Department for Transport

Commuting trends in England 1988 - 2015

November 2017

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Contents

Executive summary

Commuting - and travel to work more generally - places a disproportionate burden on the transport network due to the relative length of these journeys and their concentration at particular times of the day. Understanding how patterns of commuting have developed over time is of particular interest both to those seeking to understand the past and plan for the future. This report explores commuting in England over the last 25 years.

Between 1995/7 and 2013/14, England's population grew 12% while the total number of annual commuting journeys decreased from 8.5 billion to 7.9 billion[1]. There has been a decline in commuting trips per person, which has not been outweighed by the growth in population.

Commuting behaviour is undergoing a period of change. This report draws on a range of available datasets to explain and understand that change, anchored by the National Travel Survey (NTS), to document patterns of commuting today and how it has evolved over the last quarter-century.

Decreasing number of commuting journeys

Since the late 1980s there has been a downward trend in the number of commuting trips from 7.1 journeys per worker per week in 1988/92 to 5.7 in 2013/14 (see Section 2). This is sharper than the decline in overall trip-making per person during this period, which highlights the importance of understanding how commuting is changing. This decline in commuting journeys is seen whether one measures the number of commuting journeys on a per-person basis, per-worker, or even in absolute terms.

Several reasons contribute to this decrease in commuting journeys:

1 Workers are commuting to work fewer days per week (Section 2. Headline trends in commuting, Commuting through the week)

2 There has been growth in trip-chaining (where people combine two or more trips for differing purposes, such as dropping-off children at school on the way to work) between home and work, and a corresponding decline in traditional 'Commuting', which is defined as journeys directly between a worker's home and usual workplace with no intermediate destinations (Section 2. Headline Trends in Commuting, Time-of-day, Trip-chaining)

3 There has also been growth in the number of workers who do not have a fixed usual workplace and hence are not ‘commuting’ when they travel to a work site. This raises an issue of whether the traditional NTS definition of 'commuting' remains fit for purpose (Section 2. Commuting through the week)

[1] This estimate is based on the National Travel Survey's estimate of commuting journeys per capita multiplied by ONS' mid-year population estimates for England. Data are averaged over multiple years in the interest of statistical precision.

4 Working from home is growing, both occasionally and on a usual basis (Section 2. Commuting through the week)

5 There has been an increase in the number of people who report that they are employed, but do not work at home and are not observed to travel to work during their NTS diary week (Section 2. Headline trends in commuting, Commuting through the week)

6 Part-time employment and self-employment have also expanded somewhat over time; both of these statuses are associated with reduced numbers of commuting journeys (Section 2. Labour force structure, Commuting through the week).

Changes in modes used for commuting

Commuting as a Car Passenger has declined, with corresponding growth in use of National Rail and London Underground. However, Car Driving remains dominant, accounting for more than half of commuting journeys (Section 2. Commuting mode, Commuting in context).

Increases in commute distance and duration

Commuters are travelling further: average distances have increased. At the same time, the duration of commuting journeys has also been growing. These trends are primarily due to rapid changes in commuting behaviour by part-time workers (Section 2. Commuting journey length and duration).

Changes in time-of-day of commuting

Work-bound commuting journeys have shifted on average several minutes earlier in the morning, with homebound journeys shifting to slightly later in the afternoon. There has therefore been a lengthening in the duration of people's days at work, which has taken place alongside a consolidation of commuting into a smaller number of journeys (i.e. fewer but longer-distance commuting journeys) (Section 2. Time-of-day).

As the composition of the workforce shifts, this may have consequences on how concentrated commuting trips are during peak periods. For instance, there has been a decrease over time in the share of workers classified as 'Manual' workers, and they are less likely than others to commute during peak periods.

Car commuters experience the most-variable commute times, though road traffic reliability has improved

Drivers experience the greatest day-to-day perceived variability in the duration of their commuting journeys, with walkers and cyclists experiencing the highest reliability, followed by rail commuters. Reliability in commuting journey times has improved over time for most modes of transport, most notably for driving (Section 3. Comparison of reliability of commuting journey time by mode).

Congestion is perceived to be a major problem with commuting

Car commuters continue to indicate that traffic congestion/roadworks is their largest problem commuting. Likewise, bus commuters rate traffic congestion as the main problem affecting the duration of their commuting journeys. National Rail commuters in London consistently report lower satisfaction (than the rest of England) with the amount of available space on board train services, but report being roughly as satisfied with rail services' punctuality as National Rail commuters outside of London (Section 4. Perceived problems and susceptibility to switch commuting mode, Section 3. Bus congestion).

Congestion on local 'A' roads and the Strategic Road Network

Morning peak period travel speeds on the Strategic Road Network (SRN) appear to relate closely to traffic volumes, but this is much less true for local 'A' roads, where speeds are generally slower but appear to be less affected by traffic volume (Section 3. Road Congestion).

1. Introduction

Commuting behaviour is in a period of flux in the 21st century: patterns of travel-to-work are evolving alongside changes in the nature of contemporary labour markets and broader working practices. To understand and identify those trends, the Department for Transport's Strategy Unit and Social and Behavioural Research team commissioned this study. In particular it has sought to illuminate how commuting has changed over time and the key factors that are affecting current trends.

Despite accounting for only 16% of personal[2] journeys made in England, commuting places a disproportionate burden on the transport network. Commuting journeys are much longer-distance than other journeys, meaning that they are responsible for a fifth (20%) of all miles travelled. They are also concentrated at times when the network is busiest (morning and afternoon peak periods). Three in ten adults in England will travel to their usual workplace at some point during a typical day, and 46% will do so at least once per week.

Transport planners typically consider commuting to be one of a small number of journey-types (along with education) that are 'non-discretionary' - meaning that commuting must be done, whilst other types of journeys are 'discretionary'. While this is a 'black-and-white' simplification of a reality more accurately characterised by shades of grey, it is certainly true that, for many people, travelling to and from work is the spine around which their daily movements are organised.

As we shall see, the emergence of various forms of more flexible working mean that a growing number of workers do not follow the traditional model of commuting five days per week to a fixed workplace. For reasons that are investigated in this report, the number of commuting journeys per person has trended downwards over time[3], at the same time commutes have been getting longer[4].

Traditional commuters remain important to the economy, responsible for more than half of the income earned in England. 'Home-to-work' commuters[5] - those who went to their usual workplace at least once during an average week - in 2013/14 earn 57 pence of every pound of personal income in England, although this does represent a decline from 69 pence in 1988/92[6].

[2] The National Travel Survey measures personal travel i.e. it excludes freight and journeys made to move or deliver goods or people.

[3] Commuting journeys per capita per annum trended downwards from 176 in 1988/92 to 146 in 2013/14. Commuting journeys per worker per annum trended downwards from 368 in 1988/92 to 295 in 2013/14. In this report, results from the National Travel Survey (NTS) are presented as multi-year averages (1988/92, 1995/97, 1998/2001, 2002/04, 2005/07, 2008/10, and 2013/14). This is the standard methodology when working with NTS data: it results in larger sample sizes and hence greater confidence in statistical estimates.

[4] The average distance of a commuting journey increased from an average of 7.3 miles in 1988/92 to 8.8 miles in 2013/14.

[5] In 1988/92, 49% of adults representing 80% of workers commuted at least once during a random week. By 2013/14 these percentages had declined to 46% and 74%, respectively.

[6] Authors' analysis of National Travel Survey data

To investigate how commuting has evolved, this study uses data from the following sources:

- *National Travel Survey*[7], commissioned and managed by DfT
- *England and Wales Census*[8], from the UK Office for National Statistics (ONS)
- *Living Costs and Food Survey*[9] and its predecessor surveys by various names, from ONS
- *National Rail Passenger Survey*[10], and its more recent counterpart the *Bus Passenger Survey*[11], from Transport Focus (previously known as Passenger Focus)
- DfT *Road Congestion Statistics*[12], produced with supporting analysis by DfT
- *Labour Force Survey*[13]*,* from the UK Office for National Statistics (ONS)

The remainder of this report is structured as follows:

- In the following section, we explore the definition of 'commuting', including how it is defined in the *National Travel Survey* and this paper
- Section 2 surveys commuting trends in the context of wider socio-economic and employment trends
- Section 3 describes the major trends in commuting in recent decades, and investigates the relationships that underpin the headline trends
- Section 4 analyses patterns of commuting related congestion on roads, rail and buses
- Section 5 investigates people's perceptions of problems with their current commuting routine, as well as how easy or difficult it would be to switch to an alternative mode

[7] https://www.gov.uk/government/collections/national-travel-survey-statistics

[8] http://www.ons.gov.uk/ons/guide-method/census/2011/index.html

[9] http://www.ons.gov.uk/ons/guide-method/method-quality/specific/social-and-welfare-methodology/living-costs-and-food-survey/

[10] http://www.transportfocus.org.uk/research/national-passenger-survey-introduction

[11] http://www.transportfocus.org.uk/research/bus-passenger-survey

[12] https://www.gov.uk/government/collections/road-congestion-and-reliability-statistics

[13] http://www.ons.gov.uk/ons/guide-method/method-quality/quality/quality-information/social-statistics/quality-and-methodology-information-for-the-labour-force-survey--lfs-.pdf

What is a 'commuting' journey?

This section discusses the terms and conventions used in this report, and our rationale

The *National Travel Survey's* standard definition of 'commuting' is a journey that begins at a person's home and ends at their usual workplace, or vice versa. This standard definition is, however, limited in two respects.

1 Trip chaining: First, consider a worker who leaves home in the morning, drops their child at school, and then proceeds onwards to their own workplace. Using the standard definition of commuting, this person would be recorded as having made two journeys (home to school, and school to work), neither of which is 'commuting'. The home-to-school journey would be 'escort education' purpose, and the school-to-work journey would be classified as 'personal business'. The general issue is that any non-trivial stop that a person makes on their way to or from their workplace would lead to their travel not being classified as commuting. There is evidence that this 'trip-chaining' behaviour has increased over time (this is explored in more detail in Section 2).

2 Variable workplaces: Second, not all workers are classified as having a 'usual' workplace. In the NTS 'usual' is defined to be: "a [work]place they visit on at least two consecutive days per week for at least four consecutive weeks"[14]. A worker who has a second job would be classified as having only one 'usual' workplace: the one that they visit most frequently. In this context, 'commuting' journeys only include journeys to/from one's 'usual' workplace. This presents a challenge for the analysis because there are a growing number of workers who are classified as not having a 'usual' workplace (discussed in Section 2).

Commuting distance is measured differently by different surveys, and even amongst datasets used to calculate National Statistics there is no single standard methodology.

In the Census, for instance, workers report their home and work addresses, which are used to estimate the 'crow-flies' distance of their home-to-work commute. No account is taken of workers' frequency of commuting.

By contrast, the National Travel Survey asks respondents to report their travelled distance – i.e. the distance 'on the clock' for a car driver, which is longer than the 'crow-flies' distance between their home and workplace. Every time that a worker travels between home and work, a commuting journey is observed to take place (subject to the definition issues described above). Therefore, the travel behaviour of more-frequent commuters will be weighted more heavily in averages calculated from NTS data (relative to Census data).

[14] NTS 2013 Technical Report, p.109

If this paper focused solely on journeys defined by the NTS as 'commuting', the results might have been misleading. Our approach is instead to employ three distinct terms throughout this paper, as follows:

- 'Commuting' is used as a reference to the standard NTS definition
- Travelling ‘to/from work’ is used to describe all journeys to a person’s ‘usual’ workplace, whether or not defined to be ‘commuting’[15] . For example, this could include a journey from a child's school to a workplace.
- Travelling ‘to/from work-related activities’ encompasses all journeys that begin and/or end at any location where the traveller is performing a ‘work-related’ activity[16]

The convention of this study is to analyse journeys on a percentage basis or a per-person basis where applicable. This is in contrast to an absolute number of journeys basis.

[15] Whilst this definition works well for some analyses, it cannot be used universally for two reasons. Firstly, it would prevent more direct comparability with other publications where the standard definition is used. Second, it would encompass journeys such as a worker going out to lunch at a nearby restaurant and then returning to their workplace, as well as business trips conducted during the working day, which are very different types of travel behaviour than classical home-to/from-work ‘commuting’.

[16] This definition is useful to, for instance, identify the number of days per week in which a worker performed any work-related activity (at a location other than their home).

2. Socio-economic, employment and commuting trends

This section gives an overview of labour market trends and considers how commuting and working practices are changing

Labour force structure

In this section we consider trends (in population, workers and driving license holding) in absolute terms to provide the wider context for the averaged values (per-worker and per-journey) presented in later sections.

England's population is growing at a rate of approximately 0.8% annually in the 2010s (Figure 1). A trend change occurred in the mid-2000s: from the 1990s up to 2004 the population consistently grew at less than 0.5% annually, but since then growth has exceeded 0.5% every year. Figure 1 also demonstrates that the overall population is growing faster than the working-age (age 16 – 64) population in the 2010s, which relates to the more-rapid growth of people over retirement age.

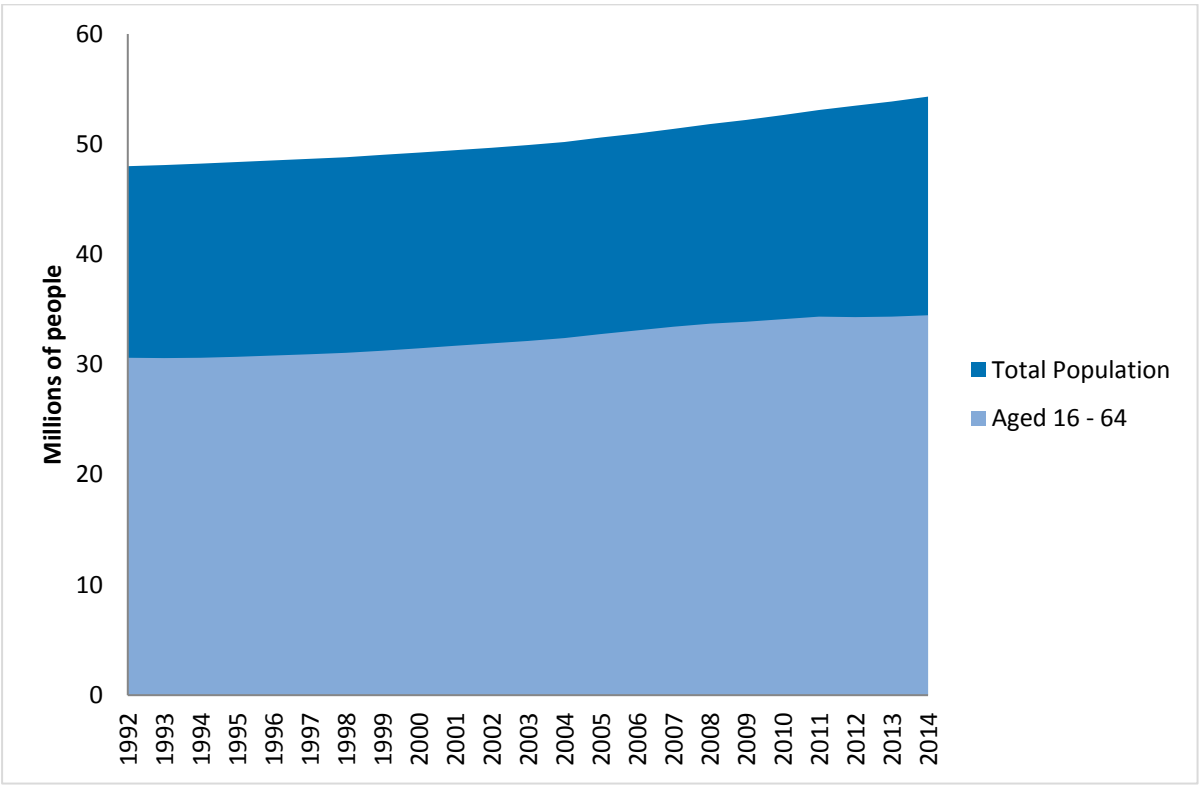

Figure 1 Working-age and total population of England. Source: ONS Population Estimates

Figure 2 shows significant shifts in the composition of the labour force since 2005. The most rapid growth has been in the number of older workers, aged 50+. The number of younger workers (those aged under 24) decreased from 2008, and began to recover in the 2010s. The number of middle-aged workers (age 30 – 49) has been broadly stable in recent years.

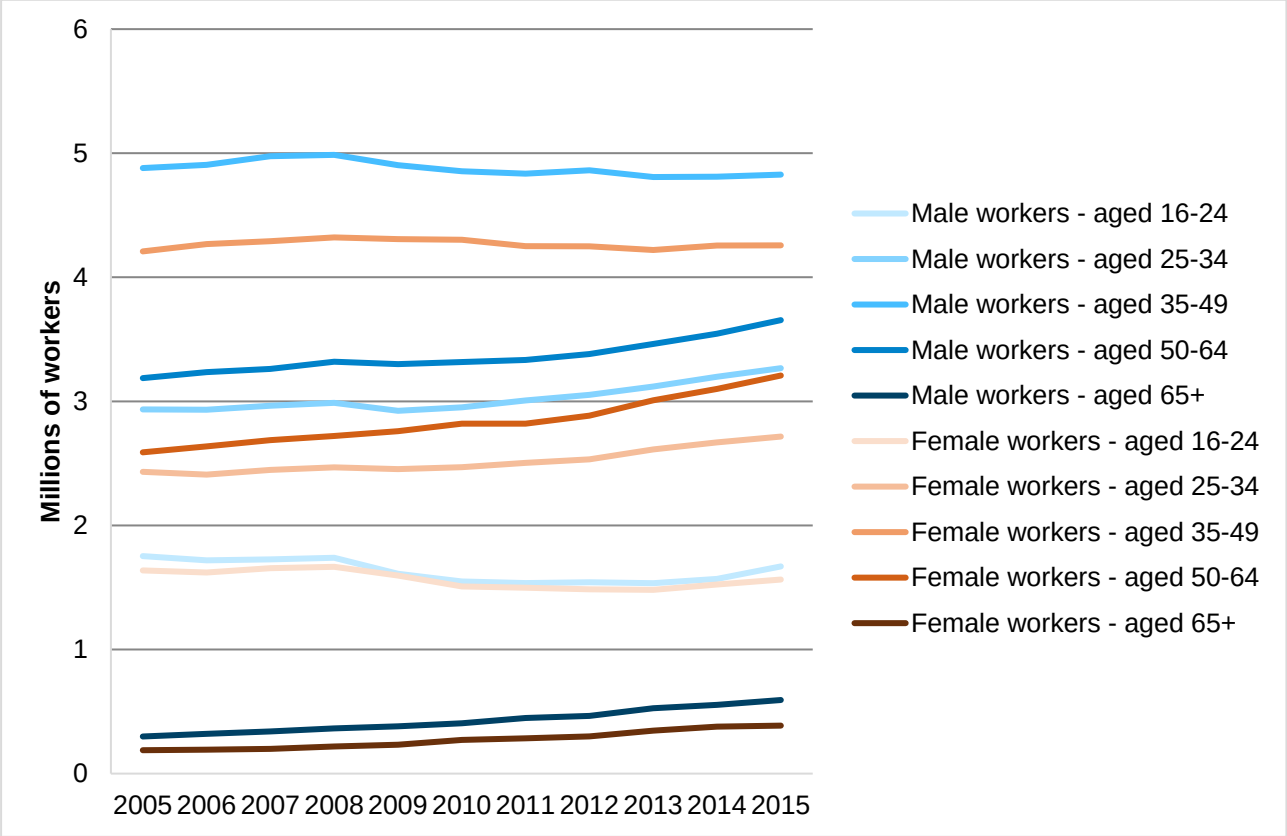

Figure 2 Working-age population over time, by age and gender. Source: Labour Force Survey

Employment is at its highest ever level. Figure 3 shows how the total number of workers has changed, as well as several types of work status[17]:

- Much of the growth in employment in the 2010s has been in the form of self-employment, rather than as an employee
- Full-time employment surpassed the pre-2008 peak level in 2014, whilst part-time employment continued to grow year-on-year through the recession
- There are more men than women working, though the number of men working decreased more markedly in 2008 than the rate for women
- There has been an increasing tendency for men to work on a part-time basis: in 1988/92 12% of part-time workers were men, and by 2013/4 this has risen to 26%.

[17] As part of data-validation, we compared the time-trends in the age/gender distribution of workers in the Labour Force Survey and the NTS. This task also involved comparing trends in the overall employment rate, employee versus self-employment status, full-time versus part-time working status, and weekly hours worked. In all cases, similar trends are observable in both datasets.

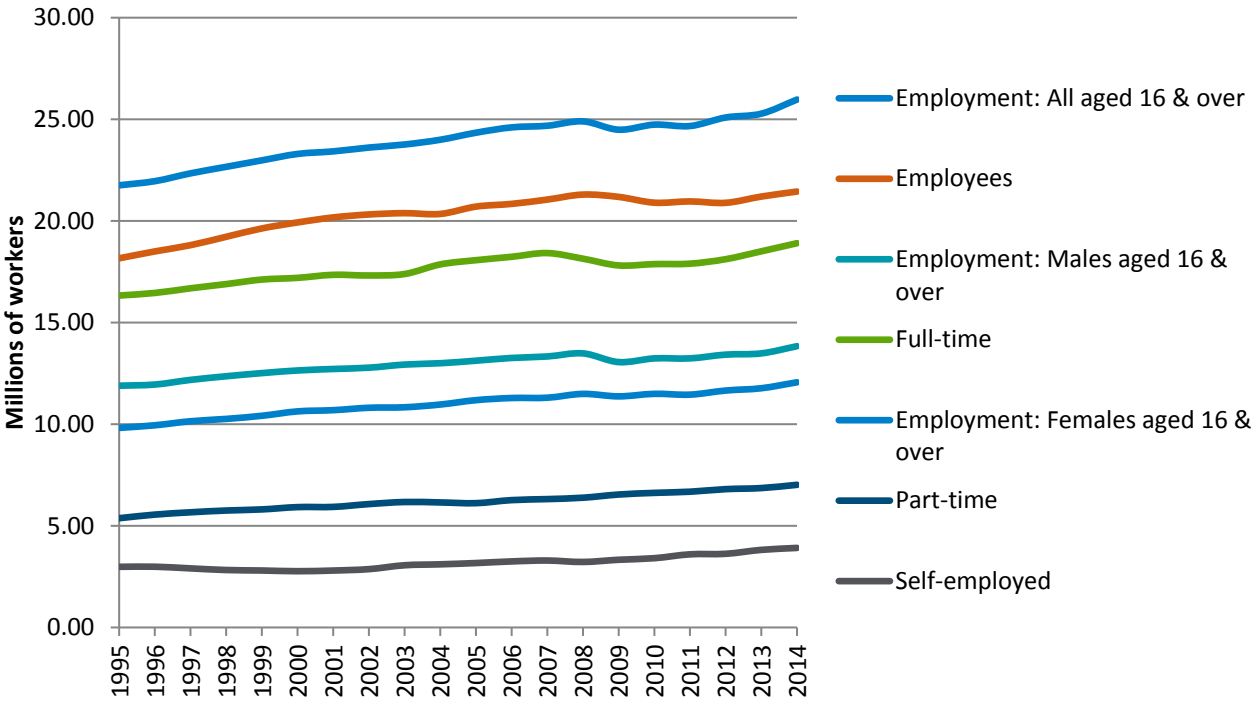

Figure 3 Trends in working status in England. Source: Labour Force Survey

There have also been shifts in workers' occupations. Figure 4 shows growth in "Professional" and "Associate Professional/Technical" employment, with decreases in the proportion of workers that perform "Administrative/Secretarial" jobs, "Skilled Trades", and "Process/Plant/Machine Operators".

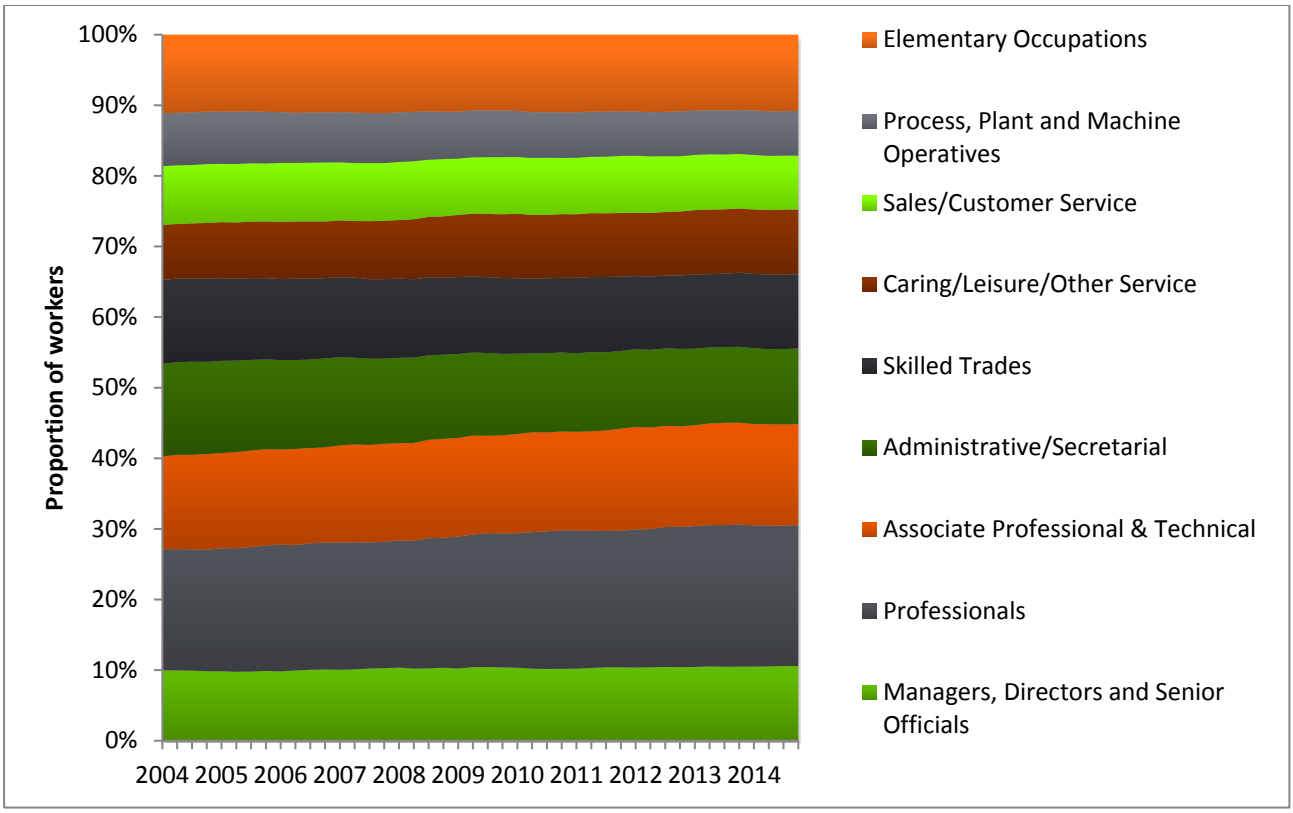

Figure 4 Trends in workers' type of occupation (SOC2010). Source: Labour Force Survey

Commuting in context

- Commuting in decline despite population and employment growth
- Decline in travel-to-work during the morning peak period
- Increase in working adults who do no work-related travel during a randomly-observed week

In 2014, approximately 8 billion commuting journeys were performed. However, Figure 5 shows that despite the increasing number of workers, the number of commuting journeys has decreased since 1995. This is within the context of overall trip-making having decreased in recent years, also in spite of population growth. Both of these trends are due to the downward trend in trip-making being greater than the upward trend in the number of workers and population.

