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ABSTRACT

Trends in Commuting Time of European Workers: A Cross-Country Analysis*

This paper examines the time spent commuting to/from work by workers in fifteen European countries, during the last three decades, with the aim of analyzing recent trends in commuting and the factors affecting commuting behavior in those countries. Using data from several waves of the European Working Conditions Survey, results show a significant gender gap in commuting time in Austria, Belgium, France, Germany, Italy, Ireland, Luxembourg, the Netherlands, and the UK, with male workers devoting more time to commuting than their female counterparts. We further explore the factors related to commuting time, documenting a level of heterogeneity in commuting behavior as certain determinants of commuting time differ across countries. By analyzing the evolution of commuting time in Europe in recent decades, and the factors associated with commuting time, our analysis may serve to guide future planning programs.

JEL Classification: R40, O57

Keywords: commuting time, european working conditions survey, trends, gender, socio-demographic factors

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1. Introduction

Millions of workers spend time travelling on their working days, and commuting to/from work is among the most important trips in workers' daily activity. One out of five workers in Europe spend more than 90 minutes commuting each day, equivalent to about 29 km (SD Worx 2018) distance. The European Parliament Resolution of 2 December 2015 on Urban Mobility (2014/2242 (INI)) reflects the demographic forecast, that by 2050 up to 82% of EU citizens will reside in urban areas different from where they work. The mobility of the European population is based on the use of private vehicles (50% use private vehicles daily, while only 16% use public transport and 12% use bicycles), such that daily commuting generates around 25% of CO2 emissions in Europe. The European Resolution places special emphasis on the many adverse health effects of the current mobility model, and tasks local governments with taking the necessary measures to improve the quality of life of the population, promoting changes towards healthy and sustainable mobility modes, in accordance with WHO guidelines. Thus, European countries need to consider new approaches to daily mobility planning by promoting healthier systems that report higher levels of well-being of the population and that are more economically, socially, and environmentally sustainable.

Given its importance, commuting to/from work plays a central role in daily mobility planning, and thus the analysis of commuting behavior is important for the correct design of mobility policy. Commuting time has been extensively studied in the past, and some level of consensus has been achieved from different settings.

For instance, commuting time has been linked to several negative outcomes. Hansson et al. (2011) and Kunn-Nelen (2016) found a negative correlation between commuting and health outcomes in Sweden and the UK, respectively. Roberts, Hodgson and Dolan, (2011), and Dickerson, Hole and Munford (2014) reported lower subjective and psychological wellbeing of workers who commute longer in the UK. Similarly, Kahneman et al. (2004) and Kahneman and Krueger (2006) found that commuting ranks among the lowest activities in terms of the "instant enjoyment", using time use data from the US; and several authors have found that commuting is associated with increased stress (Gottholmseder et al., 2009; Wener et al., 2003; Frey and Stutzer, 2008; Novaco and Gonzalez, 2009). Commuting has also been linked to increases in labor costs and losses in productivity (Allen, 1983; Grinza and Rycx, 2018), with increased commuting leading to shirking behavior and increased sickness absenteeism (Ross and Zenou, 2008; van Ommeren and Gutierrez-i-Puigarnau, 2011; Goerke and Lorenz, 2017; Gimenez-Nadal, Molina and Velilla, 2018b). The impact of

commuting on wages has also received some attention in the literature and, in general, higher wages are associated with longer commutes (e.g., Leigh, 1986; Crane, 2007; Ross and Zenou, 2008; Ruppert, Stancanelli and Wasmer, 2009; Mulalic, Van Ommeren and Pilegaard, 2014).

