



Survey evidence on COVID-19 and its impact on rail commuting patterns in Great Britain

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ABSTRACT

The COVID-19 pandemic saw a large proportion of the working population in the United Kingdom working from home for an extended period of time. In September 2021, a substantial number continued to work from home on a regular basis, a stark contrast to the situation pre-pandemic. Prior to 2020, although there was a growing trend for increased home working, this was still not a widespread practice across UK businesses, with the majority of staff working full-time from the employment location.

The aim of this paper is to report the main changes in commuting and working patterns among commuters in Great Britain (GB) brought about by the COVID-19 pandemic with a special emphasis on the rail commuting market. The paper is informed by a panel survey of 3,892 GB respondents who commuted regularly to work prior to the pandemic in two waves. The first wave was conducted in Summer 2020 and focused on respondents' pre-pandemic travel patterns. The second wave was conducted in the Autumn 2021 and asked respondents about their current travel patterns. Although the focus was on rail travel, many of the conclusions of this paper are applicable to all modes of transport.

Although a majority of pre-pandemic commuters have returned to commuting at least once per week to their place of work, there is a significant share of pre-pandemic commuters who are still working from home full-time. The return to the workplace has been slower among individuals who used to commute by rail compared to other modes. This is partially explained by current workplace arrangements being strongly linked with an individual's occupation and mode of transport. Individuals in office-based occupations are much more likely to work from home compared to those who work in other occupations.

The pandemic has brought additional challenges to transport systems in addition to the reduced ridership level. Some of the emerging issues include managing post-pandemic peak travel volumes across a curtailed working week and the associated funding for peak capacity. Nonetheless, the research has highlighted some potential strategies to boost a faster recovery for travel demand.

1. Introduction

The COVID-19 pandemic accelerated a shift towards hybrid working that had been observed in analyses of the commuting transport market prior to 2020. Up until the start of the pandemic, a progressive increase in home working was observed, resulting in a reduction in commuting frequency albeit from a low base (Le Vine et al., 2016).

By the beginning of 2020, homeworking was not commonplace across businesses in Great Britain (GB). However, with the imposition of a full lockdown in March 2020, it was mandated for the majority of the working population in Great Britain to work from home where possible in an effort to curb the rise in infections.

The working assumption in the transport industry is that the pandemic has fundamentally changed how workers and businesses perceive homeworking, commuting and physical presence in the workplace. This paper originated from a research study conducted by the Strategic Consulting team at Jacobs UK Limited for the Passenger Demand Forecasting Council to understand how working from home patterns have changed and how it has affected commuting behaviours in Great Britain, with a special emphasis on the rail industry.

To this effect, a panel of 3,892 individuals living in Great Britain pre-pandemic was surveyed at two distinct points in time: Summer 2020 and Autumn 2021. The survey results reveal the differences in commuting patterns between the pre-pandemic reference period of February 2020

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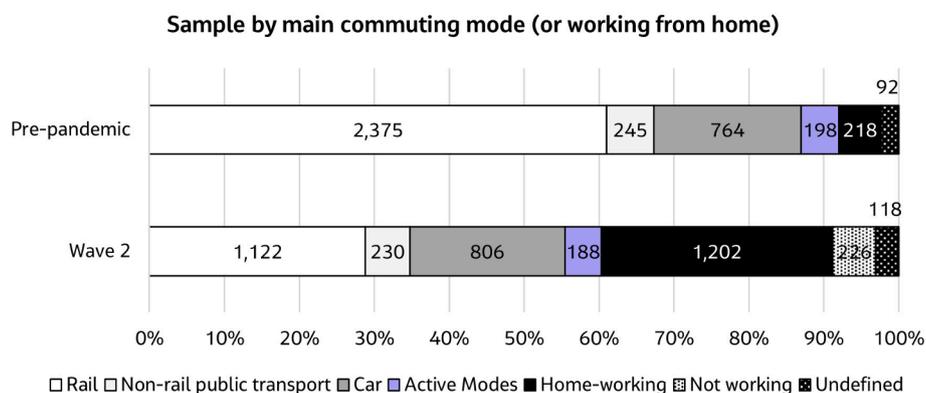


Fig. 1. Sample size by main commuting mode at the time of the survey wave – for a working individual, the main commuting mode is assigned based on the first mode they use from the following ordered list: rail, non-rail public transport, car and active modes.

and survey responses in September 2021.

It is recognised that the Wave 2 survey took place while the impact of the pandemic was ongoing. To update the evidence and establish a ‘post-pandemic’ data point, a third survey wave is planned for late 2022.

This paper is structured as follows:

- [Section 2](#) describes the panel survey sample
- [Section 3](#) focuses on the main determinants of the emerging commuting patterns
- [Section 4](#) explains the factors influencing the return to the workplace
- [Section 5](#) presents findings relevant to transport operations and ticketing strategy
- [Section 6](#) presents findings on reported intentions and expectations of employees and employer policies towards homeworking
- [Section 7](#) highlights the main challenges for transport systems in the near future and possible strategies to foster a faster recovery in commuting volumes
- [Section 8](#) provides key conclusions on findings from the survey.

1.1. Research on the impact of the pandemic on commuting patterns

There is currently some degree of uncertainty in the literature around the impacts of the pandemic on commuting behaviours.

In the academic literature, the evidence base is still quite small and very few are based on surveys. [Harrington and Hadjiconstantinou \(2022\)](#) concluded that, among previous car users, 0.4 % of respondents reported an intention of switching to rail and 5.5 % planned to work from home full-time once the pandemic was over. Among previous public transport users, the proportion of full-time home-workers was 10 %. However, this was based on an online survey which was not corrected to be representative of the UK population. [Currie et al \(2021\)](#) surveyed individuals in Melbourne and estimated a 20 %-reduction in public transport commuting. However, the impact of the pandemic in Australia was notably different from that in Europe and so the results may not be comparable across these two geographies.

Other governmental and professional studies have been conducted to evaluate the impact of the pandemic on working from home frequency, which has a direct impact on commuting trends. They all report an overall increase in working from home frequency compared to pre-pandemic behaviours though most emphasise some level of commuting would still be required as there is preference for hybrid working arrangements (for example, [ONS, 2021](#); [Institute of Directors, 2020](#); [CBI, 2020](#); [Jones and Wearn, 2021](#); [Virgin Media O2 Business et al, 2021](#); [Thomas, 2021](#)).

This paper aims to contribute to the pool of evidence on the impact of the pandemic on commuting behaviours – a key topic for transport practitioners.

2. Description of panel survey sample

The panel survey asked individuals about their working and commuting patterns at two points in time.

The first survey wave was conducted between 21st July and 27th August 2020 online. We obtained 6,024 valid responses which included pre-pandemic users of rail, car and other public modes of transport (see [Fig. 1](#) for breakdown). As the research question was focused on the impact in the rail industry, we purposefully oversampled pre-pandemic rail commuters. The objective of the first survey wave was to establish a pre-pandemic baseline. Respondents were asked about their behaviour during January and February 2020.

At the time of the survey, hospitality venues had started to reopen in England, no more than two households could mix indoors and no more than six people outdoors if they were from more than two households ([UK Health Security Agency, 2020](#)). Bars, nightclubs, spas and swimming pools were still closed ([UK Health Security Agency, 2020](#)). Face masks were compulsory on public transport and advised in any other indoor venues ([UK Health Security Agency, 2020](#)). Similar guidance and restrictions were in place in Scotland and Wales at the time ([Scottish Government – Deputy First Minister, 2020](#); [Drakeford, 2020](#)).

More specifically in the transport sector, some measures were implemented to curb the rise of infections and they had a direct impact on transport patronage. According to [Vickerman \(2021\)](#), train operating companies and urban transit operators were required to introduce social distancing measures on board trains, trams and buses. In some cases, one-way systems were implemented too and rear-door boarding on London buses to avoid contact with the driver. This led to a reduction in on-board capacity of around 85 % ([Vickerman, 2021](#)). Nonetheless, in some contexts, service frequencies were kept at pre-pandemic levels to maintain an adequate level of transport system capacity.

The second wave targeted the original panel of respondents in Wave 1. Fieldwork took place between 15th October and 8th November 2021. Individuals were asked about their travel patterns during September 2021. A total of 3,892 valid responses were received which equates to an average attrition level of 35 %.¹

At the time of the second survey wave, there was a limited number of restrictions in England ([HM Government, 2020](#)). In Scotland, all venues were open but face masks were mandatory in indoor settings and working from home was advised ([Sturgeon, 2021](#)). Similar rules were in place in Wales but face masks were not required in a hospitality setting ([Welsh Parliament, 2022](#)). The UK Government had set out a ‘Plan B’ should it be required to roll out additional restrictions ([HM Government,](#)

¹ This means that 35% of respondents to the first wave survey did not respond to the second wave survey and therefore they were dropped from the Wave 2 analysis.

