

Rates of Working from Home and Commuter Travel Times: Analysis of the Irish Census 2022

Dr William Brazil

Transport Modeller/Adjunct Assistant Professor

National Transport Authority/Trinity College Dublin

Introduction

Given the increased levels of working from home and hybrid working since the COVID-19 pandemic, there is an increased requirement for transport planners and researchers to understand the dynamics of this behaviour to shape policy that reflects the changing nature of work. Within the field of transport planning there is a need to understand the distribution of the propensity to work from home across the population. Specifically there is a need to quantify this in terms of the socioeconomic and employment characteristics of the trip makers, the geographic location of roles more likely to be associated with either hybrid or full remote work. This paper presents the results of an exploratory analysis of working from home behaviours based upon data collected as part of 2022 Irish Census.

Data

The Place of Work, School, College or Childcare Anonymised Records (POWSCCAR) dataset is used for this analysis. The dataset contains a complete (or as near as possible) set of address points for residences and places of work and education for residents of Ireland, with additional socioeconomic data such as age, sex, usual commuting mode etc. Post processing the dataset used for this analysis contains just under 1.8 million records and may be considered to be population level data for trips to work in the Irish state. The primary variables of interest in this study is collected via Question 30 on the Census form, which asks "If you are at work, do you ever work from home?" and "If "Yes", how many days per week do you usually work from home?". It should be noted that while this provides the number of days a respondent works from home, the number of total days worked (at home and on-site) are not provided. In addition, data on usual mode of commuting is restricted to a single mode.

Methods

As the dependent variable is the form of count data, and as the data was observed to be overly dispersed, a negative binomial regression model was selected as the most appropriate analysis tool. While the POWSCCAR data has a large number of observations, the number of variables contained within the dataset is somewhat limited for both for the purposes of anonymization and due to the census not being a transport specific survey. This means that the number of independent variables available for analysis has been somewhat restricted so far to those variables that have been used in other studies and/or in the NTA's suite of transport models. The negative binomial model contained the following independent variables:

- Respondent sex
- Respondent age (in age bands)
- Residence location area type (as per CSO definition1)
- Work location area type (as per CSO definition)
- Main mode of transport for commuting
- Usual commuting travel time (in time buckets)
- Job type socioeconomic grouping
- Number of cars within the household
- Residence area type as defined by the Pobal Deprivation Index for Ireland 2022 (differs from CSO definitions)

Note: Area types are assigned to records based on the census small area in which the record owner resides.

Negative binomial regression models represent a fairly common approach to modelling over dispersed count data and described by:

$$wfh_d = e^{Int + C(d)_1 + \dots + C(d)_n}$$

Where:

wfh_d is the number of days worked from home

Int is the regression estimate for the Intercept; and

$C(d)_1, \dots, C(d)_n$ are regression estimates for coefficients for independent variable n taking the value d

Results

Due to the large number of parameters estimated by the model, the next section will provide an outline with respect to the independent categorical variables. Results are provided in terms of IRRs (the exponent of the estimated parameters) for ease of interpretation and should be understood with respect to the reference category (which takes the value 1), specifically the relative likelihood of working from home. Parameter estimations are considered to be more meaningful than descriptive means of subgroupings, as this approach controls for the respective independent variables included in the model.

Figure 1 shows the IRR values associated with the parameters estimated relating the respondent's sex with the likelihood of working from home (WfH). These estimates suggest a slight, but quite modest, increase in working from home is associated with being male.