Regarding trends in commuting and factors affecting commuting, prior research has documented increasing trends in commuting time during recent years in the US (Kirby and LeSage, 2009; Mckenzie and Rapino, 2009; Gimenez-Nadal, Molina and Velilla, 2018a), Germany (Gimenez-Nadal and Molina, 2014), and the Netherlands (Susilo and Maat, 2007). Furthermore, education has been found to be positively correlated to commuting, as highly educated workers may search for more specialized jobs, which can require commuting longer distances (Rouwendal and Nijkamp, 2004; Sandow and Westin, 2010; Dargay and Clark, 2012). Urban structure and geographic characteristics have also been found to be important determinants of commuting in different settings (Cropper and Gordon, 1991; Manning, 2003; Rouwendal and Nijkamp, 2004; Susilo and Maat, 2007; Deding, Filges and Van Ommeren, 2009; Sandow and Westin, 2010; McQuaid and Chen, 2012).

But despite interest in the analysis of commuting, most of the existing literature has focused on single countries. The analysis of several countries at once, with harmonized and comparable information, may serve to draw general patterns and differential factors with the aim of guiding transport policies. In that context, this paper explores how commuting time has evolved during the last three decades, using data from the European Working Conditions Survey (EWCS) for Austria, Belgium, Denmark, Finland, Germany, Greece, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom. Our results suggest that, in general terms, commuting has increased during that period in Denmark, Finland, Sweden, Ireland, Italy, Spain, Belgium, France, and the Netherlands. Conversely, we find decreasing trends in commuting time in Austria, Germany, Greece and Portugal.

Second, we analyze the existence of gender gaps in commuting time, and how they have evolved. The analysis of the gender gap in commuting is recurrent, finding in many settings that male workers commute more (time/distance) than their female counter parts (e.g., Hanson and Johnston, 1985; White, 1986; van Ommeren and van der Straaten, 2006; Sandow, 2008; Sandow and Westin, 2010; Roberts, Hodgson and Dolan, 2011; Dargay and Clark, 2012; McQuaid and Chen, 2012; O'Kelly, Niedzielski and Gleeson, 2012; Gimenez-Nadal and Molina, 2014;). However, this gender difference can be small or nonexistent in some countries (van der Berg and Gorter, 1997; Doyle and Taylor, 2000; Grossen and Purvis, 2005; Vandersminssen, Thériault and Villenueve, 2006; Albert, Casado-Díaz and Simón,

2019), and thus identifying the countries with the highest or lowest/nonexistent gender gaps in commuting may be important for policy issues. The analysis of gender differences in commuting is of interest, given that it may lead to differences in well-being and health between male and female workers, and could even explain the wage gender gap (Le Barbanchon, Rathelot and Roulet, 2019). We find significant gender differences in commuting time in Anglo-Saxon and Continental countries, but not in Nordic and Mediterranean countries. Furthermore, such gender gaps have increased during recent years in Ireland, Italy, Belgium, and France.

Third, we study the determinants of commuting time during the 2010s, for each of the countries in the sample. We find a certain degree of heterogeneity in the determinants of commuting time, depending upon the country examined, in terms of sociodemographic, labor, household, and occupation attributes of workers. Such heterogeneity suggests that commuting time is a complex process that may depend on several unobservable or stochastic factors.

The contributions of the paper are threefold. First, we provide a descriptive study of commuting over time, using harmonized data for fifteen European countries, against several studies that have focused on single countries. The comparison of countries may help to identify which countries have done better, putting them as reference countries in terms of transport and planning policies. Second, we contribute to the debate over the gender difference in commuting time, showing that it is not a generalized fact. Third, we gather information on what factors generally contribute to more or less time in commuting, leading to conclusions of general application.

The remainder of the paper is organized as follows. Section 2 describes the data used in the empirical analysis. Sections 3 and 4 present general trends in commuting time and in the commuting gender gap in Europe during the 1995-2015 period, respectively. Section 5 analyzes the determinants of commuting time, and Section 6 concludes.