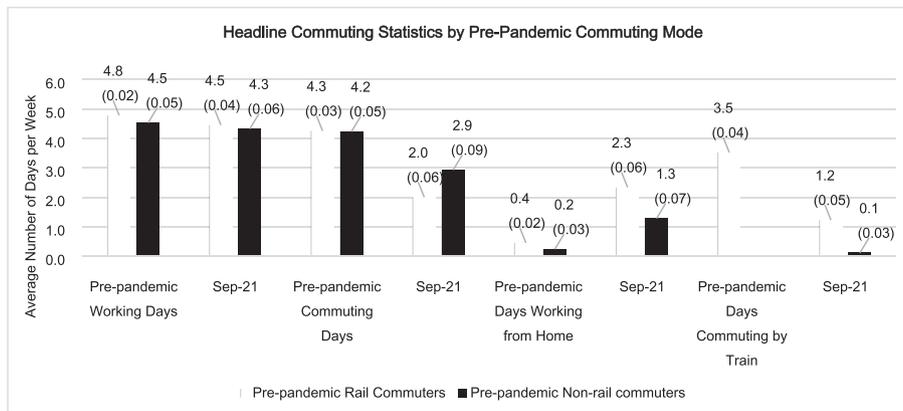


Fig. 2. Average weekly frequency of working, commuting, working from home and commuting by train by pre-pandemic commuting mode (standard errors in brackets).

2020). This plan was not implemented until after the survey collection was completed (HM Government, 2020). The high proportion of employees working from home meant that the panel in Wave 2 had a larger proportion of full-time home-workers compared to prior to the pandemic (Fig. 1).

Sample attrition was found to be non-random across age groups and income levels. Young adults aged 18 to 24 years old had an attrition rate of 69 %. This is much higher than the sample average and, as a consequence, the number of respondents in this age group was reduced to only 33 individuals. On the other hand, low attrition rates were observed among the older age groups – under 25 % among individuals over 55 years old.

In addition, elevated attrition rates were found in low-income households. Households earning less than £5,000 per year had an attrition rate of 50 % while households earning between £5,000 and £10,000 per year had an attrition rate of 40 %. Attrition rates were around the sample average for the remaining income bands and across commuting modes, occupations, sector of employment, gender, region and working status.

The sample was weighted to match the population proportions reported for rail and non-rail commuters separately in the National Transport Survey between 2015 and 2017. The factors used for weighting were age, occupation, sector of employment, region, income, gender, type of settlement (urban/rural) and business traveller category. As a result, the survey weights corrected the non-random attrition emerging in the second wave of the survey.

Due to the oversampling of pre-pandemic rail commuters, all results are reported separately for the two subgroups: pre-pandemic rail and pre-pandemic non-rail commuters. As such, throughout the analysis, the terms ‘Pre-pandemic rail commuters’ and ‘Pre-pandemic non-rail

commuters’ are used to segment the responses. This does not mean the stated results refer to pre-pandemic behaviours. Instead, it means that they refer to the subgroup of commuters who commuted by rail (or by another mode, respectively) before the pandemic. As a result, for example, the group of pre-pandemic rail commuters in September 2021 will include individuals commuting by rail, by another mode or not commuting at all.

3. Main determinants of emerging commuting patterns

Commuting volumes fell drastically at the beginning of the COVID-19 pandemic and have yet to recover to pre-pandemic levels in most city transport markets. Variations in commuting volumes can be explained by a variety of factors including changes in regularity at which employees work from home, changes in employment status (entry and exit from the workforce) and changes in average weekly hours worked.

3.1. Observed changes in commuting patterns

In September 2021 (wave 2), the frequency of commuting amongst pre-pandemic rail commuters declined from a pre-pandemic average of 4.3 days per week to 2.0 days per week (Fig. 2). The increase in frequency of homeworking was the most important factor driving this change.

In absolute terms (days per week), rail commuters saw a larger increase in homeworking compared to non-rail commuters. Prior to the pandemic, non-rail commuters worked on average 0.2 days per week from home increasing to 1.3 days on average in September 2021. In contrast, rail commuters’ homeworking frequency increased from 0.4 days per week pre-pandemic to 2.3 days per week at the time of the

Workplace Arrangements in September 2021 by Main Commuting Mode before the pandemic

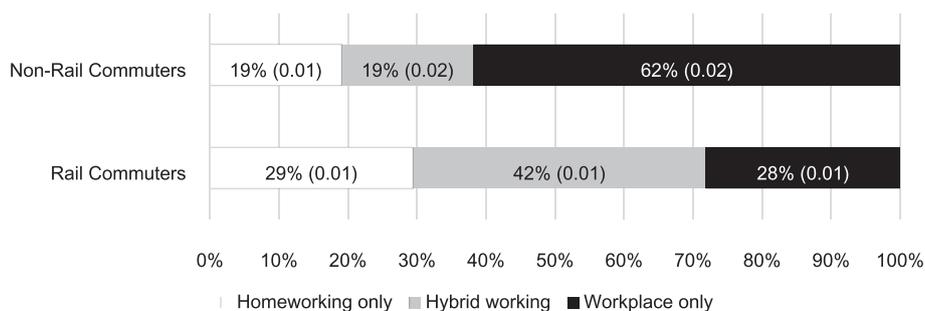


Fig. 3. Proportion of respondents by workplace arrangement and pre-pandemic commuting mode at the time of the second survey (standard errors in brackets).

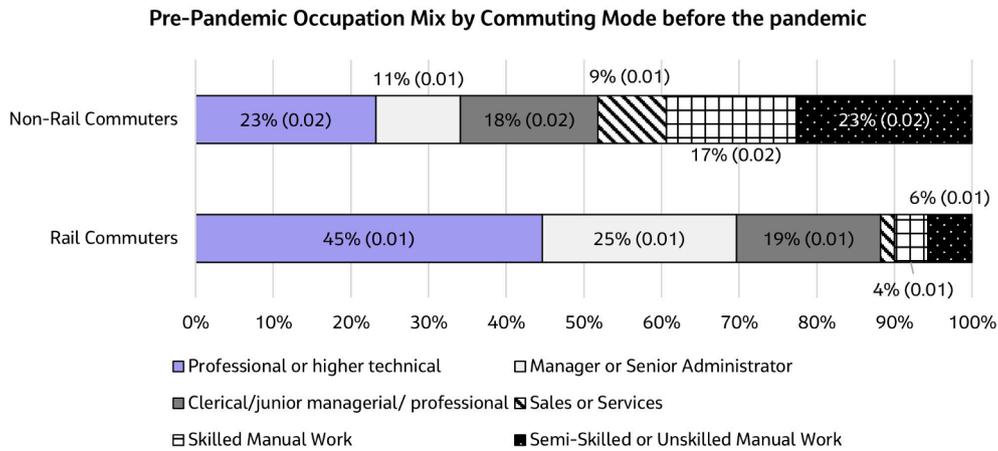


Fig. 4. Pre-pandemic mix of occupations among rail and non-rail commuters (standard errors in brackets).

Wave 2 survey. These results point to, on average, non-rail commuters travelling to work a full extra day per week compared to rail commuters.

3.2. Influence of changes in workforce during the pandemic on commuter volume

Across the sample, 4 % of pre-pandemic rail commuters (standard error s.e. 0.006) stopped working between the two survey waves. More than half of those respondents (52 % s.e. 0.068) have become economically inactive which includes retirement and those not actively seeking employment. Based on the age distribution of these individuals - a large proportion was in the top age group -, retirement looks to be an important contributor to the movement from employment to inactivity. Yet, around 41 % (s.e. 0.067) of those no longer working have become unemployed between the two surveys. Both these changes in the respondents' economic status translate into fewer commuting trips.

In addition, 17 % (s.e. 0.018) of pre-pandemic rail commuters have changed jobs over the same period of time. But changing job does not necessarily result in a change in commuting patterns.

3.3. Determinants of working from home frequency

In September 2021, only 19 % of pre-pandemic non-rail commuters worked from home full-time compared to 29 % of rail commuters (Fig. 3). Furthermore, only 19 % of pre-pandemic non-rail commuters were following a hybrid working pattern dividing their time between their homes and their places of work. This share was twice as large among pre-pandemic rail commuters. As a result, at the time of the second wave, more than half of pre-pandemic non-rail commuters were

travelling to work every day whereas only just over a quarter of pre-pandemic rail commuters were doing so.