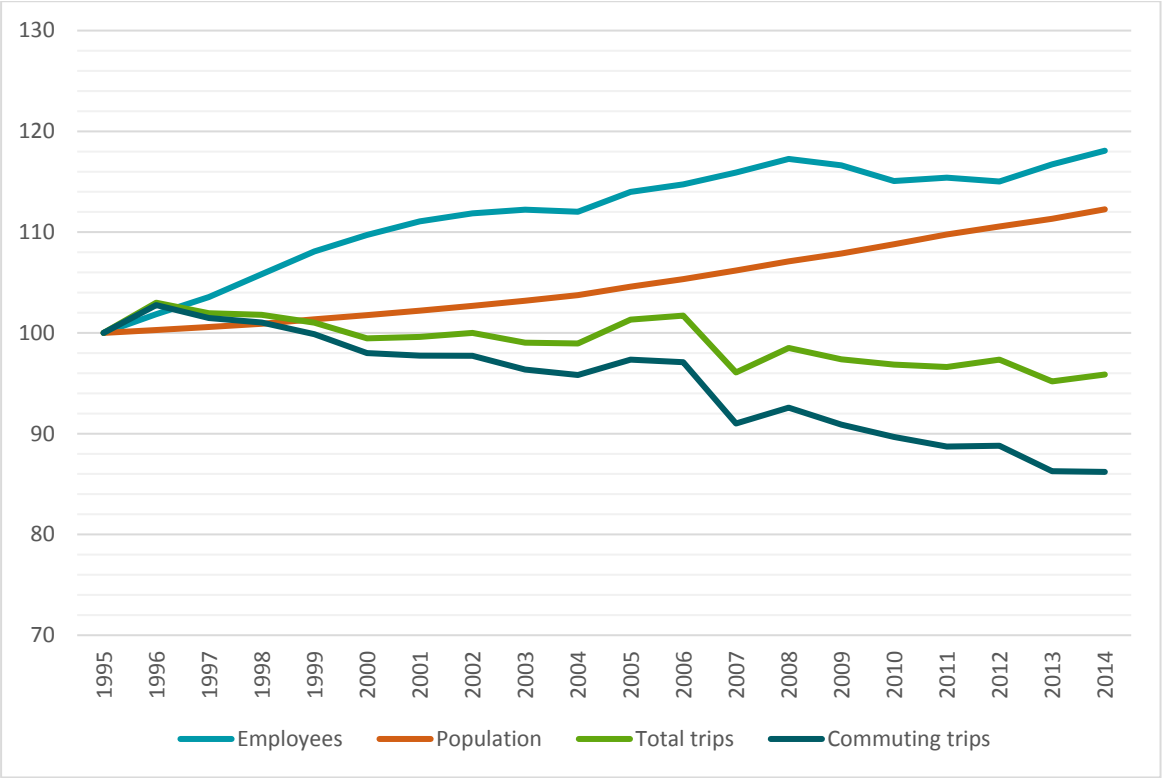

Figure 5 Employees, total population, total journeys and commuting journeys in England (100 = indexed to 1995 levels). Sources: Labour Force Survey, ONS Population Estimates, National Travel Survey

Figure 6 shows that car driving is the dominant mode for all journeys, with more than 20 million performed annually; the trend has been downward since the mid-2000s.

A sustained decrease in the number of walking trips can also be seen, as well as growth (from a much smaller base) in the number of National Rail[18] journeys. Table 1 shows the time-trend in use of different modes in percentage terms.

[18] Throughout this report, the term 'National Rail' excludes local metro rail services.

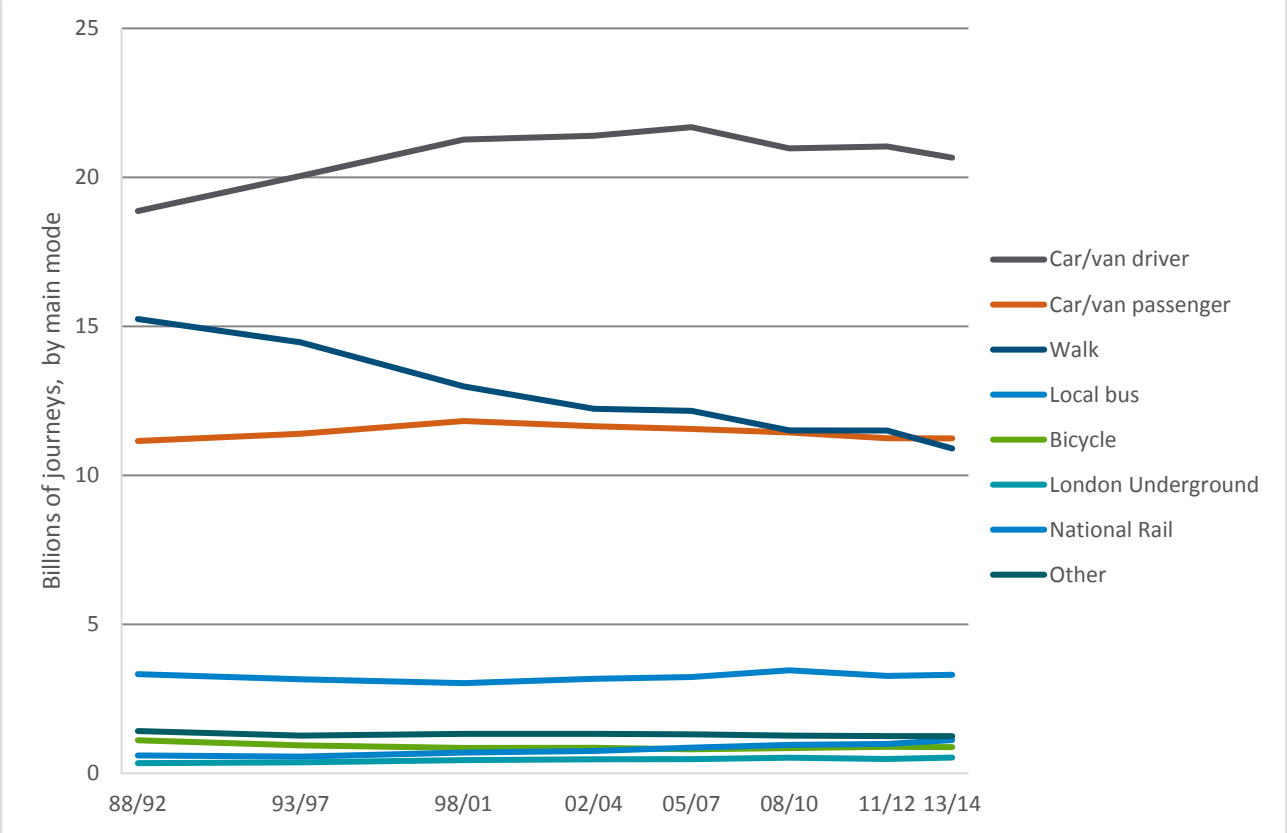

Figure 6 Annual number of journeys, by main mode. Source: Authors' analysis derived from National Travel Survey and ONS Population Estimates[19]

Table 1: Annual mode share for all journeys, by main mode. Source: National Travel Survey

	1988/92	2013/14
Car/van driver	36	41
Car/van passenger	21	23
Walk	29	22
Local bus	6	7
Bicycle	2	2
London Underground	1	1
National Rail	1	2
Other	3	2

While the number of driving journeys has yet to exceed the peak annual level seen in the mid-2000s, the number of driving licence holders continued to increase into the 2010s (Figure 7). Despite a decrease in licence-holding among younger adults[20], this overall

[19] NTS data on trips per person by mode have been multiplied by ONS mid-year population estimates to derive estimates for total numbers of trips

[20] See Statistical data set Driving licence holding and vehicle availability, Table NTS0202. Available at: https://www.gov.uk/government/statistical-data-sets/nts02-driving-licence-holders.

growth is associated with an increasing number of adults and an increase in licence-holding among older adults.

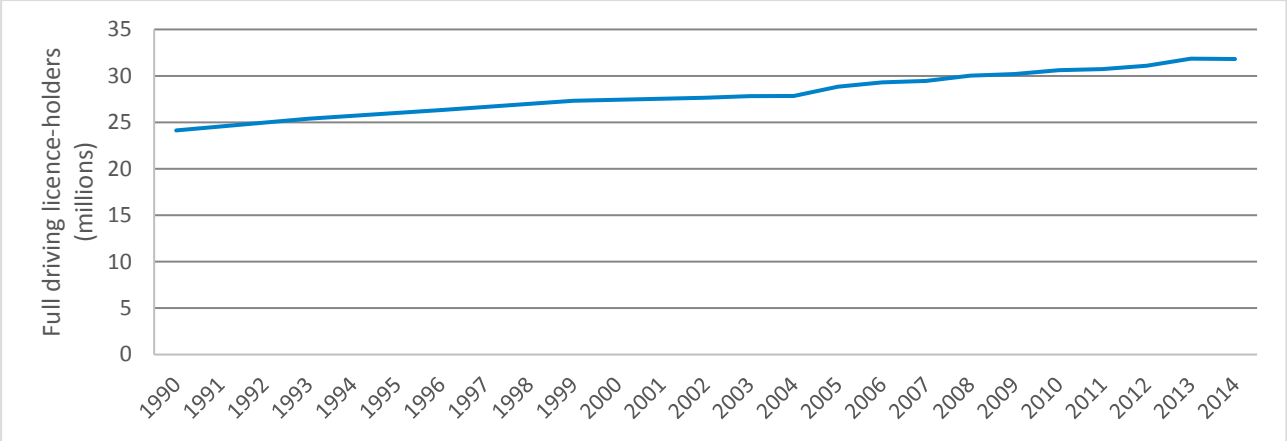

Figure 7 Driving-licence holding. Source: National Travel Survey

Headline trends in commuting

- **The average worker is making fewer 'commuting' journeys. Some, but not all, of this is due to how 'commuting' is defined**
- **Workers are working fewer hours per week**

Commuting journeys per worker have consistently trended downwards in recent years, from 7.1 journeys per week in 1998/92 to 5.7 in 2013/14 (Figure 8). This is consistent with patterns observed in other UK countries. In Wales commuting journeys per worker fell from 6.8 in 1988/92 to 5.9 in 2011/12, and in Scotland the trend was from 7.6 to 6.1 over this same time period. Similar trends have also occurred in other advanced industrialised nations: the USA's National Household Travel Survey, for instance, shows that the number of trips to/from work per worker decreased by 4% between 1990 and 2009.[21]

The fact that the typical worker now travels to work at their usual workplace less frequently is due in part to the growth of people working either from home or at multiple places but without a single 'usual' workplace. However, this is not a complete explanation: even if we only consider people that travel to their usual workplace at least once per week, Figure 8 demonstrates that the number of times they do so has gone down.

[21] Bespoke analysis provided by Nancy McGuckin, as supplement to: Pisarski, A. et al. (2013) *Commuting in America 2013: The National Report on Commuting Patterns and Trends.* http://traveltrends.transportation.org/

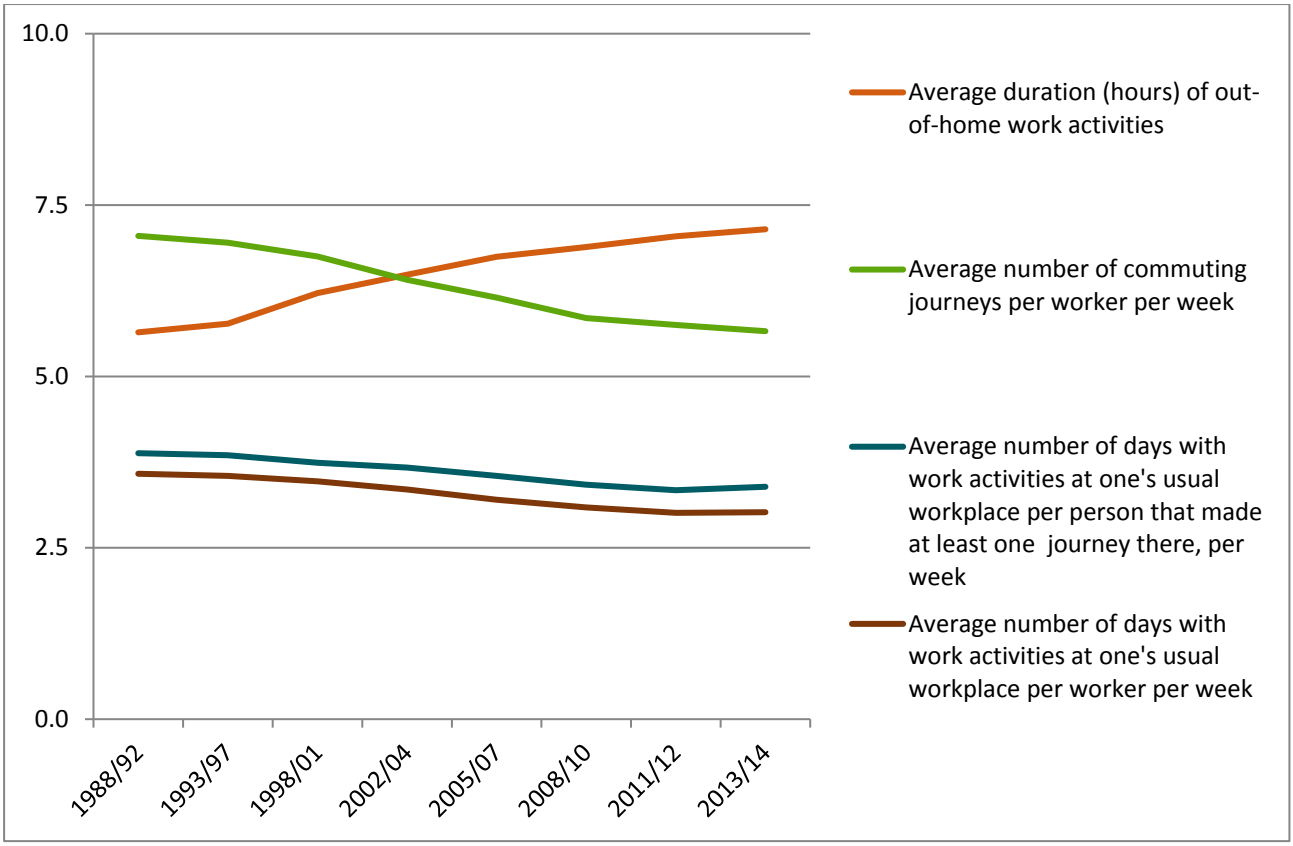

Figure 8 Trends in commuting and work activity, 1988/92 to 2013/14. Source: National Travel Survey

Figure 9 shows that between 1998/92 and 2013/14 there was a slight downward trend in the proportion of adults that perform any work-related travel during a representative week. There has been a sharper and more sustained downward trend of eight percentage points in the proportion of adults traveling to work on any given weekday during the traditional morning peak period for commuting.

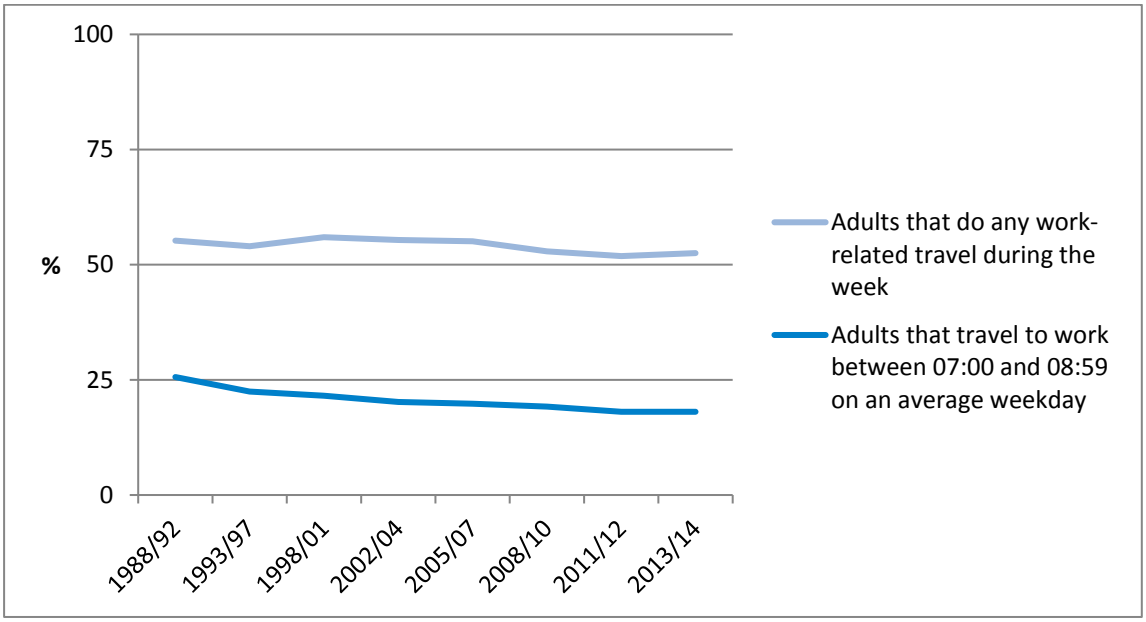

Figure 9: Work related travel during an average week. Source: National Travel Survey

While England has seen a longer average working day, the number of hours per week worked declined throughout the 2000s, with a small rebound since 2011. Figure 10 shows this pattern exists for both full- and part-time workers. Both have tended to spend fewer hours per week at their workplace, though they are spending more time there during each day that they work.

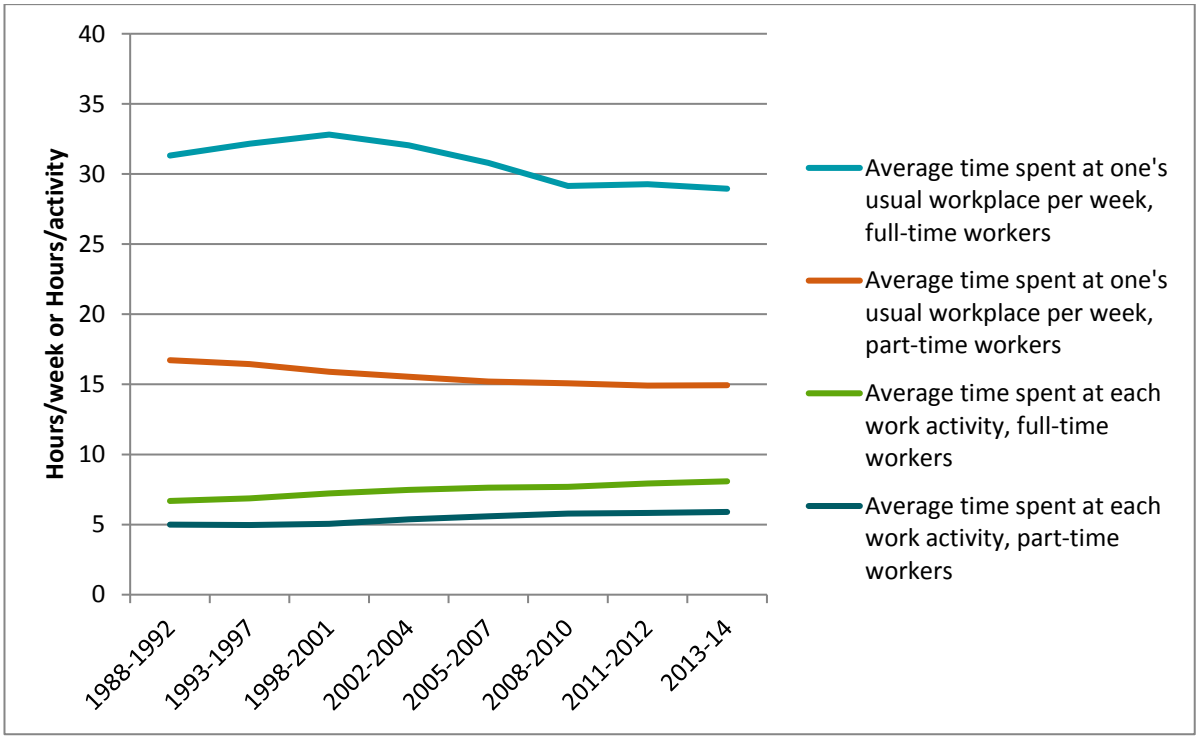

Figure 10 Hours spent at workplace and average duration of work activities. Source: National Travel Survey

There has been a long term decline in the number of journeys the average person makes each year, from 1,091 in 1988/92 to 922 in 2013/14. Within this, the number of commuting journeys has seen the strongest decline of all. This can be seen in Figure 11 as the decrease in commuting's share of all trips made by English residents. In the most recent period (2013/14) there was an upturn in commuting as a proportion of all journeys; this recent upturn could reflect increased labour market participation, however it is not clear at this point whether this reflects a longer-term pattern.

Travel to work activities can be characterised in multiple ways (see "What is a Commuting journey?" earlier), however. Figure 11 shows that the downward trend holds whether we consider the standard definition of commuting, or other measures of travel to/from work.

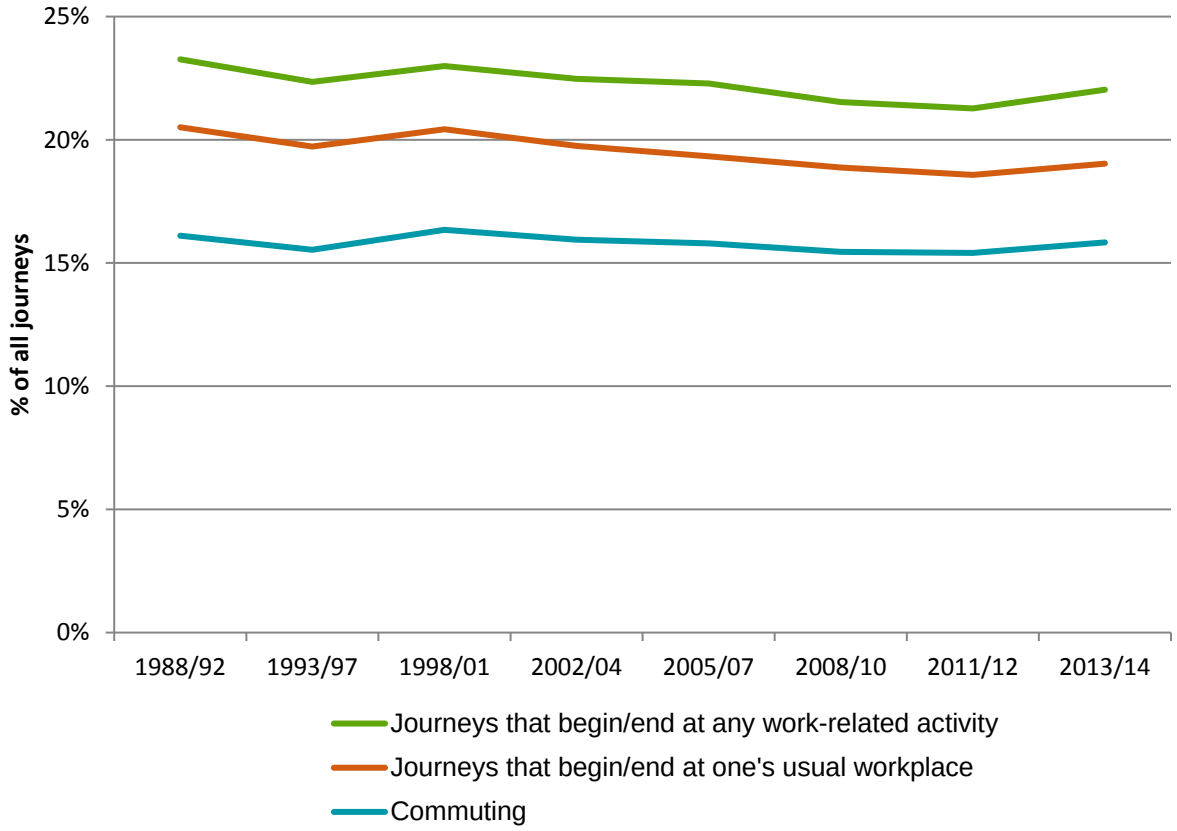

Figure 11 Commuting, journeys to/from usual workplace, and all work-related journeys as a proportion of total journeys. Source: National Travel Survey

Commuting mode

- **More than half (56% in 2013/14) of commuting journeys are made by car as a driver. This proportion was stable through to 2008, after which it decreased by several percentage points.**
- **Approximately 10% of commuting journeys are performed as a car passenger; this proportion has decreased over time**
- **National Rail commuting journeys are, on average, further than commuting journeys by other modes of travel**
- **Cycling to work has increased in London, but the trends elsewhere have been mixed**

The majority of commuting journeys (56% in 2013/14) are made as a car driver. This proportion increased during the 1990s and up to 2005/7, and then trended down slightly.

Walking and travelling as a car passenger are the next two most popular modes. Both have decreased over time but these downward trends have now stabilised. By contrast, the proportion of commuting journeys made by National Rail, London Underground, and local buses have all increased over time. The increase in local bus use for commuting is the net effect of strong growth in London and an overall decline elsewhere.

Walking has declined rapidly amongst all journeys that begin or end at one's usual workplace but are not to/from one's home. This is due to a decrease in the

prevalence of workers making personal journeys during the middle of the working day. As with walking for commuting purposes, the most recent data show that this decline has also now stopped.

Driving is most dominant for work-related journeys that do not begin or end at one's usual workplace. For this type of work-related journey, however, driving has decreased over time. This may be a consequence of changes in tax treatment of company cars since the late 1990s.