2. Data and variables

We use data from the European Working Conditions Survey (EWCS), for the years 1995, 2000, 2005, 2010, and 2015. The EWCS is a cross-sectional micro-database conducted every five years by the Eurofound since 1990.[1] The EWCS is based on stylized questionnaires, and

[1] See https://www.eurofound.europa.eu/es/surveys/european-working-conditions-surveys. Years 2000 and 2001 correspond to the 3rd EWCS wave. All the countries of the sample used throughout the analysis correspond to the year

includes information for the 28 European Union members, along with the five candidate countries (Albania, Macedonia, Montenegro, Serbia, and Turkey), Switzerland, and Norway. The main purpose of the EWCS is to provide researchers and institutions with harmonized and cross-country information about the conditions of workers in their respective job places. Furthermore, the EWCS includes specific sociodemographic information of sampled individuals.

The sample used in the analysis is restricted to workers in countries that are followed during all the years covered by the EWCS. As we are interested in employed workers, which comprises working-age individuals, we retain in the sample employees between 16 and 65 years old (inclusive). Workers with missing information on the relevant variables (commuting time, age, gender, occupation, and education) are also omitted. Self-employed individuals are excluded from the analysis, given that the behavior of the self-employed differs from that of employees (Gimenez-Nadal, Molina and Velilla, 2018a). That leaves 87,869 individuals in the sample, corresponding to the following countries: Austria, Belgium, Denmark, Finland, Germany, Greece, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom. (See Table A1 in Appendix A for a summary of sample sizes, by country and year.)

Commuting time in the EWCS is defined as two-way commuting time, and is measured in minutes per day from the following question: "In total, how many minutes per day do you usually spend travelling from home to work and back?".[2] It is important to acknowledge that time is, in general, more accurate than distance in measuring commutes, which reduces the error term, and collects some aspects that distances do not capture, such as traffic density, accessibility, accessibility or speed of commutes (van Ommeren and van der Straaten, 2008; Jara-Díaz and Rosales-Salas, 2015; Gimenez-Nadal, Molina and Velilla, 2018a).[3]

For the analysis of commuting time, the five waves of the EWCS are divided into the decade of the 1990s (i.e., the 1995 wave), the decade of the 2000s (the 2000 and 2005 waves), and the decade of the 2010s (the 2010 and 2015 waves). For the analysis, we follow Aguiar and Hurst (2007), and Gimenez-Nadal and Sevilla (2012), and use demographic weighting, as proposed by Katz and Murphy (1992), to report the cross-country trends in commuting

2000 within the 3rd EWCS wave. Data from the 1990 EWCS is not used in the analysis, given that there is no information on commuting time.

[2] The evolution of the question regarding commuting time in the EWCS surveys is shown in Table A2 in Appendix A.

[3] A potential limitation of this study relies on the fact that commutes are defined in terms of a stylized question, where respondents are asked for the time they usually spend commuting. Commuting time measured from time use diaries may be more reliable (Robinson, 1985; Bonke, 2005; Yee-Kan, 2008).

time. Details for the demographic weights, computed in terms of the original sample weights and the demographic composition of the sample, are shown in Appendix B.

3. Trends in commuting time

In this Section, we analyze the evolution of commuting time over the last three decades in Europe. Table 1 includes the average commuting time, using demographic weights, by country and survey of the EWCS, along with robust standard errors. Errors are computed by regressing, for each country, commuting time in terms of three dummies representing the three decades considered in the sample, with no constant term to avoid over-identification. We also report the raw differences for the comparison between the 1990s and the 2000s, the 2000s and the 2010s, and the 1990s and the 2010s, along with *t*-test *p*-values for the statistical significance of such differences, to analyze whether or not there has been a statistically significant increase/decrease in commuting time. Countries are grouped according to their similarities in their social welfare regimes, which comprises Nordic countries (Denmark, Finland and Sweden); Anglo-Saxon countries (Ireland and the United Kingdom); Mediterranean countries (Greece, Italy, Portugal and Spain); and Continental countries (Austria, Belgium, France, Germany, Luxembourg and the Netherlands).[4]

