

Mobile knowledge workers and traditional mobile workers: Assessing the prevalence of multi-locational work in Europe

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Abstract

This article contributes to the discussion on flexible working by assessing empirically the prevalence of mobile, multi-locational work in Europe (EU-28, Norway and Switzerland). Drawing on data from the Sixth European Working Conditions Survey, the prevalence of multi-locational work across Europe is examined in terms of the knowledge intensity of the work. Knowledge-intensive occupations are characterised by a high level of individual skills, typically acquired through tertiary-level education, and a high degree of autonomy combined with frequent use of ICT. According to the results, working on mobile sites – a practice that augments working in the primary workplace – is most common in northern European countries, where the proportion of knowledge-intensive occupations is high. However, even in the Nordic region, knowledge workers predominantly work at their employers' premises. This finding is in marked contrast with the hyperbole and expectations which assume that ICT allows knowledge workers to work free from the constraints of time and space. Agriculture, construction and transport workers still represent the largest proportion of the mobile workforce. Knowledge-intensive job features, however, predict the adoption of working at home. The analysis adds to the literature on flexible working by taking into account both traditional and knowledge-intensive forms of multi-locational work as well as providing a cross-national comparison.

Keywords

Flexible work, home-based work, knowledge work, mobile work, multi-locational work, telework, comparative research, Europe

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Introduction

Knowledge workers are commonly characterized as mobile and dynamic ‘road warriors’ or ‘nomadic workers’ who can work practically anywhere and anytime (Clemons and Kroth, 2010). Since the 1970s, in the research literature pertaining to post-industrialization, it has been suggested that the time and location of economic activities are losing their relevance. A popular concept here is that in a ‘network society’ the constraints of the clock and of distance have been radically relieved, the corporations and the individual being capable of managing their affairs independently of time and place.

New forms of information and communication technologies (ICTs) such as smartphones and tablet computers indeed promise historic change in the way we work and live (Eurofound, 2016: 86; Popma, 2013). The world of work and organisations is presumed to be undergoing a thorough change driven by the growth of knowledge-intensive occupations and ubiquitous technologies (Kuldeep et al., 2009; Schönauer et al., 2013). Critical empirical analyses, however, have provided contrasting evidence, suggesting that these on-going changes are more gradual and subtle than many optimistic visions suggest (Vilhelmson and Thulin, 2016). Time-use surveys, for example, indicate that there is a surprisingly strong pattern of working from 8 am to 5 pm in a traditional office (Glorieux et al., 2009; Ojala and Pyöriä, 2015).

According to the Sixth European Working Conditions Survey (EWCS), conducted by Eurofound (Eurofound, 2016), 11% of wage and salary earners in the EU used ICTs at least three-quarters of the time – either daily or several times a week – outside of their employer’s premises (at home, in their car, in a client’s premises or in a public space). Some 3% teleworked mainly from home and 8% were exclusively ICT-mobile workers. Denmark, the Netherlands, Sweden and Luxembourg had the highest proportions of ICT mobile workers and teleworkers (Eurofound, 2016: 86; Eurofound, 2017).

In this article, we assess empirically the state of mobile, multi-locational work across Europe, and contribute to the discussion on flexible working by deepening the understanding of the ways mobility and knowledge work are – or are not – intertwined. We already know a lot about flexible work designs, their special working conditions (Koroma et al., 2014), and their connections to employee well-being (ter Hoeven and van Zoonen, 2015), but an important gap in the research literature remains. Although, for example, the adoption of telework has been widely investigated for decades (Hislop and Axtell, 2007; Pyöriä, 2011), the analysis of other types of multi-locational working has received less attention in survey research, especially from a comparative perspective.

In the literature on multi-locational work, international comparisons are rare, notable exceptions being the Emergence and Sibis projects conducted over 15 years ago (Bates and Huws, 2002; Huws, 2003; Sibis, 2003). Most survey studies on the subject have a rather narrow focus. They are usually based on national samples (Aguilera et al., 2016), represent certain branches of the economy (Neirotti et al., 2013), or concentrate on a specific company (Hill et al., 2010). These kinds of studies, though highly important in their own right, lack the scope of the data at our disposal and seldom provide comparative evidence. A recent Eurofound report fills this gap inasmuch as it gives an overview of multi-locational ICT work in Europe, but it excludes traditional mobile workers altogether (Eurofound, 2017).

In light of the EWCS 2015, we investigated the prevalence of multi-locational work in different physical environments, such as homes, clients’ premises, vehicles, outside sites, and public spaces. Our analysis, covering the EU-28 countries, Norway and Switzerland, compares traditional and knowledge-intensive features of work. By knowledge-intensity we refer here to the high levels of skills acquired through tertiary education. Another central feature in knowledge work is the autonomy that co-exists with the freedom of the working methods and practices available. Autonomy is particularly important in this context, because it is linked to increased productivity and organisational commitment (Peters et al., 2009; Saari and Pyöriä, 2015). Use of ICT is also an integral part of the knowledge work process (Pyöriä, 2005; Pyöriä et al., 2005), and it is usually associated with mobile work (Hislop and Axtell, 2007; Peters et al., 2004; 2009; Pyöriä, 2003; 2009). For example, making business calls, checking email and preparing memos are typical tasks for knowledge workers on the move (Green, 2002; Hislop, 2013).

However, concentrating solely on knowledge work would lead to a biased overview – many traditional jobs also involve mobility (Hinds and Kiesler, 2002). Therefore, we set out to examine the work situation of all wage and salary earners in order to compare the degree to which knowledge workers' and other employees' jobs are multi-locational in different European countries. With more than 30,000 respondents, the EWCS 2015 offers a comprehensive platform for a robust cross-national overview of different types of mobile, multi-locational work.