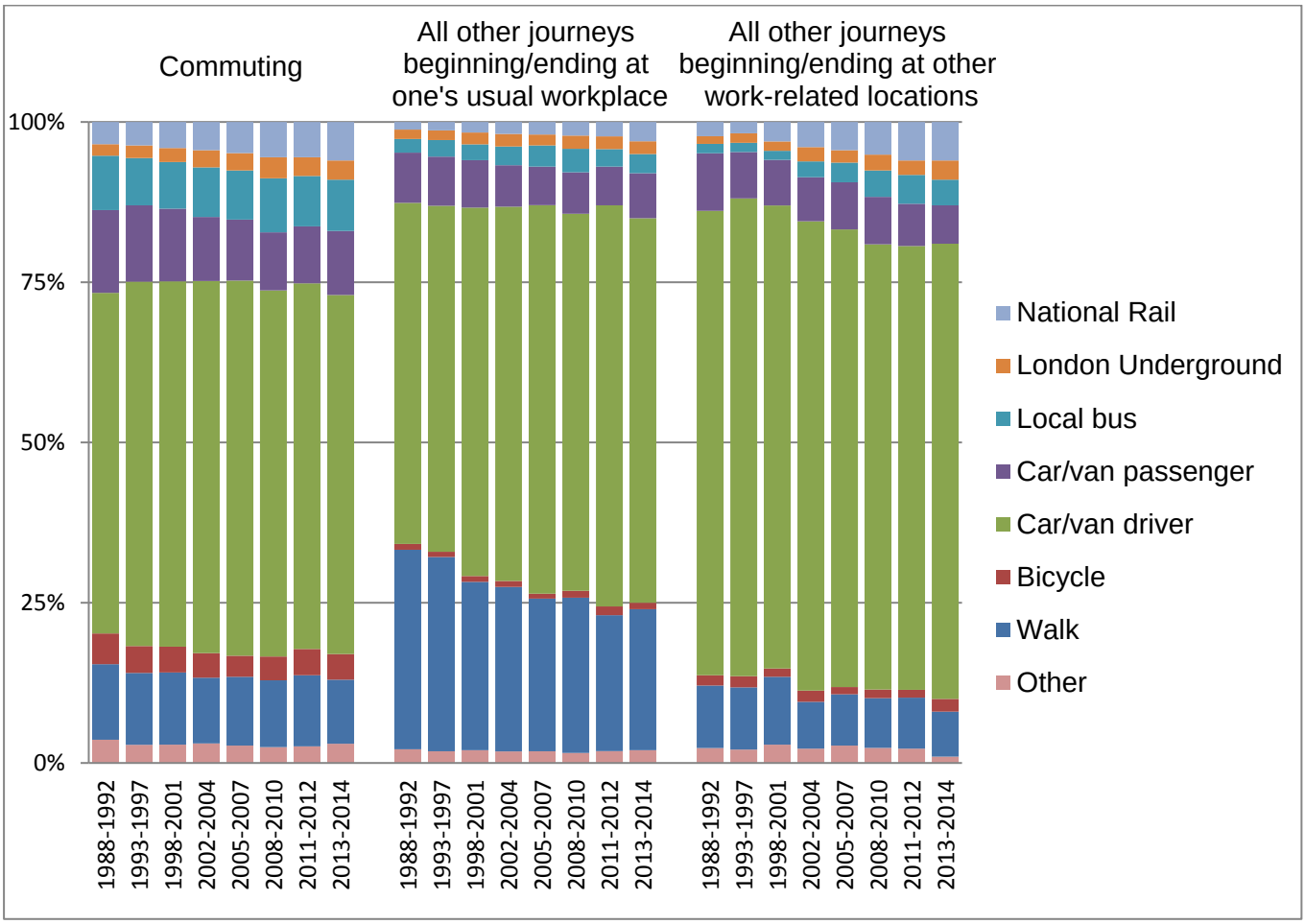

Figure 12 Proportion of journeys by mode, by types of work-related trips. Source: National Travel Survey

Gender and age

Car travel is the predominant commuting mode for all age/gender groups. Amongst men, public and active modes are more popular for younger groups; bicycle commuting is most popular amongst men aged 20-49. Car driving becomes increasingly popular with age. Women have a similar trend of increasing car use and decreasing public transport with age, although the use of active modes is broadly stable (13-14%) across age groups.

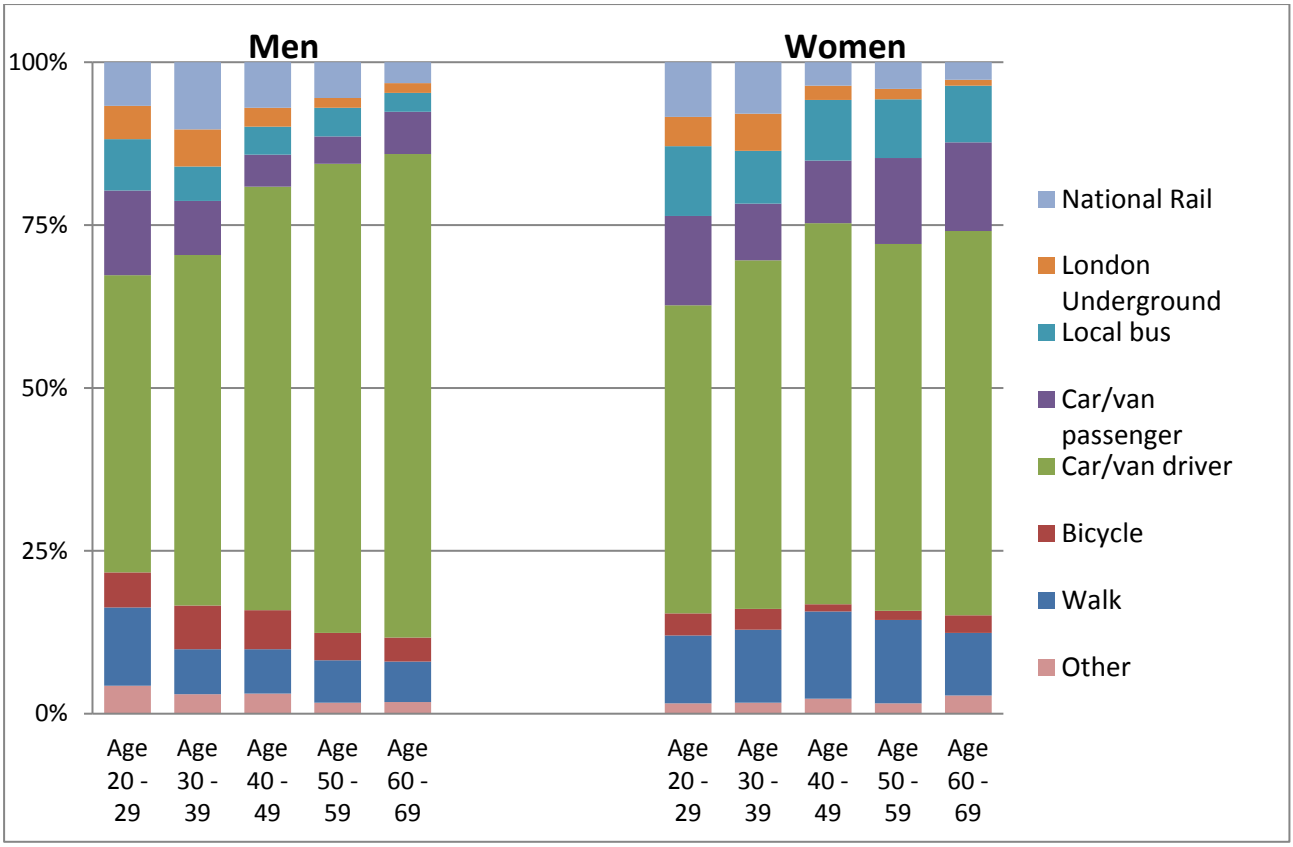

Figure 13 Commute mode share by age and gender (2013/14). Source: National Travel Survey

Mode and distance

Some modes of transport are used more frequently for long-distance commuting than others. Perhaps unsurprisingly, active modes represent the shortest average journeys - walking is less than a mile while cycling is around three miles. Local bus journeys average half (5.3 miles) the distance of car journeys (10 miles). Perhaps reflecting its use for inter-urban journeys, commuting by National Rail at an average of 20 miles is the longest distance amongst major modes of transport.

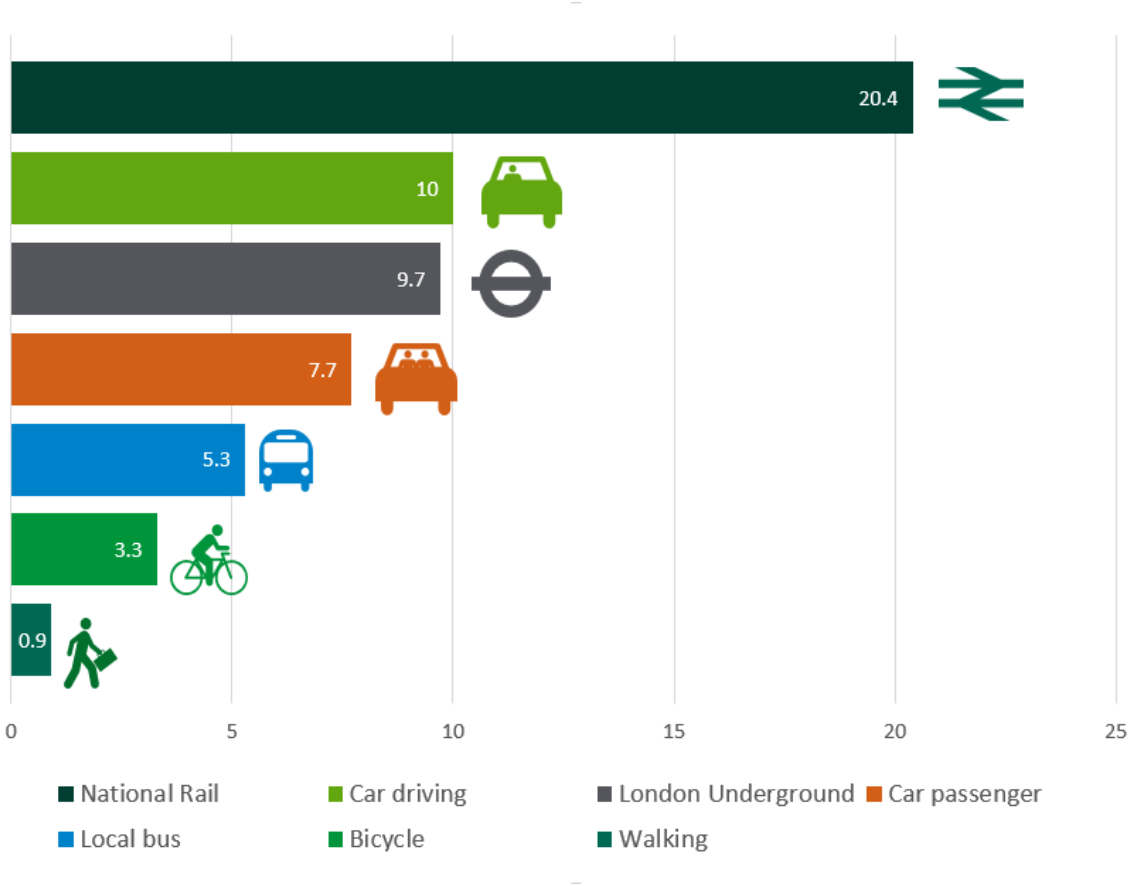

Figure 14 Average distance of commuting journeys in miles, by main mode (2013/14). Source: National Travel Survey

Settlement size

In addition to demographics, commuting patterns also depend strongly on where people live. Table 2[22] shows commuting by car is higher in more rural areas and lowest in the largest urban areas, particularly London.

London has experienced a sharp decrease in car driving for commuting in the 2000s, however it is noteworthy that the decrease in car driving's mode share was much smaller in the second-tier (e.g. Manchester, Liverpool) and third-tier (e.g. Bristol, Doncaster) conurbations.

Commuting by public transport tends to increase as areas become more urban. Levels of National Rail commuting are highest in London (18%); inner London has seen the strongest growth (10 percentage points) since 2002.

Commuting by active modes (walking and bicycles) is most common in inner London and 'urban with city and town' areas (18%), and least popular in outer London (where just 9% use active modes). The well-established strong growth in cycling is evident, although in outer London the growth has been much lower. Elsewhere, commuting-by-bicycle was mixed: an increase in one area, a stable level in one area, and a decrease in three areas.

[22] ONS' standard classification is comprised of six areas; this was extended for the purposes of this study by distinguishing both Inner and Outer London separately from the rest of the *Urban with Major Conurbation* area. It was possible to merge this with National Travel Survey data beginning with year 2002.

	Mainly Rural	Largely Rural	Urban with Significant Rural	Urban with City and Town	Urban with Minor Conurbation	Urban with Major Conurbation	Inner London	Outer London
Walking	13% (+2%)	9% (-1%)	11%	12% (+1%)	8% (-4%)	10%	10%	6%
Bicycle	3% (-1%)	4% (-1%)	3% (-2%)	6% (+1%)	4% (-2%)	3%	8% (+3%)	3% (+1%)
Car/van driver	67% (-1%)	69% (+3%)	67% (+3%)	58% (-4%)	62% (-2%)	56% (-1%)	12% (-5%)	35% (-9%)
Car/van passenger	10% (-1%)	10% (-1%)	10%	13% (-2%)	12% (-1%)	11%	1% (-1%)	5% (-2%)
Local bus	3% (-1%)	2% (-1%)	3% (-1%)	6%	10%	10% (-2%)	21% (-2%)	12% (+1%)
London Underground	--	--	--	--	--	--	26%	16% (+1%)
National Rail	2% (+1%)	3%	4% (-1%)	3%	3% (+2%)	7% (+3%)	18% (+10%)	18% (+3%)

Table 2 Journeys to/from usual workplace by main mode and area type, 2013/4. Values in brackets show change in percentage points from 2002/4. Source: National Travel Survey, using ONS' standard spatial classification.

Commuting throughout the week

- **There has been a sharp decrease in travelling to work on six or seven days per week**
- **Home working is increasing, but a more rapidly growing group is self-declared workers who perform no work-related travel during an average week, but do travel for other purposes. The causes of this increase are not clear.**
- **The decrease in the proportion of workers travelling to their usual workplace is not primarily due to people switching to 'usually' working from home, but rather to other factors such as people 'occasionally' working from home and an increase in workers who do not have a single 'usual' workplace.**
- **There has been an increase in the proportion of National Rail commuters who commute by National Rail on each day that they work, but who work fewer than five days per week**

There has been a large drop in the proportion of workers who travel to work six or more days per week (Figure 15). Though we cannot know with certainty, this trend appears to be linked with phenomena observed across a number of datasets[23] of decreasing hours worked per week, and in particular fewer hours of overtime working.

There has not been a shift from six or seven-day working weeks to five-day weeks. Instead there is a growing group who describe themselves as employed full-time, but who are observed to travel to work fewer than five days per week (from 30% in 1988/92 to 35% in 2013/14), or who did not travel to work at all during their diary week[24] (from 12% to 17%).

[23] Labour Force Survey, Annual Survey of Hours and Earning and National Travel Survey
[24] The term *diary week* is employed throughout this report to describe the seven-day period during which each NTS respondent records their journeys.

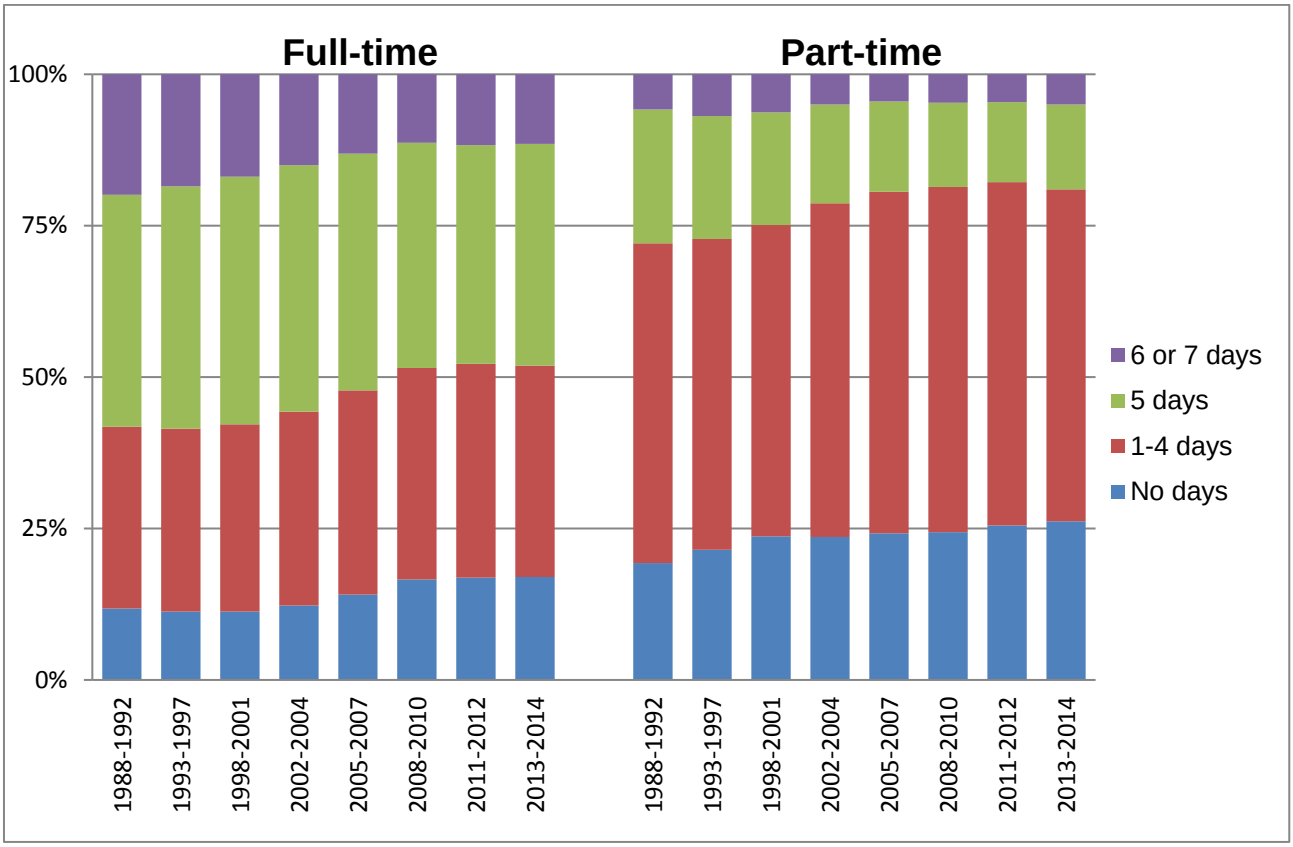

Figure 15 Number of days per week with work-related travel for full-time and part-time workers. Source: National Travel Survey

Over the long-term, working outside of the home has decreased on every day of the week except Sunday (see Figure 16). The fewest work trips take place on Sundays, but over time Sundays have become more like Saturdays due to the fact that commuting has tended to decrease on Saturdays and increase on Sundays. The largest number of work trips take place on midweek days (Tuesdays, Wednesdays and Thursdays), followed by Fridays and Mondays.

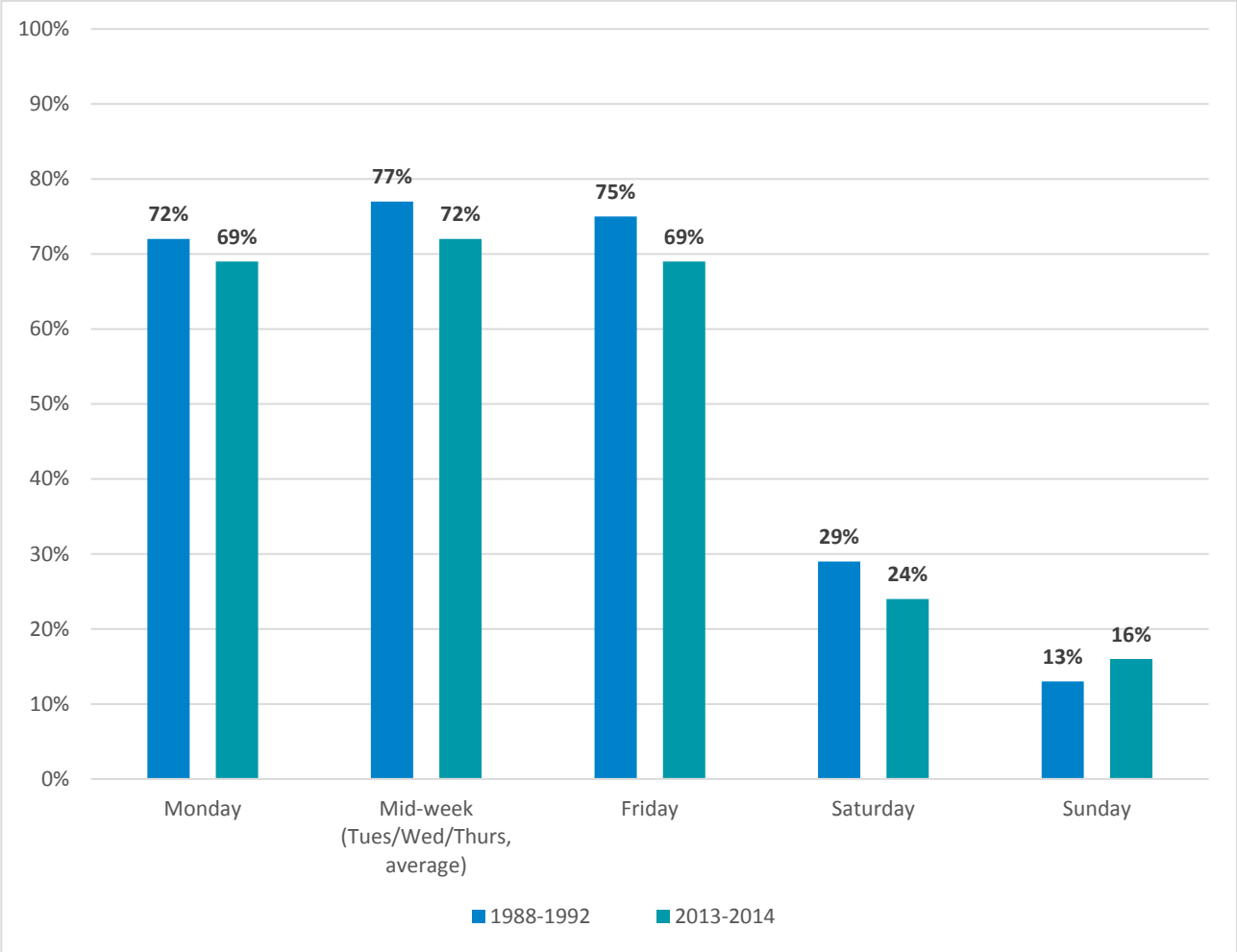

Figure 16 Proportion of workers travelling to their usual workplace on each day of the week (among workers those who do so at least once a week). Source: National Travel Survey

Figure 17 shows that the share of full-time workers who travelled to work at their usual workplace at least once has declined. This is mainly accounted for by an increase in workers who describe themselves as being employed outside of their home, and are travelling during their diary week but not for work purposes. This analysis does not identify whether this is in the form of short-term (for example, holiday) or long-term time off work (e.g. people with a long term illness who self-declare as 'employed'). It makes clear, however, that the decrease in the workers travelling to their usual workplace is not primarily due to people switching to 'usually' working from home.

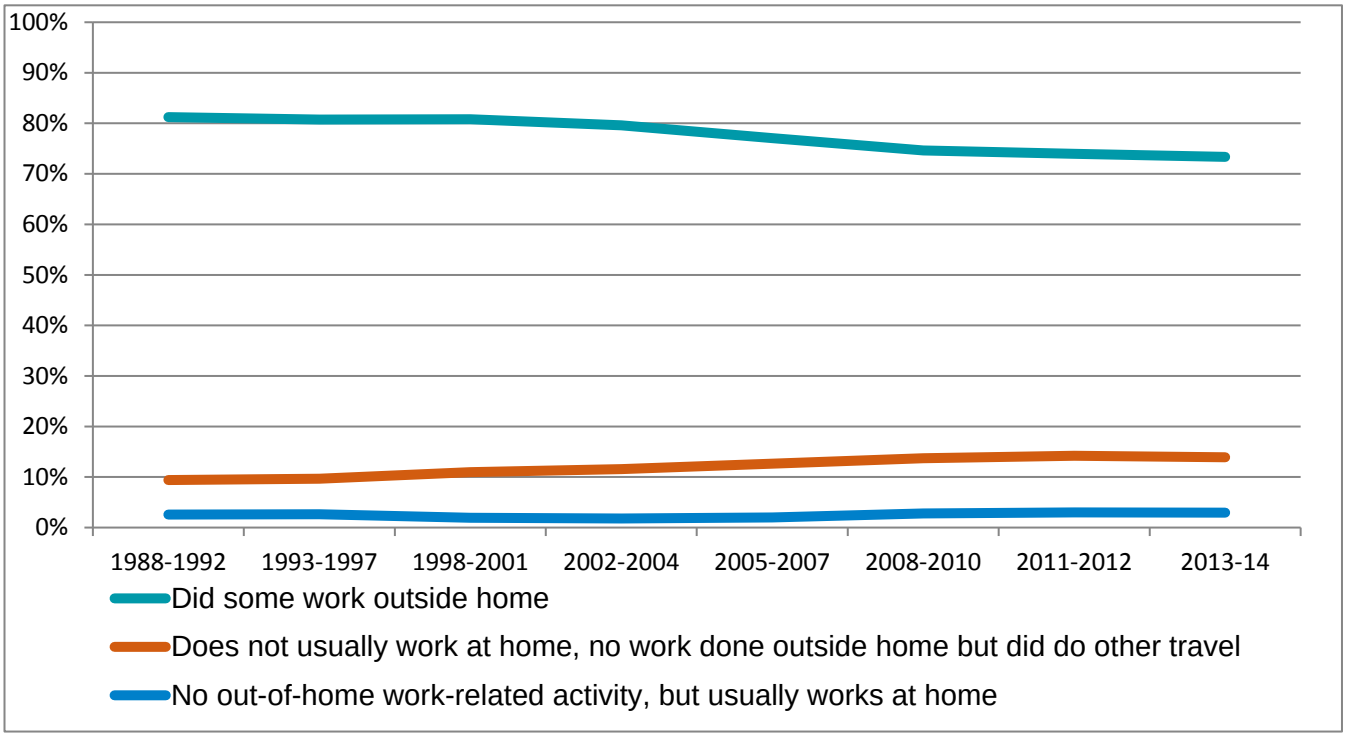

Figure 17 Workers by whether work/non-work travel is performed during diary week and/or whether they report 'usually' working at home.
Source: National Travel Survey

Figure 18 shows how the proportion who undertake no work-related travel during their diary week has changed among workers with different types of workplace. This increase in zero-outside-of-home-work-activity weeks is most clearly linked with workers who work at more than one place (who in 2013/14 account for 16% of workers, up from 9% in 1988/92). Among this group, the proportion undertaking no work-related travel increased from 13% in 1998/92 to 30% in 2013-14.