Denmark, Finland, and Sweden show similar increasing trends in commuting. In the 1990s, the average time spent in commuting by workers in Denmark and Sweden was about 39 minutes per day, and 41 minutes in Finland. Commutes barely changed between the 1990s and the 2000s, with average commutes of 39, 40 and 41 minutes per day in Sweden, Denmark and Finland, respectively. The changes in the 2000s decade, relative to the 1990s, were not significant at standard levels for any of the Nordic countries included in the sample. However, commuting time shows a significant increase from the 2000s to the 2010s. In Denmark and Sweden, the average commute during the 2010s was about 47 minutes per day, and in the case of Finland average commutes increased by less, reaching 45 minutes in the 2010s, with these differences, with respect the 1990s and the 2000s, being statistically significant at standard levels.

Anglo-Saxon countries (Ireland and the United Kingdom) show a relatively heterogeneous trend in commuting time. The average commuting time in the 1990s was 46 minutes for workers in the United Kingdom, and 39 minutes for their counterparts in

[4] See Table A5 in Appendix A for the classification of countries in different clubs, according to their social welfare regimes.

Ireland. However, the average commute in the 2000s decreased to 30 minutes in the UK, with this difference being highly significant, and to 37 minutes in Ireland. Table 1 documents a dramatic increase of commuting in both countries in the 2010s decade, with average commutes of 49 and 46 minutes per day in the UK and Ireland, respectively. This increase was significant at standard levels for both countries. However, when comparing the overall 1990s-2010s period, Ireland shows a significant increase in average commutes of about 7 minutes per day, while for the UK the overall increase was less than 3 minutes per day, and not statistically significant at standard levels. Nevertheless, the UK shows the longest commuting time of all the countries studied, during the 1990s and the 2010s decades.

The third set of countries shown in Table 1 corresponds to the Mediterranean countries Greece, Italy, Portugal, and Spain. We observe that Greece and Portugal show a significant decrease in the time spent commuting by workers during the period analyzed, as Greece shows a decrease of commuting time of almost 5 minutes between the 1990s (38 min) and the 2000s (33 min), and an additional slight decrease of about 1 minute between the 2000s and the 2010s (32 min), with the overall difference (6 minutes) between the 1990s and the 2010s being highly significant. In the case of Portugal, the average time spent commuting by workers in the 1990s was 36 minutes, vs 33 minutes in the 2000s, and 26 minutes in the 2010s, with all the differences between the three decades analyzed being statistically significant at standard levels. In fact, workers in Portugal commuted the shortest time in the 2010s, and the difference between the 1990s and the 2010s is the largest, relative to the other countries studied.

In the case of Spain and Italy, trends were increasing over the 1990s-2010s period. For instance, average commuting time in Italy increased from 24 minutes in the 1990s to 32 minutes in the 2000s, with this difference being statistically significant at standard levels. However, average commutes decreased to 30 minutes in the 2010s, compared to the 2000s, with the overall difference between the 1990s and the 2010s, 6.3 minutes, being positive and highly significant. Spain, on the other hand, shows a homogeneous and small increase in commuting time during the last three decades. The average time spent commuting by Spanish workers was 32 minutes in the 1990s and the 2000s, with the difference between the two decades being positive, small, and not significant at standard levels. However, average commutes increased to about 35 minutes in the 2010s, with the overall difference between the 1990s and the 2010s, while still small (about 3 minutes), being significant at standard levels.

Regarding the rest of the countries (Continental economies) considered for the analysis, we can again distinguish two kinds of trend. First, in the case of Austria and Luxembourg, overall trends are decreasing, but with no significant differences found between the 1990s and the 2010s. Workers in Austria and Luxembourg used to commute about 38 and 41 minutes in the 1990s, and 33 and 39 minutes in the 2000s (with the decrease in Austria being significant at standard levels, but not in Luxembourg), and 36 and 40 minutes in the 2010s, respectively. Similarly, Germany shows a decreasing trend in commuting time, but in this case the difference is significant at standard levels. Specifically, German workers commuted about 49 minutes on average in the 1990s, 42 minutes in the 2000s, and 44 minutes in the 2010s, with all the differences among the three periods considered being highly significant.