Flexible working at the levels of society and organisations

There is no single theory on the flexibility of work but, rather, a heterogeneous set of analytical distinctions that have guided empirical research. Work-related flexibility takes place on three levels, including the societal level, the organisational/occupational level, and the level of the individual employee (Skorstad and Ramsdal, 2016). First, the uses of labour relate to adjusting to the employers' needs necessitated by economic fluctuations (societal/structural flexibility). Second, organisational/occupational flexibility refers to the everyday organisation of work; for example, to satisfy customer requirements. Third, individual flexibility refers to meeting employees' personal aspirations and work–family demands. These factors, as they relate to working conditions and job quality, are high on the European policy agenda. Labour flexibility has been addressed as a solution to global job competition, and current European policy concerns also include work–life balance and ensuring a proper balance between individual flexibility and the needs of employers (Eurofound, 2016).

The present analysis focuses on societal and organisational/occupational-level flexibility that has seldom been addressed from a comparative perspective. Individual flexibility, on the other hand, has yielded many empirical analyses, partly due to the popularity of case studies. Personal aspirations as well as household and family issues are indeed important aspects in everyday work practices (Nätti et al., 2011; Vilhelmson and Thulin, 2016). For example, the outcomes (well-being, work–family balance) of such practices for employees have been widely analysed (ter Hoeven and van Zoonen, 2015; Ojala et al., 2014; Sullivan, 2012).

At the organisational/occupational level, the theoretical discussion has recognised different, partly overlapping frameworks for flexibility. Vilhelmson and Thulin (2016), for example, separated work-related factors (managerial trust, autonomy, organisation of work, specific work tasks, control over space) from spatial factors (physical transportation, ICT use, regional accessibility). In a similar vein, Kakiyama and Sørensen (2004) distinguished physical, interactional (communicating with IT tools), and operational flexibility (flexibly organised tasks).

For the purposes of the present analysis, it is important to consider the difference between knowledge-intensive and traditional work. In transportation, for example, mobility is obviously needed to take a physical object from one place to another. At the same time, it is important to distinguish analytically the location of work and technology, because many jobs may involve significant amounts of physical mobility but require little use of ICTs (Hislop and Axtell, 2007). We therefore expect to find a significant amount of physical mobility in traditional branches of the economy where ICT use is infrequent (Hypothesis 1).

In knowledge work, in contrast, multi-locationality often entails a combination of autonomy, frequent communication and co-operation with ICTs coupled with face-to-face interaction, requiring spatial mobility (Eurofound, 2016: 60, 84–87; Koroma et al., 2014; Vilhelmson and Thulin, 2016). We thus expect to see a high level of autonomy related to multi-locational knowledge work (Hypothesis 2a).

Combined with a high level of ICT use, typical examples of spatial mobility in knowledge work include alternating between different business facilities and working in private vehicles and on public transportation (Davison et al., 2006; Hislop and Axtell, 2007). Due to the diminishing physical/temporal boundaries of work, we expect to see high levels of mobility related to frequent ICT use (Hypothesis 2b).

ICT use, however, may not only substitute for activities in one location; rather, it may complement, modify, or have a neutral effect – for example, the substituting effect that has been expected to happen with telework has actually been a complementing and modifying one (Andreev et al., 2010). There are, of course, ‘lonely riders’ – full-time mobile workers (Koroma et al., 2014) – but the more typical everyday multi-locality among knowledge workers seems to involve working at the main workplace and to a lesser extent alternating between work-related and private, secondary locations such as homes or private vehicles (Nätti et al., 2011; Ojala and Pyöriä, 2015). On this basis we postulate that knowledge work is also characterised by a high incidence of work at the most traditional site of work – the employer’s premises (Hypothesis 2c).

Furthermore, home-based telework is typical for knowledge workers (Ojala and Pyöriä, 2015). We expect to see that knowledge workers work from home more often than traditional workers (Hypothesis 3) for personal and professional reasons, due to the increased availability of ICTs as well as emerging organisational practices supporting employee flexibility and work–family balance (Ojala et al., 2014; Peters et al., 2004; 2009; Sullivan, 2012). From earlier studies, we know that job characteristics – for example, the need or desire to work long hours due to low pay or professional esteem – play the most important role in work–family conflicts rather than the family as such (Crosbie and Moore, 2004), although teleworking is somewhat more prevalent among employees with children (Ojala et al., 2014).

At the societal level, flexibility is differentiated by the country’s production regimes (agricultural; industrial; services; knowledge-intensive), uses of labour (employment contractual arrangements contrasting especially employed vs entrepreneurial work, working time, divisions by gender), and the characteristics and educational attainment of the labour force (Gallie, 2007). Country-specific labour market features are then manifested in marked differences as regards the levels of flexible working patterns.

Concerning the comparative aspect, we assumed that national labour force characteristics may largely affect the levels of flexible work designs. The skills levels (tertiary education) of the labour force are reflected both in the levels of flexible work practices and occupational divisions by country (Eurofound, 2012: 19). The countries with the highest shares of managers and professionals (> 30% among the EU: Belgium, Denmark, Ireland, Luxembourg, the Netherlands, Finland) may also have highest incidences of flexible knowledge work designs (working at clients’ sites, at home). Managers and professionals are also frequent ICT users (Eurofound, 2012: 69), supporting flexible work arrangements.