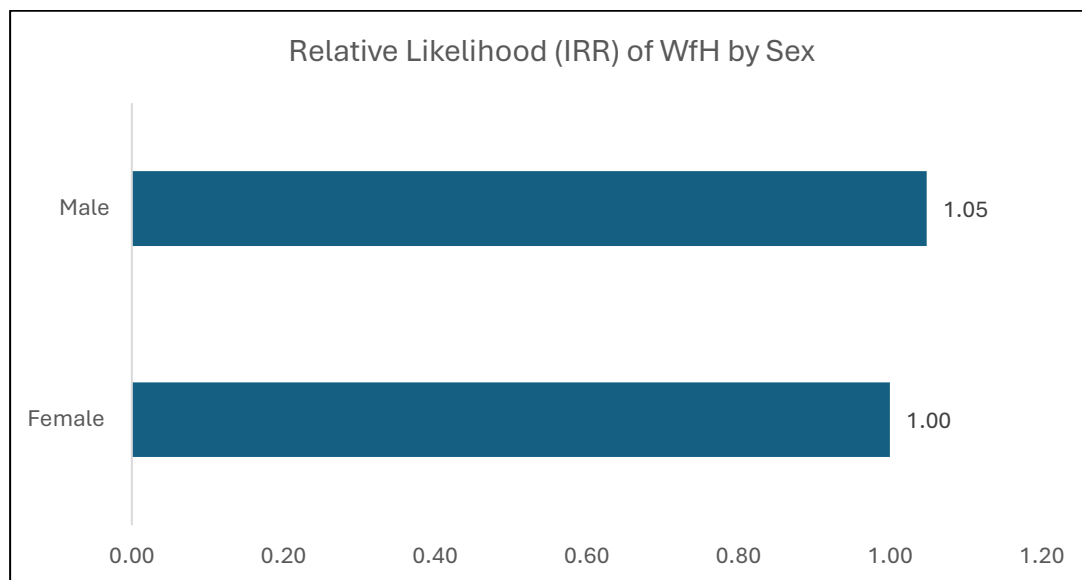


Figure 1

Figure 2 outlines the relative likelihood of working from home with respect to age group, with 30–34-year-olds being the reference grouping. The results show significantly lower levels of working from home for people under 25, and while there is variance between levels observed for other age groupings, these differences are less pronounced.