These people may be freelance workers, working at multiple sites on a regular basis, but not making work-related journeys during their NTS diary week. For workers who work at the same 'usual' workplace each time they travel to work, the increase in 'zero-work-activity' weeks has been smaller.

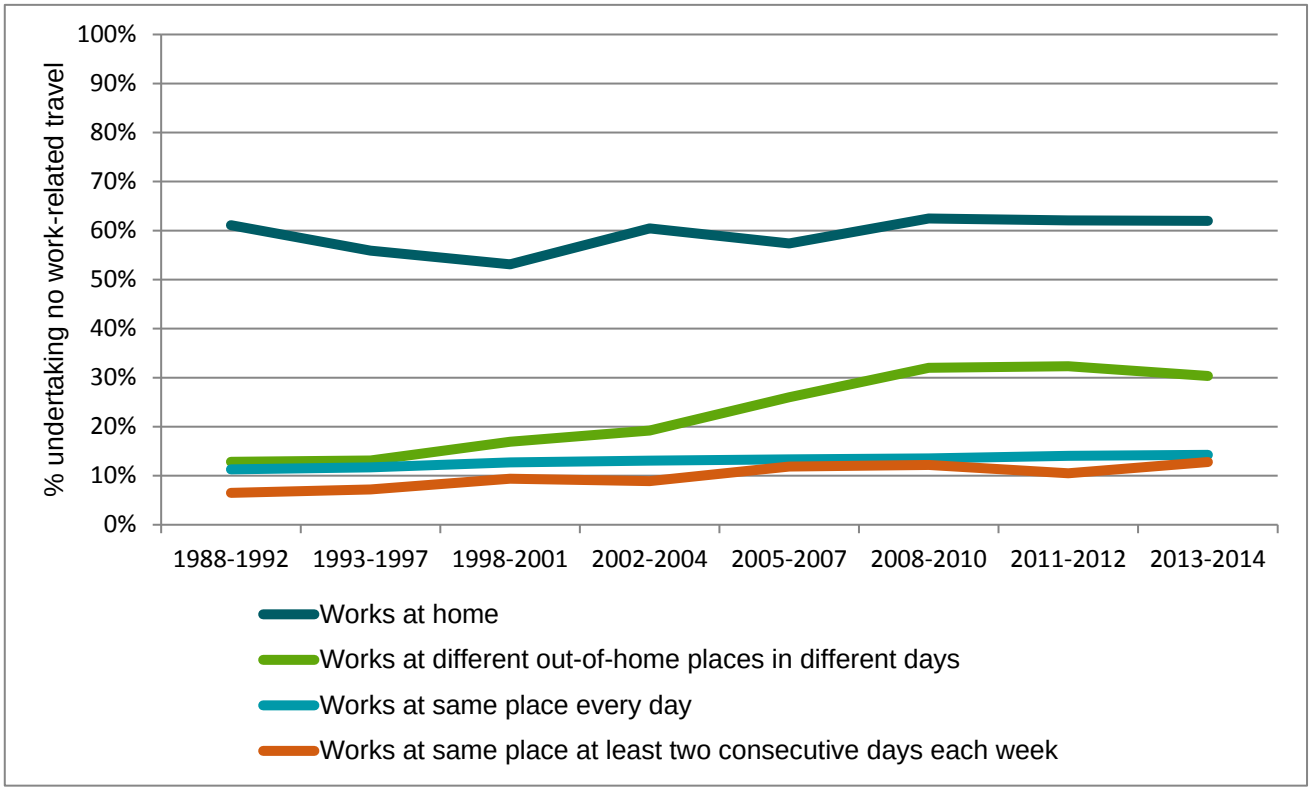

Figure 18 Workers undertaking no work-related travel, by type of workplace. Source: National Travel Survey.

Figure 19 shows that self-employed non-professionals are the type of worker most likely to not have performed any out-of-home work activities during their diary week. At the other end of the spectrum, manual workers are over-represented amongst those working outside the home 6-7 days. As described earlier in this section, self-employment is increasing.

It is noteworthy that Figure 4 also shows a decrease over time in the share of Manual-type workers[25], which are the most likely to perform work activities on more than five days per week.

[25] Note that the "SOC2010" categories shown in Figure 19 do not align perfectly with the “SEG” categories shown in Figure 4.

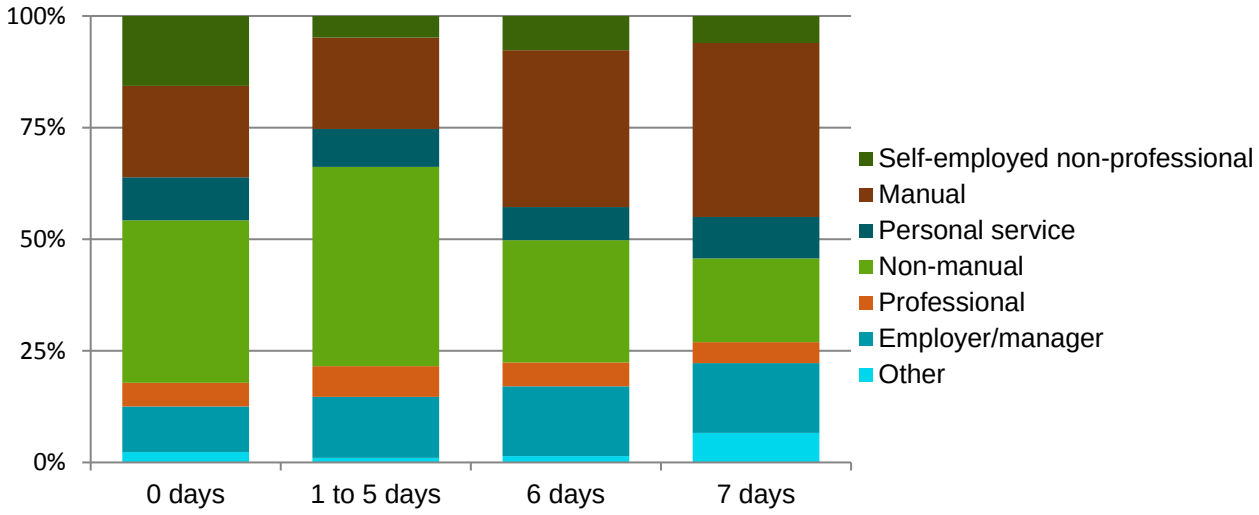

Figure 19 Number of days out-of-home work-related activity performed, by occupation type (SEG). Source: National Travel Survey

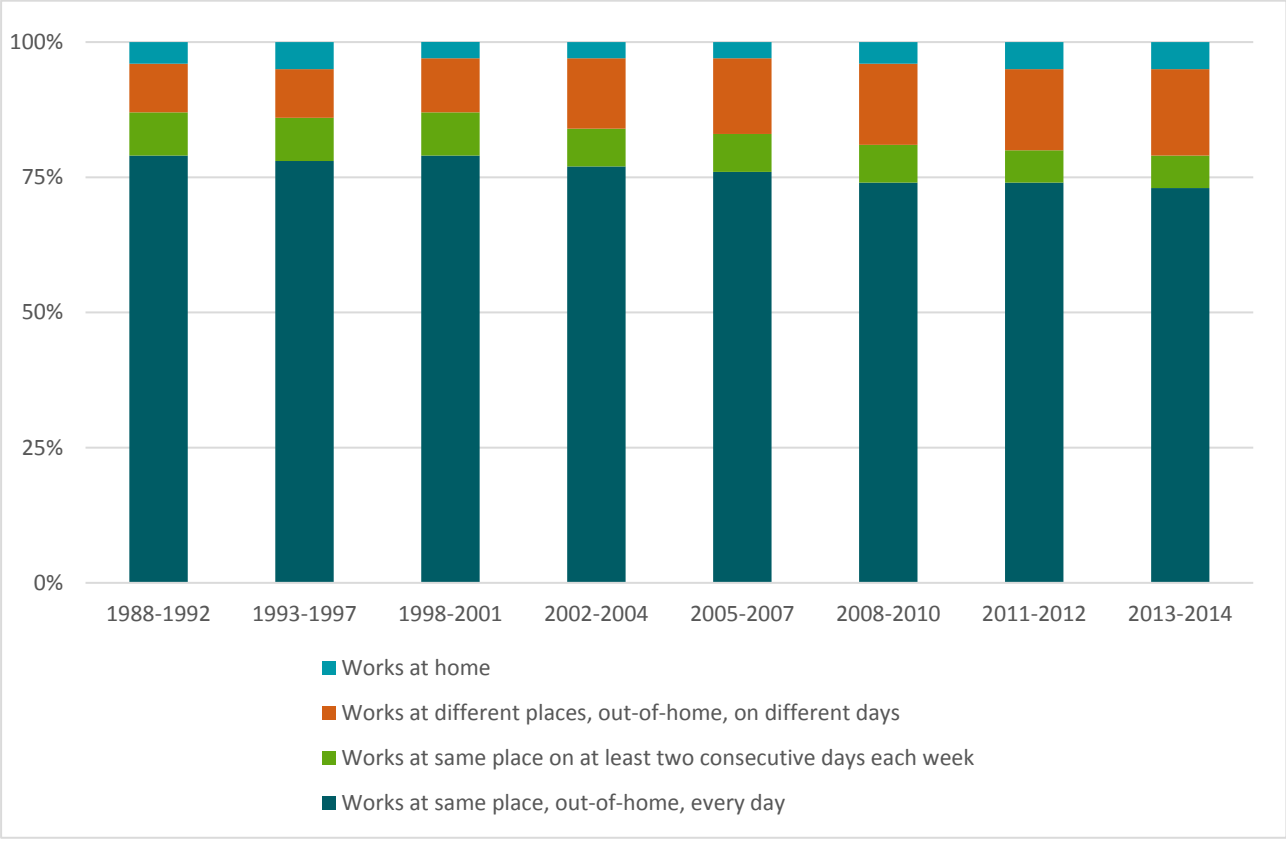

Figure 20 Workers by place of work throughout the week. Source: National Travel Survey.

Research recently published by ONS[26] has shown that self-employed workers are concentrated in industries such as construction, taxi-driving and farming.

Figure 20 shows that there has been an increase in working at home on a usual basis, but that there has been quicker growth in working at 'different places on different days' (i.e. having no fixed workplace). There has been a decline in the more traditional pattern of working consistently at the same out-of-home workplace. Further analysis (not shown in Figure 20) demonstrates that self-employed workers are much more likely than employees both to usually work at home and to work at different places on different days.

As was detailed earlier in this section, self-employment has also been increasing in the 2000s. ONS further reports that the increase in self-employment has been driven largely by a decrease in the number of people leaving self-employment, which it suggests might be due to fewer opportunities to work as an employee after the onset of the 2008 economic downturn.

ONS shows that London has the highest concentration of self-employed workers of any region, at 17% of its workforce. With the growth in self-employment, their average income has decreased (ONS reports a decrease of 22% between 2008/9 and 2012/13), suggesting that the newly self-employed workers may have relatively lower incomes then the previous pool of self-employed workers, and are perhaps therefore also less likely to travel for work reasons. In other words, it is possible that the increase in self-employment signifies under-employment, which could contribute to the overall reduction in commuting.

Between 1998 and 2008, NTS respondents who usually worked outside of their home were asked whether they had worked at home (instead of travelling to work) in the week before their interview, and if so which specific days of the week. From 2009, the question was modified to ask whether workers usually work from home instead of travelling to work.[27], [28]

In 2008, workers whose usual workplace is not their home worked an annualised average of 7.7 days/year at home. In 2009 the new question format resulted in an estimate of only 3.6 days/year. Using the richer data available most recently in 2008, there were large differences on the basis of whether or not workers had a usual workplace:

- Workers with a single ‘usual’ out-of-home workplace worked at home an average of 4.8 days/year in 2008

[26] http://www.ons.gov.uk/ons/rel/lmac/self-employed-workers-in-the-uk/2014/sty-self-employed.html

[27] Prior to 2009, the question wording was: *Can I just check, in the week ending last Sunday (the [Date of last Sunday]), did you work at home on any of the days INSTEAD of travelling to your usual place of work? [IF YES:] On which days did you work at home?* From 2009 onwards, the question wording is: *On which days of the week do you usually work from home or does it vary?*

[28] The annual average increased from 5.9 days/year of this 'occasional' home-working in 2002 to 7.7 days/year in 2008 (this is 0.11 days/week during the NTS diary week in 2002 and 0.15 days/week in 2008, scaled to an annual level by a grossing up factor of 52 weeks/year.

- Workers who do not have a single usual workplace, but who work at the same place on at least two consecutive days each week worked at home an average of 14.6 days/year in 2008
- Workers who work at different out-of-home places on different days worked at home most frequently, an average of 19.6 days/year in 2008.

Three other findings are worth noting. First, there is also an increasing overall trend in working at home some of the time (2.7 days/year in 2002 to 3.6 in 2008), particularly amongst 'same place' workers (3.0 in 2002 to 4.8 in 2008) and 'same place on at least two consecutive days' workers (10.6 to 14.6) (among 'different place' workers the trend was from 19.6 to 19.4). Second, in 2008 more than half (52%) of 'some-of-the-time' workers worked at home on only one day the previous week. Finally, there is a sharp drop-off between 2008 and 2009 (3.6 days/year to 1.6 days/year). This suggests that workers were choosing to work at home on an opportunistic basis, with many fewer saying that they have usual days per week that they work at home instead of travelling to work.

In terms of types of work performed (SEG), 'Professionals' were the most likely to work at home occasionally (in 2008 16% reported doing so), followed by 'Employers/Managers' (14%) and 'Self-Employed Non-Professionals' (8%). 'Manual' and 'Personal Service' workers were the least likely (at fewer than 1% each).

Focus on: National Rail commuting

Our analysis demonstrates significant shifts in commuting by National Rail throughout the week, which have taken place within the wider context of rapid growth in rail patronage since privatisation[29].

First, Figure 21 shows a downward trend in those using National Rail services for their commute five or more days per week, from 36% in 1988/92 to 30% in 2011/12. This was largely replaced by an increase in workers commuting on fewer than five days-per-week on National Rail, increasing from 64% to 71% during this period.

The 2013/14 data show a reversal (six percentage point increase), however, and it is not clear whether this is a real pause /reversal of this trend (and which may therefore continue) or a statistical blip.

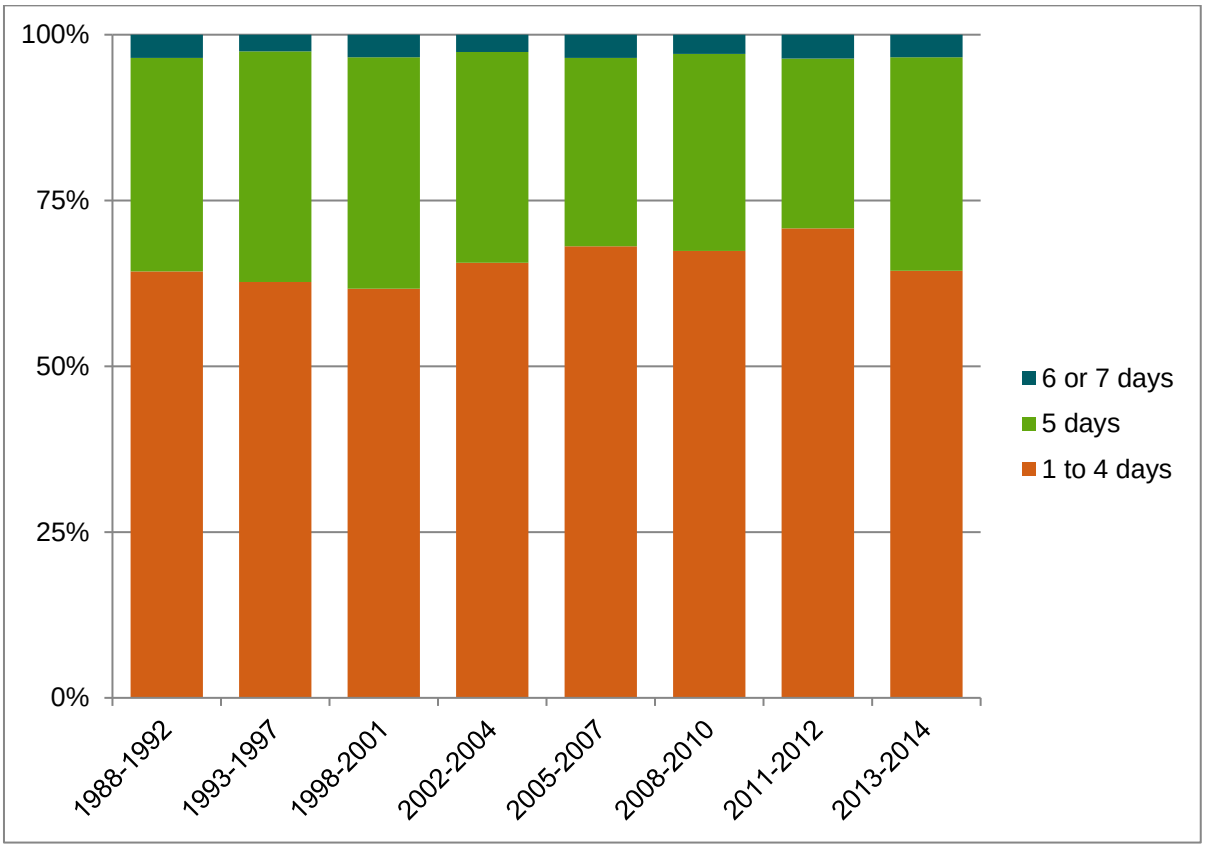

Figure 21 Of people that travelled to/from their usual workplace by National Rail at least once during their diary week, the number-of-days that NR was used for these journeys. Source: National Travel Survey

Figure 21 raises the question of whether there is a significant proportion of National Rail commuters who sometimes use another mode to get to work. Figure 22 suggests that this is not the case: the change can be largely explained by workers

[29] See: http://orr.gov.uk/__data/assets/pdf_file/0013/20029/passenger-rail-usage-2015-16-q2.pdf

not travelling to work a full five days per week, as opposed to using rail some days and other modes on other days. This is consistent with patterns observed earlier in this section of the more general decrease in the number of days with work activity.

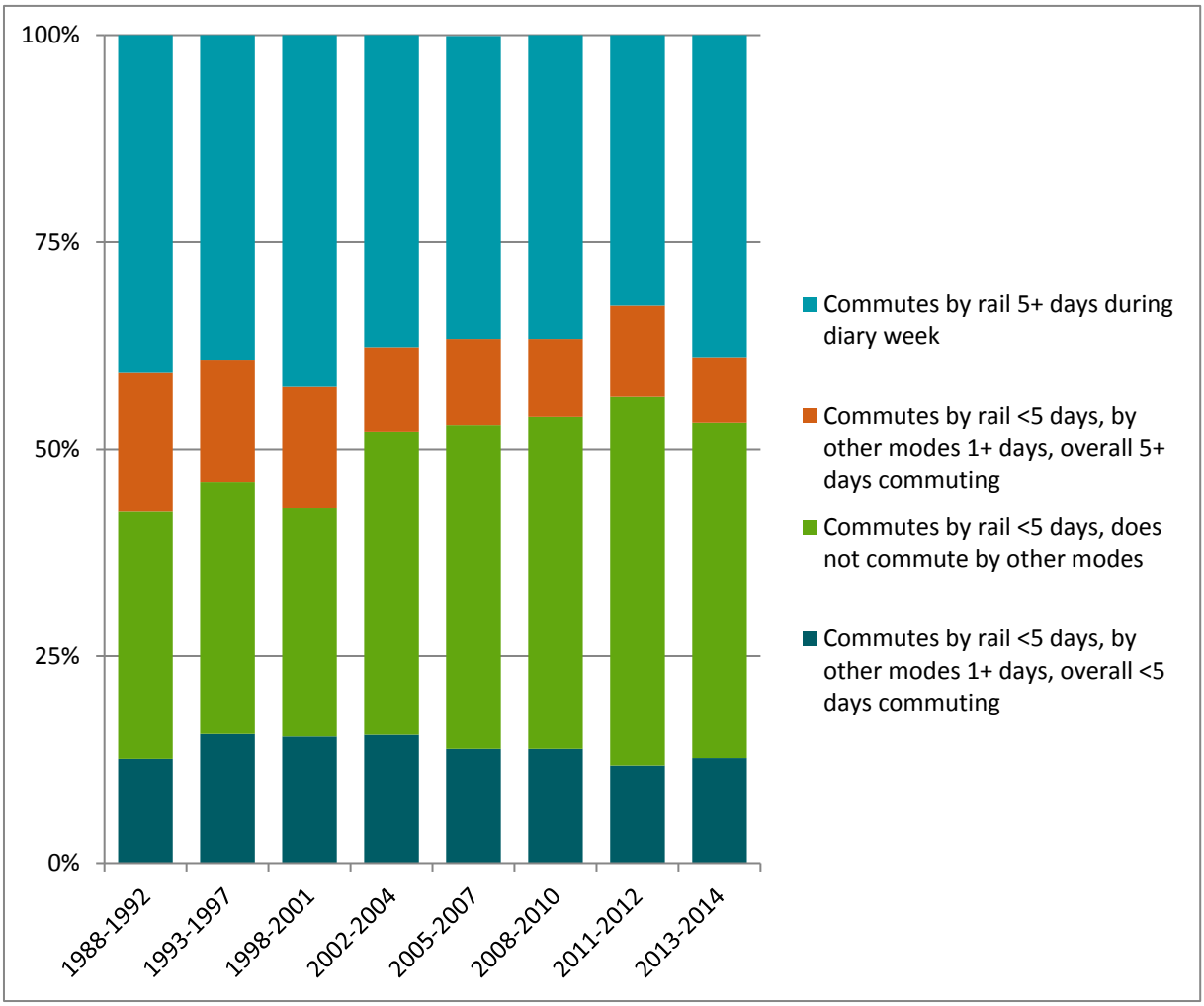

Figure 22 Days with a commute throughout the week, and whether rail sole mode or other mode used on at least one day. Base: National Rail commuters. Source: National Travel Survey

Figure 23 shows the same information as Figure 22, with workers split by full/part-time status. Amongst both full-time and part-time workers, there has been a shift away from sometimes using National Rail for commuting and sometimes using other modes.

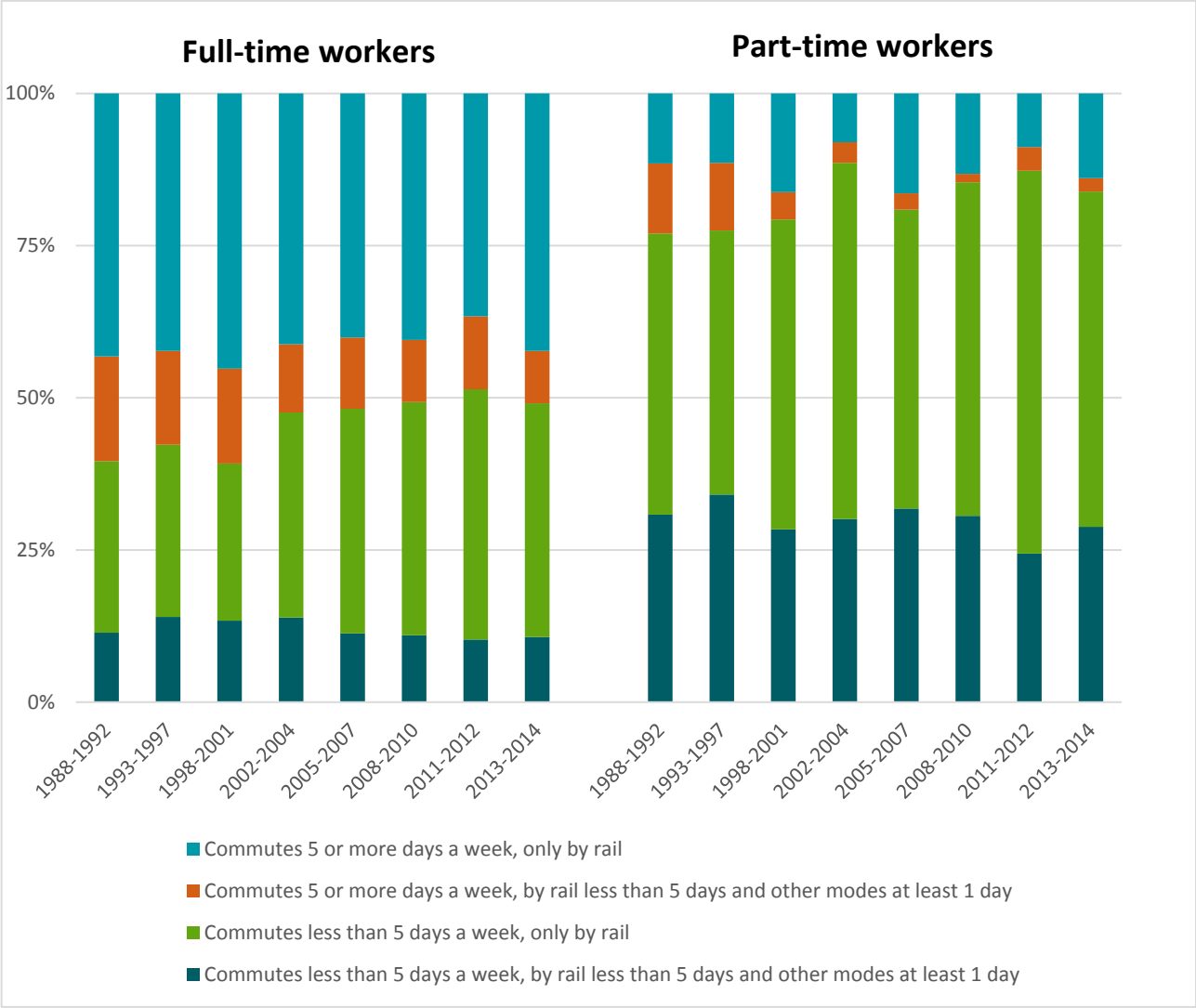

Figure 23 Days with a commute throughout the week, and whether rail sole mode or other mode used on at least one day, and whether full- or part-time. Base: National Rail commuters. Source: National Travel Survey

Time-of-day

- **Trips from work-to-home concentrating in a shorter period in the afternoon; no similar effect seen in the morning peak period**
- **Home-to-work journeys account for a decreasing share of morning peak period travel**
- **Decline in mid-day travel to/from work for shopping purposes**

Over time, 'workbound' commuting journeys (journeys from one's home to their usual workplace) have tended to start a few minutes earlier. By contrast, the departure time

of ‘homebound’ commuting journeys has become several minutes later (Table 3). This is consistent with the trend of increasing duration of work activities that is shown in Figure 10.

