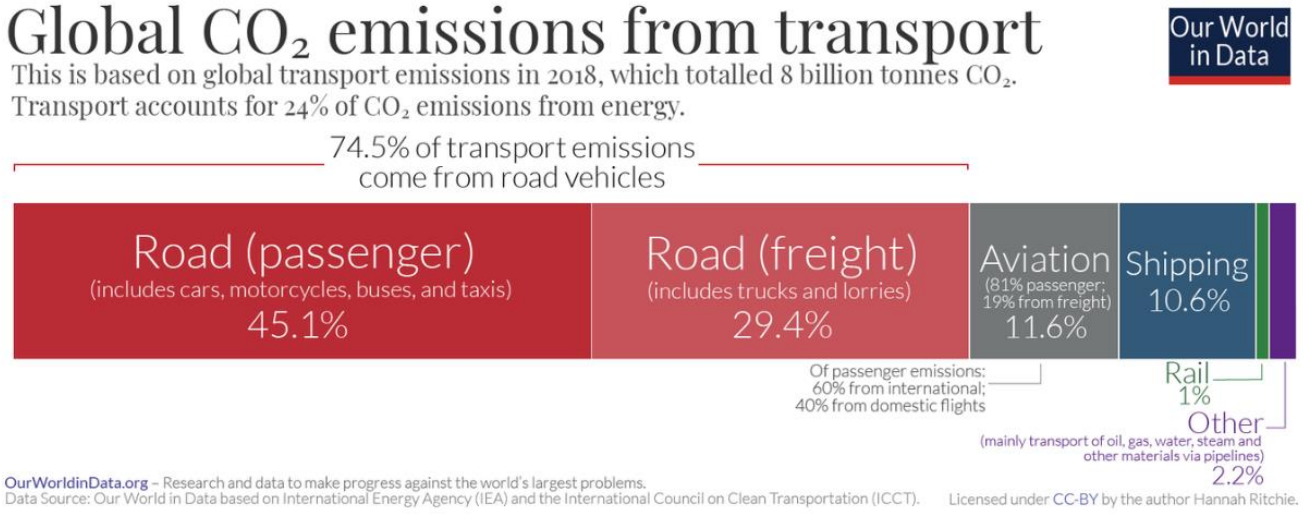
- Understanding the determinants of travel behaviours is high on global policymaking agendas.
  - Transport accounted for 26% of all domestic emissions in 2021.





Introduction and Motivation 3.0

- Internationally, this situation is not entirely unique.
  - Indeed, approximately 20%~ of global emissions are attributable to transport and 75% of **this** stems from road-based transportation.
  - UN SDG 11.2: *By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all…*



Theory and Existing Literature

Strand 1: Travel Behaviours and Built Environments

Strand 2: Mobility Biographies

Strand 3: (The consequences of) Location Decisions

Literature Strand 1: Built Environments

- The behaviour of individuals is shaped by their ability to maximise the utility associated with decisions, subject to budget constraints (Ewing and Cervero, 2010).

- Hagerstrand's (1970) time-space geography emphasizes how temporal constraints (as influenced by regional spatial structures) shape individual behaviours by altering the costs associated with decisions.

- Cervero and Kockelman, (1997) put forward the Three D's as a framework for operationalising how these temporal constraints manifest across space.
  - Distance, Density, Diversity.

Literature Strand 2: Mobility Biographies

- Mobility Biographies relate to this idea that the needs of individuals change throughout their life-cycle, and that these changes will be evidenced in behaviours (Scheiner, 2018).
  - Think, getting married, having kids, losing your job…or moving to a new country for a new job (me).

- There are three broad categories for these “events”: Those related to the house, the job, and those related to local environments (Scheiner and Holz-Rau, 2013).
  - These events can plausibly impact travel differently, but when viewed as a “disruptor of habits”, these events take on a similar conceptual form as an exogenous shock (Klinger, 2017; Zhao and Zhang, 2018).

Literature Strand 3: (…) Location Decisions

- Traditional frameworks, like those derived from the idea of utility maximization, emphasize how location decisions are, at least partly, a trade-off between land-values and transport costs .

- Life-event perspectives, particularly events like residential relocations, imply that either: A) Utility was never maximised in the first place, or B) The point at which utility is maximised has changed, and therefore requires a re-configuration (i.e., a relocation).

- Therefore, relocations can offer an important “window of opportunity”.

How Do I Contribute To These Literatures?

Contribution 1: Explore the relative importance of socio-demographic and built environment characteristics in influencing travel behaviours. (Cao, Mokhtarian and Handy, 2009; Ding *et al.,* 2018)

Contribution 2: Mobility Biographies literature typically under-utilise spatial data and often work with relatively small samples. (Adhikari, Hong and Frank, 2020; Kamruzzaman *et al.,* 2020)

Contribution 3: Panel data is relatively unique in literature which assesses the relationship between built environments and travel. (Jeong, Lee and Gim, 2022; O'Driscoll *et al.,* 2024)

Data and Methods :D

Waves 1-12 (from 2009/2010 to 2021/2022) of the UK Household Longitudinal Study

Land-Use Characteristics, Property Values, Transport Infrastructure and Accessibility

Linear Probability Models

Data, Data, Data: UKHLS

- *UKHLS* captures a range of social, economic and attitudinal information about the lives of (all) members of 40,000 households through an annual, computer-assisted, personal interview.