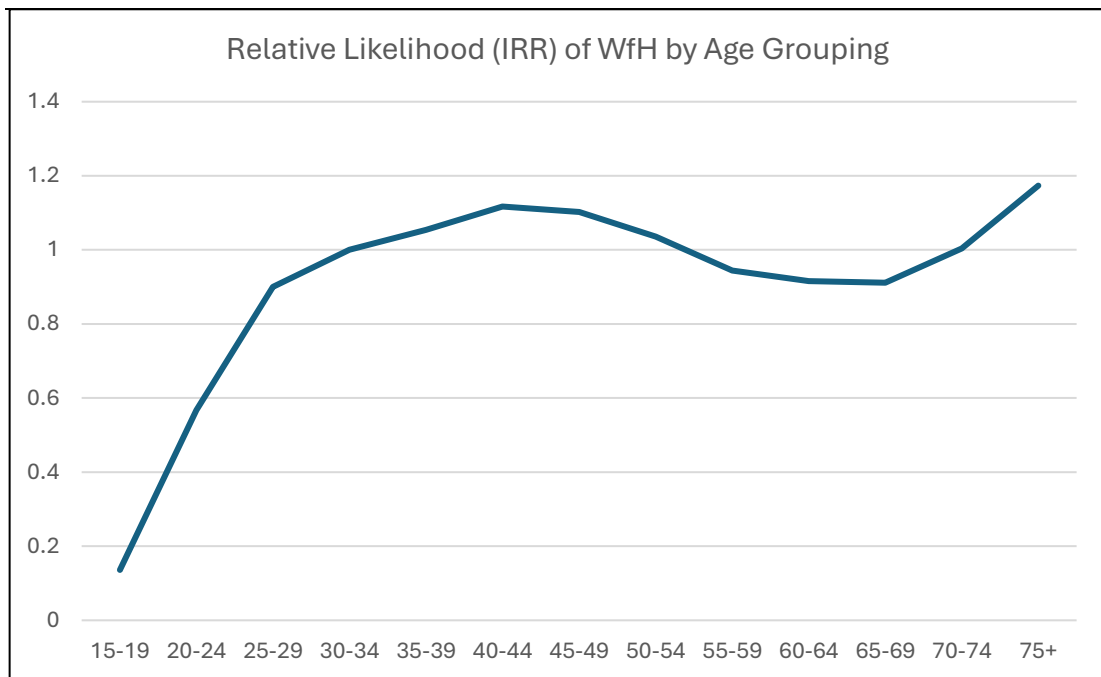


Figure 2

Figure 3 presents the relationship between the relative likelihood of working from home with the location of the respondents' workplaces and residences. "City" is the reference category and associated with the highest level of working from home for both residents and people who work in such areas. The estimated parameters clearly show that workplace location has a larger impact on the propensity to work from home than residential location, with City workers much more likely to work from home than any other group. This may be important to consider for city-based policy makers as it could suggest there is the potential to overestimate the extent of working from home based upon personal experiences.

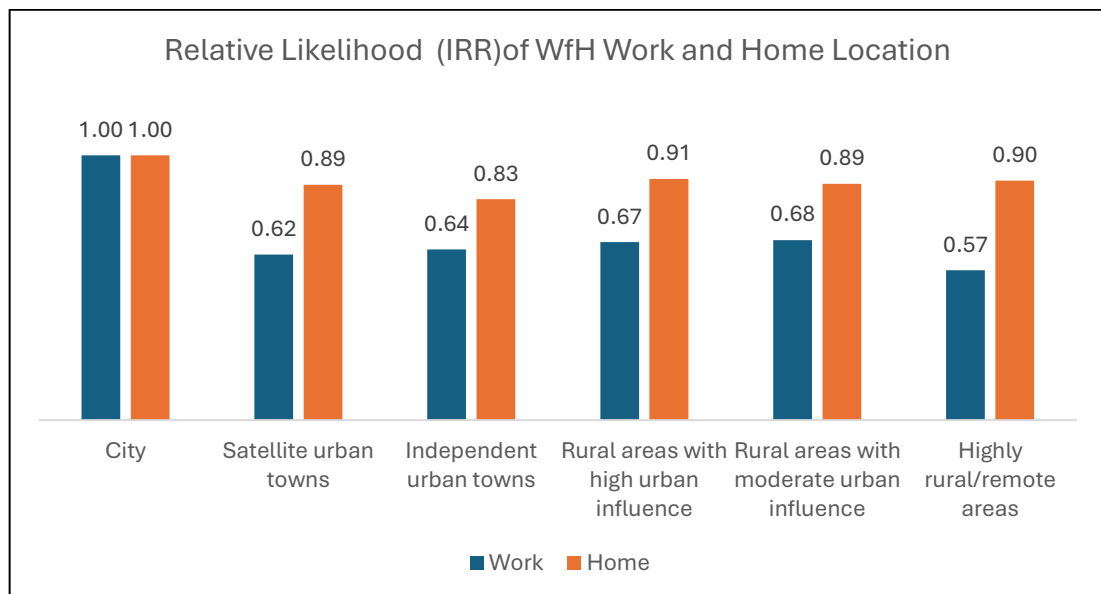


Figure 3

Figure 4 presents the relationship between the relative likelihood of working from home and the Deprivation Index area type definitions, with the percentage of census small areas assigned a given area type within a given category provided for context. The results presented demonstrate a clear relationship between the relative deprivation/affluence of an area with the

likelihood that its residents work from home, with areas of greater affluence being associated with higher levels of working from home.