Second, Belgium, France and the Netherlands show increasing trends in commuting between the 1990s and the 2010s. The overall increase in Belgium was about 6 minutes, from 40 minutes in the 1990s and 41 minutes in the 2000s, to almost 47 minutes, on average, in the 2010s. While the difference between the 1990s and the 2000s was small and not significant at standard levels, commutes increased about 6 minutes in the 2010s, relative to the 1990s and the 2000s, with the corresponding differences being highly significant. Similar trends are reported in France, with a non-significant difference between the 1990s (36 minutes) and the 2000s (34 minutes), but then a significant increase during the 2010s, reaching 42 minutes on average in that decade. Finally, in the Netherlands there seems to be a significant decrease in average commuting time of about 5 minutes between the 1990s and the 2000s (from 43 minutes to 38 minutes), but then average commutes increased up to 46 minutes in the 2010s, with the difference being significant at standard levels, relative to both the 2000s and the 1990s.

In summary, trends for some of the countries considered in this study are consistent with prior research, which has documented increasing trends in commuting in Germany during the 1991-2001 period (Gimenez-Nadal and Molina, 2014) and the Netherlands between 1993 and 2005 (Susilo and Maat, 2007). Furthermore, commuting time has decreased over the analyzed period in Greece, Portugal, and Germany, which posits these three countries as examples to be analyzed for the reduction of commuting time. Our results indicate that further research is required to understand cross-country differences in both the level and evolution of commuting time, where such differences might be due to a wide range of factors that includes differences in transport infrastructures and traffic congestion, or better information about housing and job vacancies, among others. To the best of our knowledge,

this represents the first empirical approach to tackling commuting trends in a multi-country study.

4. The gender gap in commuting time

Prior research has documented the existence of a significant gender gap in commuting time in Canada (Mok, 2007), France (Le Barbanchon, Rathelot and Roulet, 2019), Ireland (Moss, Jack and Wallace, 2004; O'Kelly, Niedzielski and Gleeson, 2012), Korea (Lee and McDonald, 2003), Spain (Albert, Casado-Díaz and Simón, 2019), Sweden (Sandow, 2008; Sandow and Westin, 2010), the Netherlands (van Ommeren and van der Straaten, 2006; Gimenez-Nadal and Molina, 2014; Oakil, Nijland and Dijst, 2016), the US (Kain, 1962; Hanson and Johnston, 1985; White, 1986; Turner and Niemeirer, 1997; Crane, 2007; Gimenez-Nadal and Molina, 2016), and the UK (Grieco, Pickup and Whipp, 1989; Dex, Clark and Taylor, 1995; Roberts, Hodgson and Dolan, 2011; Dargay and Clark, 2012; McQuaid and Chen, 2012; Dickerson, Hole and Munford, 2014; Nafilyan, 2019).[5] This Section focuses on the gender gap in commuting time, by analyzing the evolution of commuting time of workers, by gender, along with the trends in commuting time gender gaps. To that end, Table 2 shows the evolution of commuting time, by gender, during the 1990s, 2000s and 2010s. Furthermore, Table 2 also reports the gender gap in commuting time, defined as the average commuting of men, minus that of women, by country and year, using demographic weighting. Countries are aggregated in four panels, analogously to Table 1. We additionally include the difference in the commuting time gender gap between the 1990s and the 2000s, the 2000s and the 2010s, and the 1990s and 2010s, along with the statistical significance of those differences according to t-tests.

Regarding the Nordic countries, averages show no gender gap in commuting time, with differences between male and female workers being not statistically significant at standard levels. Furthermore, gender gaps have remained non-significant during all the periods analyzed, as no statistical differences are found between the 1990s, 2000s, and 2010s. This is an interesting result, as prior research has repeatedly documented significant differences in commuting time between male and female workers in the US, Germany, and the Netherlands (Roberts, Hodgson and Dolan, 2011; Gimenez-Nadal and Molina, 2014; 2016).