The Nordic countries in particular stand out in the adoption of flexible working time arrangements. According to the 2013 European Company Survey the average proportion of European employees entitled to use flexible working time arrangements varied between about 30% and 90%. In Finland, nine out of ten establishments practice a flexitime scheme, with Denmark (88%) and Sweden (82%) following closely behind (Eurofound, 2015). As such, we expect to see high levels of multi-local work in the Nordic and central European countries where flexitime schemes, ICT use, and professional occupations are widespread (Hypothesis 4a).

In contrast to the Nordic region, countries with the highest numbers of workers in agriculture and fisheries (> 10% in Greece, Poland, Romania, and Norway) and ‘basic’ occupations (> 10% in Bulgaria, Spain, Cyprus, Italy, France, Portugal, Romania, Slovakia, and Norway) may rank highly in work done outside or on the move. We thus expect to find a significant amount of physically mobile work (without the use of ICTs) in countries where the dominant production regimes are agriculture and basic industries (Hypothesis 4b).

Researching mobile, multi-local work

Conceptually, the spatial (and temporal) dispersion of work has been variously labelled as distributed work, hybrid work, mobile/multi-local work, telework, and e-work (Andriessen and Vartiainen, 2006; Bélanger and Collins, 1998; Koroma et al., 2014; Sullivan and Smithson, 2007; Vartiainen and Hyrkkänen, 2010). Clear-cut conceptual boundaries between the aforementioned concepts remain

open to debate and are widened, narrowed or stretched one after another depending on the study (Sullivan, 2003).

The common denominator of these conceptualisations is the aim to grasp the growing importance of mobility, be it physical movement between different workplaces or virtual collaboration. Another linkage is the understanding that the diverse use of ICTs is changing work and organisational processes in distributed environments (Pyöriä, 2009). We adopted the concept of mobile, multi-locational work as the starting point for our analysis, focusing on spatial mobility in physical work environments. Virtual collaboration is beyond our discussion, although we do examine the technology element (use of ICT) in relation to different physical settings.

The EWCS 2015

The EWCS project, developed by the European Foundation for the Improvement of Living and Working Conditions, has provided invaluable data at five-year intervals on European working life since 1990. Eurofound, an EU agency based in Dublin, is mandated to gather knowledge that can contribute to the planning and design of policies to improve the living and working conditions of Europeans. The EWCS is perhaps the most important statistical source on working conditions in Europe (de Bustillo et al., 2011: 83).

In this study, we made use of the latest-available EWCS, from 2015. The selections made with the data were first to include the EU-28 countries plus Norway and Switzerland. The second selection was to focus on employees. Entrepreneurs have been excluded from this study due to their differentiated employment and working conditions (working hours, discretion) and practices.

There were originally 31,399 respondents included in the analysis of the 30 countries selected. The data are weighted using Eurofound-provided aggregate and national-level weights that take into account household size and the stratification of the countries. The analysis evaluating knowledge work and industry effects on multi-locational work uses an aggregate weight that takes into account the very different sizes of employed populations in the countries. By contrast, the results produced for country comparisons use the national-level weights that reflect the country means.

The number of respondents in different countries varied from 637 (Greece) up to 2748 (Spain), depending on the national samples. This was sufficient to provide reliable descriptions of the country means for different types of multi-locational work.

Research task and methods

The aim of our analysis was twofold: (1) to assess the associations of mobile, multi-locational work in accordance with knowledge-intensive job characteristics and branches of the economy; and (2) to describe the prevalence of these kinds of work arrangements across Europe.

We used multivariate methods. The nesting of the data within the national level was first analysed with multilevel modelling, but only up to 2% of the variation between different types of multi-locational work was dependent on the group level (country) variation. The use of a multilevel method was therefore not needed. A linear probability model (LPM) was deployed to examine the extent and the antecedents of working at different locations (as specified below) and how they are associated with knowledge-intensive job characteristics, the branch of industry, and the countries. LPMs are an extraction from general linear models, and they have distinct advantages, over non-linear models because they allow for the assessment of results across groups and models (Mood, 2010).

In the LPMs used here, the dependent variable is dichotomised. This offers the advantage of actually estimating the proportions of respondents having certain work or background characteristics as percentages of all respondents, even when background factors are controlled for. In other words, the use of LPMs is justified because of the straightforward interpretation of their estimates (Angrist and Pischke, 2009). The potential violation of the homoscedasticity assumption with linear models does not seem to

be of practical importance because the basic tests used with these kinds of models are robust (Hellevik, 2009: 64).

The F-test significance values were evaluated at the following levels: $* = p \leq 0.05$; $** = p \leq 0.01$; and $*** = p \leq 0.001$. In addition to the F-test results, both 95% confidence intervals and the means for all evaluated categories are presented, in order to estimate the substantive significance (Bernardi et al., 2017) of the antecedents of multi-locational work. When evaluating country differences with the LPMs, the means reflect the percentages of employees working in multiple locations in different countries. Furthermore, we present the Eta-squared percentages for knowledge-intensive features of work, country and industry effects in order to compare their substantive importance.

Variables

In the EWCS 2015, the following question was used to measure multi-locational work: 'How often you have worked in each location during the last 12 months in your main paid job?' Six alternative locations were given: 'Your employer's premises' (office, factory, shop, school); 'Clients' premises'; 'A car or another vehicle'; 'An outside site' (construction site, agricultural field, streets of a city); 'Public spaces such as coffee shops, airports, etc.'; and 'Home'. For each location, the following five-point scale was applied: 'Daily'; 'Several times a week'; 'Several times a month'; 'Less often'; and 'Never'. We opted the frequency of at least 'Several times a month' in our analyses.

The survey items allow us to evaluate the extent of multi-locational work by background factors. We first assess how knowledge intensive job characteristics and industrial branches are related to working in multiple locations in order to analyse societal- and organisational level flexibility. The measure for the branch of industry is based on the international one-digit NACE classification. This is an essential measure for the entire discussion on flexible working because the extent and nature of multi-locational work varies considerably from one industry to another.