- Individual-level panel data, with a temporal dimension captured in terms of years before and years after a residential relocation. When a residential relocation has occurred, $t=0$. Individuals are only retained if they provide responses for the interval ranging from $-2 \leq t \leq 3$.
  - 3,253 Individuals spread across 6 T's and many Lower Layer Super Output Areas.

Data, Data, Data: Spatial Data 1.0

- *Torres and McArthur (2024)* compute accessibility indicators at the LSOA level for a number of relevant amenities, including:
  - *The number of employment opportunities, medical facilities, supermarkets, and schools which are accessible within 15 minutes.*
  - *The nearest city, supermarket, medical facility, and school.*

- *Fleischmann and Arribas-Bel (2022)* compute spatial signatures (i.e., geographical characterisations of urban form) across the UK at LSOA level.
  - This dataset allows me to compute a measure of land-use mixing, but it also allows me to document the predominant land-use class in a given area.

Data, Data, Data: Spatial Data 2.0

- The LSE-REEF index is a micro-geographic mix-adjusted property price index. Its unique feature is that it reveals house price trends in about 35,000 lower-layer super output areas in England and Wales from 2010 to 2020.

- The **Na**tional **P**ublic **T**ransport **A**ccess **N**odes (NaPTAM) dataset covers all UK public transport access points. I use bus and rail links in a cross-sectional structure.

- The OS Open Roads dataset offers a high-level view of the road network, from motorways to country lanes across the UK. I use this in a cross-sectional structure.

Empirical Model

- This work employs a basic linear probability model using panel data.
- Year, Region, Year * Region, and Individual fixed effects are used.
- *LE* represents life-event variables, *SD* spatial variables, *MD* moving variables, *Z* individual-level controls.

$$P(Y = 1|X_1, X_2, \dots X_k) = \alpha + \delta_i + \gamma LE_{it} + \gamma SD_{it} + \gamma MD_{it} + \gamma Z_{it} + \varepsilon_{it}$$

Results

Six RQ's :O

RQ1

How do life events impact the likelihood of relocating?

Changing marital and employment status appear most relevant.

Having children, changing jobs, or changes in your ability to access cars seem to strengthen roots.

Dependent Variable: Probability of Relocating to a new LSOA since the previous survey wave
RQ1: How does the occurrence of life events impact the probability of relocating?

	addrmov_dv
change_maritaly1	0.090***
	(0.017)
change_nchildy1	-0.052***
	(0.012)
change_jbstaty1	0.070***
	(0.014)
change_jbnssecy1	-0.035***
	(0.011)
change_carusey1	0.027*
	(0.016)
change_drivey1	-0.014
	(0.011)
Spatial Data	NO
Reason For Moving	NO
Individual Level Controls	YES
Year Fixed Effects	YES
Region Fixed Effects	YES
Year-Region Fixed Effects	YES
N	19,518
R2	0.083
Adjusted R2	-0.111
F Statistic	8.977*** (df = 163; 16102)

RQ2

How do life events impact commuting?

All events significantly influence the likelihood of changing commute mode.

Events related to changing economic circumstances do appear strongest.

Dependent Variable: Probability of Changing Commute Mode since the previous survey wave
RQ2: How does the occurrence of life events impact the probability of switching?

	change_commutey1
change_maritaly1	0.021*
	(0.011)
change_nchildy1	0.027***
	(0.008)
change_jbstaty1	0.152***
	(0.009)
change_jbnssecy1	0.349***
	(0.007)
change_carusey1	0.051***
	(0.010)
change_drivey1	0.020***
	(0.008)
change_oac11spy1	0.032***
	(0.008)
Spatial Data	NO
Reason For Moving	NO
Individual Level Controls	YES
Year Fixed Effects	YES
Region Fixed Effects	YES
Year-Region Fixed Effects	YES
N	19,518
R2	0.302
Adjusted R2	0.154
F Statistic	41.434*** (df = 168; 16097)

RQ3

When do these changes occur?

Relative to the year of a move, changes in commuting mode are typically insignificantly associated with the years leading up to, or the years post move.

Dependent Variable: Probability of Changing Commute Mode since the previous survey wave
RQ3: How long does it take for commuting behaviours to change?

	change_commutey1
time_move_years_neg2	0.031
	(0.036)
time_move_years_neg1	-0.064***
	(0.019)
time_move_years_1	-0.018
	(0.019)
time_move_years_2	-0.038
	(0.036)
time_move_years_3	-0.061
	(0.053)
Spatial Data	NO
Reason For Moving	NO
Other Life Events	YES
Individual Level Controls	YES
Year Fixed Effects	YES
Region Fixed Effects	YES
Year-Region Fixed Effects	YES
N	19,518
R2	0.302
Adjusted R2	0.154
F Statistic	41.434*** (df = 168; 16097)

RQ4

Relative to individuals who do not move in a given year, the reasons underlying residential relocations do not exhibit a statistically significant association with the probability of changing commute mode.