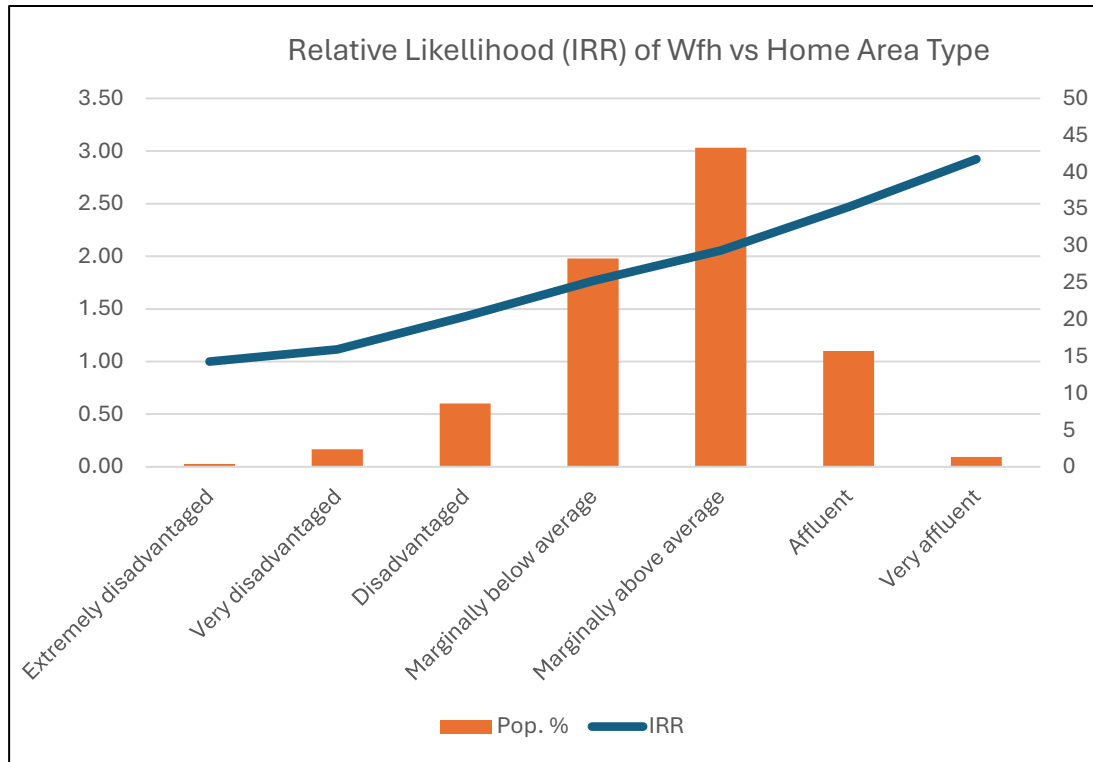


Figure 4

Figure 5 outlines the relationship between the estimated parameter IRRs for each commuting trip time and the likelihood of working from home. Note that only parameters up to 100 minutes are presented here, as the relationship beyond this point is much less clear, however the values graphed account for 98.5% of the commuting records within the POWSCCAR dataset. This figure shows a clear relationship, with higher average commuting times being strongly correlated with the propensity to work from home. It should be noted that this does not provide any information regarding the direction of this relationship, only that a correlation is present.