This difference between the working arrangements across the two commuter subgroups is explained by one main factor. On average, rail commuters have a different combination of occupations compared to non-rail commuters. Pre-pandemic, almost 90 % of rail commuters had either a professional, technical, managerial, administrative or clerical occupation (Fig. 4) – occupations which are normally office-based. Manual work and sales and services (including for example retail and hospitality) made up just over 10 % of rail commuters. Conversely, professional, technical, managerial, administrative or clerical occupations only constituted slightly more than 50 % of non-rail commuters.

Occupations vary in the degree to which it is feasible for the role to be performed from home. Office-based occupations are more conducive to homeworking compared to manual, sales or services occupations. This disparity results in a stark variation in reported working from home frequency across occupations.

As a result, on average, 77 % (s.e. 0.013) of pre-pandemic rail commuters have a job that can be done from home compared with just 43 % (s.e. 0.021) among pre-pandemic non-rail commuters.

Respondents working in Professional, Managerial, Administrative and Clerical occupations worked on average 2.6 days per week from home at the time of the second survey (Fig. 5). This represented an increase from an average of around 0.5 days a week pre-pandemic. In contrast, occupations less likely to be associated with an office working environment, such as those involving Sales, Services and Manual Work, had an average working-from-home frequency of only 0.2 days a week – similar to the pre-pandemic average.

This difference in the ability of individuals in certain occupations to

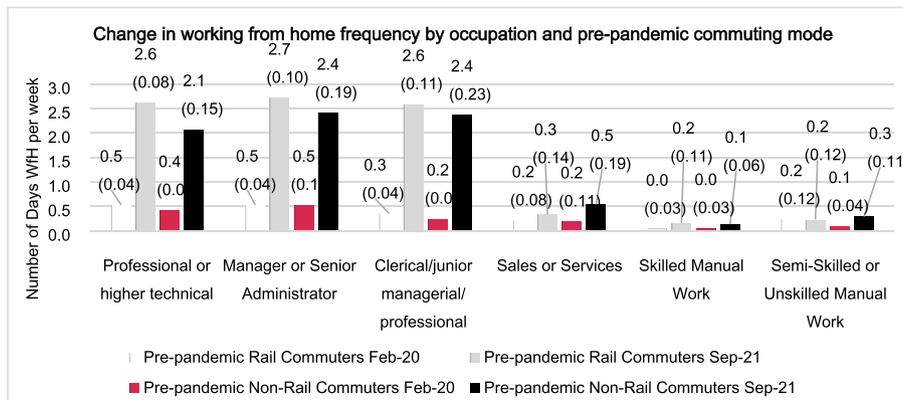


Fig. 5. Working from home frequency by pre-pandemic mode and occupation (standard errors in brackets).

Table 1
Share of employed workers by workplace arrangement (2nd wave), by occupation, sector or household income band (standard errors in brackets).

| | Share of employed respondents (pre-pandemic rail commuters only) | | |
|---|--|----------------|------------------|
| | Workplace only | Hybrid working | Homeworking only |
| Occupation | | | |
| Professional or higher technical | 22 % (0.02) | 43 % (0.02) | 35 % (0.02) |
| Manager or Senior Administrator | 18 % (0.02) | 53 % (0.02) | 29 % (0.02) |
| Clerical/junior managerial/professional | 28 % (0.03) | 38 % (0.03) | 34 % (0.03) |
| Sales or Services | 55 % (0.08) | 40 % (0.08) | 5 % (0.03) |
| Skilled Manual Work | 97 % (0.02) | 1 % (0.01) | 2 % (0.01) |
| Sector | | | |
| Primary & Energy | 15 % (0.07) | 32 % (0.10) | 54 % (0.12) |
| Construction | 38 % (0.07) | 44 % (0.07) | 17 % (0.06) |
| Manufacturing | 43 % (0.08) | 40 % (0.08) | 17 % (0.06) |
| Wholesale & Retail | 41 % (0.06) | 40 % (0.06) | 19 % (0.04) |
| Information & Communication | 7 % (0.02) | 46 % (0.04) | 47 % (0.04) |
| Financial services | 16 % (0.03) | 46 % (0.04) | 38 % (0.04) |
| Business services | 11 % (0.03) | 58 % (0.04) | 31 % (0.04) |
| Education & Research | 33 % (0.04) | 46 % (0.04) | 21 % (0.03) |
| Health & Social care | 49 % (0.06) | 27 % (0.05) | 25 % (0.05) |
| Culture | 38 % (0.07) | 48 % (0.07) | 15 % (0.05) |
| Accommodation & Food | 72 % (0.13) | 19 % (0.11) | 9 % (0.08) |
| Transport | 69 % (0.06) | 21 % (0.05) | 9 % (0.03) |
| Household Income Band | | | |
| under £5,000 per year | 82 % (0.11) | 11 % (0.08) | 7 % (0.07) |
| £5,000 to £9,999 per year | 53 % (0.14) | 34 % (0.15) | 13 % (0.06) |
| £10,000 to £14,999 per year | 51 % (0.12) | 37 % (0.12) | 12 % (0.10) |
| £15,000 to £19,999 per year | 62 % (0.13) | 32 % (0.12) | 6 % (0.03) |
| £20,000 to £24,999 per year | 56 % (0.08) | 32 % (0.08) | 11 % (0.04) |
| £25,000 to £29,999 per year | 48 % (0.07) | 21 % (0.05) | 31 % (0.06) |
| £30,000 to £34,999 per year | 36 % (0.06) | 35 % (0.06) | 29 % (0.06) |
| £35,000 to £39,999 per year | 36 % (0.08) | 40 % (0.07) | 24 % (0.05) |
| £40,000 to £44,999 per year | 38 % (0.07) | 32 % (0.05) | 31 % (0.06) |
| £45,000 to £49,999 per year | 39 % (0.06) | 30 % (0.05) | 31 % (0.05) |
| £50,000 to £59,999 per year | 27 % (0.04) | 40 % (0.04) | 32 % (0.04) |
| £60,000 to £69,999 per year | 26 % (0.05) | 39 % (0.05) | 35 % (0.05) |
| £70,000 to £99,999 per year | 21 % (0.03) | 47 % (0.03) | 32 % (0.03) |
| £100,000 to £149,999 per year | 13 % (0.02) | 59 % (0.03) | 28 % (0.03) |
| £150,000 and over | 16 % (0.04) | 50 % (0.05) | 35 % (0.05) |

work from home combined with the occupation mix for certain modes are a determining factor in the slower recovery in transport demand recovery seen in rail compared to other public transport modes.

Only a small difference in working from home frequency was observed when we compared rail and non-rail commuters working in the same occupation (Fig. 5) and the difference is within the statistical

interval of the estimation.

The ability to work from home also provides some explanation for the resilience in transport demand across some modes during the pandemic. Key workers such as hospital staff and police officers continued to commute to work during lockdown and formed a core of demand. According to our survey, before the pandemic 28 % (s.e. 0.014) of rail commuters were key workers. Among non-rail commuters, they represented 49 % (s.e. 0.021). Consequently, rail commuter travel demand was subject to a higher reduction as it was more reliant on individuals who were not required to be physically present at the workplace.

A similar but weaker correlation was identified between working from home frequency and both sector of employment and household income. On average, respondents in sectors more likely to require a physical presence at their place of work, like Transport and Accommodation & Food, reported substantially lower average working from home frequencies than respondents in sectors such as Financial Services, Business Services and Information & Communication. In addition, the survey responses point to working from home frequency increasing with income level. This reflects the fact that higher paid positions are more likely to be office-based even within sectors such as Construction where a physical presence is usually required.

3.4. Variation in hybrid working patterns across socioeconomic groups and commuting time

The share of respondents with hybrid working patterns also varied considerably by occupation. Fewer than 30 % of pre-pandemic rail commuters with office-oriented occupations were commuting to their places of work every day in September 2021 (Table 1). Instead, individuals with office-oriented occupations were more likely to either be working from home full-time (29 % to 35 %) or dividing their time between the workplace and home (hybrid working) accounting for between 38 % and 53 % of respondents in the sub-group. This compares with 55 % of individuals with Sales and Services occupations working full-time at the workplace and over 90 % among those with a manual occupation.

In Table 1, the findings for the Primary & Energy sector are unexpected as a large proportion of respondents reported working from home full-time. This was potentially driven by an unanticipated oversampling of individuals with an office-like job who worked for businesses in this sector.