Our definition of knowledge work follows from earlier research (Pyöriä, 2005; Pyöriä et al., 2005) comprising the following components: the skill level independent of the employers' needs (higher education), autonomy in the work process, and the use of ICTs. Autonomy and formal education in particular are important because these are the key qualities associated with skilled flexible labour (Archibugi and Lundvall, 2001).

Although there is no consensus on how best to define knowledge work (this has been debated since Fritz Machlup published his seminal work over 50 years ago), the indicators presented in Table 1 are consistent with prior research. Of course, even highly educated employees may perform routine tasks and not all experts have an academic degree. However, the view advocated here is that autonomy in the work process is the core of knowledge work which, together with the education criterion, allows us to distinguish knowledge workers from traditional workers on the basis of the design component involved in the job (Pyöriä, 2005: 123).

To estimate working in multiple locations among the same respondents, we included measures for other mobile forms of work they undertook. Composite indicators for clients' premises, vehicles, outside sites and public spaces were used, excluding the one under evaluation, because these multi-locational forms of work correlate highly with each other (see Table 4 in the Appendix). Work at home was kept as an individual measure (lower correlation). When evaluating the extent of multi-locationality in the countries in total, we created combination dependent variables; first, to determine if any multi-locationality takes place among the countries' employed populations; and, second, to determine the means of the extent of work at locations other than the employer's premises.

The respondent's occupation (one-digit ISCO classification) correlates strongly with the indicators describing knowledge-intensive job characteristics, and was thus omitted as a controlling factor in order to avoid multi-collinearity. Other important aspects of multi-locational work designs were controlled in the analysis instead. Several socio-demographic characteristics were adjusted for, such as gender (man, woman), age (15–30 years, 31–40 years, 41–50 years, 51+ years), and having a child (under 18 years)

Table 1. A detailed description of the indicators that comprise knowledge work.

Skills	Skills refer to the level of education based on the International Standard Classification of Education (ISCED): ISCED levels 1–3 (primary and lower secondary) refer to basic education; levels 4–5 (upper and post secondary) refer to secondary education; and levels 6–9 to tertiary education.
Autonomy	<p>Autonomy was measured with two sum variable indicators:</p> <p><i>Autonomy in work practices; that is, in choosing or changing</i></p> <ol style="list-style-type: none"> the order of tasks the speed or rate of work methods of work (originally measured with ‘Yes’ vs ‘No’, summing positive responses to a dummy variable, $\alpha=0.758$); <p><i>Autonomy in work contents; that is, the level that the respondent</i></p> <ol style="list-style-type: none"> ‘is involved in improving the work organisation or work processes’ ‘has a say in the choice of working partners’ ‘is able to apply his/her own ideas in his/her own work’ ‘can influence decisions that are important in the work’ (measured with a five-point scale from ‘Always’ to ‘Never’; the four items were summed and rescaled to include three categories: low, middle, and high levels of autonomy, $\alpha = 0.788$).
ICT use	Use of ICT was measured with a variable asking if the respondents’ main paid job involves ‘working with computers, laptops, smartphones, etc.’ on a seven-point scale, from ‘All of the time’ to ‘Never’. We truncated the scale to three categories: ‘Never’, ‘Up to half of the time’, and ‘Up to all of the time’.

and a spouse living in the same household. Socio-demographic variables, especially gender and age, are often presumed to influence the adoption of multi-locational work (Peters et al., 2004; Vilhelmson and Thulin, 2016). Working from home, for example, can be preferred when there are small children (Ojala et al., 2014; Sullivan and Smithson, 2007).

On the other hand, a long commuting time (Nätti et al., 2011) and long working hours may increase telework from home (Andreev et al., 2010; Noonan and Glass, 2012), which is why we controlled for commuting time (< 45 minutes a day, 46–90 minutes, 91–360 minutes) and weekly working hours (1–30 hours, 31–44 hours, 45+ hours). The respondent’s managerial status (≥ 1 person works under the respondent’s supervision vs none) was also adjusted for as an issue important to the discretion available in both choosing and having to adapt to certain responsibilities, times and places of work, as well as to time pressure (Peters and Heusinkveld, 2010; Ojala et al., 2014).

With categorical independent variables, the missing values were recoded as the median value, except for the ISCED classification (educational level) and branch of industry, which cannot be recoded in any meaningful way. Unfortunately, about 300 respondents lacked details on their branch of industry, which decreased the number of respondents in the model. Another restriction concerned small countries when using aggregate-level weighting. Some of the countries are omitted from the aggregate model because the number of their employed populations is too low for the evaluation.

Results

Multi-locational work by job characteristics

Table 2 presents the connections between multi-locational work and knowledge intensive job characteristics as well as societal/structural factors (country and industry). Work and socio-demographic characteristics are adjusted for. The F-tests describe if there is a statistical difference within the categorised respondent groups. The grand means give an overall estimate of the extent of working in different locations in the 30 countries.

Table 2. Antecedents and estimates for the extent of multi-locational work (at least several times a month) by knowledge-intensive job characteristics and industry (EWCS 2015): linear probability model.