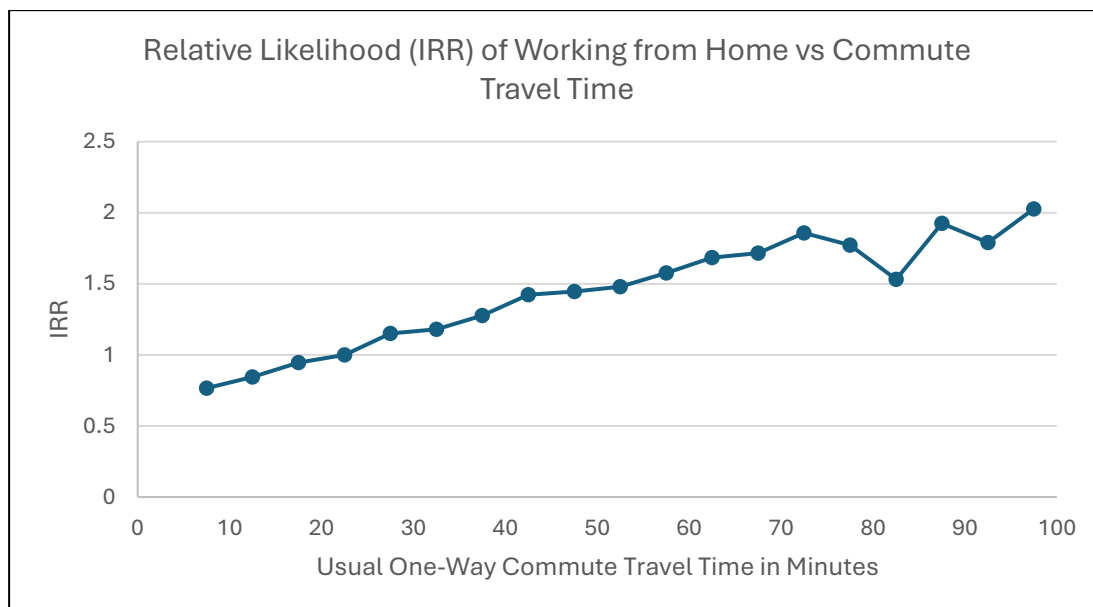


Figure 5

Figure 6 presents the relative likelihood of working from home as a function of usual mode of transport when commuting occurs, with On Foot (walking) being the reference category. These results indicate a much lower likelihood of working from home for those individuals who commute by lorry or van or as a passenger in a car, while higher levels of working from home are associated with individuals who travel by either light or heavy rail.

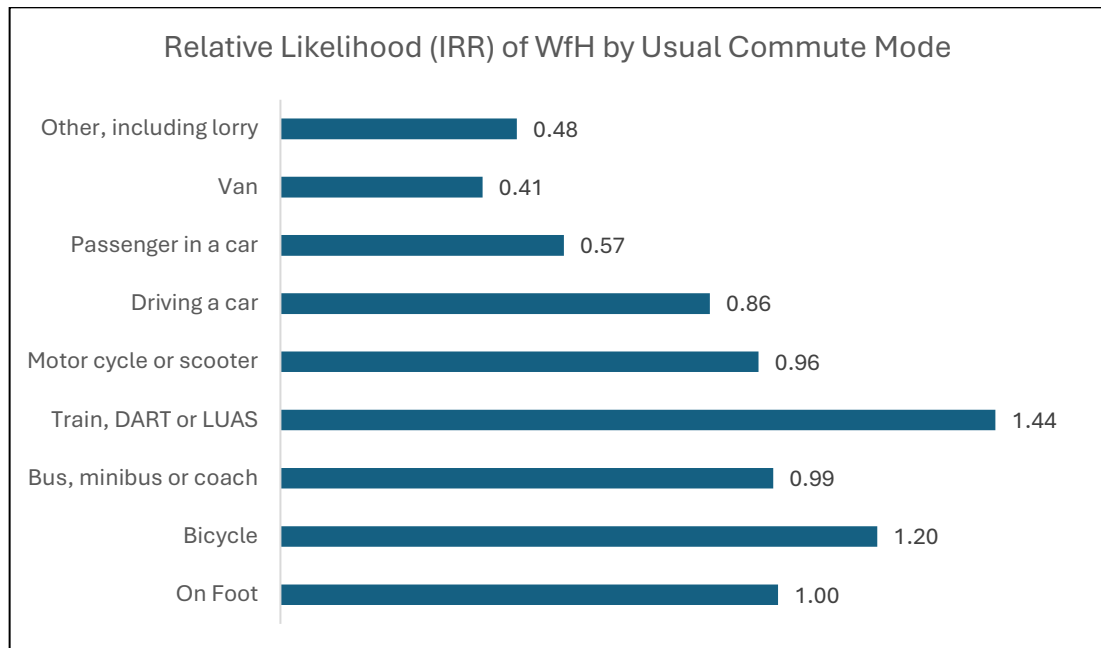


Figure 6

Figure 7 represents the respective IRR estimates for the job type category (as defined by the Irish CSO) the respondents are associated with. A high level of heterogeneity is observed across the respective categories with the highest level of working from home being observed for farmers (as may be expected as many will live on their farms). A clear pattern also emerges between occupations that may be broadly categorized as white collar (employers and managers, higher and lower professionals) and blue collar (unskilled, semi-skilled, manual skilled). While these definitions are quite broad, and it is highly likely that there are distinct differences between different sectors and industries, the results do emphasize that working from home is far from universal behaviour.