Pre-pandemic rail commuters with lower incomes were observed to be more likely to commute to work every day (Table 1). As income levels rise, the proportion of individuals working from home full-time or in a

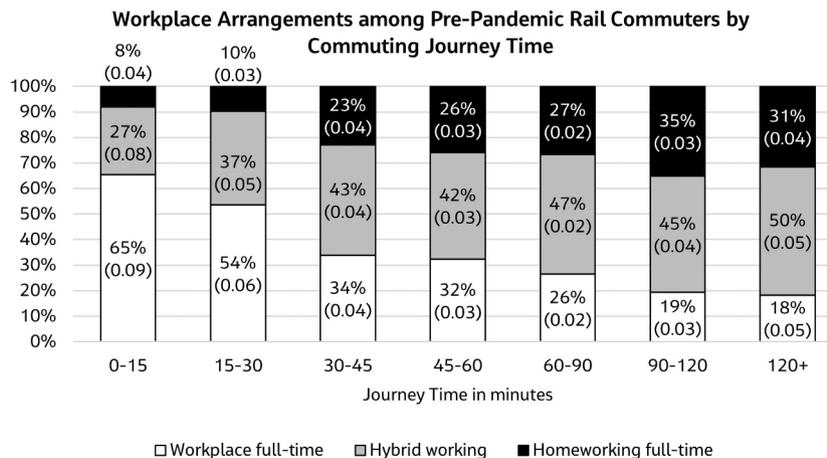


Fig. 6. Workplace arrangements at the time of the second wave by commuting time to work in minutes among pre-pandemic rail commuters (standard errors in brackets).

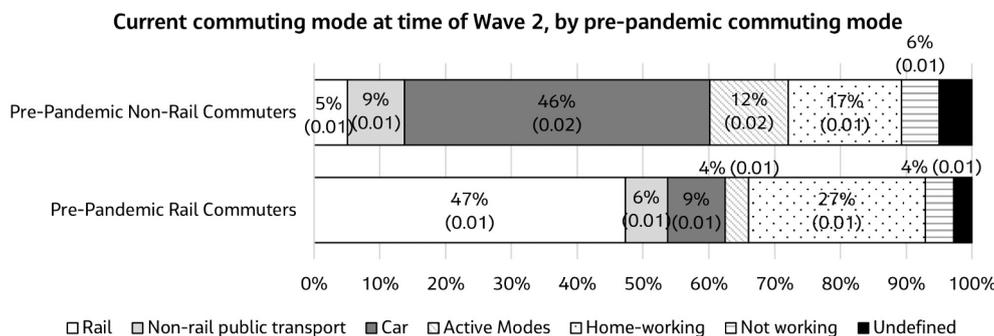


Fig. 7. Change in commuting mode between survey waves by pre-pandemic commuting mode (standard errors in brackets).

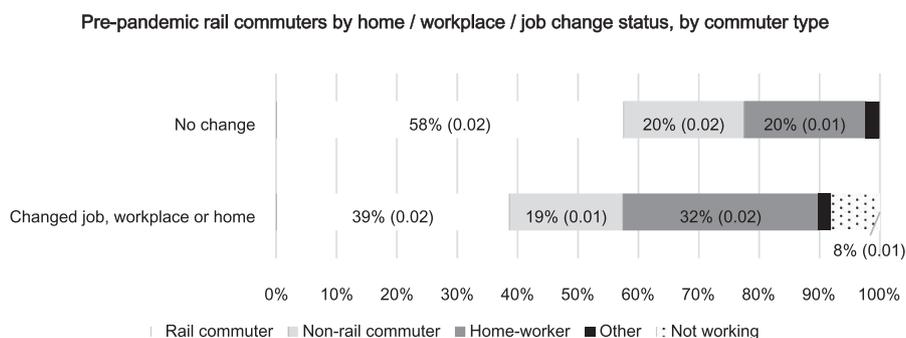


Fig. 8. Commuting status at the time of the second wave by whether there was a change in job, workplace or home in the same period of time among pre-pandemic rail commuters (standard errors in brackets).

hybrid arrangement increases also. Among respondents in the higher income bands, hybrid working was the most common arrangement.

Despite working from home arrangements and frequency being heavily dictated by the occupation / employment / income of each respondent, travel time to work is also a significant determinant of homeworking. Pre-pandemic rail commuters with shorter journeys were more likely to report travelling to the workplace every day in Wave 2 compared to individuals with longer commuting journeys (Fig. 6).

On average, over 50 % of rail commuters with journeys under 30 min were travelling to work every day. This compares with only 25 % to 35 % of those with journeys between 30 and 90 min and less than 20 % of those with commutes greater than 90 min travelling every day. This indicates a positive relationship between the frequency of homeworking and commuting journey time.

3.5. Mode shift

Several trends were observed in mode shift towards and away from rail between the first and second waves. Both these changes have a direct effect on rail commuting volumes.

Of the pre-pandemic rail commuters identified in the sample, only 47 % were still commuting by rail at the time of the second wave (Fig. 7). Only 27 % of pre-pandemic rail commuters were working from home full-time and 19 % were using another mode to commute to work – car was the dominant substitute mode.

Among pre-pandemic non-rail commuters, a smaller share (17 %) was working from home full-time in September 2021. But 5 % had started commuting by rail to work. These were individuals who shifted from another mode of travel to rail between the two waves of the survey.

These two trends result in a pattern of mode shift in the period of 19 months between the two waves that has not been seen before. This same volume of individuals moving to and away from rail for commuting purposes is generally observed over a period of time of no less than six

years according to a brief analysis conducted on data from the National Transport Survey between 2002 and 2017 in England and Wales. Ergo, the COVID-19 pandemic has led to unprecedented shifts in travelling behaviour in a short period of time.

One observation may help to explain recent changes in commuting mode share. It was observed that 53 % (s.e. 0.033) of those shifting away from rail have also changed either job, workplace or home. Among this group, the proportion of those travelling by rail was lower than among those without changes in job, workplace or home (58 % versus 39 % - Fig. 8). This suggests that the observed change in mode is partially driven by changes in the economic, location or lifestyle characteristics of the respondents.

This result points to two plausible explanations. Firstly, individuals may be changing jobs or home so that they can work from home full-time (i.e. working from home full-time is the objective). Secondly, individuals may be relocating home location because they are permitted by their employer to work from home full-time (i.e. working from home is the cause).

The survey cannot unpick what the determinant factor in the change was - the job or the change in home - however there is some indirect evidence from the survey to support either of these explanations. Around 35 % (s.e. 0.038) of pre-pandemic rail commuters who changed home location said they now face longer commuting travel times and 42 % (s.e. 0.040) said they have higher commuting costs. Both of these observations suggest a movement away from their places of work and potentially favourable to homeworking.

On the other hand, 29 % (s.e. 0.038) of pre-pandemic rail commuters who moved home location reported a reduction in commuting time and 22 % (s.e. 0.036) reported a reduction in commuting cost – responses associated with individuals moving closer to their places of work. However, it is worth noting that this may be the result of market forces in the housing market trying to fill the homes left empty due to the effect identified in the previous paragraph.

Current commuters as a percentage of pre-pandemic levels, by occupation tier group, Great Britain

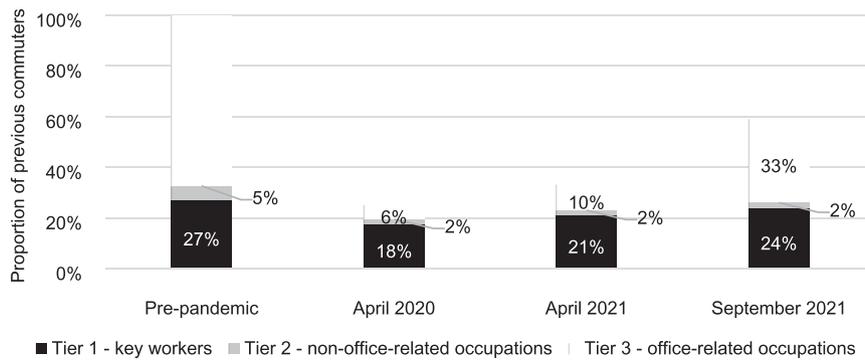


Fig. 9. Current rail commuters as a proportion of pre-pandemic rail commuters: pre-pandemic, April 2020, April 2021 and September 2021 by occupation tier.