	Employer's premises	Client's premises	Vehicles	Outside sites	Public spaces	Home	1+ mobile locations	Mean, mobile locations
Model F(df) Sig.	132.03(52)***	199.84(52)***	250.59(52)***	249.51(52)***	86.08(52)***	133.69(51)***	175.80(51)***	147.76(51)***
Grand mean (CI 95%)	83% (80–86)	21% (18–25)	18% (15–22)	24% (21–28)	7% (5–10)	14% (11–17)	49% (44–53)	18% (16–20)
Knowledge intensive job characteristics	10.50(2)***	41.50(2)***	4.89(2)ns	.48(2)ns	3.54(2)*	13.74(2)***	67.58(2)***	71.20(2)***
Autonomy in contents								
Low ^a	82% (79–85)	19% (15–22)	17% (14–21)	24% (21–27)	7% (5–10)	12% (9–16)	44% (40–49)	16% (14–19)
Middle	82% (79–86)	20% (17–24)	18% (15–22)	25% (21–28)	7% (4–9)	13% (10–16)	48% (44–53)	18% (16–20)
High	84% (81–88)	24% (21–28)	19% (16–23)	24% (21–28)	7% (5–10)	15% (12–18)	54% (49–58)	21% (19–23)
Autonomy in practices	0.04(1)ns	37.75(1)***	2.96(1)ns	0.99(1)ns	3.59(1)ns	76.81(1)***	60.53(1)***	43.60(1)***
Low	83% (80–86)	20% (16–23)	19% (15–22)	25% (21–28)	7% (5–10)	12% (9–15)	47% (42–51)	17% (15–20)
High	83% (80–86)	23% (19–26)	18% (15–21)	24% (21–27)	7% (4–9)	15% (12–18)	51% (46–55)	19% (17–21)
Education	21.79(2)***	8.93(2)***	5.49(2)*	25.93(2)***	1.14(2)ns	338.66(2)***	92.31(2)***	65.76(2)***
basic	81% (78–85)	21% (17–24)	18% (14–21)	27% (24–30)	7% (4–10)	9% (6–12)	48% (43–53)	18% (15–20)
secondary	82% (79–85)	20% (17–24)	19% (16–23)	24% (20–27)	7% (5–10)	10% (7–13)	45% (40–49)	17% (15–19)
tertiary	85% (82–88)	23% (19–26)	18% (15–21)	22% (19–26)	7% (4–10)	21% (18–24)	54% (49–58)	20% (18–22)
ICT use	421.30(2)***	23.28(2)***	66.71(2)***	97.27(2)***	28.49(2)***	83.50(2)***	128.93(2)***	120.51(2)***
never	74% (71–77)	23% (19–26)	16% (13–19)	26% (22–29)	6% (3–8)	11% (8–14)	50% (46–55)	17% (15–19)
≤ 50% of the time	85% (82–89)	22% (18–25)	22% (18–25)	27% (24–30)	9% (6–11)	13% (10–16)	53% (49–58)	21% (19–23)
> 50% of the time	89% (86–92)	19% (15–23)	18% (14–21)	20% (17–24)	7% (4–10)	17% (14–20)	43% (38–47)	16% (14–19)

(continued)

Table 2. (continued)

Structural factors	Employer's premises		Client's premises		Vehicles		Outside sites		Public spaces		Home		I + mobile locations		Mean, mobile locations	
Country ^b	6.58(26) ^{***}	7.79(26) ^{***}	11.59(26) ^{***}	5.18(26) ^{***}	6.14(26) ^{***}	13.25(26) ^{***}	20.82(26) ^{***}	21.97(26) ^{***}								
Industry	114.95(10) ^{***}	183.14(10) ^{***}	239.84(10) ^{***}	387.71(10) ^{***}	124.95(10) ^{***}	170.20(10) ^{***}	219.94(10) ^{***}	167.73(10) ^{***}								
Agriculture	72% (68-76)	9% (5-14)	15% (11-19)	60% (56-64)	0% (-3-3)	14% (10-18)	61% (56-67)	24% (21-26)								
Industry	88% (85-91)	19% (15-23)	16% (13-19)	16% (12-19)	5% (3-8)	12% (9-15)	28% (23-32)	11% (9-13)								
Construction	64% (60-67)	44% (40-48)	8% (5-12)	56% (52-59)	0% (-3-2)	7% (4-11)	69% (64-73)	29% (26-31)								
Wholesale, retail, repairs	89% (86-93)	18% (15-22)	22% (18-25)	12% (9-15)	6% (4-9)	11% (8-14)	32% (27-36)	12% (10-14)								
Hotels, restaurants	93% (89-96)	11% (7-15)	9% (5-13)	7% (3-11)	29% (26-32)	10% (7-14)	44% (39-49)	14% (12-16)								
Transport	78% (74-81)	17% (14-21)	48% (44-51)	19% (15-22)	6% (3-9)	9% (6-12)	60% (55-64)	24% (21-26)								
Financial services	81% (78-85)	33% (29-36)	14% (11-18)	15% (12-19)	5% (3-8)	14% (11-17)	49% (44-54)	18% (16-20)								
Public administration and defence	89% (85-92)	20% (16-24)	25% (21-28)	31% (28-35)	11% (8-14)	8% (5-11)	52% (48-57)	22% (20-24)								
Education	88% (84-91)	8% (4-12)	11% (7-14)	16% (13-20)	2% (0-5)	36% (33-39)	52% (47-57)	14% (12-16)								
Health	86% (83-89)	27% (24-31)	19% (16-23)	14% (11-18)	6% (3-9)	9% (5-12)	39% (34-44)	15% (13-17)								
Other services	83% (80-87)	26% (22-30)	15% (11-19)	21% (18-25)	8% (5-11)	20% (16-23)	51% (46-56)	20% (17-22)								
N ^c	30.273	30.273	30.273	30.273	30.273	30.273	30.273	30.273								
Eta Sq Knowledge work factors summed	2.9%	0.7%	0.4%	0.8%	0.2%	3.1%	2.0%	1.8%								
Eta Sq Branch of industry	3.7%	5.7%	7.4%	11.4%	4.0%	5.3%	6.8%	5.3%								
Eta Sq Country	0.6%	0.7%	1.0%	0.4%	0.5%	1.1%	1.8%	1.9%								
Full model, Adjusted R ²	18.4%	25.5%	30.0%	29.9%	12.8%	18.3%	22.7%	19.8%								

^aThe values in the rows are estimated means on the dependent variable scale 0 = Respondent Never/Less often works in the location ... 1 = Respondent works in the location Daily/Several times a week/Several times a month. In other words, the values between 0 and 1 represent the estimated percentage of respondents working in the location.