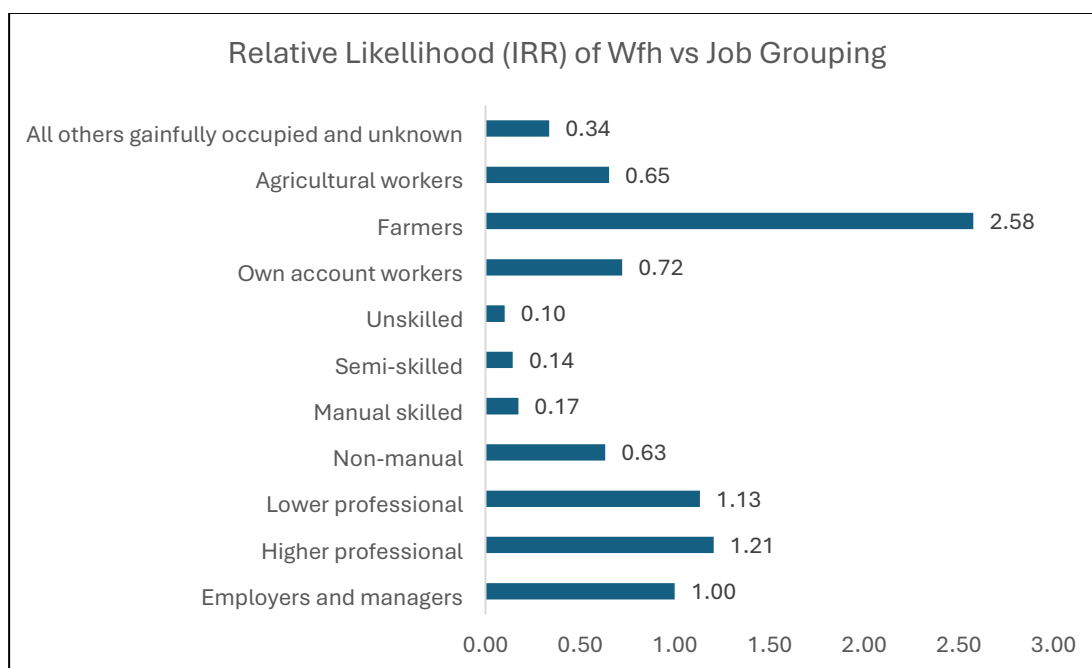


Figure 7

Conclusion

This paper presents the results of an exploratory study undertaken to understand of the differences in the likelihood of working from home within Ireland. The results of modelling undertaken via a negative binomial regression highlight the non-homogenous levels of working from home within the population, with considerable differences being observed with respect to individuals' job, residential location, relative affluence, workplace location, usual mode of transport and usual journey time when commuting. These results suggest that further work is required to understand the spatial and sociodemographic distribution of working from home to better plan around this behaviour and create transport models that are reflective of the relatively new working and commuting conditions. Furthermore, given the evolving nature of hybrid working in the post-COVID 19 world, it may be important to continue monitoring trends in working from home patterns to respond to changes across demographics and industries.

References

1 Central Statistics Office. Urban and Rural Area Types
<https://www.cso.ie/en/census/census2022/census2022smallareapopulationstatistics/>.
 Accessed 27.04.2026

Note: Results are based on analysis of strictly controlled Research Microdata Files provided by the Central Statistics Office (CSO). The CSO does not take any responsibility for the views expressed or the outputs generated from this research.