4. Factors influencing the recovery of commuting volumes

Once the worst phase of the pandemic was over, transport companies started devising strategies to attract passengers back to their networks. Up to that point, the volume of travel on most transport systems was sustained by key workers commuting to and from work and other essential journeys. As a result, the volume of trips during that period was substantially below the pre-pandemic trend.

4.1. Profile of employees returning to the workplace

The second survey wave indicated that among pre-pandemic rail commuters around 60 % (s.e. 0.013) of respondents were commuting on a regular basis at the time. Among pre-pandemic non-rail commuters, this percentage was around 67 % (s.e. 0.019). Hence, at face value, other modes were doing slightly better than rail at attracting back former commuters.

Among pre-pandemic rail commuters that had not returned to a regular commute, 43 % reported they were working from home full-time permanently, 42 % were working from home full-time as a result of their individual decisions and only 6 % were mandated to do so by their employers. Therefore, there remained a substantial pool of respondents who had yet to return to commuting and had the potential to do so.

Respondents who were travelling regularly to work were asked about what reasons had prompted them to return to the workplace. Among current rail commuters, 46 % (s.e. 0.021) of respondents reported that

their employer asked them to return to the workplace while 32 % (s.e. 0.019) said their employer allowed them to return – for example by re-opening places of work or removing/alleviating restrictions on workplace attendance – was a factor. Moreover, 29 % of respondents (s.e. 0.018) reported they preferred returning to their workplace and 26 % (s.e. 0.017) mentioned the fact of being vaccinated. Only 15 % (s.e. 0.016) indicated that the Government declaring the return to the workplace to be safe was a factor in their decision. It should be noted that the question allowed for the selection of multiple answers and hence the proportions do not add up to 100 %.

During the first lockdown of April 2020, travel was very much reduced to predominantly key workers (Fig. 9). Key workers were defined as individuals who were travelling to their places of work during the lockdown in Spring 2020. As restrictions were eased, individuals with office-type occupations who were not key workers started returning to their places of work. They made up the majority of the returning rail commuters in September 2021. Individuals with non-office related occupations represented a small share across all time periods. This is because rail is a less popular commuting option for these occupations, as noted in section 3.2.

Despite rail commuting recovery levels being lower than other modes, the pace of recovery since Spring 2021 has been faster (Fig. 10). The proportion of returned passengers among pre-pandemic rail commuters increased from 28 % in April 2021 to 57 % in September 2021.

The observed difference between rail and non-rail modes appears to be explained well by the mix of socioeconomic characteristics among

Current commuters as a percentage of pre-pandemic levels, by commuter type, Great Britain

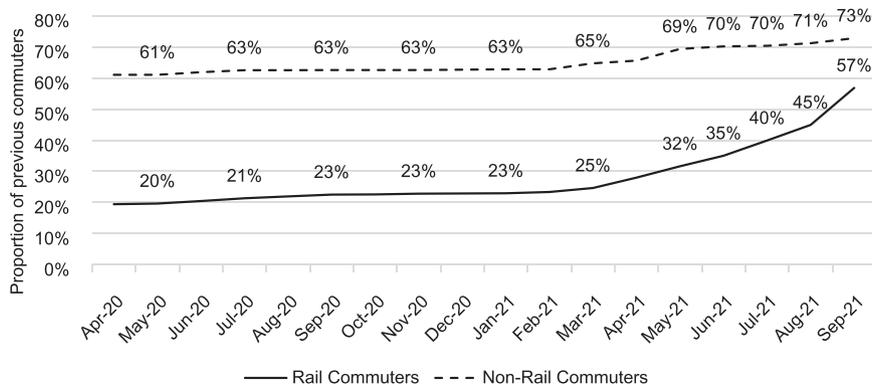


Fig. 10. Evolution of pre-pandemic commuters returning to a regular commute.

Conditions to Return to the Workplace among Pre-Pandemic Rail Commuters not currently commuting (Wave 2)

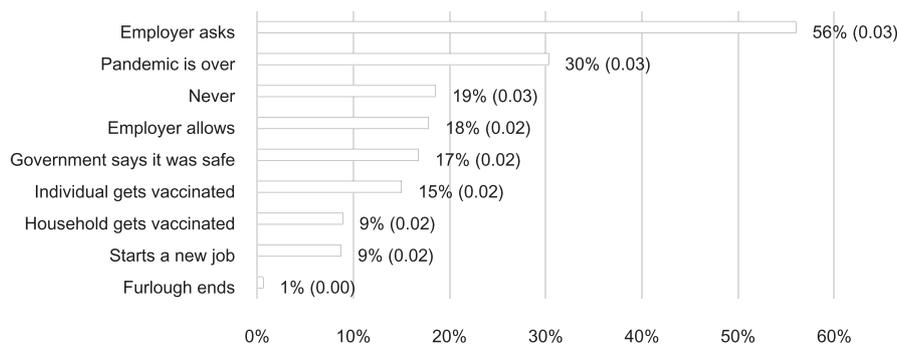


Fig. 11. Conditions for returning to work as reported by pre-pandemic rail commuters who had not returned to a regular commute by the time of the second survey wave (standard errors in brackets).

Estimated Commuting Volume at the time of the second wave

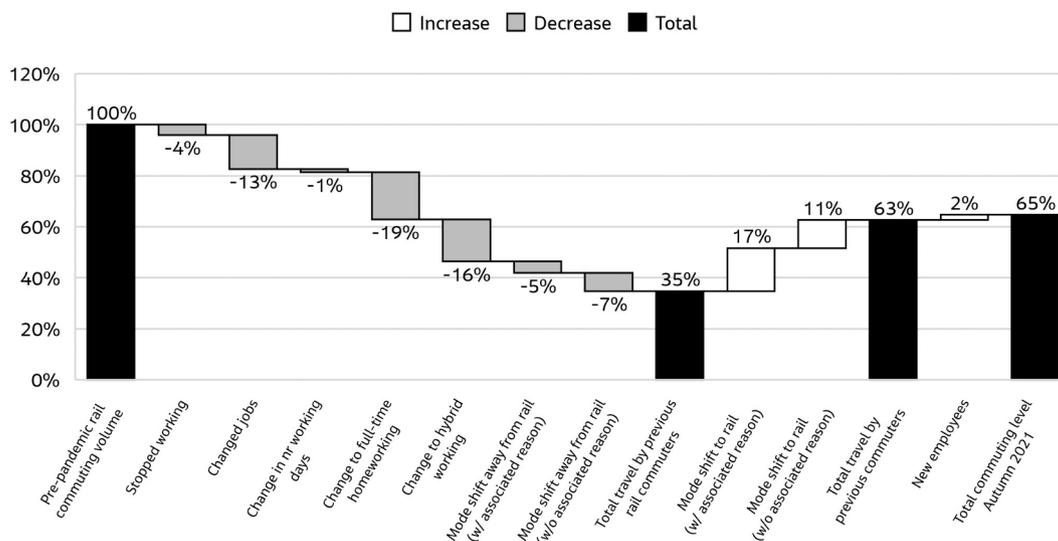


Fig. 12. Estimated level of rail commuting at the time of the second wave and respective components.

each commuter group. Office-oriented occupations which make up a greater share of rail commuters were more likely to be able to work from home and have returned more strongly since Spring 2021 with the change in Government work from home guidance. Conversely, respondents in other occupations were less able to work from home during the pandemic and therefore continued travelling to work during the months of lockdown. The trend observed for rail commuters tracks well with the trend identified among individuals with office-oriented occupations.

4.2. Continued return to the workplace

Individuals in the sample who were not travelling regularly to work were asked which conditions would need to be met for them to return to their commute (Fig. 11). The most common condition was for the employer to ask employees to return – reported by 56 % of pre-pandemic rail commuters not commuting at the time of the second wave.

But around 19 % of pre-pandemic rail commuters who were not commuting in September 2021 said they did not expect to return to a regular commuting pattern in the future (defined as going to the workplace at least weekly). This group reflects the shift into full-time

working from home that is identified in this paper.

4.3. Overall impact on rail commuter travel volume

The second wave survey results imply rail commuting levels were around 65 % (±14 percentage points at the 95 % confidence interval) of pre-pandemic levels (Fig. 12) at the time of survey fieldwork.

The current level of rail commuter travel volume is influenced by multiple factors. The most important factor is the shift towards full-time homeworking and hybrid working patterns among previous rail commuters. The combination of reduced commuting frequency, exit of individuals from the labour force, switch to full-time home working and mode shift away to rail (particularly to car) led rail commuting volume to drop to 35 % (±3p.p.) of pre-pandemic levels in September 2021 among those previously commuting by rail.