Dependent Variable: Probability of Changing Commute Mode since the previous survey wave
RQ4: How do these relationships change if you control for reason for moving?

	change_commutey1
Move since previous wave	0.020*
	(0.011)
Family Reasons	-0.004
	(0.014)
Education Reasons	-0.004
	(0.033)
Job Reasons	0.043
	(0.031)
Housing/Area Reasons	-0.006
	(0.012)
Other	-0.004
	(0.012)
Spatial Data	NO
Other Life Events	YES
Individual Level Controls	YES
Year Fixed Effects	YES
Region Fixed Effects	YES
Year-Region Fixed Effects	YES
N	19,518
R2	0.296
Adjusted R2	0.146
F Statistic	39.828*** (df = 170; 16095)

RQ5

Similarly, relative to people who don't move in a given year, the probability of switching mode shares a statistically insignificant relationship with the types of environment people live in…when environments are operationalised through socio-demographic prisms.

RQ5: How do these relationships change when we include the type of environment people move to?

	change_commutey1
Move since previous wave	0.036***
	(0.008)
Move to "Rural Areas"	-0.013
	(0.018)
Move to "Cosmopolitans"	0.035
	(0.037)
Move to "Ethnicity Central"	0.017
	(0.042)
Move to "Multicultural Metropolitans"	0.047*
	(0.024)
Move to "Urbanites"	0.011
	(0.016)
Move to "Suburbanites"	-0.008
	(0.015)
Move to "Constrained City Dwellers"	-0.020
	(0.025)
Move to "Hard Pressed Living"	-0.020
	(0.018)
Spatial Data	NO
Reason For Moving	YES
Other Life Events	YES
Individual Level Controls	YES
Year Fixed-Effects	YES
Region Fixed-Effects	YES
Year-Region Fixed Effects	YES
N	19,518
R2	0.294
Adjusted R2	0.144
F Statistic	38.952*** (df = 172; 16093)

RQ6

When people move to areas with less employment opportunities, the probability of switching increases.

Conversely, when everyday amenities become more accessible, the probability of switching also increases.

Moving up the urban hierarchy also increases the probability of switching.

Dependent Variable: Probability of Changing Commute Mode since the previous survey wave
RQ6: How does the built environment influence these relationships?
* ONLY SIGNIFICANT COEFFICIENTS RETAINED

	change_commutey1
Move since previous wave	0.020
	(0.013)
less_empopps_15mins	0.043***
	(0.013)
more_markets_15mins	0.039**
	(0.016)
less_expensive	0.023*
	(0.013)
up_urban_hier	0.030***
	(0.011)
Reason For Moving	YES
Other Life Events	YES
Individual Level Controls	YES
Year Fixed Effects	YES
Region Fixed Effects	YES
Year-Region Fixed Effects	YES
N	19,518
R2	0.299
Adjusted R2	0.149
F Statistic	34.118*** (df = 201; 16064)

Conclusions and Policy Insights

Conclusions? Implications? Anything?

- Relocation is more likely in the year immediately following an event rather than a more delayed response **(RQ1).**
  - Events related to economic conditions appear to be the most important influence on commuting behaviours **(RQ2).**

- There is little evidence suggesting that individuals pre-emptively switch prior to a move, and similarly, little evidence suggesting they wait until some time after (**RQ3**).

- Why people move does not seem to matter as much, in terms of influencing switching, as much as self-selection theories might suggest (**RQ4**)**.**

Conclusions? Implications? Anything?

- When areas are conceptualised through socio-demographic frameworks, there is no evidence suggesting that particular environments influence the probability of switching commuting modes (**RQ5**).

- Accessibility seems to matter a great deal more. Reduced levels of employment opportunities increase the likelihood of switching, as does increased levels of local amenity accessibility, something which is conceptually aligned with movements up the urban hierarchy (**RQ6**).

So…What's going on here?

- **RQ1** speaks to the fact that life-events exhibit a distinct, and immediate effect, on the probability of re-location. Similarly, these events exhibit heterogenous, but intuitive, effects on this probability.

- **RQs 2-6** imply that the occurrence of life events is the most significant predictor of switching commute mode. Of particular importance, are those related to changes in economic circumstances.
  - Controlling for why people move or where they move to, does generally not change this overarching conclusion.

Next Steps

- **Spatial Data:** The use of this spatial data, in this kind of setting, is rather novel and complicated, so more robustness checks and “tinkering” needs to be done?
- **Creating parsimony:** The modelling structures at the moment are highly complicated and produce an obscene amount of coefficients. I am beginning to “separate the wood from the trees”, and putting a good story together.
- **Have I missed anything?** Anticipation Effects? Switch to what modes?

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Appendices: Coefficient Tables, Dataset Descriptors etc.

Appendix 1: Descriptive Statistics

Appendix 2: Spatial Data

- The formula I used to generate my relative entropy variable is described below:

$$\sum_{j=1}^{k \geq 2} \frac{P_{kj} \cdot \ln(P_{kj})}{\ln(K)}$$