^bCountry estimates in Table 3.

^cEWCS aggregate weight applied. Adjusted for covariates: Other mobile work locations (sum variables on work at clients'/vehicle /outside/public spaces, excluding the one under evaluation), Manager status, Weekly working hours, Commuting time, Having a child 0-17 yrs, Having a spouse, Gender, and Age.

According to the results, the degree and nature of mobility vary considerably in different jobs. Hypothesis 1 is thus confirmed. According to this hypothesis, we expected to find a significant amount of mobility in traditional work. Indeed, the most nomadic group of employees work in construction; they frequently combine working at clients' premises and on outside sites. As the results in Table 2 show, there are a number of traditional branches involving a high degree of mobility. Obvious examples are construction, transportation, and agricultural workers as well as armed forces personnel, for whom it is natural to work on outside sites without frequent ICT use.

Work at clients' premises is split into two distinct groups: this is the most probable option when the employee never uses ICTs at work and, in most cases, the person doing this works in construction (Table 2). However, clients are often also met by knowledge workers employed in financial services. This was expected, because networking and collaboration are vital for knowledge workers. The health care sector is another branch where it is more common than average to work at clients' facilities.

The nature of work in vehicles is as expected: this is the most prevalent practice among transport workers and to a lesser extent among public administration and defence personnel. Also in line with our expectations, outside site workers are more typically employees in the agricultural and construction sectors, with the lowest levels of education and ICT use. Employees working in public spaces typically work in the hospitality business (hotels, restaurants) – which, again, is no surprise.

According to Hypothesis 2a, we expected high levels of autonomy to pertain to multi-locational working practices adopted by knowledge workers. Partly challenging this view, we found that high levels of autonomy predict the adoption of all kinds of multi-locational work, including the mobility that we expected to be typical of agricultural and 'basic' workers (working at outside sites, in vehicles) who are usually not characterised as being highly autonomous. This implies that trust and the adoption of goal-oriented management – as opposed to time-based surveillance of work – is important in all types of multi-locational work.

One surprising finding is that we found no evidence supporting claims that public spaces such as coffee shops and waiting areas are being crowded by highly-educated and autonomous knowledge workers equipped with ICTs. Frequent ICT use does not equal a high level of mobility. Hypothesis 2b was thus rejected, indicating that the image of the nomadic knowledge worker has become a highly charged symbol, in some instances a clear myth, incorporating an overtly optimistic vision of the possibilities that mobile communication technologies have to offer.

Confirming Hypothesis 2c, working at the employer's premises is the most probable option when the employee is a knowledge worker – i.e. highly educated, autonomous, and whose work involves frequent ICT use. Work at employers' sites by knowledge workers reflects the importance of collaboration, communication and teamwork in traditional, employer-facilitated office settings. We surmise that knowledge workers need their work communities for social and work process reasons more than is often acknowledged (Pyöriä, 2007; Saari and Pyöriä, 2015). On the other hand, work at the employer's premises is also common in the hospitality business as well as in wholesale and retail services (Table 2).

Hypothesis 3 – knowledge work has spread to home offices – was confirmed. Rather than populating public spaces, knowledge workers typically extend office boundaries by taking work home. Knowledge-intensive job features (frequent ICT use, high levels of education, and autonomy) are systematically related to the adoption of work at home. However, the frequency of teleworking is lower than might have been expected. In this respect, traditions still prevail. Teleworking remains the most prevalent option in the education sector. For decades, teachers have continued their workday by planning teaching and marking exams and essays at home (Felstead et al., 2005).

Our findings imply that there may be more continuity in work practices than prior research (which often focuses on knowledge work) has acknowledged. This source of confusion is due to the majority of studies on distributed or mobile work not addressing traditional mobile occupations. The most nomadic employees work in traditional occupations within the related branches of industry, reminding us about the concrete target and goal of the work task. At the same time, the extent – large – to which people still work at their employers' facilities comes as a surprise; around four fifths of all European employees and almost up to nine out of ten knowledge workers are based at their employer's premises.

Table 3. Estimates for the extent of multi-locational work (at least several times a month) in 30 countries, adjusting for the variables in Table 2 (EWCS 2015): linear probability model.