The reduction in travel among pre-pandemic rail commuters has been partially mitigated by a mode shift into rail among individuals who previously commuted using other modes of transport. These individuals represented around 28 % (±13p.p.) of additional rail commuting demand – the majority of which shifted to rail due to a home move, job move or workplace relocation.

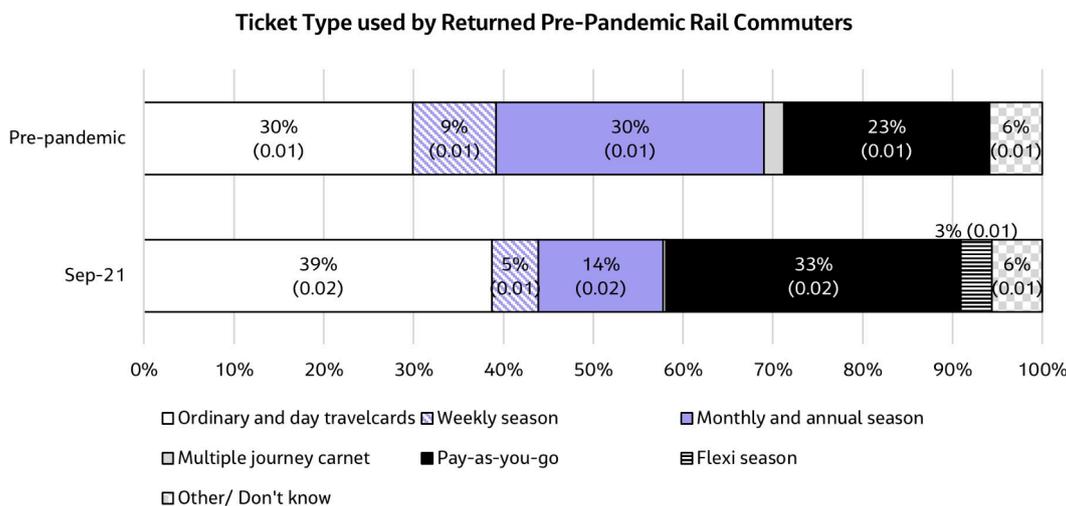


Fig. 13. Ticket type mix - among rail commuters, Wave 1 (pre-pandemic) and Wave 2 (Sept 2021) (standard errors in brackets).

Proportion of Individuals Commuting each day of the week among pre-pandemic rail commuters by occupation mix

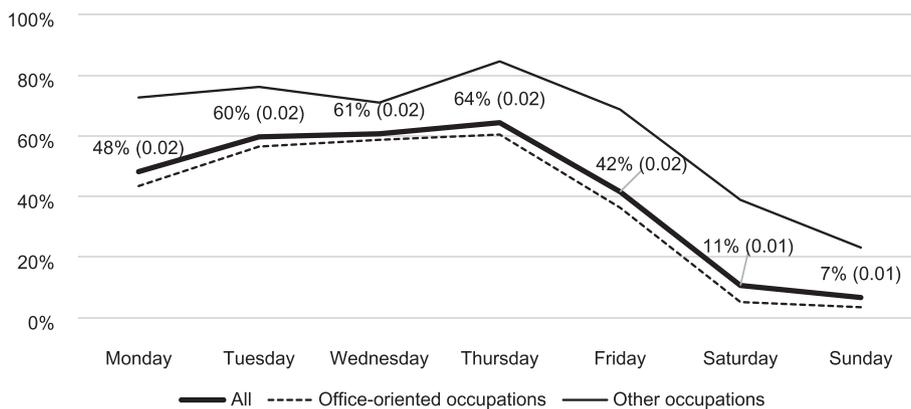


Fig. 14. Proportion of individuals commuting among pre-pandemic rail commuters by day of week and type of occupation at the time of the second survey (standard errors in brackets).

Moreover, considering the panel survey focused on individuals employed pre-pandemic, it excluded those who entered the labour market between the two survey waves. Based on official statistics and assuming new entrants would commute as frequently as those already in employment, it was estimated these individuals would contribute an additional 2 % in rail commuting volume.

5. Implications of changing commuting patterns for transport operations and ticketing strategies

The pandemic has seen major changes in rail use and a new *status quo* has yet to be reached. However, it is clear that not only the volume of commuting trips has changed but also the distribution of those trips over the week.

5.1. Commercial aspects

Pre-pandemic, 39 % of rail commuters were commuting with a weekly, monthly or annual season ticket (Fig. 13) – representing 49 % of commuting trips. At the time of the second wave, only 22 % of previous rail commuters still commuting by rail were travelling with season tickets. Instead, 72 % of rail commuters used day tickets, ordinary

tickets or pay-as-you-go alternatives compared to 53 % pre-pandemic.

Pay-as-you-go tickets can be bought very close to the time of travel and do not commit the individual to a minimum frequency of travel. Conversely, season tickets require an upfront payment for unlimited travel within a specified period of time. From a risk perspective, the former ticketing option is virtually risk-free albeit more expensive on a per-ticket basis – passengers buy and use the tickets when needed. With the latter, passengers will only get the full value from the ticket if they make a minimum number of trips within the stated period. At a time when lockdowns were possible and infection rates were still high, committing to a regular commuting frequency was challenging for many rail commuters.

5.2. Operational aspects

From an operational perspective, a number of changes has also been visible. A new peak in commuter travel has emerged. Tuesday, Wednesday and Thursday were reported as the busiest days of the week. In the second survey, between 60 % and 65 % of current rail commuters were travelling on those days (Fig. 14). Conversely, Monday and Friday saw lower levels of demand at around 45 % of current commuters.

The Tuesday-to-Thursday peak in travel is particularly pronounced

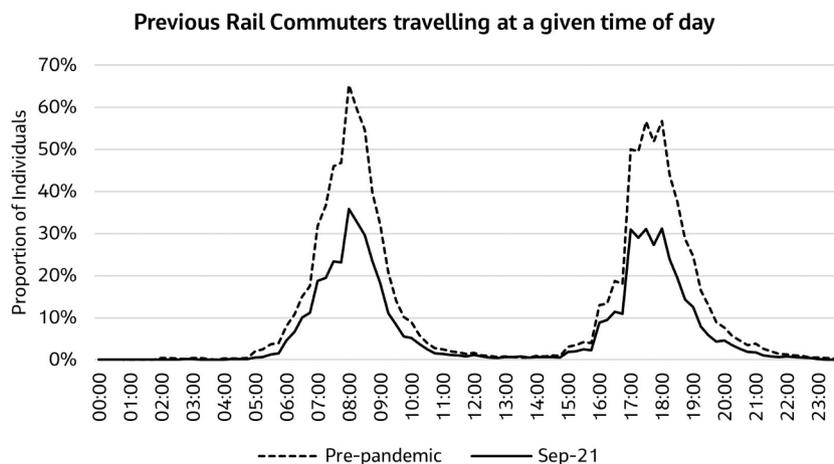


Fig. 15. Proportion of individuals travelling for commuting purposes at the time of the second wave by time of day (have started their commuting journey but have not arrived).

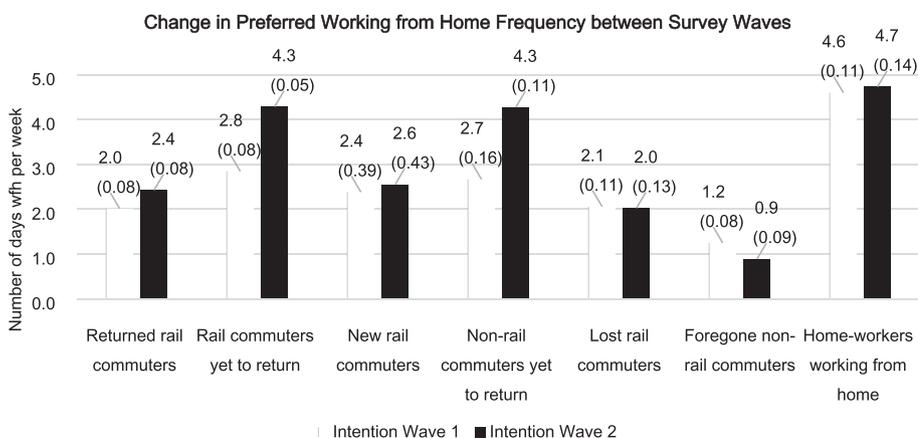


Fig. 16. Change in preferred frequency of working from home between the two survey waves by commuter subgroup. Returned rail commuters are pre-pandemic rail commuters who in Wave 2 commuted by rail. Rail commuters yet to return are pre-pandemic rail commuters working from home full-time in Wave 2. New rail commuters are pre-pandemic non-rail commuters who in Wave 2 commuted by rail. Non-rail commuters yet to return are pre-pandemic non-rail commuters working from home full-time in Wave 2. Lost rail commuters are pre-pandemic rail commuters who commuted by another mode in Wave 2. Foregone non-rail commuters are pre-pandemic non-rail commuters who continued not commuting by rail in Wave 2. Finally, home-workers working from home worked from home full-time pre-pandemic and in Wave 2. (standard errors in brackets).

among office-based occupations whereas respondents with other occupations had a commuting volume that was broadly constant across the five days of the working week. For the latter individuals, commuting frequency was also higher on Saturdays and Sundays which can be explained by offices being ordinarily closed on weekends while shops, factories and other consumer services staying open.