Table 3: Start times for ‘outbound’ and ‘homebound’ commuting journeys. Source: National Travel Survey

	Average start time of ‘outbound’ commuting journeys	Average start time of ‘homebound’ commuting journeys
1988/92	07:55 AM	16:03 PM
2013/14	07:51 AM	16:23 PM

Figure 24 shows the distribution of journeys to and from the workplace by time-of-day. Each of three sets of curves show journeys that either begin at the home (left), end at the home (right), or neither begin nor end at the home (centre).

There has been a decrease in the share of ‘from-home’ commuting journeys that are during the peak morning hour (07:00 - 07:59) and just after midday, with the greatest increases during the 06:00 and 10:00 hours.

The greatest change can be seen in the centre panel. Here only journeys to or from the usual workplace that do not begin or end at home are shown. There has been a broad shift in time for these journeys, away from the midday period and towards the morning and afternoon peak periods. The increase during the morning is largely due to more workers escorting children to school. Additionally, there has been a shift in shopping activities away from the midday period and towards the late afternoon

Amongst homebound commuting journeys, there has been a decrease around midday, and some growth during the late evening hours. The decrease in commuting around midday, both from-home and to-home, could indicate that a larger share of part-time workers are working full-length working days several days per week, as opposed to short-duration workdays on every weekday. Further research would be needed to determine whether this interpretation is correct.

It was noted previously that ‘Commuting’ journeys (defined as journeys between home and work with no intermediate stops) have declined as a share of all journeys. This shift has been concentrated in the peak periods (particularly the morning), as can be seen in Figure 24[30]. At the same time, there has been rapid growth in escort-to-education journeys (i.e. mainly accompanying children to school/college), as well as in other journeys that neither begin nor end at people’s usual workplaces.

[30] Only trips by adults (age 16+) are shown in Figure 24, to avoid the effect of large numbers of school pupils’ journeys

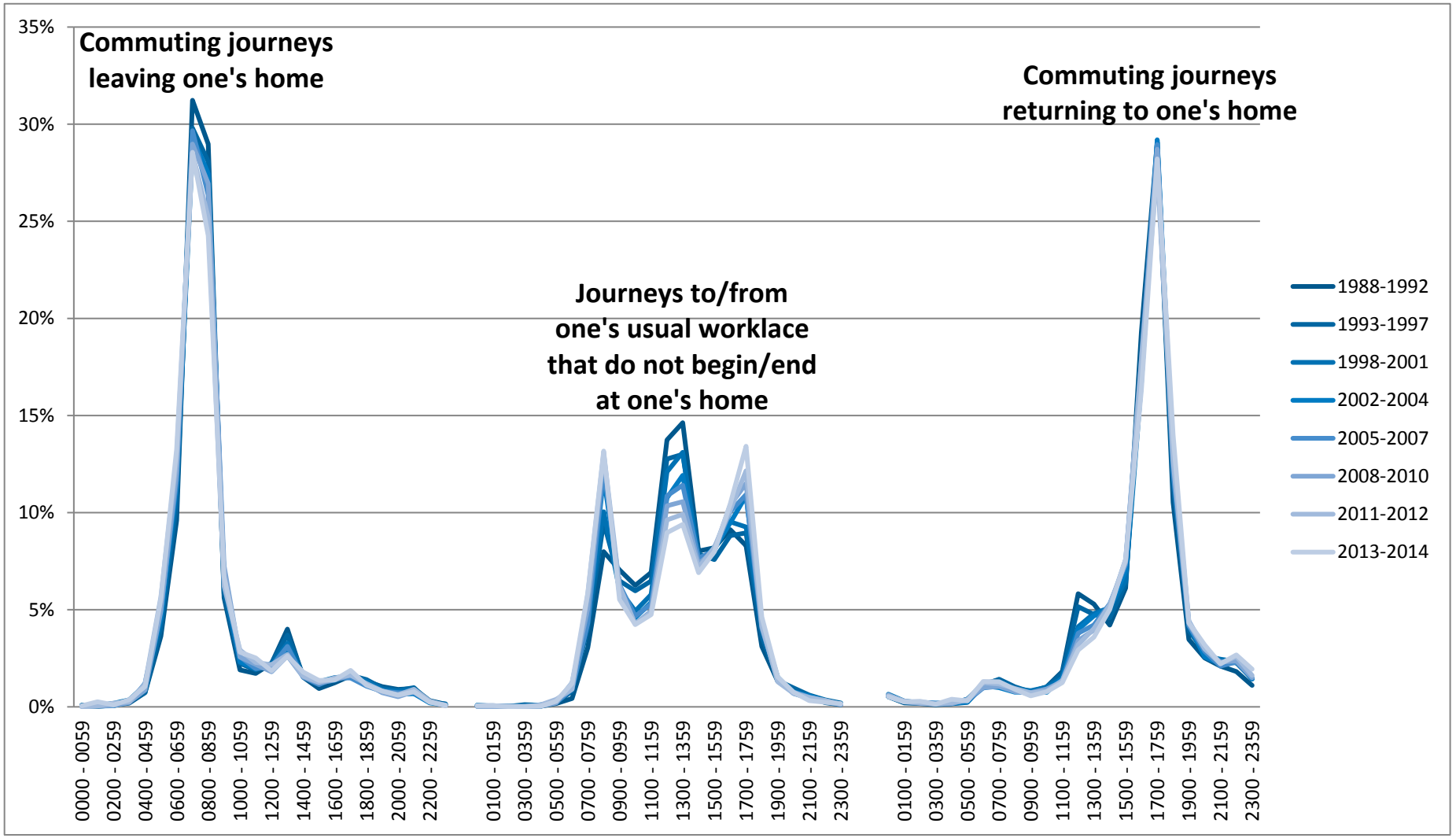

Figure 24 Journeys to/from one's usual workplace by hour-of-day (AM peak period). Panels show journeys from one's home (L), to one's home (R), and neither beginning nor ending at one's home (centre). Source: National Travel Survey.

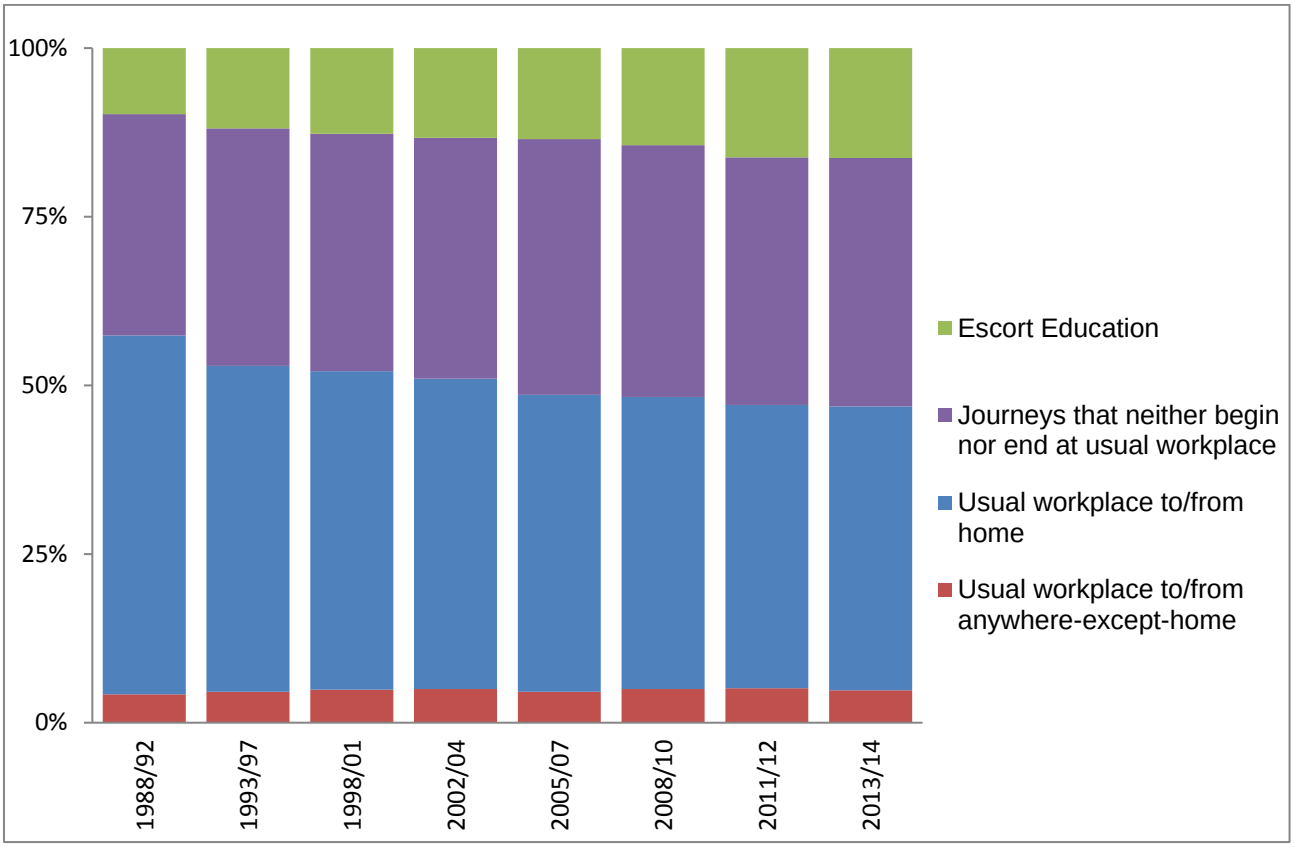

Figure 25 Distribution of journeys by whether or not trip is Escort-to-Education purpose, begins/ends at work, and the purpose of the non-work trip end (all journeys during the AM peak period only: 07:00 – 08:59). Source: National Travel Survey.

Different types of workers commute to or from work at different times of the day. In Figure 4, it can be seen that the 'Non-manual', 'Professional' and 'Employer/Manager' types of workers follow a traditional daily commuting pattern (morning and afternoon/evening peak period) most closely. At other times of the day, 'Manual' and 'Personal service' workers are over-represented. As the composition of the workforce shifts, this may have consequences for the degree of concentration of commuting trips during peak periods. For instance, there has been a decrease over time in the share of workers that are in the 'Manual'-type category of (see Figure 4), and it could be that this has tended to counteract the trend of peak-spreading in the morning peak period (shown in Figure 24).

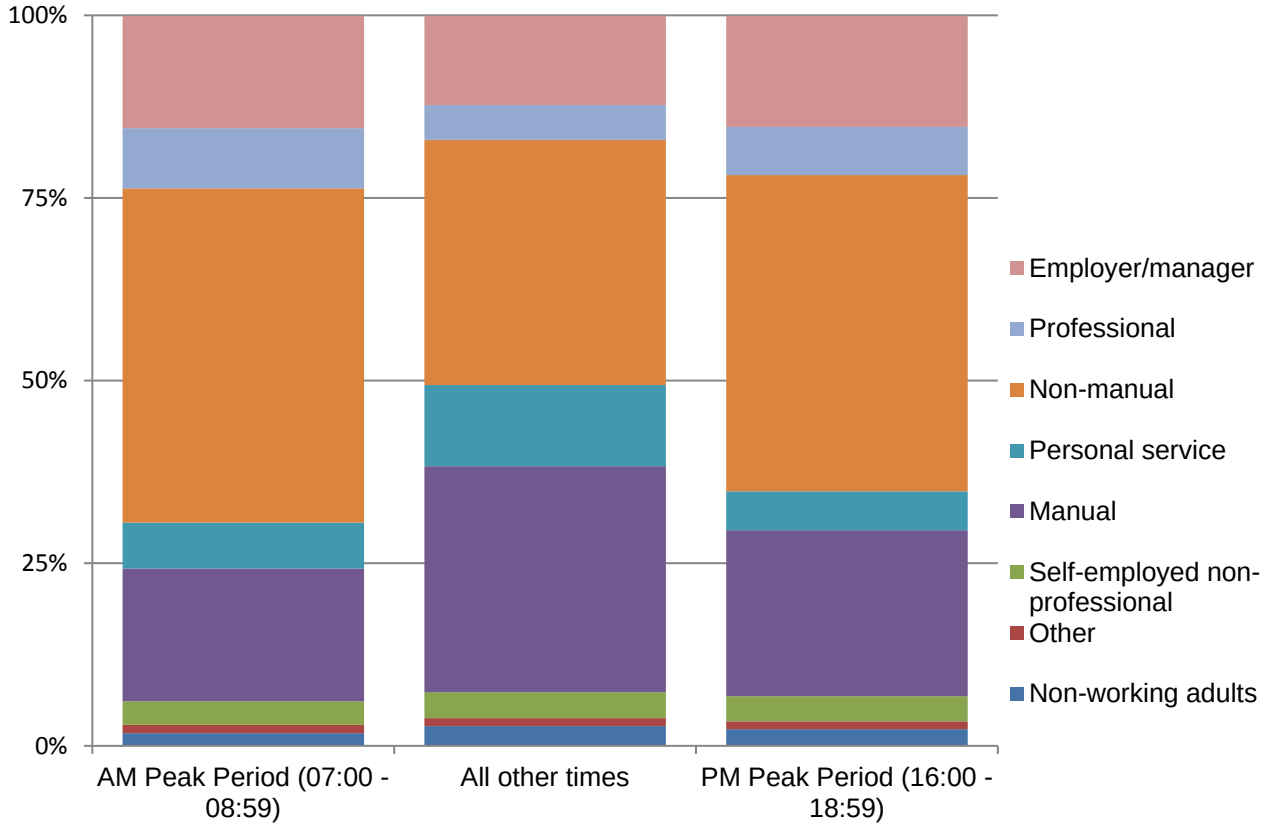

Figure 26 Distribution of workers' occupation type (SEG) by time-of-day of commuting journeys. Source: National Travel Survey

Trip-chaining

- **Travel to or from work during peak periods is becoming more complex, with a growing share of journeys between work and locations other than a worker's home**

In this section we investigate whether journeys to work are becoming more or less likely to have intermediate stops along the way. As noted in the Introduction, this would have a downward effect on the calculated number of 'commuting' journeys, because commuting journeys are classically defined in the NTS to be direct between home and work (in either direction) with no stops along the way.

During the morning period an increasing number of trips to or from work are to or from a child's school to work. This is contributing to the downward trend in 'commuting' journeys (using the standard NTS definition) during the classical peak commuting periods. But during off-peak times of day, the opposite trend is evident, which is linked with the decrease in midday shopping and personal business journeys noted earlier.

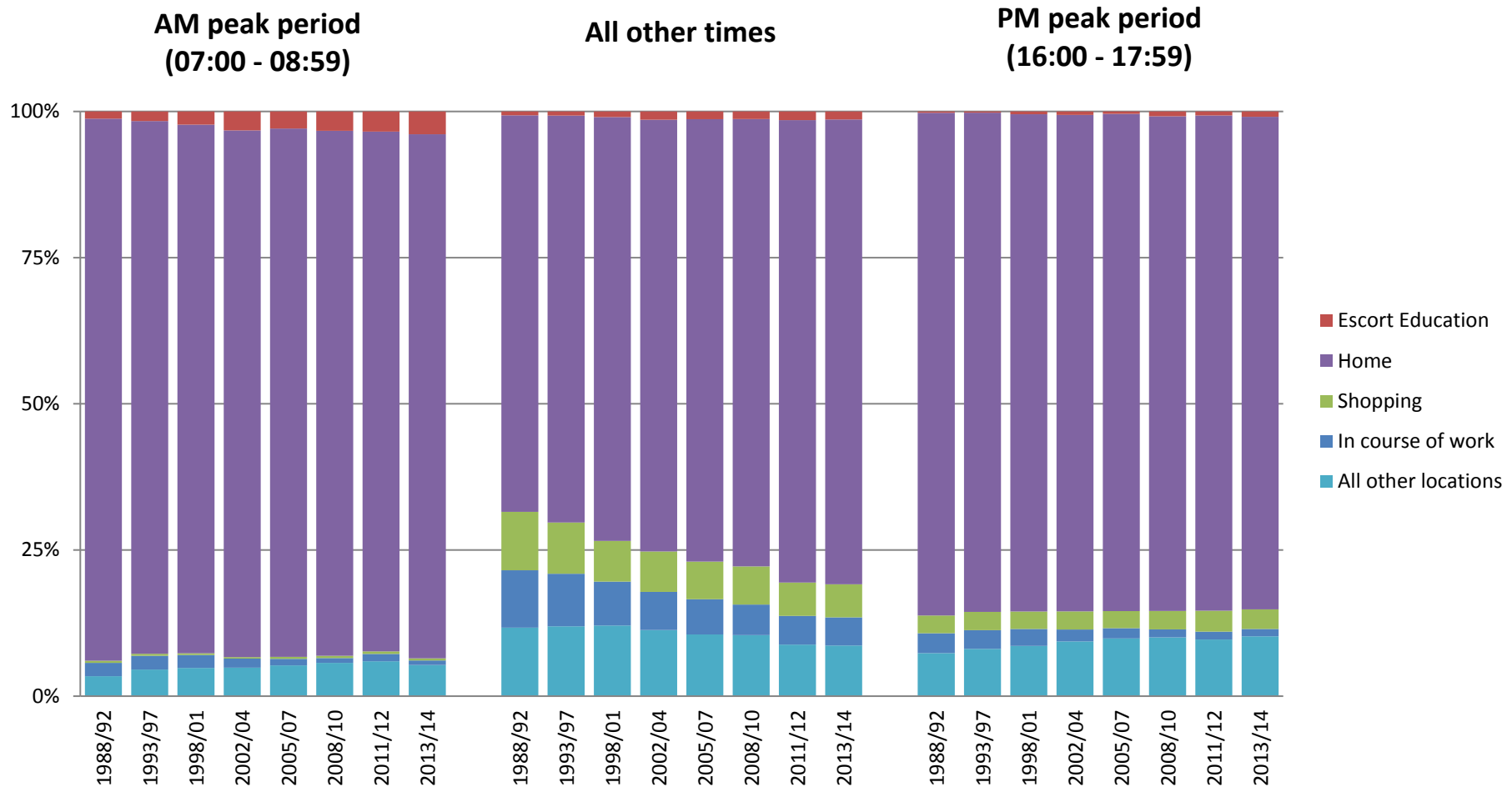

Figure 27 Distribution of journeys to/from one's usual place of work by time-of-day and the purpose of the non-work trip end. Source: National Travel Survey.

School holidays versus Term-time

- **During school term time, part-time workers are much more likely to escort children to/from school than full-time workers**

Commuting patterns differ between school term-time and school holidays[31]. Figure 28 shows that workers' trip-making is marginally higher during term-time, and that this is due to the higher number of commuting and escort-to-school journeys; all other journey purposes combined are higher during school holidays.

During term times, part-time workers perform on average more than three times as many escort-to-school journeys as full-time workers. Part-time workers also perform 24% more commuting journeys during school term-time than holidays, compared to 18% for full-time workers.

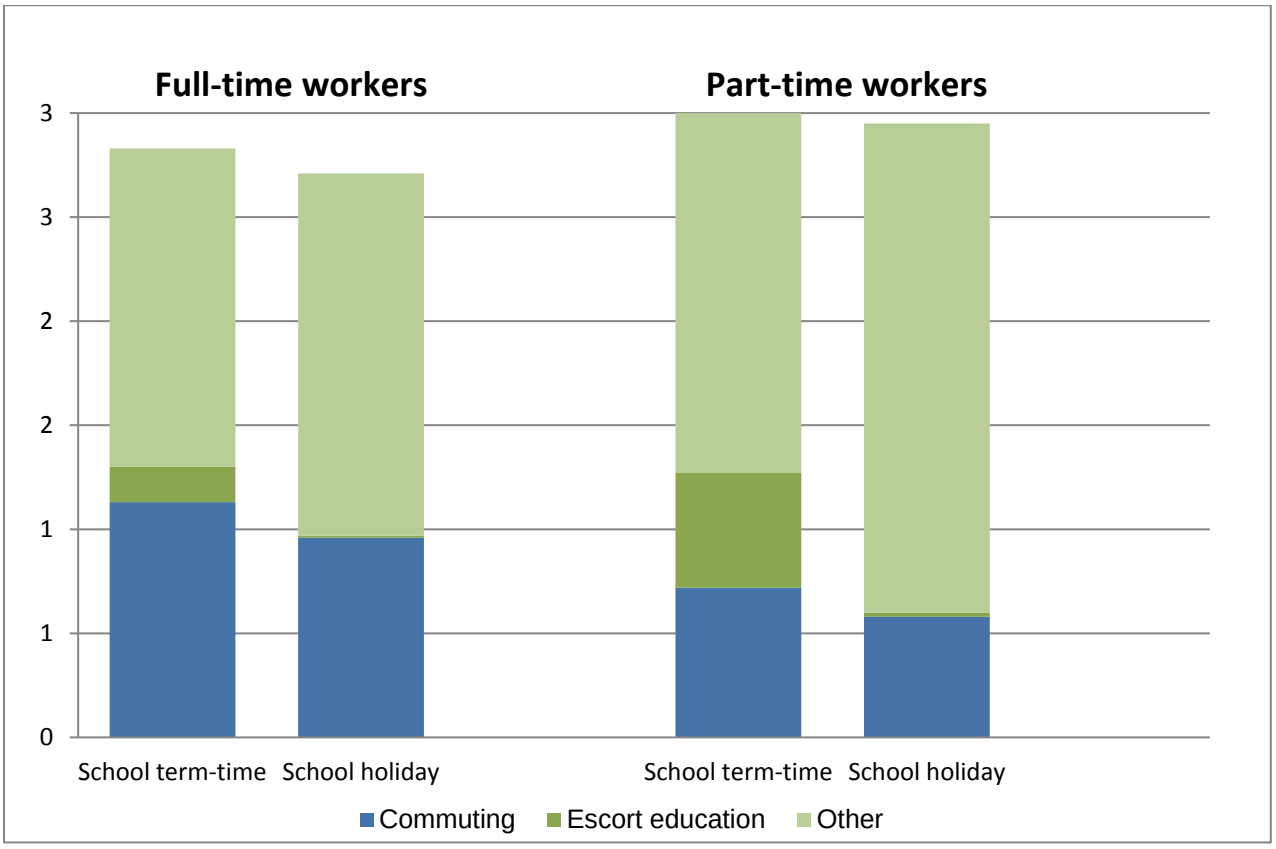

Figure 28 Number of journeys per worker per day, by school term-time versus school holiday periods (2013/14). Source: National Travel Survey.

[31] The NTS dataset classifies each day into a category, including whether it is school term-time or holiday

Commuting journey length and duration

- **Commuting distances are increasing, largely amongst part-time workers**
- **Male workers in their 20s are commuting shorter distances; distances amongst other groups are stable or increasing**

Over time, commuting journeys have become longer – both in distance and time taken (Figure 29). Part-time workers are primarily responsible for the increasing distance of commuting journeys in recent years (average commuting distance has levelled off for full-time workers). Full-time workers' commuting distances are approximately twice those of part-time workers, though the difference in duration is not as large. This means that the average commuting speeds of part-time workers are slower than those for full-time workers, which may relate to a different mix of commuting modes.

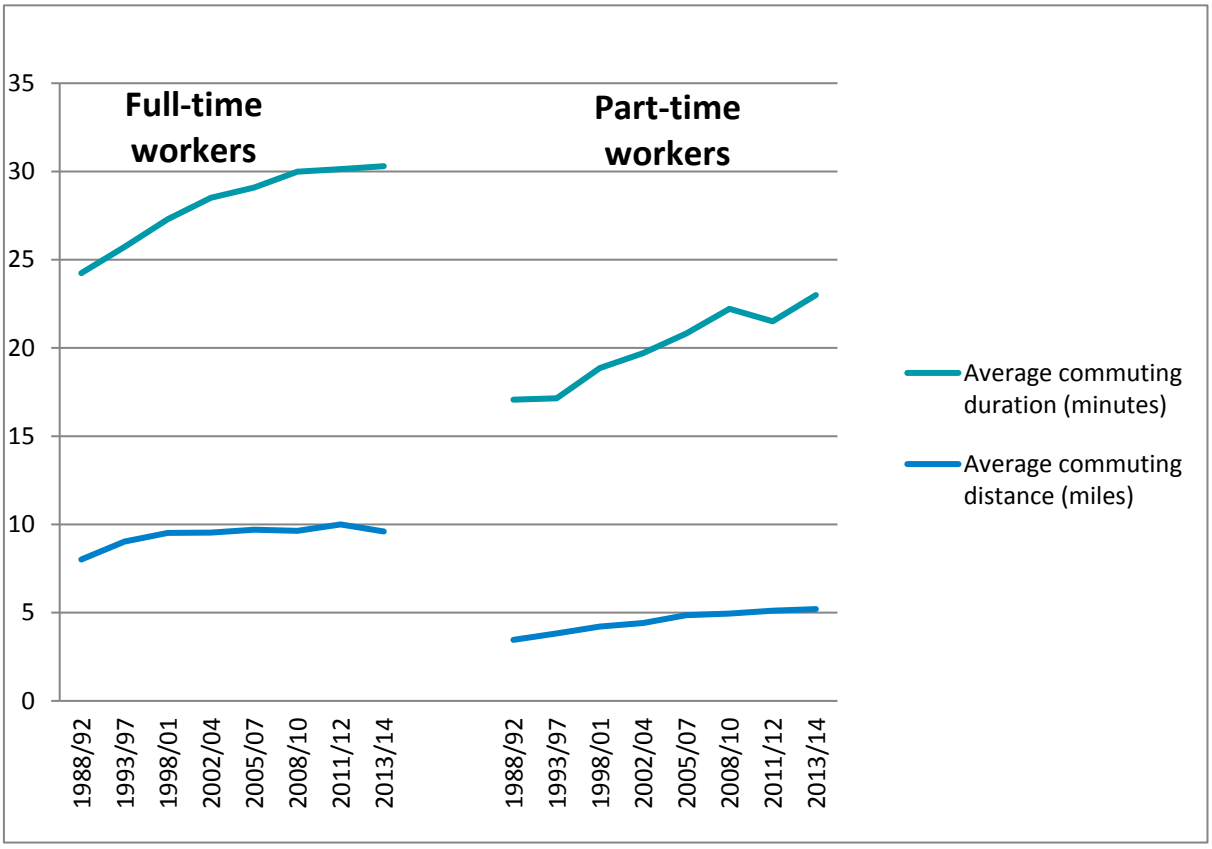

Figure 29 Average commuting distance (miles) and duration (minutes) by full-time/part-time working status. Source: National Travel Survey.

Figure 30 considers commuting distance and time taken by quintiles of personal income and by place of residence. Higher-income workers commute much further than lower-income workers, and they do this at higher speeds. Average commuting distances are highest in rural areas, though average durations are highest in London,

meaning that Londoners commute at comparably low speeds relative to other places, even other major conurbations.