	Employer's premises	Client's premises	Vehicles	Outside sites	Public spaces	Home	I+ mobile locations	Mean, mobile locations
Sweden	83%	25%	22%	29%	12%	18%	63%	25%
Denmark	88%	23%	19%	28%	11%	23%	65%	25%
Norway	89%	17%	22%	31%	8%	17%	62%	23%
Netherlands	84%	32%	17%	23%	7%	21%	60%	23%
Finland	88%	21%	18%	31%	6%	17%	62%	23%
France	84%	20%	23%	24%	10%	15%	53%	20%
Austria	85%	20%	18%	26%	8%	16%	54%	20%
UK	85%	23%	20%	23%	11%	14%	47%	19%
Croatia	77%	17%	24%	27%	10%	10%	50%	19%
Czech Republic	86%	18%	25%	26%	7%	11%	51%	19%
Switzerland	84%	22%	14%	26%	10%	14%	52%	19%
Luxembourg	83%	17%	19%	24%	13%	12%	51%	18%
Romania	84%	23%	17%	26%	7%	11%	51%	18%
Belgium	81%	26%	15%	21%	7%	16%	51%	18%
Slovenia	87%	17%	20%	23%	9%	11%	50%	17%
Hungary	79%	17%	17%	26%	9%	15%	45%	17%
Cyprus	81%	23%	17%	25%	10%	6%	45%	17%
Germany	84%	22%	16%	22%	7%	12%	50%	17%
Estonia	84%	16%	19%	27%	7%	11%	47%	17%
Greece	85%	18%	16%	23%	13%	7%	48%	16%
Poland	81%	19%	16%	23%	9%	12%	45%	16%
Lithuania	66%	15%	15%	29%	9%	8%	45%	15%
Malta	89%	17%	19%	23%	10%	8%	44%	15%
Spain	78%	20%	14%	22%	12%	9%	44%	15%
Latvia	72%	16%	14%	26%	9%	9%	45%	15%
Slovakia	81%	19%	16%	21%	8%	7%	43%	14%
Portugal	86%	17%	14%	20%	9%	10%	44%	14%
Ireland	76%	20%	14%	22%	8%	12%	39%	14%
Italy	81%	17%	14%	21%	11%	9%	37%	13%
Bulgaria	77%	15%	18%	23%	8%	6%	40%	13%

The values in the rows are estimated means on the dependent variable scale 0 = Respondent Never/Less often works in the location . . . 1 = Respondent works in the location Daily/Several times a week/Several times a month. In other words, the values between 0 and 1 represent the estimated percentage of respondents working in the location. EWCS country weight applied.

Multi-locational work from a comparative perspective

For the purpose of cross-national comparison, Table 3 provides the estimated mean values of working in different locations by country. There, the estimated extent of various forms of multi-locational work (clients' premises, vehicles, outside sites, public spaces, home) can be compared to working at the employer's premises, reflecting the degree of job flexibility across Europe.

Those countries that can aptly be labelled post-industrial 'information societies' have the largest spatially mobile workforce, confirming Hypothesis 4a. In addition to the Netherlands, the Nordic countries of Sweden, Denmark, Norway and Finland form a group where the extent of multi-locational work (especially at clients' sites and homes) is significantly large (see also Eurofound, 2016; 2017). These countries are technologically advanced and networked, have been adept at competing with larger economies, and have shown a high level of organisational flexibility. Furthermore, their workforces are tertiary educated and therefore differentiated by having more jobs in knowledge-intensive sectors of the economy.

We also expected to see high levels of multi-locationality in countries with high proportions of managers and professionals in their labour force (Eurofound 2012: 19). In Table 3, Belgium and Luxembourg closely follow the Nordic countries. However, no obvious country clusters can be identified other than the Nordic region. There are significant cultural and legislative divergences among the European economies that affect organisational practices and individual preferences and opportunities (Skorstad and Ramsdal, 2016). For example, Ireland, where the proportion of managerial and professional positions is high (Eurofound, 2012: 19), ranks low in our comparison of autonomous multi-locational work.

Furthermore, European countries differ due to geographical and agricultural specialisation (climate, need for long-distance transportation). We expected to find a significant amount of physically multi-locational work in countries that have higher levels of agriculture and basic production (Hypothesis 4b). This hypothesis was confirmed, but not exactly as expected. The Nordic ‘information societies’ ranked higher than we anticipated in work done on outside sites and in vehicles, referring to the co-existence of large knowledge industries and traditional agriculture, construction and transportation sectors. In contrast, working on the move or on outside sites appears to be less prevalent than expected in those European countries where agriculture, fisheries and basic occupations still have a central role. Interestingly, Norway, with its high proportion of fishery workers (Eurofound, 2012: 19), ranks the highest both in work at employers’ premises (referring to knowledge work) and in outside site working (probably referring to fisheries).

All in all, there seems to be a connection between a high-level of workplace flexibility inherent in the Nordic labour markets and the widespread adoption of multi-locational work arrangements. Workplace flexibility, including worker autonomy, implies trust – which in certain countries seems to extend beyond organisational boundaries. We assume the high level of trust, as well as the related level of responsibility, given to workers is seen in the above-average levels of home-based telework and other forms of multi-locational work in the Nordic countries (see also Eurofound, 2017: 15).

Discussion

According to the proponents of post-industrialization, rapid technological development and changes in the social division of labour have contributed to reducing the dependence of work on time and place. An integral part of this development is the growth of knowledge work as well as collaboration and networking across organizational boundaries, allegedly leading us towards a ‘network society’ characterized by a radical revision of time–space relations (Webster, 2014).

For a long time, the majority of research on flexible working concentrated on home-based telework, a phenomenon extensively theorised and empirically investigated since the 1970s. Surprisingly little attention was paid to work done on the move: according to Hislop and Axtell, ‘this neglect is problematic not only because mobile teleworkers represent a significant and growing subgroup in the population of teleworkers, but also because there appears to be a number of factors which distinguish mobile from home-office teleworkers’ (Hislop and Axtell, 2007: 35). More recently, theoretical and empirical reflections on multi-locational work have emerged (e.g. Koroma et al., 2014), but the overall extent of mobile, multi-locational work has received less attention.