In the past, peak spreading was often thought of as a response by commuters to avoid the most crowded services and save money with off-peak fares. With a large reduction in crowding during the pandemic, it is conceivable passengers may have switched back to their preferred time of travel.

There does not seem to have been an increase in peak spreading with individuals reporting to travel on average at the same time of day as they did pre-pandemic. The morning peak tends to start at around 6.00 and to have finished by 10.30 with the highest number of individuals in the network at around 8.00. On the other hand, the afternoon commuting peak starts at around 16.00 and ends by 21.00. And the highest volume of travel is recorded between 17.00 and 18.00. At the time of the second wave, there was a general reduction in the size of the peak in line with the reduction in commuter travel (Fig. 15).

6. Employees' intentions and expectations on future commuting patterns

The increase in the frequency at which employees work from home is the main driver of the observed reduction in rail commuting. When deciding how often to work from home, three major factors are at play.

The first is whether the job can be done from home. The second is the policies and rules determined by the employer on working from home and/or working in the company's facilities. The third is the employee's willingness to work in any of those places. The intersection of these three factors determines the actual working from home frequency. The first was addressed in section 3.2 of this paper. This section focuses on the other two determinants.

6.1. Employees' perceptions

In Wave 1, respondents were asked about their preferred working from home frequency before the pandemic. In Wave 2, the same question was asked to evaluate how preferences had changed. We analysed the responses based on their pre-pandemic commuting status and their status at the time of the second wave.

In Summer 2020, on average, respondents reported they would like to work from home 2 days a week (Fig. 16). The largest exception was among the small sample of pre-pandemic full-time home-workers who preferred to work 4.6 days a week from home on average. This outlier is not surprising and suggests that pre-pandemic home-workers were working from home because this was their preferred working pattern.

Comparatively, in October 2021, the responses were more varied. Among individuals who had returned to a regular commute, the average preference for working from home had not changed much compared to the average response 14 months previously. This points to the idea that the period of forced working from home did not have a great impact on their perception of working from home.

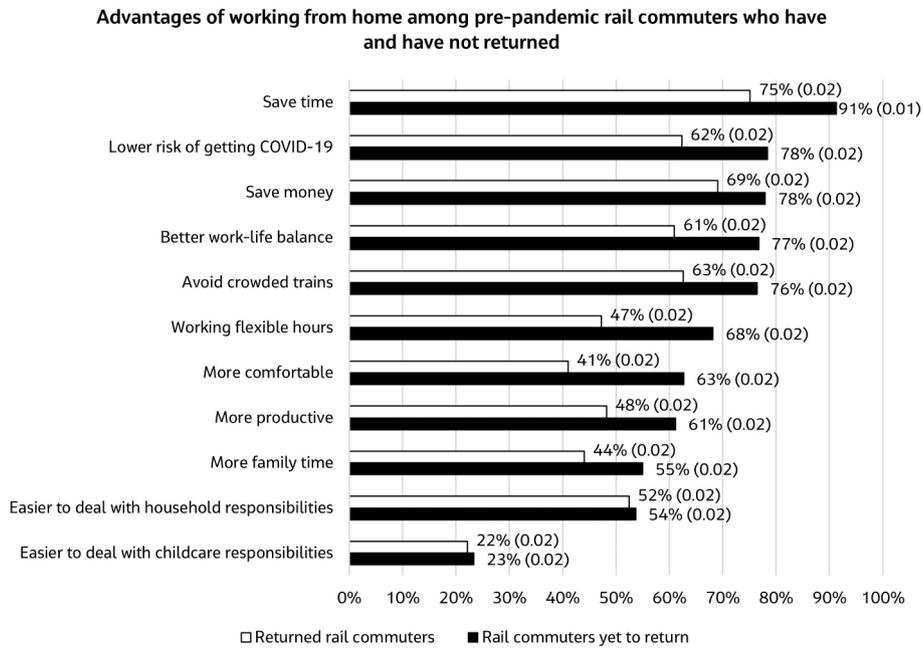


Fig. 17. Cited advantages of working from home among returned rail commuters and rail commuters yet to return (standard errors in brackets).

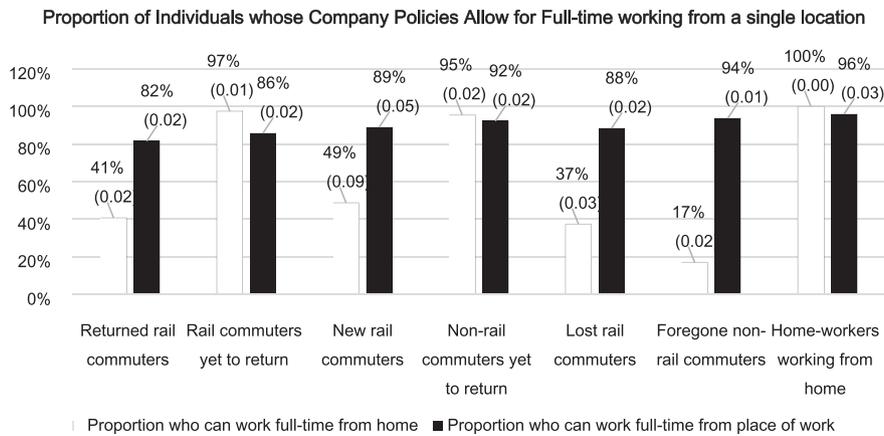


Fig. 18. Employer rules on working from home and full-time working from a company location by commuter subgroup (standard errors in brackets).

However, the same cannot be said of those who used to commute pre-pandemic and were working from home full-time at the time of the second survey. On average, these individuals had already reported a slightly higher preferred frequency of homeworking than their returned colleagues. But in the second wave, the average preferred frequency increased from 2.8 days a week to 4.3 days a week among previous rail commuters (from 2.7 to 4.3 days a week among previous non-rail commuters). This suggests that the lockdown period of working from home has convinced this group of the benefits of staying at home. Nevertheless, it is noted that the reported preferences may have been tempered by the respondents' respective commuting habits at the time of the survey and may not reflect a true unconstrained intention.

Looking at just pre-pandemic rail commuters who have not returned to their places of work, 91 % reported that saving time was an advantage of working from home (Fig. 17), 78 % cited saving money and 76 % stated that avoiding crowded trains was an advantage. A lower risk of getting infected (78 %) and better work-life balance were also selected (77 %) by a large proportion of respondents.

Commuter-related factors are important for a large proportion of pre-pandemic rail commuters who have returned to commuting but can

otherwise work from home. Amongst returned rail commuters, 75 % mentioned that working from home allowed them to save time, 69 % said it allowed them to save money and 63 % cited the advantage of avoiding crowded trains.

6.2. Employer workplace policies

There is some evidence to indicate that employer workplace policies are an important driver of the observed increase in commuting frequency.

Less than half of respondents who had returned to a regular commute stated that they were allowed to work from home every day (Fig. 18). Among returning rail commuters this proportion was 41 % but among returning non-rail commuters it was only 17 %. This can be explained by the differences in the type of occupations rail and non-rail commuters have as previously discussed in section 3.2.