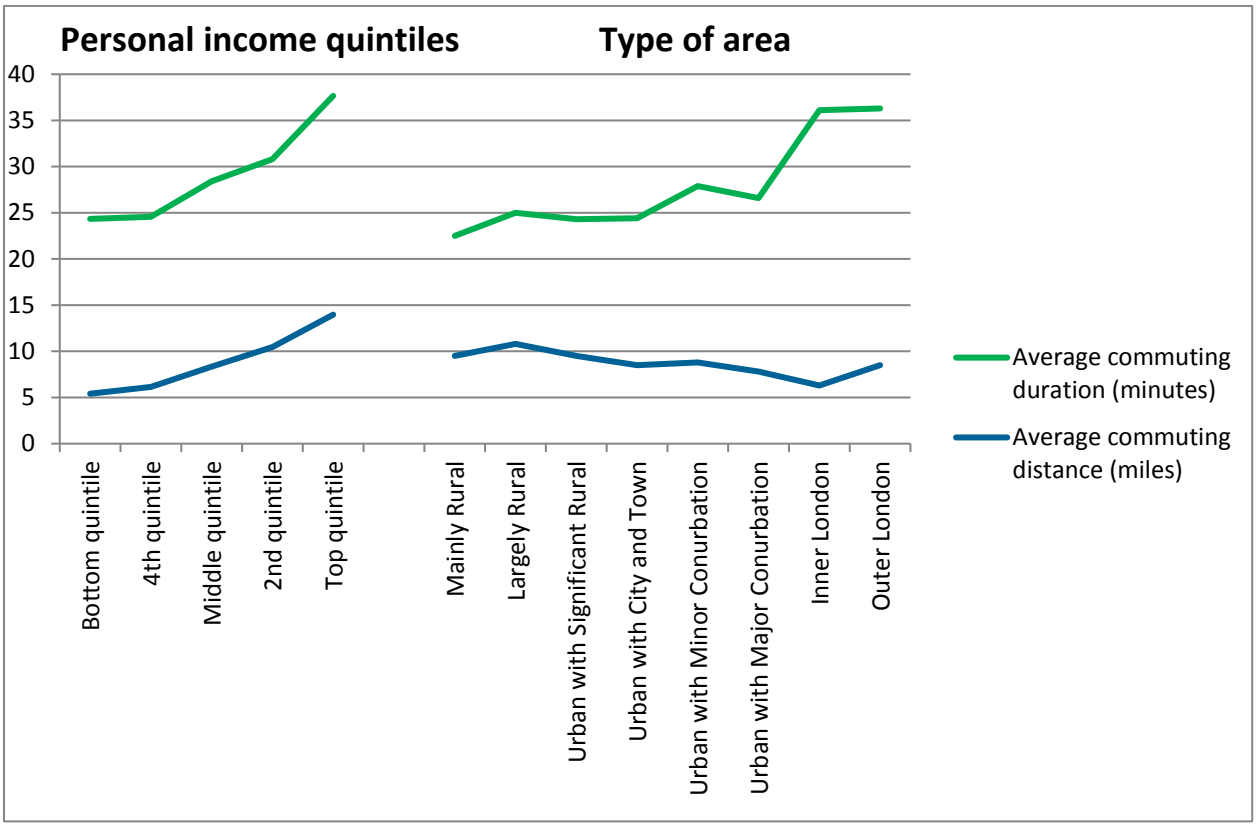

Figure 30 Average commuting distance (miles) and duration (minutes) by personal income bands and ONS' standard urban/rural spatial classes (2013/14). Source: National Travel Survey.

Commuting distances differ across age and gender groups (Figure 31). Workers over age 30 are primarily responsible for the overall trend of longer commute journeys. Men under 30 are the only group whose commuting distances have consistently decreased, which has taken place from around the year 2000. This means that effectively the geographic size of the labour markets that young men are accessing is decreasing, which is consistent with other socio-economic phenomena exhibited by them, such as more part-time working, falling incomes, and decreasing car use, etc.[32]

[32] Le Vine, S. and Polak, J. (2014) *Trends in Urban Travel Behaviour.* In: *Moving Cities: The Future of Urban Travel*. Edited by: Stephen Glaister and Elizabeth Box. RAC Foundation. Available at: http://www.racfoundation.org/assets/rac_foundation/content/downloadables/Moving_Cities_The_Future_of_Urban_Travel_RAC_Foundation_Dec_2014.pdf

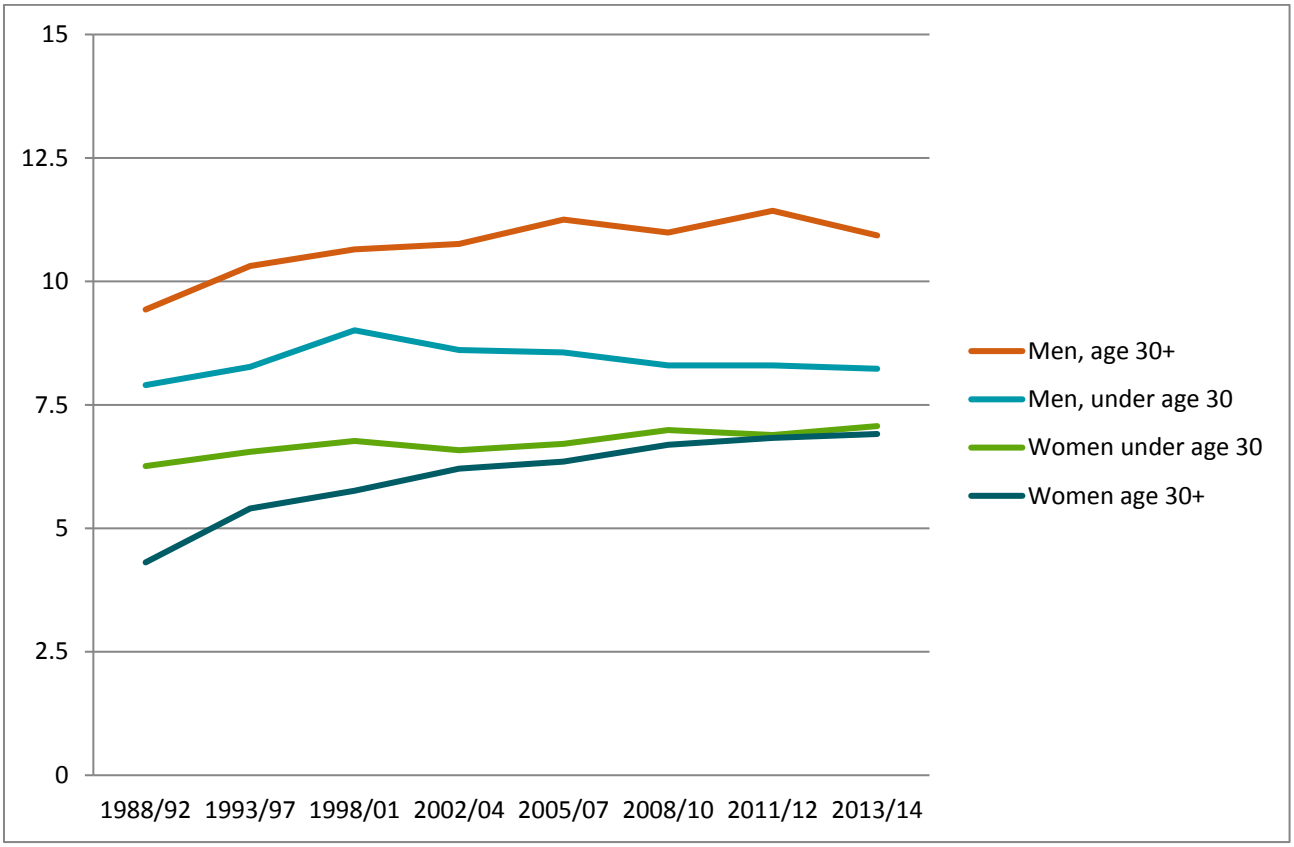

Figure 31 Average commuting distance (miles) by age and gender. Source: National Travel Survey

Commuting expenditure

- **Costs of running and maintaining a car have risen, but cost of purchasing has fallen**
- **Rail and bus fares have increased faster than overall price inflation**

This section examines changing patterns of expenditure on commuting travel. Table 4, shows the changes in real (inflation-adjusted, relative to the all-items RPI index) prices of rail and bus fares, as well as the major components of the costs of motoring.

All costs shown have increased faster than general price inflation, with the exception of the cost of purchasing a vehicle. Bus and rail fares increased less quickly than the 'non-purchase' costs of motoring. 'Tax and insurance' increased most quickly in both decades. It is worth noting that the price of motoring varies across demographic groups; for instance young men have historically paid higher insurance premiums than other groups.

Table 4: Retail prices index, transport components, compared with the all-items RPI index. Source: Reproduced from 2011 Census Analysis: Method of Travel to Work in England and Wales Report.[33]

	Rail fares	Bus/coach fares	Vehicle purchase	Vehicle maintenance	Petrol and oil	Tax and insurance
Change between 1991 and 2001 in real terms	+17%	+14%	-22%	+20%	+33%	+43%
Change between 2001 and 2011 in real terms	+15%	+19%	-41%	+25%	+30%	+43%

[33] http://www.ons.gov.uk/ons/dcp171766_299766.pdf

3. Patterns of congestion

This section investigates congestion on local and strategic roads, National Rail services and bus networks. Given that there has been a reduction in the number of commuting journeys, we may reasonably hypothesise that congestion has also decreased.[34]

Whilst congestion on a transport network may appear to be a simple concept, there is no uniquely-correct method to characterise it. A network with only a single vehicle travelling on it clearly cannot experience congestion, but beyond this boundary condition there is no natural threshold between 'uncongested' and 'congested' flow[35]. Furthermore, how congestion is perceived will depend both on context and the individual traveller's expectations. There is also evidence[36] that travellers value the two aspects of congestion differently: the drop in average travel speeds, and the increase in journey-time variability. Finally, the concentration of travel in particular places and times is experienced differently on roads and public transport, as public transport service levels are generally highest when and where demand is most concentrated.

The discussion of congestion that follows is based on multiple data sources with different properties. As the datasets that we study are available for a relatively short period (fewer than 10 years), we focus primarily on cross-sectional analysis in this section.

Road congestion data[37] is based on traffic speeds during the morning peak period (07:00 to 09:59), relative to 'free-flow' traffic speeds. This dataset is analysed at the Regional level for the Strategic Road Network (SRN), and at the Local Authority level for the local 'A' road network.

The National Rail and bus congestion data are quite different. Rather than objective measurements of network-speed (as with the road congestion data), these are based on travellers' self-reported experiences of crowding and delays for both bus and National Rail, and in the case of National Rail also observed passenger count data.

[34] We note that many of the analyses in this section are either cross-sectional or based on relatively short time-series. This is because many of the data sources are not available for prior years.

[35] *An introduction to the Department for Transport's road congestion statistics.* Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/230433/an-introduction-to-dft-congestion-statistics.pdf

[36] Bates, J., Polak, J., Jones, P., Cook, A. (2001) *The Valuation of Reliability for Personal Travel*. Transportation Research Part E: Logistics and Transportation Review. 37(2), p.191-229.

[37] Provided by DfT's Road traffic Statistics team

The main set of data regarding rail services is sourced from the National Rail Passenger Survey (NRPS). The NRPS covers all of Britain, and has been collected since 1999. The secondary source of data is DfT's Passengers in eXcess of Capacity (PiXC) datasets.

Information of congestion on local buses comes from the Bus Passenger Survey (BPS), which is newer than the NRPS. The BPS was first collected in 2009, and is limited geographically to outside Greater London. Both of these surveys are administered by Transport Focus (formerly known as Passenger Focus), which provided the data tabulations discussed below.

These measures of congestion that are specific to each mode are discussed later in this section. We begin with analysis that compares the reliability of commuting durations for each of the major forms of commuting, using the National Travel Survey.

Commuting journey time reliability

- **Car commuting the most variable of all modes, although its reliability has improved**
- **Active modes are most reliable, followed by National Rail and London Underground**

The NTS defines commuting journeys to be between one's home and usual workplace[38]. Given that the crow-flies distance between home and work is identical for each commuting journey that any given person performs, it is possible to determine the variability in the reported durations of a person's commuting journeys, and to relate this calculated level of variability to personal and contextual characteristics.

In this section, we employ the standard deviation in the durations of a person's commuting journeys as a percentage of their average home-to-work[39] journey time as the metric of variability. In other words, we consider how much the duration of a person's commute varies from day-to-day.

Known limitations[40] mean that the results in this section need to be interpreted with caution. This application of the NTS is, however, the first known use of the dataset for this type of analysis, and is intended to provide an additional source of information regarding patterns of commuting-related congestion.

[38] Or the most-frequently visited workplace, if a person works at two or more places on at least two consecutive days per week.

[39] We exclude work-to-home commuting, in order to minimise effects due to time-of-day differences between work-bound and homebound commuting.

[40] We cannot know with certainty whether variations in people's commuting journey durations are only because of congestion, and journey durations are self-reported by NTS respondents in their travel diaries. This reporting process is subject to known rounding processes (e.g. to the nearest 5-minute increment, and especially the nearest 15-minute increment)

An important research need is to compare the findings from this analysis with alternative techniques to estimate the prevalence and intensity of congestion. This analysis should consider the distinctive congestion patterns on different types of Roads (See Figure 34 through Figure 36) as well as trends in traffic volumes by road type.

Reliability has improved over time across all major modes used for commuting, with particularly strong downward trends in variability for car driving and London Underground. There appear to be two distinct groups of modes: car-driving, car-passenger, and bus are relatively high-variability commuting modes (all of which directly experience some degree of road congestion), whereas Underground, National Rail, cycling, and walking are relatively low-variability modes. It is logical that walking is shown to consistently have the lowest variability.

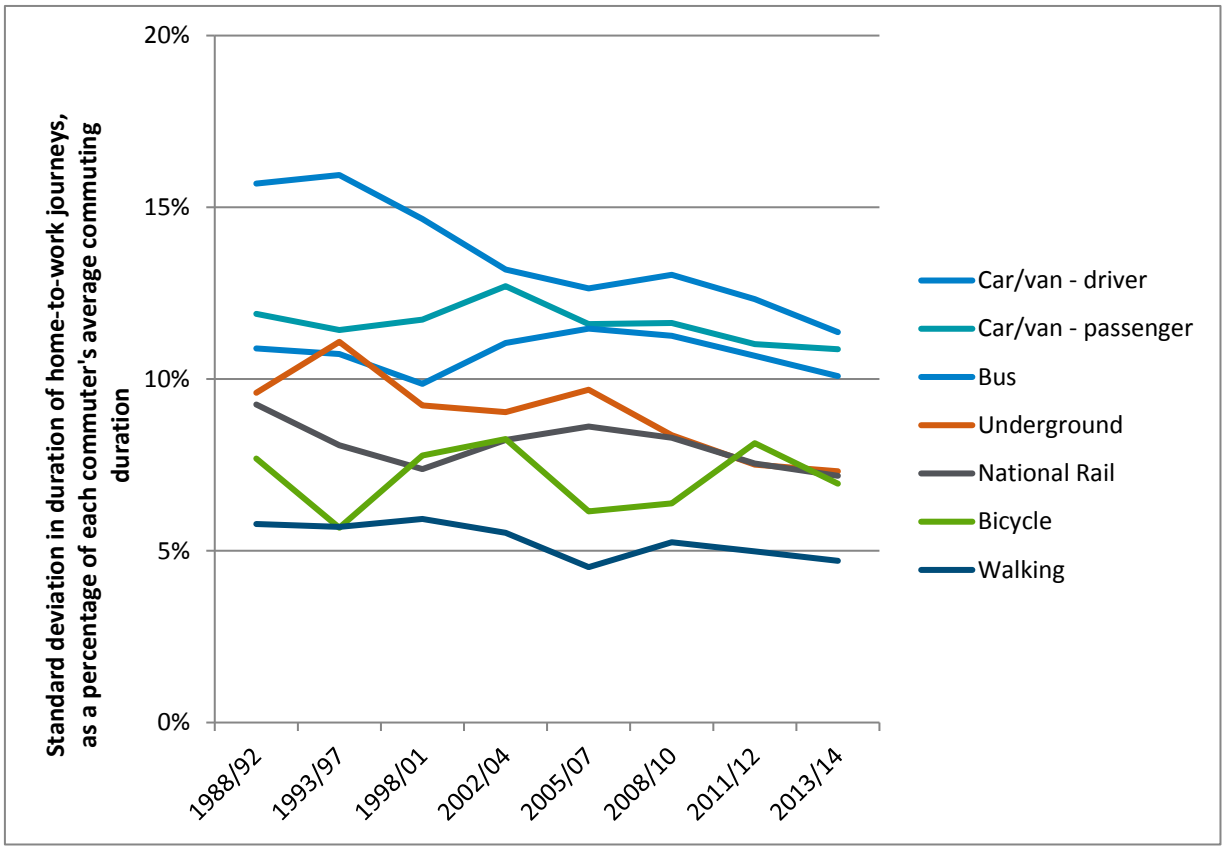

Figure 32 Variability in commuting journey duration, by mode. Source: National Travel Survey.

It is noteworthy that commuters living in Inner London experience the lowest variability in commuting journey times, despite having the slowest commutes of all regions as we saw earlier (Figure 33). This is due in part to the mix of commuting modes in Inner London (see Table 2 and Figure 30) including comparatively large shares of 'high-reliability' forms of commuting (notably Underground and National Rail).

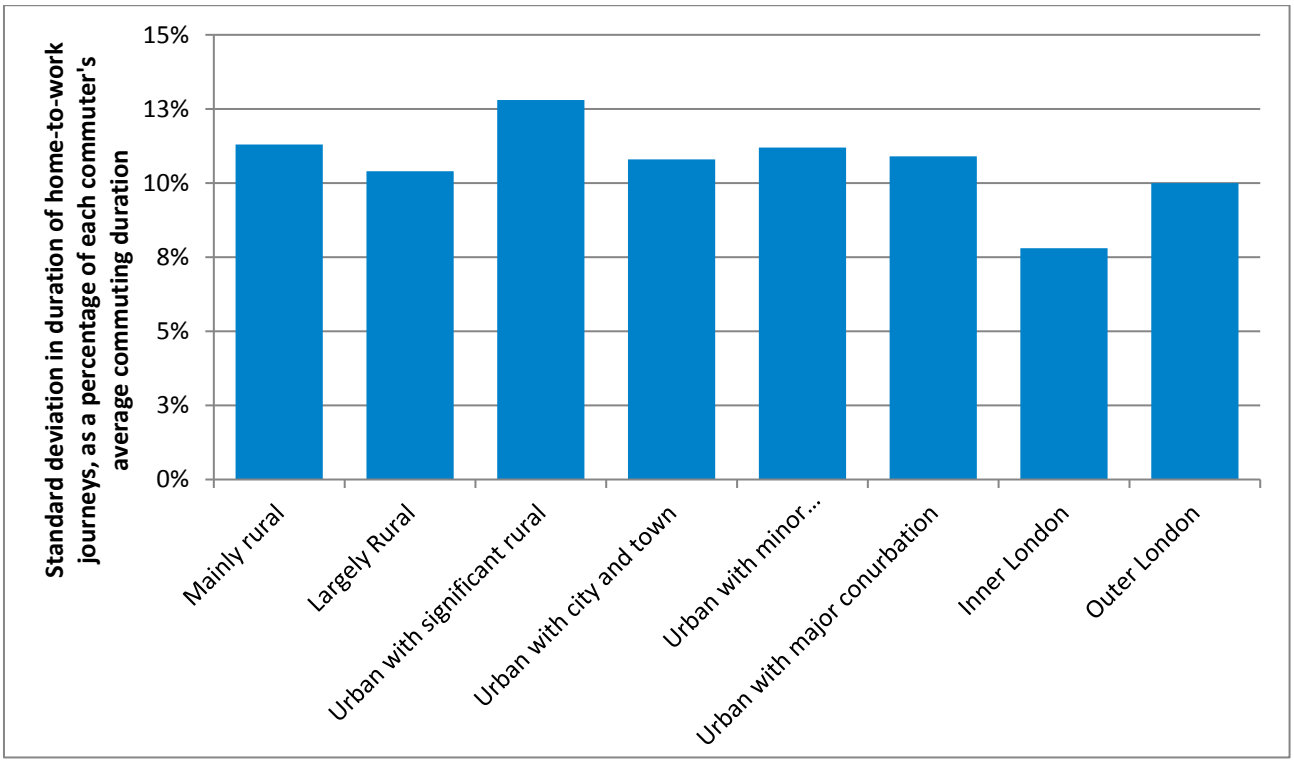

Figure 33 Variability in commuting journey duration, by area type (2013/14). Source: National Travel Survey

Road Congestion

- **Nine of the 10 local authorities with the largest difference between free-flow and morning peak speed are in London**
- **Morning peak period travel speeds on the Strategic Road Network appear to relate more closely to traffic volumes, in comparison to local 'A' roads**

The average speed on England's Strategic Road Network (SRN)[41] was 54.9 mph in 2014 during the morning peak period, as compared to free-flow speed of 66.8 mph[42]. Figure 34 shows the difference between free-flow and congested speeds for each of England's regions (lower-level geography was not used in this analysis as the SRN is relatively sparse).

[41] The SRN is made up of the motorways and major trunk roads in England that are managed by the Highways Agency. It comprises approximately 4,400 miles of roadways. Further details are available via: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/448276/strategic-road-network-statistics.pdf

[42] These speeds are averaged over the period between 2009 and 2014.

Despite having the lowest level of variability, by this metric, London experiences the greatest level of congestion on the SRN (travel speeds during the morning peak period are 19.8 mph lower than free-flow), followed by the North East (-14.4 mph) and South East (-13.3 mph). The South West has the lowest level of SRN congestion (-5.9 mph) by some distance: all other regions experience a drop of at least 10 mph during the morning peak period.

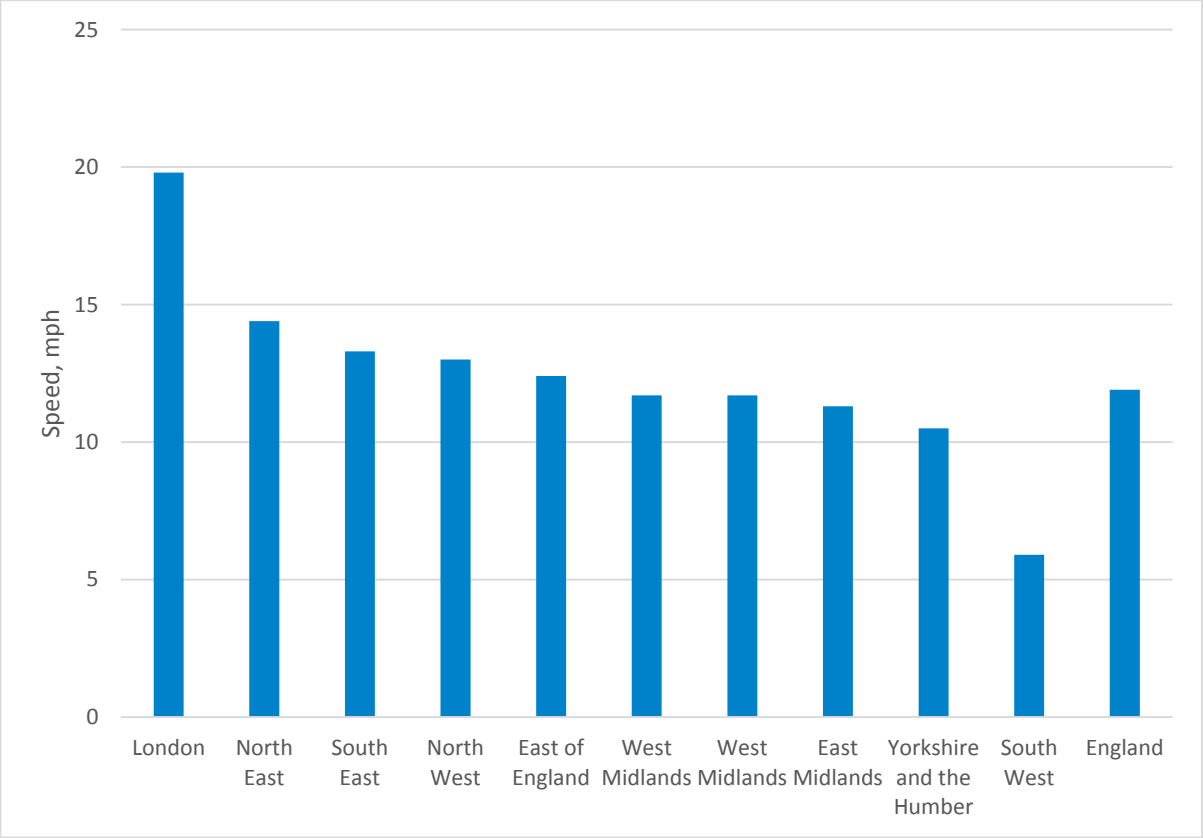

Figure 34 Reduction in speed (miles per hour) on the Strategic Road Network in the morning-peak-period relative to free-flow speed. Source: DfT Road Congestion Statistics

The relationship between free-flow and congested speeds is very weak (r2 = 0.05[43],[44] at the regional level). All regions experience free-flow speeds within a narrow range, between a low of 64.9 mph (North East and South West) and a high of 68.0 mph (South East). By contrast, the range of congested speeds is much larger (from 46.2 mph in London to 59.0 mph in the South West).

[43] This calculation is based on treating each GOR as an equally-weighted observation, which neglects the fact that they vary in various ways (population density, road network geometry, etc.)

[44] The measure r2 is an output from a type of statistical analysis known as regression, which measures how closely two variables are related to one another. The closer to one that r2 is, the stronger the relationship between the two (and vice versa for r2 values close to zero).

Road traffic congestion on local ‘A’ roads was analysed at the Local Authority level of geography, as this local ‘A’ road network is much less sparse than the SRN.

Nine of the ten most-congested local ‘A’ road networks (defined by the largest drop in traffic speeds between free-flow conditions and the morning peak period, between 07:00 and 09:59) are in London boroughs (with Salford, Greater Manchester the exception). Table 5 shows the five most- and least-congested Local Authority areas in England. Hillingdon (home to Heathrow Airport) experiences the largest drop of any local authority (from 44.2 mph to 21.7 mph, a decrease of 22.5 mph). Other than Cornwall, the least-congested local ‘A’ road networks are found in the North: the four local authorities that experience a drop of less than 10 mph during the morning peak period are Rutland (-9.4 mph), Hartlepool (-9.8 mph), Northumberland (-9.8 mph), and Cumbria (-10.0 mph).