We compared European countries and estimated the societal- and organisational-level flexibility by taking into account both traditional and knowledge-intensive jobs. We found that knowledge workers most often regard their employer’s premises as their main site of work. Knowledge workers hardly qualify as ‘road warriors’ or ‘nomadic workers’ who switch constantly between different locations. This finding may appear contradictory in the light of such commonly held perceptions. These kinds of presumptions are clearly far-fetched inasmuch as they do not take into account the everyday realities of workplaces, different organisational cultures, individual preferences, and country-specific variation.

Employers' premises are thus the most common environment for knowledge work, supplemented by clients' facilities and private spheres. According to technologically deterministic visions, advances in ICTs should allow knowledge workers 'full access to communication, data, and computing from any location at any time' (Davis, 2002: 67). This kind of interactional mobility (Kakihara and Sørensen, 2004) is undoubtedly an important feature in the everyday reality of knowledge work, but – based on the present analysis – it only co-exists with locational mobility in a limited manner.

Technological development is only one aspect that has an influence on the spatial mobility of work. In the age of laptops, tablets and smart phones, mobile workers routinely check their email and use other applications to stay connected to the company and work colleagues while on the road; but organisational practices that support flexible working are equally important. According to our results, multi-locational work goes hand-in-hand with the job autonomy and workplace flexibility for which the Nordic countries are renowned. Autonomy, however, pertains to all kinds of flexible working, regardless of the industry. Traditional jobs in construction or transportation also involve a significant amount of flexibility and autonomy.

It is important to stress here that there are different modes and rhythms of spatial mobility. While the traditional office remains the knowledge workers' primary base, their work extends and spills over into their homes. Some increase is seen in the extent to which knowledge workers adopt informal overtime practices, and a limited proportion of employees continually work very long weekly hours and extend their workdays into private spheres. Evening and weekend work by an average highly skilled worker includes checking emails and reading professional literature in order to 'keep up to speed', resulting in additional weekly working hours (Ojala et al., 2014). Besides, during the past couple of decades, there has been a strong international tendency towards the intensification of working hours (Green, 2006), which may be followed by more informal work at home (Aguilera et al., 2016).

However, there is a caveat frequently overlooked in earlier research. Mobile, multi-locational work continues to be most common practice in traditional occupations and branches of industry. The source of bias we have addressed here is the lack of empirical survey interest in mobile work that takes into account different facets of multi-locationality. In this respect, the EWCS has its strengths and weaknesses. Among its strengths, the EWCS allows one to evaluate the extent and intensity of multi-locational work. The list of alternative workplaces given in the questionnaire explicitly takes into account clients' premises, vehicles, outside sites and public spaces; these have often been ignored in earlier survey studies.

With regard to the EWCS's weaknesses, the most important restriction of the data is the size of the sample (about 1000 cases per country). The sample size is sufficient to provide reliable statistical generalisations of the whole survey population at the national level, but should one wish to break down the results – for example, by detailed occupational level (ISCO minor groups and unit groups) – the number of cases used for specific estimations quickly becomes too small (de Bustillo et al., 2011: 84). Due to this limitation, we were unable to analyse the interaction effects between country and industrial branches, which makes the comparative element of our study a preliminary one.

These issues notwithstanding, the EWCS provides the most detailed and robust basis for the comparative assessment of mobile, multi-locational work in Europe. We would argue that in the future more attention should be paid to measuring the temporal dimension of various multi-locational work arrangements. In addition, the potential associations between working in multiple sites – especially with extensive hours – should be analysed, as should their connections with other working conditions and potential health outcomes.

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Appendix

Table 4. Spearman correlations.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Employers	1																
2 Clients	-0.209**	1															
3 Vehicles	-0.095**	0.417**	1														
4 Outside	-0.207**	0.347**	0.381**	1													
5 Public spaces	-0.061**	0.236**	0.280**	0.253**	1												
6 Home	0.006	0.122**	0.146**	0.065**	0.149**	1											
7 Education	0.144**	0.008	0.013*	-0.073**	0.017**	0.260**	1										
8 Autonomy in contents	0.062**	0.100**	0.067**	0.038**	0.048**	0.162**	0.203**	1									
9 Autonomy in practices	0.041**	0.069**	0.021**	0.002	0.011	0.144**	0.162**	0.338**	1								
10 IT use	0.243**	-0.023**	0.011	-0.124**	0.006	0.178**	0.394**	0.216**	0.184**	1							
11 Gender	0.098**	-0.178**	-0.226**	-0.258**	-0.079**	0.009	0.047**	-0.047**	0.022**	0.060**	1						
12 Age	-0.037**	0.031**	0.031**	0.01	-0.043**	0.037**	-0.064**	0.043**	0.060**	-0.022**	-0.004	1					
13 Spouse	0.020**	0.020**	0.044**	0.005	-0.022**	0.064**	0.059**	0.084**	0.054**	0.055**	-0.006	0.227**	1				
14 Child	0.020**	0.01	0.011	-0.009	-0.016**	0.063**	0.077**	0.055**	0.031**	0.045**	0.062**	-0.083**	0.346**	1			
15 Manager	0.058**	0.051**	0.075**	0.043**	0.071**	0.108**	0.138**	0.295**	0.121**	0.167**	-0.096**	0.057**	0.091**	0.053**	1		
16 Long hours	-0.014*	0.126**	0.173**	0.130**	0.085**	0.091**	0.071**	0.106**	0.014*	0.091**	-0.305**	0.005	0.056**	0.177**	0.177**	1	
17 Commuting time	0.029**	0.038**	0.026**	0.002	-0.005	0.056**	0.116**	0.026**	0.01	0.145**	-0.045**	-0.005	0.001	-0.004	0.070**	-0.086**	1
N	30702	30702	30702	30702	30702	30702	30549	30702	30702	30702	30692	30702	30702	30702	30702	30702	30702

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).