It also supports the finding that on average individuals currently working full-time from home are doing so out of their own volition. There is not a material difference between returned and yet-to-return commuters in the proportion of employees who are not allowed to

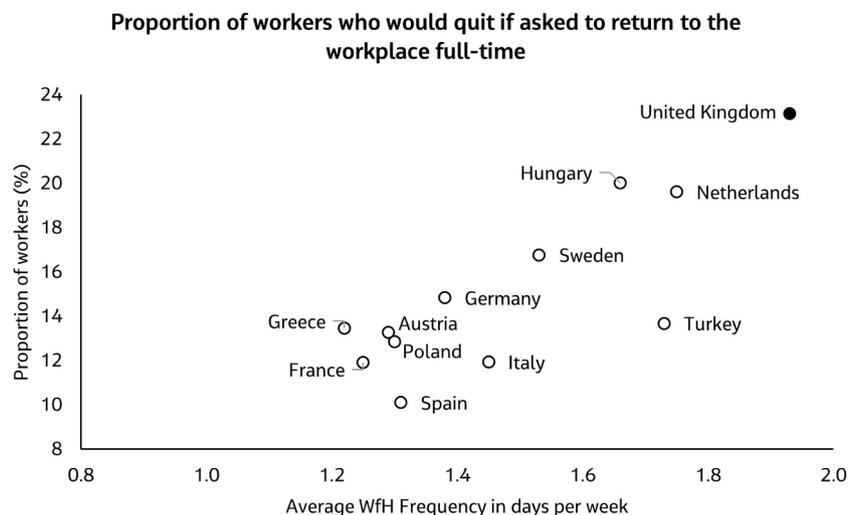


Fig. 19. Proportion of workers saying they would quit their job if they were asked to return to their place of work full-time (Source: Aksoy et al, 2022).

work from their places of work every day. Among pre-pandemic rail commuters, 82 % of returned commuters can work from an employer location every day whereas that proportion is 86 % among those yet to return. Among pre-pandemic non-rail commuters, those proportions were 94 % and 92 % respectively.

This indicates that employers are not imposing restrictions on workplace attendance to yet-to-return commuters to a greater extent than those applied to returned commuters. Hence, there is no evidence that employers are responsible for the proportion of employed population not regularly commuting at the time of the second survey. Thus, the conclusion is that this is an employee-led trend.

7. Discussion

7.1. Unlocking commuting journeys

Even though there is an industry-wide push for individuals to return to travelling, the majority of transport systems are still experiencing a reduction in commuter traffic levels. This paper has produced some insights that could be used to stimulate a further return to commuting and an increase in the frequency of travel.

First, rail is more dependent on commuting journeys made by individuals whose jobs allow them to easily substitute commuting days with working from home. If the railway can promote a mode shift to rail among non-office workers, it will increase its patronage but also increase its resilience as, if working from home is taken up more consistently, its commuting mix will have a higher proportion of individuals travelling regardless. Some 15 % (s.e. 0.015) of pre-pandemic non-rail commuters reported that rail was an option for their commutes at the time. This is a part of the commuting market that rail can seek to attract.

Second, the railway industry can tip the scale when employees decide between working from home or travelling to the workplace. This paper concludes that the remaining share of individuals yet to return to their places of work is being driven by their own decisions. And partially this is based on the potential savings in commuting time and the cost of travel as the survey has identified. Changing travel patterns provide an opportunity to look again at pricing strategies for peak time travel and the relationships between peak, season and off-peak fares so that the rail option is made more attractive to commuters.

Finally, this paper shows that employers can have a major impact on commuting patterns. Employers were the driver of the first wave of returning commuters. They have also been identified as a required condition for the return of those who are still working from home full-time. But more than enticing full-time homeworkers to commute

again, if the industry is to return to pre-pandemic levels of commuter travel, workers need to commute more often. In most circumstances, employers have the power to mandate employers to return to their workplaces. If they do so, this will generate more commuting journeys and a more complete recovery in rail demand.

7.2. Challenges for transport systems

Rail investments tend to be long term and lumpy in nature. While there has always been uncertainty, changes in travel demand have tended to be gradual and occurring over long periods of time. The pandemic has greatly accelerated the move towards homeworking and this has major implications for future investments. Lower demand translates into fewer user benefits in transport appraisal, making investments harder to justify.

There are now two main categories of commuters. Those who cannot work from home and those that can interchange the workplace with homeworking. The latter group may be able or required to work from home in particular circumstances, e.g. bad weather, to contain spread of contagious illnesses, to reduce energy consumption, during school holidays. They are also currently mostly free to choose which day to travel to work. These potential fluctuations in demand from day to day and week to week raises question about what level of future capacity should be provided, from both an infrastructure and a timetable perspective, and the most economic and equitable way of balancing demand and supply and funding the service.

7.3. Parallels between Great Britain and other European geographies

This paper is focused on the changes in commuting patterns in Great Britain and how they are reflected in rail commuting volumes. Thus, it is relevant to understand how replicable these results are for other geographies. There is some evidence that workers in the United Kingdom are working from home more frequently than in other European countries (Aksoy et al, 2022). This means fewer commuting trips.

Aksoy et al (2022) points to one potential reason being because British workers are more attached to working from home than workers in other European countries. Fig. 19 shows that the UK has the highest proportion of workers saying they will quit their job if they are required to return to the workplace full-time (Aksoy et al, 2022). Simultaneously, the UK is also the country with the highest average frequency of working from home (Aksoy et al, 2022). As a result, employers in the UK are less able to impose restrictions on homeworking unilaterally without losing staff.

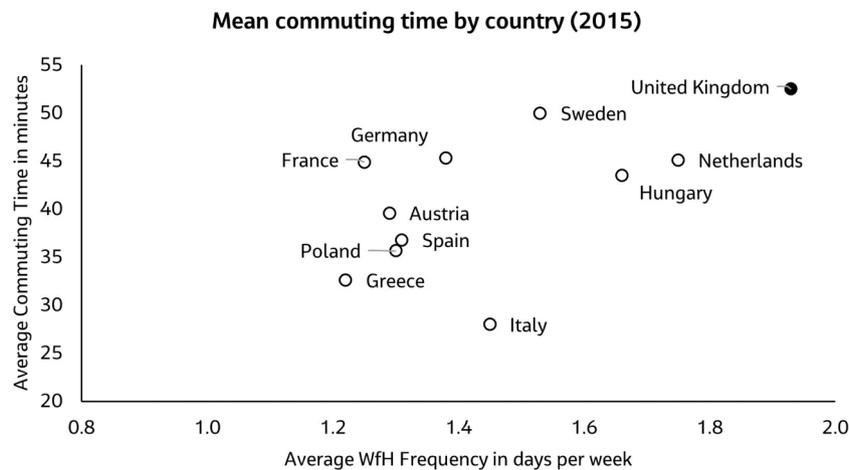


Fig. 20. Mean commuting time in 2015 in minutes by country (Source: Eurofound, 2019) and average working from home frequency (Source: Aksoy et al, 2022).

In addition, commuting journey times in the UK are also on average longer than in other European countries (Eurofound, 2019). As reported in section 3.4, home working increases with commuting journey time. Since commuting journeys take longer in the UK, one can also expect average higher frequencies of working from home as observed in Fig. 20.

8. Conclusions

This paper finds that the drop in commuting volume caused by the pandemic was larger among rail compared to non-rail modes. This is mainly explained by the occupation mix of each of these commuting subgroups and the differences in the feasibility of homeworking across occupation.

Since Spring 2021, there has been a consistent return to the workplace which accelerated after Summer 2021. This wave of returning commuters appears to have been driven in part with the cooperation of the employees, who showed some willingness to return to the place of work citing the social benefits of workplace interactions, but it was mostly dictated by employers. This is supported by the commuting frequency in September 2021 being slightly higher than the reported employees' preference and the employer requesting employees to go to the workplace being the most cited reasons for the return.

Despite this, a significant proportion of the working population is still working from home full-time. The results suggest this is an employee-led trend. Those who have not returned to a regular commute are doing so because they prefer working from home. These individuals cited 'saving time and money' and 'avoiding crowded trains' as being among the most common reasons for homeworking to be beneficial. We have not found any evidence that employers of respondents working from home full-time are imposing restrictions on workplace attendance beyond those applied by other employers. Yet, the most cited condition for a potential return is the employer making such request. Hence, the key for a stronger return to commuting seems to rest with employers compelling staff to attend the workplace.

The pandemic has generated several challenges for the transport sector. The rail industry is now dependent on individuals who travel less and concentrate their travel between Tuesday and Thursday. As a result, peak travel still exists although it is smaller in magnitude and over fewer days per week. Should a full recovery not materialise, it may be more challenging to justify rolling stock and infrastructure investment for peak-specific enhancements. Greater consideration will also be needed towards enhancements that benefit off-peak and leisure travel demand which currently makes up a larger share of rail demand than it did in the pre-pandemic era.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: this research was sponsored by the Passenger Demand Forecasting Council at the Rail Delivery Group in Great Britain. The statements in this paper are the responsibility of its authors and do not reflect the views of the funders.

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