Table 5: Local Authority areas with the most- and least-congested[45] local ‘A’ road networks during the weekday AM peak. Source: DfT Road Congestion Statistics

Ranking	Local Authorities with the least-congested local ‘A’ road networks	Free-flow traffic speed, mph	AM peak period traffic speed, mph	Difference, mph
1	Cornwall UA	42.5	32.3	-10.2
2	Cumbria	41.9	31.9	-10.0
3	Northumberland UA	45.5	35.7	-9.8
4	Hartlepool UA	42.7	32.9	-9.8
5	Rutland UA	50.3	40.9	-9.4

Ranking	Local Authorities with the most-congested local ‘A’ road networks	Free-flow traffic speed, mph	AM peak period traffic speed, mph	Difference, mph
151	Hillingdon	44.2	21.7	-22.5
152	Barnet	37.8	16.0	-21.8
153	Havering	44,6	22.9	-21.7
154	Greenwich	37.4	16.0	-21.4
155	Barking and Dagenham	37.5	17.2	-20.3

[45] Congestion defined by the absolute drop (in mph) in flow-weighted traffic speeds between free-flow conditions and the weekday AM peak period (07:00 – 09:59).

What causes congestion?

Figure 35 shows the relationship between free-flow and 'congested' AM peak period speed on local 'A' roads. A close correlation exists (r2 = 0.88) at the local authority level, meaning that much of the pattern of travel speeds during the morning peak hour can be explained simply by the free-flow speed in each local authority area. This pattern holds at the regional level as well (r2 = 0.95, not shown).

The implication is that morning peak period travel speeds on the SRN appear to relate closely to traffic volumes, but this is much less true for local 'A' roads.

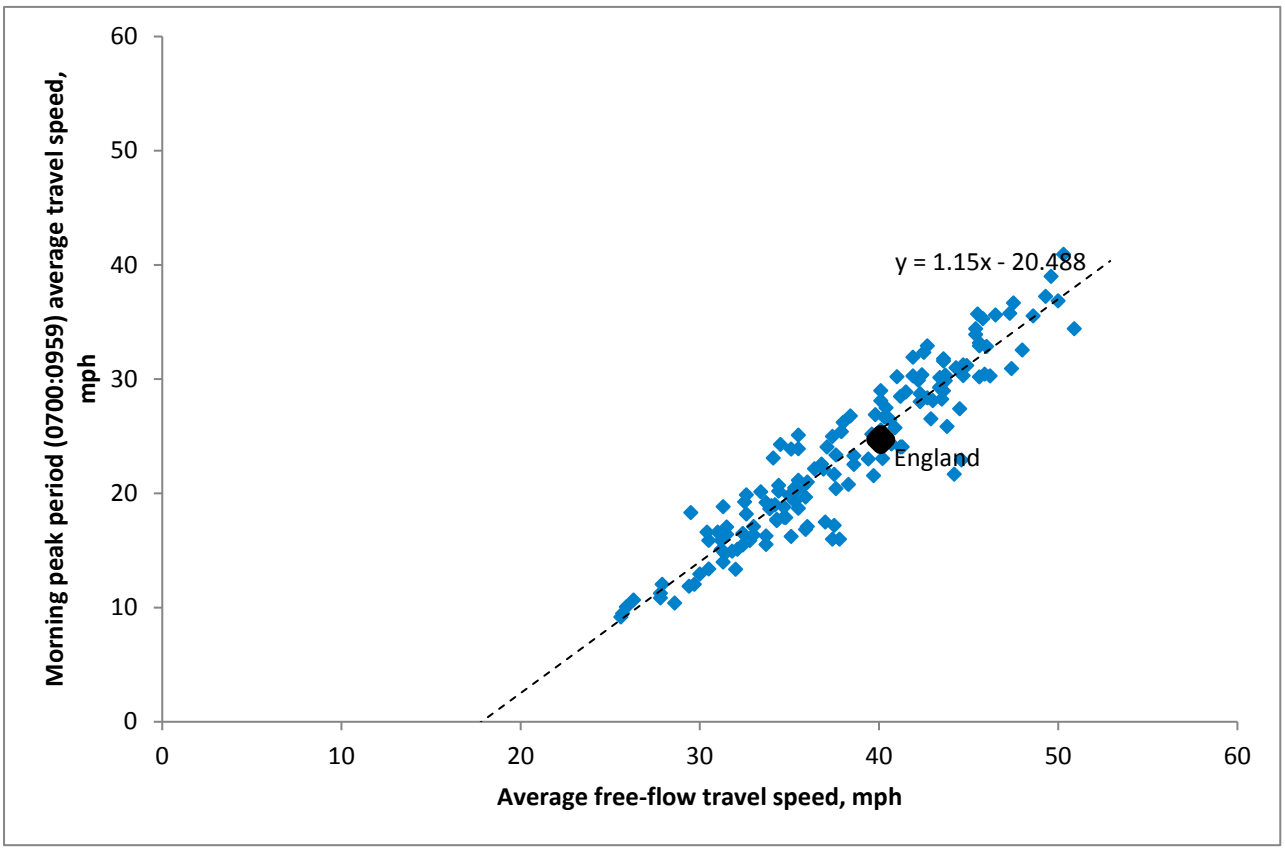

Figure 35: Free-flow (x-axis) and morning-peak-period (y-axis) flow-weighted average road traffic speeds on the local 'A' road network within Local Authority areas, in miles per hour. Source: DfT Road Congestion Statistics

Figure 36 shows that both free-flow and morning-peak traffic speeds on the local 'A' road network tend to decrease from rural to increasingly-urban areas. The top of each bar represents free-flow speed, and the size of the dark blue portion of each bar shows how much slower traffic moves during the morning-peak period. The difference is larger for slower peak-period speeds: London has both the lowest free-flow network speed and the largest drop in speed due to traffic congestion.

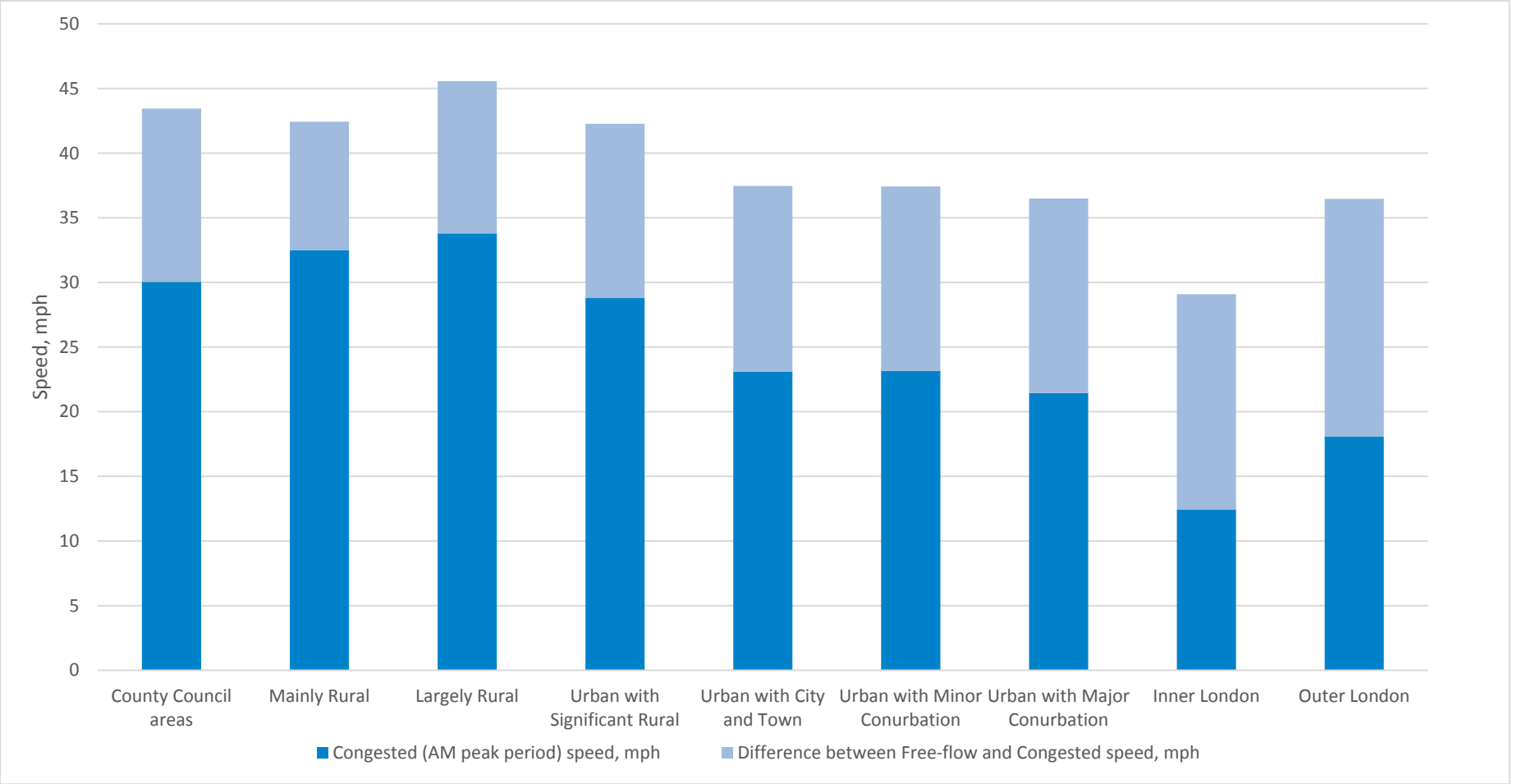

Figure 36 Free-flow and morning-peak-period flow-weighted average road traffic speeds on the local 'A' road network averaged across Local Authorities within each of ONS' rural-urban classes, in miles per hour. Source: DfT Road Congestion Statistics

Rail Congestion

- **London rail passengers rate trains more crowded than those elsewhere, but approximately as punctual**

Compared to the road network, rail network congestion is distinctive in that there are two major types of capacity limits – one being the train-moving capacity of the fixed infrastructure and the other being the person-carrying capacity of rail rolling stock.

Congestion on the rail network is characterised in this study by two different sources of evidence.

The first is the Passengers in Excess of Capacity (PiXC) measure that DfT has tracked for London since 1991 and for other major cities since 2011. PiXC is "the proportion of standard class passengers that are above the capacity of the [rail] service (i.e. a specific train) at its busiest point". This is effectively the maximum physical capacity of the train carriages. This measure therefore establishes the *objective* level of passenger crowding on rail rolling stock. It is a quite high benchmark for characterising 'congestion', because rail passengers may begin to perceive congestion well before the physical space on the rolling stock is completely occupied.

The second source of information is the National Rail Passenger Survey, which Transport Focus has administered on a continuous basis since 1999. This is a large-sample survey (50,000+ rail passengers are surveyed annually) which tracks passengers' satisfaction with various rail service attributes. Of relevance to this study, each NRPS respondent indicates which specific train service they are travelling on, the purpose of their rail journey, and their satisfaction with 1) the punctuality/reliability of their train journey, and 2) availability of sufficient room for all passengers to sit/stand. The first of these questions is an indicator of rail-infrastructure congestion but not a perfect one, because train services could be delayed either due to congestion or for other reasons. The second of these relates directly to passenger-congestion on rail rolling-stock. In both cases, the NRPS data are different to both the road-congestion data sources and PiXC in that travellers' *perceptions* of congestion are tracked, rather than objective measures of congestion.

In the remainder of this section, we first discuss trends shown by the PiXC data, followed by the NRPS dataset.

Analysis of PiXC train-crowding data

Figure 37 shows that the PiXC measure (in proportional terms) is larger during the morning peak period than the afternoon peak period, with higher values generally found in London, compared to other cities. Manchester has the second-highest absolute numbers of passengers in excess of capacity outside of London, however there is an order-of-magnitude difference with London of a factor of 23 in the morning peak and 15 in the afternoon peak. This is because the number of rail passengers entering London during the morning peak period is much higher than other cities, with

563,400 passengers arriving in London, followed immediately by 39,500 in Birmingham and 30,900 in Manchester.

PiXC is consistently higher in the morning than the afternoon, and the gap between London and elsewhere is also larger in the morning peak.

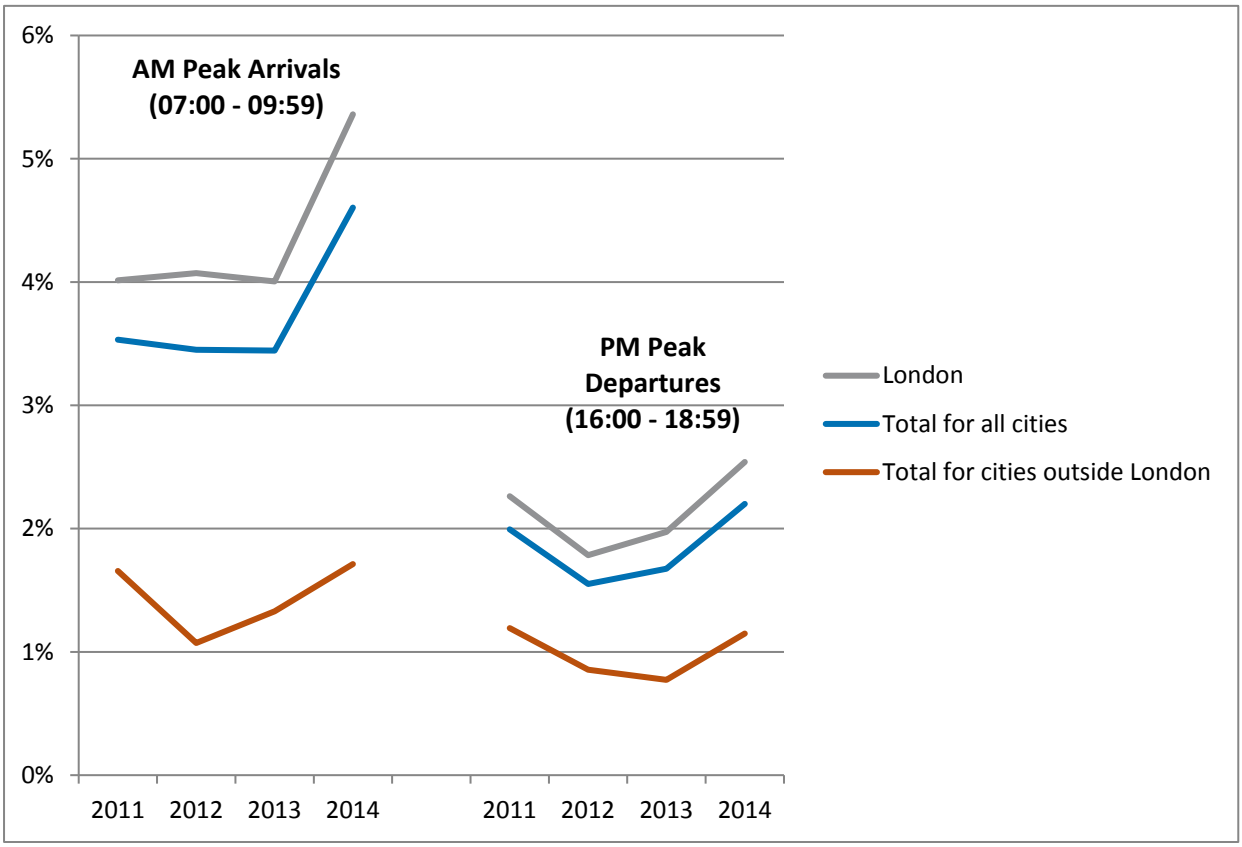

Figure 37 Passengers in excess of capacity (PiXC), as percentage during AM and PM peak periods, 2011-2013. Source: DfT Table RAI0209, based on passenger count

Analysis of NRPS perceived-crowding data

Figure 38 shows the trends in commuters' perceptions of rail congestion (punctuality/reliability and availability of sufficient room on board) from the NRPS, averaged across all of England. Three time periods are shown: the AM peak period (07:00 – 09:59), the PM peak (16:00 – 18:59), and all other [off-peak] times.

The sharp drop in punctuality caused by the disruption to rail services following the Hatfield train crash (October 2000) can be clearly seen, however by 2005 commuters were rating punctuality better than before Hatfield. Commuters' satisfaction with service reliability moved slowly upwards until the early 2010s, after which it declined (more sharply during peak periods than off-peak times). Rail commuters have

consistently been more likely to indicate that they are satisfied with service punctuality/reliability than with the availability of space on board.

There was, however, a sustained improvement in rail passengers' rating of sufficient space to sit/stand between 2007 and 2012, which might be due to train providers improving their rolling stock, additions to rolling stock, or possibly due to reductions in the number of people in work, specifically the number of rail commuters on board peak-period services. This improvement can be seen during both the morning and afternoon peak periods, but not during off-peak times of day (when ratings of sufficient space have consistently been much higher).

Rail commuters' perceptions of both service punctuality and space to sit/stand have trended downwards most recently (from peak levels of satisfaction observed in 2012 in both cases), with perceptions of punctuality decreasing more rapidly during the AM and PM peak periods than during off-peak times.

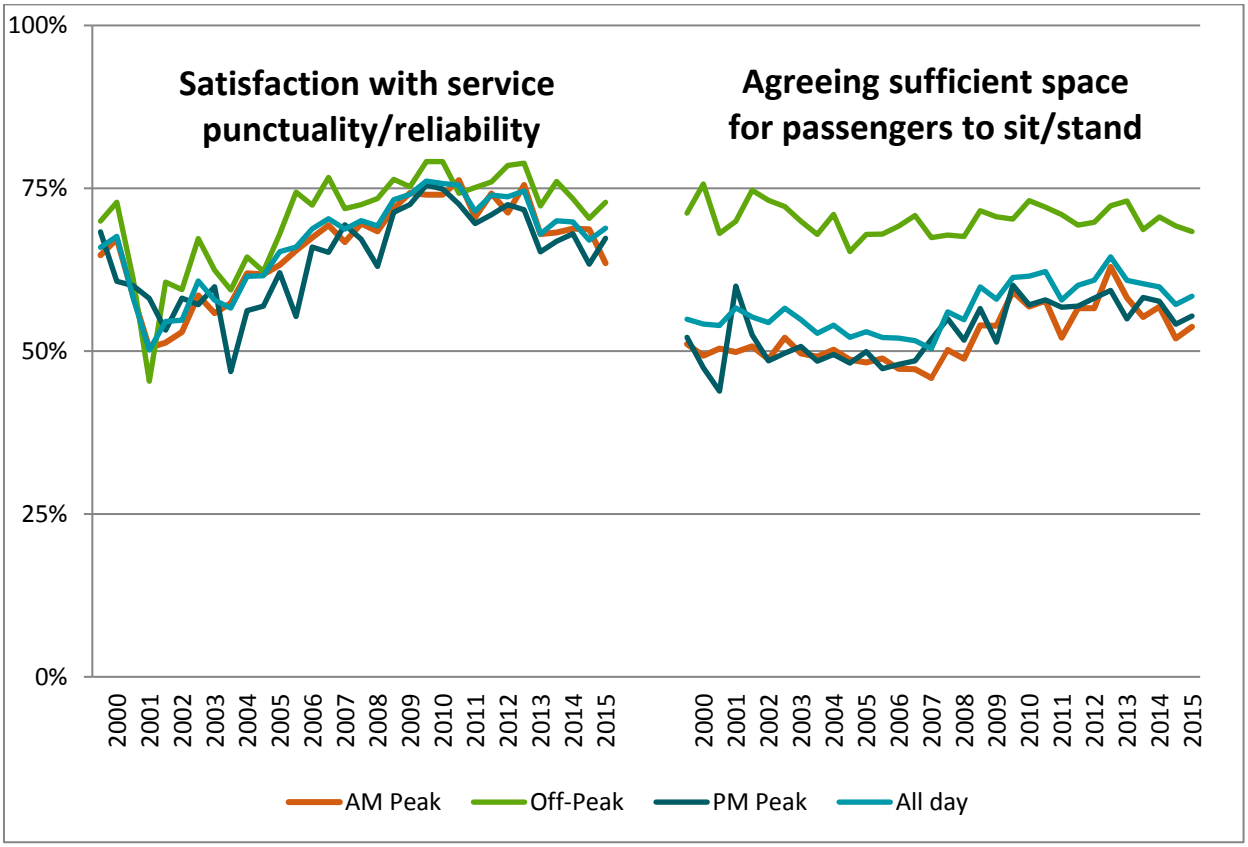

Figure 38 Passenger satisfaction with rail service punctuality and ratings of sufficient space for passengers to sit/stand, by time-of-day. Source: National Rail Passenger Survey.

Figure 39 shows results from the NRPS broken down by the location of the origin of rail journeys, with London, the two encircling regions (South East and East of England) and the rest of England analysed separately.

Commuters' ratings of available space on board train services in the early 2000s was much lower in London than elsewhere; this difference narrowed during the late 2000s. Rail commuters beginning their journeys in London are less likely (than commuters in other regions, even in the South East/East) to report that there is enough space on board their train service. In terms of punctuality, however, London does not rate consistently higher or lower than other parts of England.

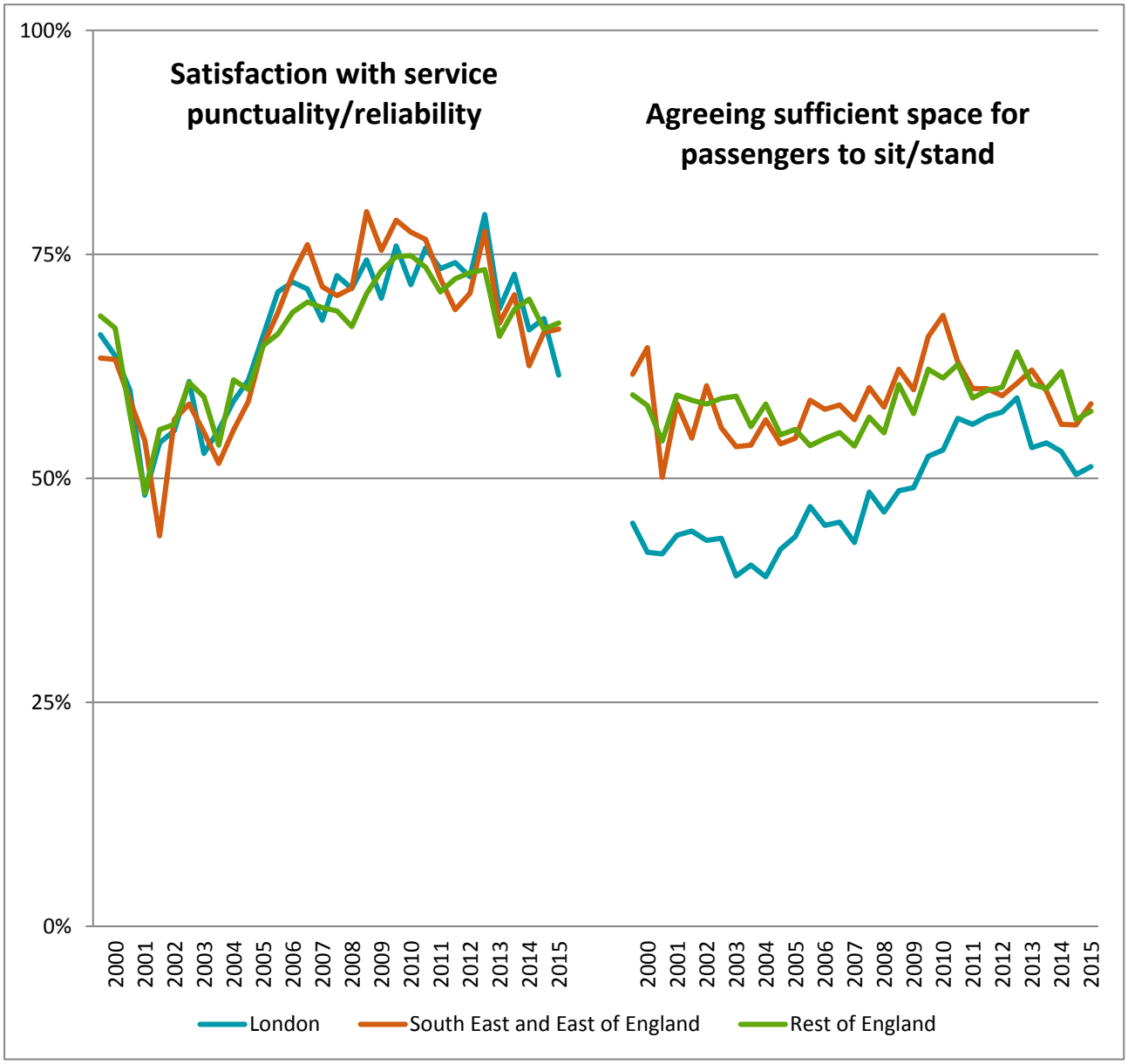

Figure 39: Passenger satisfaction with rail service punctuality and ratings of sufficient space for passengers to sit/stand, by London, South East/East of England, and Rest of England. Source: National Rail Passenger Survey

Bus Congestion

- **Bus commuters outside London rate congestion and time for passengers to board as the main causes of delays**

The Bus Passenger Survey (BPS) is Transport Focus' more-recent counterpart to the National Rail Passenger Survey. Passengers complete a self-administered questionnaire regarding the local bus journey they are undertaking when approached by the interviewer.

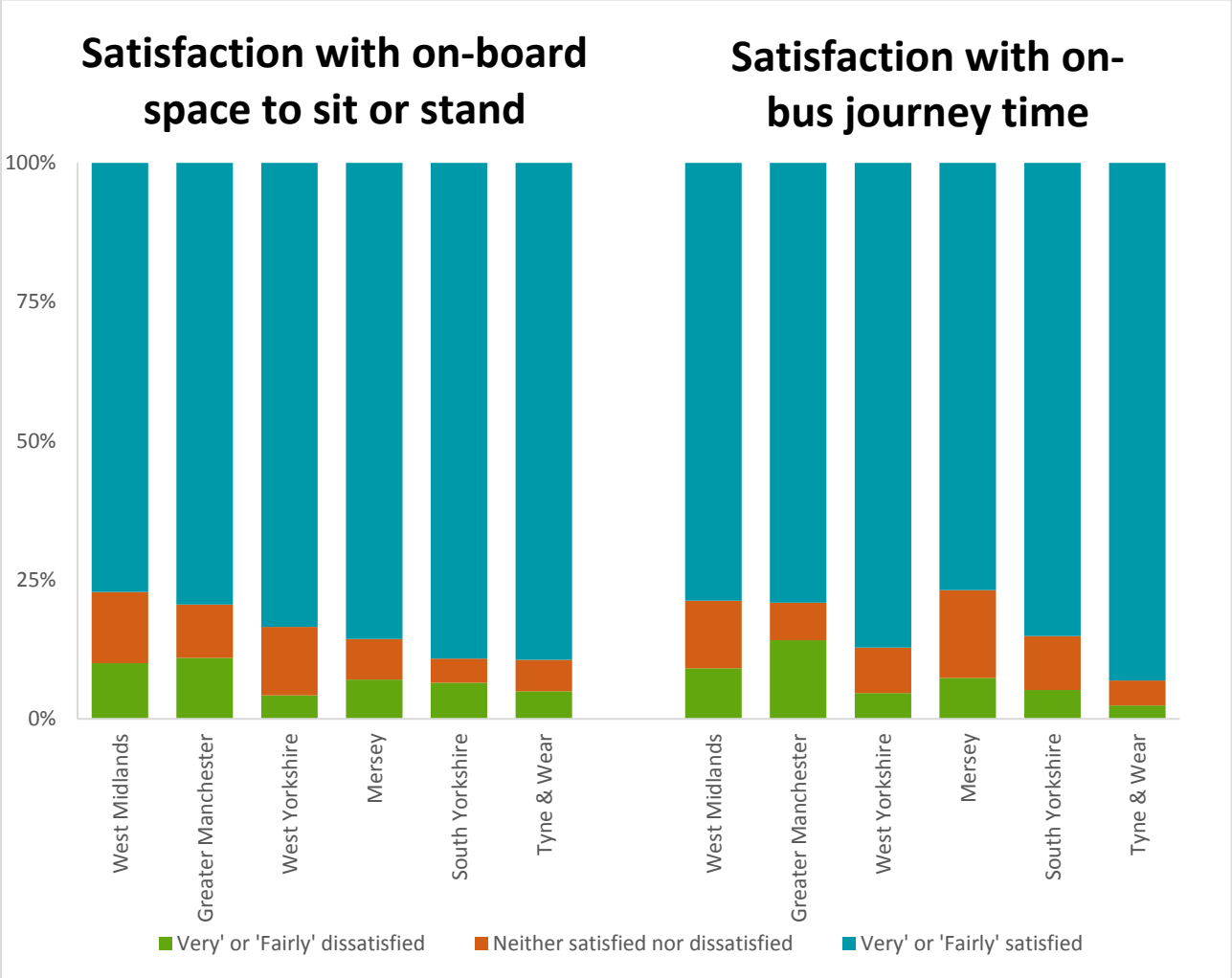

Figure 40: Passenger satisfaction (only commuting journeys) with availability of seating or space to stand, and with on-bus journey time (Autumn 2014). Source: Bus Passenger Survey

The BPS was first established in 2009, and due to the relatively short time series since its inception this section employs the Autumn 2014 wave as a cross-section rather than investigating time trends. The BPS' remit is England outside of London, with the core of the survey covering the six Passenger Transport Executive (PTE)

areas in England (except for Transport for London). In recognition of the specific research questions motivating this study, Transport Focus made available bespoke cross-tabulations which, unlike the BPS' standard data products, focus exclusively on commuting-purpose journeys during the 08:00 – 09:30 AM time window. Only journeys within the six PTE areas are considered[46]. The number of sampled journeys meeting these criteria is approximately 93,000 in the Autumn 2014 wave. We first examine satisfaction with two aspects of bus service affected by congestion: availability of space on the bus to sit/stand, and on-bus journey time. The latter is reflective of road network congestion in part, though not exclusively.

Bus commuters in Tyne and Wear report the highest rate of being very or fairly satisfied with both of these dimensions of bus service. Across the six PTE areas, there is a moderate degree of correlation (r=0.64) between the percentage that is 'Very/Fairly' satisfied with on-bus space and journey time: PTEs where bus commuters report high satisfaction in the space available to them tend to also have high satisfaction in bus journey times.

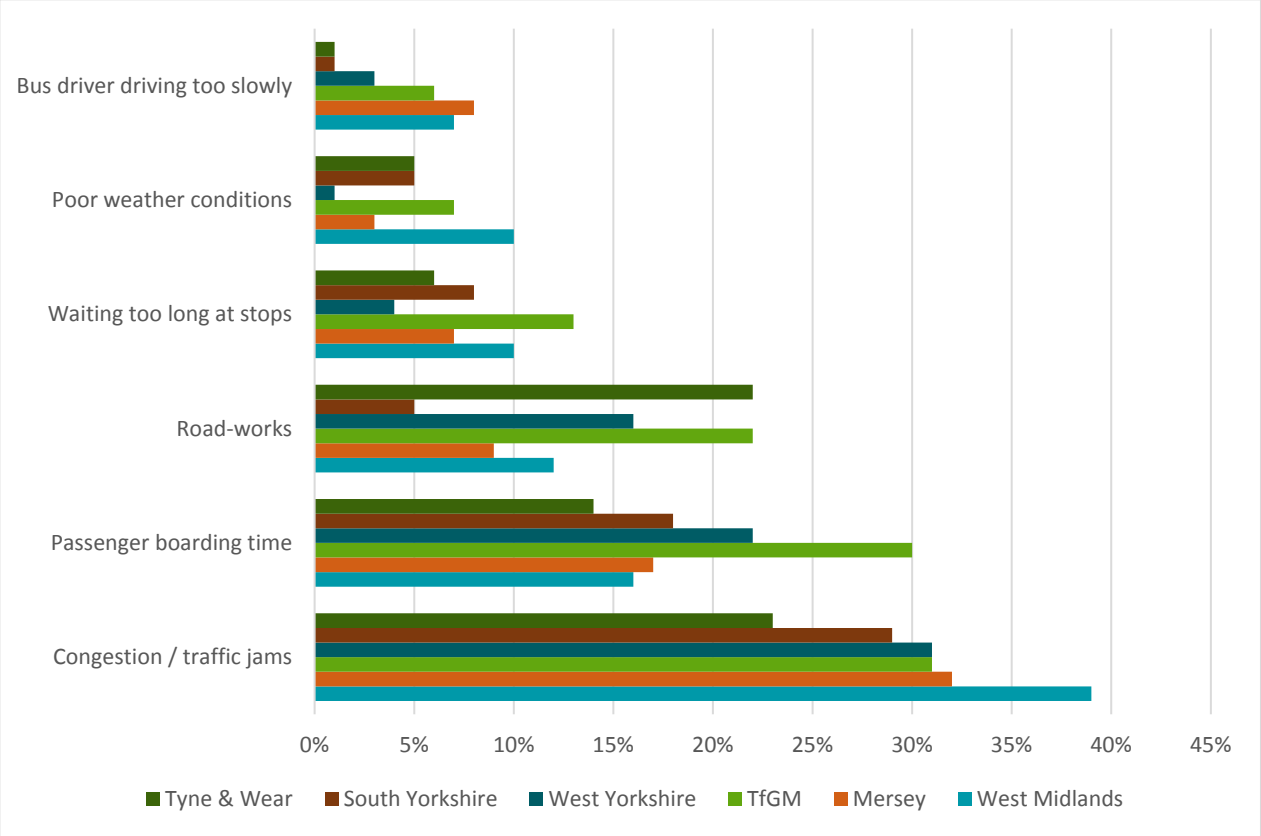

Figure 41: Proportion of local bus passengers (only commuting journeys) reporting that the length (duration) of their sampled journey was affected by various problems (Autumn 2014; multiple selections allowed). Source: Bus Passenger Survey.

[46] This is due to multi-year sampling protocol in which other local bus systems are not all covered during each wave.

Across all 6 PTE areas, satisfaction with available on-bus space and with journey time are both greater than 75%.

We next turn to bus commuters' reported difficulties with their journeys. As with car-driving commuters (see Section 4), bus commuters are most likely to report experiencing delays with 'congestion/traffic jams'. However, whereas the NTS' data do not allow us to distinguish between congestion and roadworks, the BPS does. Bus commuters across all PTE areas report delays due to congestion at a higher rate (a much higher rate, in most PTE areas) than delays associated with roadworks.

The second most frequently cited cause of bus commuting journey delays is the amount of time that it takes passengers to board. Here it is worth noting that the total number of bus commuters is relevant to commuters' satisfaction: satisfaction with time other passengers take to board a bus is likely to depend on the number of boardings.

4. Perceived problems and susceptibility to switch commuting mode

Up to this point this study has focused on observed patterns of commuting. The limitation of this approach is that *observed* travel behaviour outcomes do not inform us about the *processes* through which people make their travel decisions or their views about their commuting options.

This section therefore complements the earlier analyses by drawing on attitudinal data. Specifically, we investigate the problems that commuters report with their current commuting journeys and the difficulty of switching to an alternative form of travel, using data that have been collected as part of the National Travel Survey since 2002.

Problems experienced whilst commuting

- **Three in five car commuters report no difficulties with their commute**
- **Car commuters report congestion and roadworks to be their largest problem, similarly to bus commuters**
- **Rail commuters show a long-term trend of improved satisfaction, though it is not clear whether this is continuing in the 2010s.**

Car-driving commuters

Approximately three out of five car-driving commuters report no difficulties with their commuting, and the trend has been increasing since 2005/07 (Figure 42). Of those reporting any difficulties, the large majority report that the problem is traffic congestion or roadworks (this is similar to the pattern found for bus commuters), but it is not possible to distinguish in the NTS data between the problems of congestion and roadworks. The proportion reporting difficulties with congestion or roadworks has decreased over time, however.

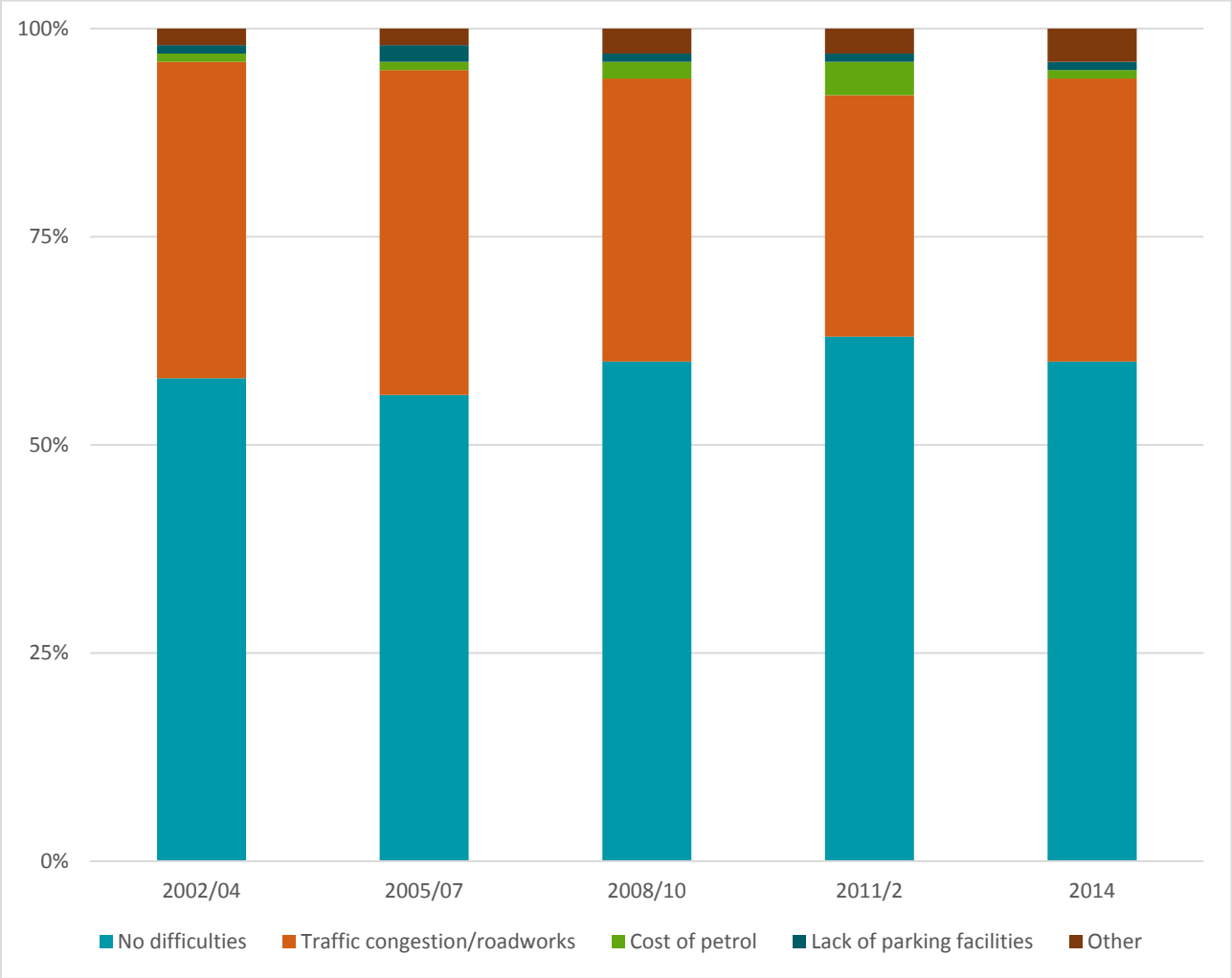

Figure 42 Car commuters' (drivers and passengers[47]) reported greatest difficulty with their commute. Source: National Travel Survey

Public transport, walk and cycle commuters

National Rail commuters are more likely than other commuters to report difficulties, however there has been a sharp decrease amongst them, notably with fewer reporting that National Rail services are unreliable

Those who walk to work report very few difficulties with commuting. Cyclists report fewer difficulties than public transport commuters, and their most frequently reported difficulties are concerns over personal safety, the weather, and a lack of cycle lanes.

[47] Starting in 2012, commuters who usually travel to work by car do not specify whether they are a driver or passenger. Drivers and passengers are combined for previous years for comparability with post-2012 data.

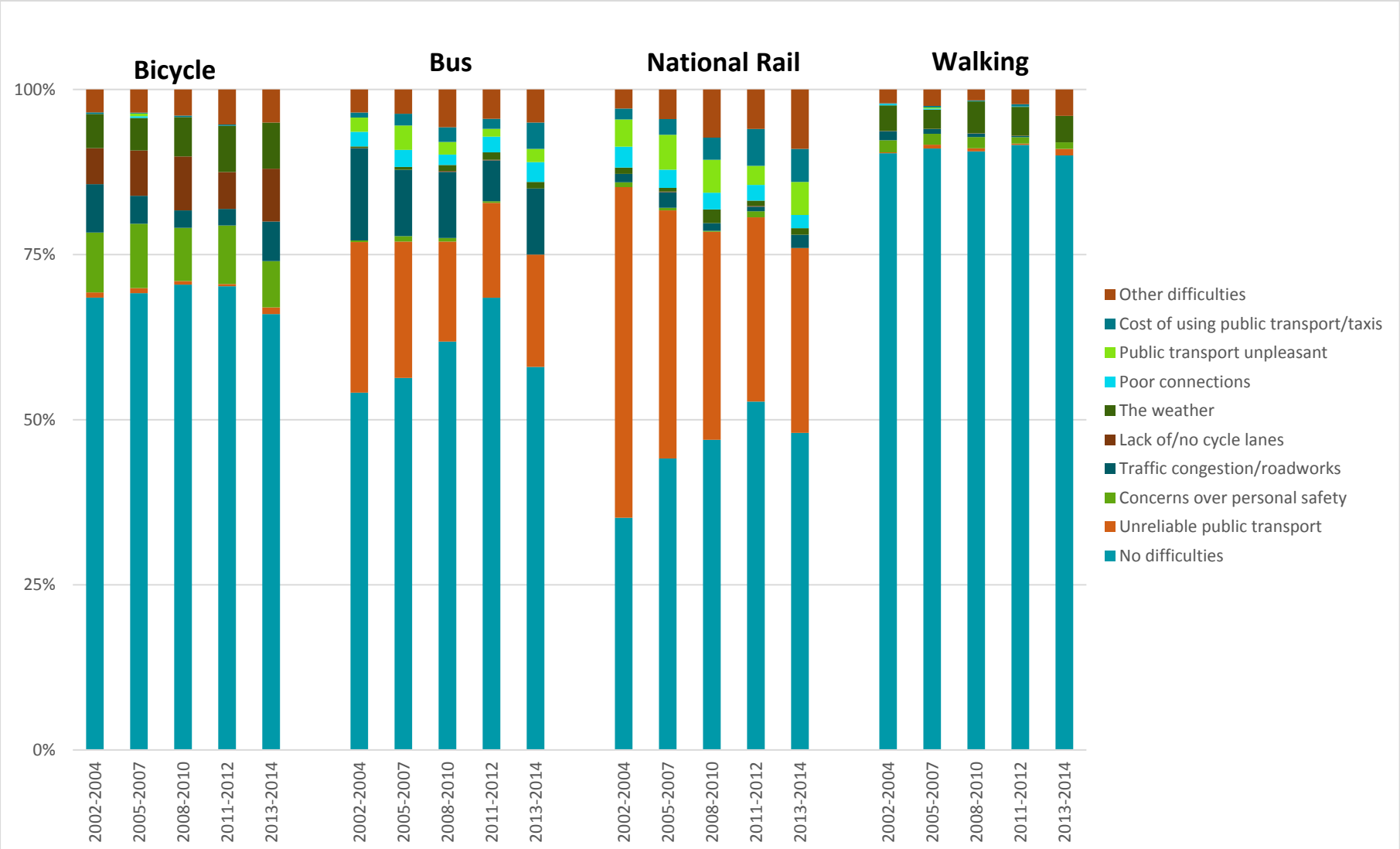

Figure 43 Bicycle, Bus, National Rail, and Walking commuters' self-reported greatest difficulty with their commute. Source: National Travel Survey

Ease of switching commute mode away from car

- **Car commuters in London report that they would have less difficulty in switching commute mode than car commuters elsewhere**
- **As city size decreases, the proportion of car commuters who say that they could switch to public transport also decreases**

Car commuters are asked how difficult it would be to travel to work (Figure 44), and how they would do so (Figure 45) if they could no longer travel by car.

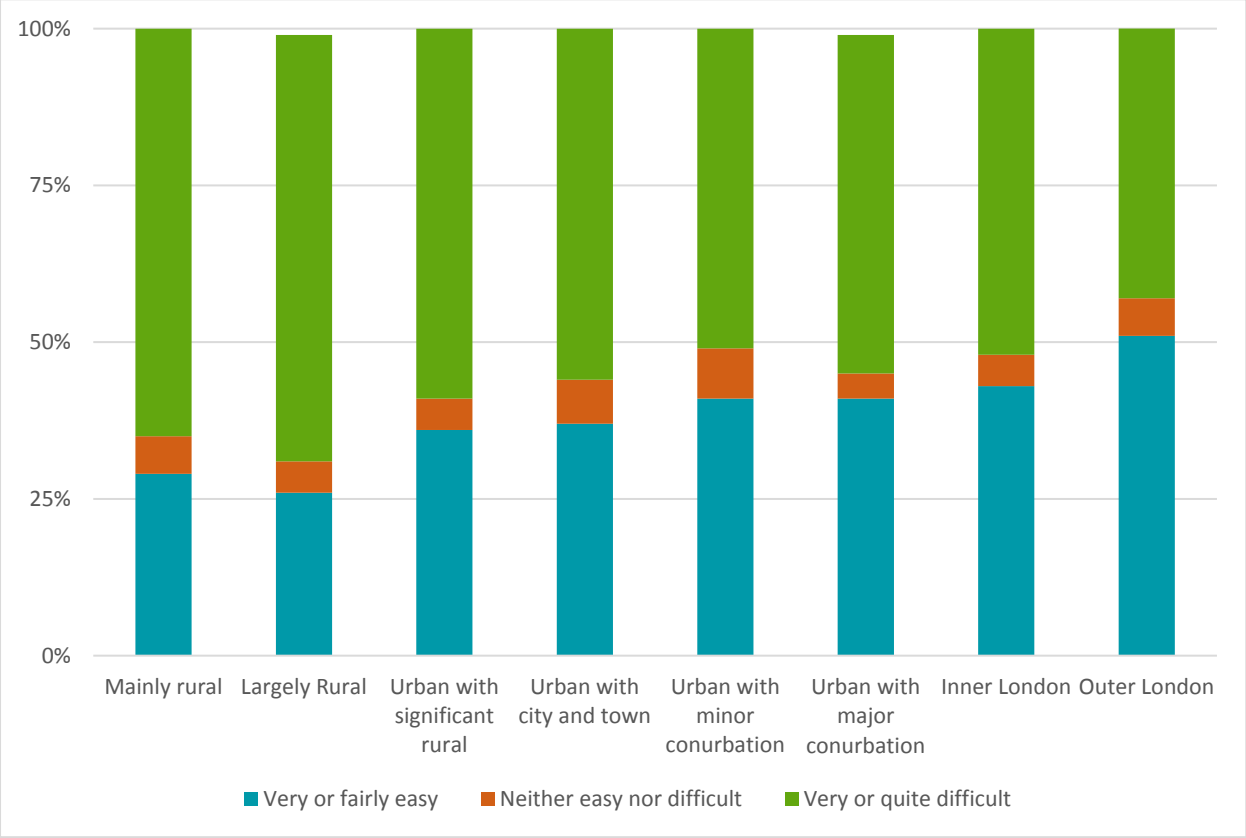

Figure 44 Car commuters' self-reported difficulty of commuting by another mode (2014). Source: National Travel Survey

As might be expected, commuters living in rural areas report the greatest difficulty and those living in London report the least difficulty (though nearly half in London indicate that it would be fairly or quite difficult). In general, as city size increases fewer car driving commuters report difficulties in potentially switching to public transport.

Rural car commuters are more likely than urban car commuters to indicate that they could not get to work without travelling by car, whilst London car commuters are far more likely to report that they would switch to public transport.

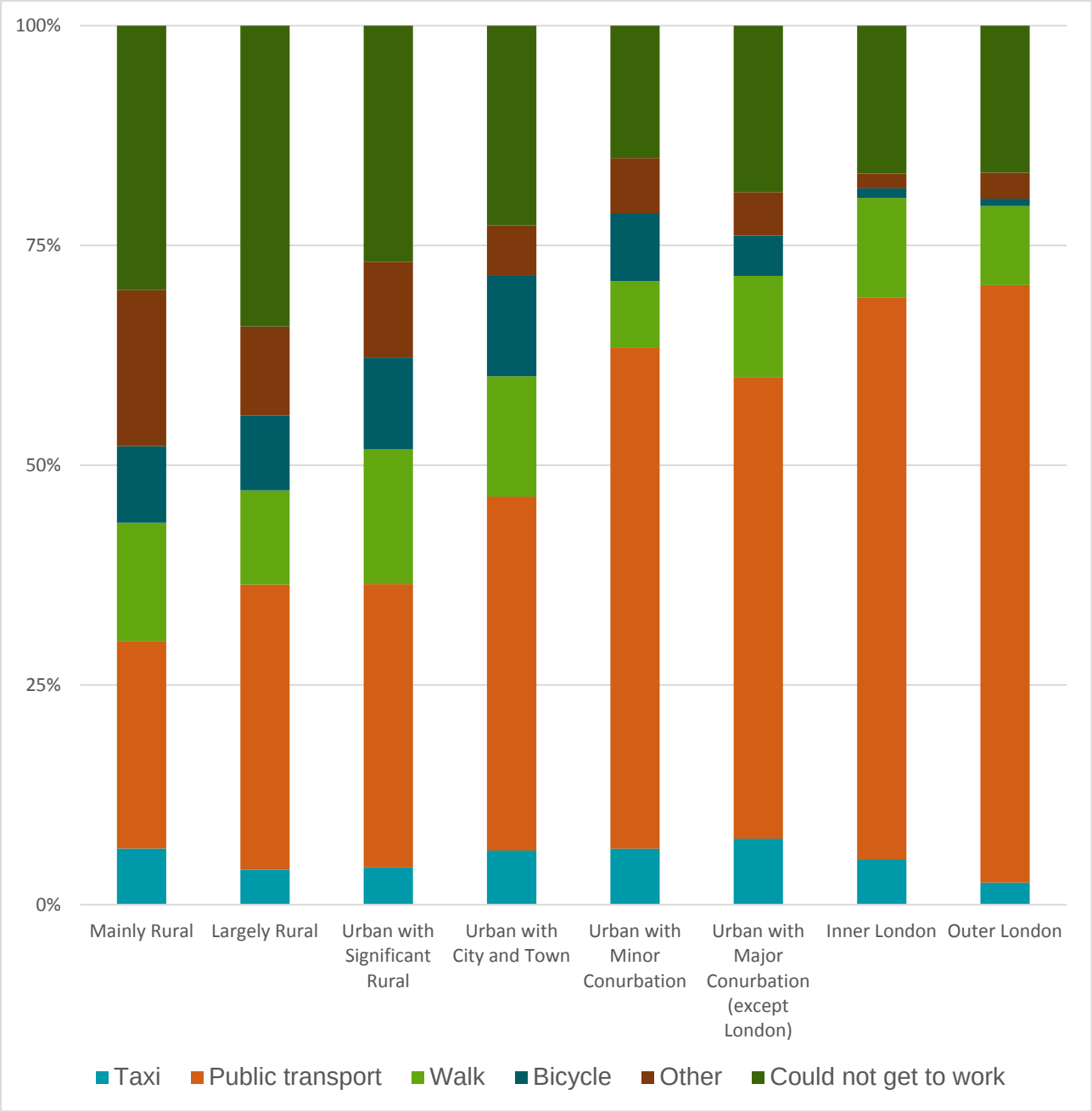

Figure 45 Amongst car driving commuters, the alternative mode that would be used if they could no longer commute by car (2014). Source: National Travel Survey

5. Conclusion

This report has analysed trends in commuting and other travel to work between 1988 and 2014, primarily employing the National Travel Survey dataset and drawing on other evidence as appropriate.

During this period there has been a downward trend in the number of commuting trips. This trend is seen whether one measures the number of commuting journeys per-person, per-worker, or in absolute terms.

This decrease relates in part to increased trip-chaining during travel-to/from-work, particularly escorting children to school in the morning. This raises an issue of whether the classical definition of 'Commuting' (journeys directly between home and usual workplace with no intermediate destinations) remains fit for purpose. The National Travel Survey's unique design provides useful information to address this research question, whereas Census data do not.

In addition to increased trip-chaining, there has been growth in home-working, including working at home both occasionally and all the time. There has also been growth in the number of workers who do not have a fixed usual workplace, and hence are not 'commuting' when they travel to a work site (9% in 1988/92 to 16% in 2013/14). Part-time work and self-employment have also increased, both of which are associated with low rates of commuting trip-making. Finally, there are an increasing number of people who say that they are employed, but do not do any work-related activity during a random week (9% in 1988/92 to 14% in 2013/14). The overarching story is one of increased flexibility in both working practices and commuting practices, which poses challenges to traditional data resources such as the Census and NTS. The currently in-progress 2015 Time Use Survey will provide a welcome additional evidence base regarding how work and commuting patterns are changing.

Finally, we investigated patterns of congestion relating to commuting as part of this study. A key finding was that traffic speeds on the strategic road network relate closely to traffic volumes at different times of the day, whereas speeds on local 'A' roads appears to depend less on traffic levels. We also found that drivers experience the greatest day-to-day variability in commuting speed, with walkers and cyclists experiencing the least variability.