[5] Ng and Acker (2018) examined travel behaviors of workers in eight cities (Auckland, Dublin, Hanoi, Helsinki, Jakarta, Kuala Lumpur, Lisbon and Manila), and found that women travel shorter distances than men, where the former prefer public transport modes but the latter prefer private cars.

Results for Anglo-Saxon countries regarding the gender gap in commuting time draw a completely different picture than those for Nordic economies. The gender gap in Ireland was not significant at standard levels in the 1990s and the 2000s. However, the commuting time of men, but not that of women, shows a large increase during the 2010s, leading to a highly significant gender gap of about 10 minutes in the 2010s. Thus, the gender gap in commuting time in Ireland increased to 9 minutes between the 1990s and the 2010s, while it was nonexistent in the 1990s and 2000s. In the UK, on the other hand, gender gaps have decreased during the 1990s-2010s period, but remain highly significant. Male workers commuted about 13 more minutes than females in the 1990s, decreasing to 9 more minutes during the 2000s and 2010s. Despite the fact that the decrease in the commuting gender gap is estimated to be significant at standard levels, the gender gap during the 2000s and the 2010s is also highly significant.

The gender gap in commuting in Mediterranean countries shows a similar trend to that for Nordic countries, with the exception of Italy, where gender gaps are significant at standard levels. In Greece, Portugal, and Spain, the gender gap in commuting time was not significant during the 1990s, 2000s, and 2010s. The gap has neither increased nor decreased during these three decades, as differences are not significant at standard levels. However, the gender gap in commuting in Italy shows a different trend, as it was not significant in the 1990s, increased to about 2 minutes in the 2000s, and then to 4 minutes in the 2010s, with the latter gap being significant at standard levels. That is to say, the relative commuting time of male workers shows an increasing trend, relative to that of female workers.

For Continental countries, we observe three kinds of trend for the gender gap in commuting time. First, in the case of Luxembourg, averages show that the difference in commuting time between men and women was small (about 2 minutes) and not significant in the 1990s and the 2010s, with the overall difference between these two decades being also not significant at standard levels. However, the difference was significant during the 2000s, where male workers commuted about 5 more minutes than women. Second, for Austria, Germany and the Netherlands, gender gaps are highly significant during all the decades analyzed. For instance, male workers commuted 7, 5, and 6 more minutes than females in Austria during the 1990s, 2000s, and 2010s, respectively. The corresponding gaps for Germany are 7, 3 and 6 minutes, and 8, 7, and 11 minutes for the Netherlands. Furthermore, the differences between the 1990s and the 2010s in these gaps are not significant for any of these countries. Third, in Belgium and France, the gender gap in commuting time increased during the analyzed period. In particular, in Belgium male workers commuted 5 more

minutes than females in the 1990s, 4 more minutes in the 2000s, but then the relative commuting of males increased in the 2010s, leading to a significant gap of 9 minutes, with the overall increase in the commuting gender gap being also significant at standard levels. In France, on the other hand, male and female workers used to commute for similar times during the 1990s and the 2000s, with differences of less than a minute. Then, apparently following the same phenomenon as in Belgium, the gender gap in commuting time shows a significant increase up to about 4 minutes in the 2010s, with that also being significant at standard levels.

To sum up, trends in the commuting time gender gap show different pictures for the groups of countries considered. While for Nordic and Mediterranean countries there seem to be non-significant gender gaps, results for Ireland, the UK, Austria, Belgium, France, Germany, and the Netherlands show significant differences between male and female workers in terms of commuting behaviors. Indeed, in all of these countries, male workers commute longer than female counterparts, with the largest differences being in the Netherlands during the 2010s (about 11 minutes) and the UK during the 1990s and the 2010s (13 and 9 minutes respectively). Furthermore, although the gender gap in commuting time has decreased in the UK, it has increased in Ireland, Italy, Belgium, and France.

5. The factors associated with commuting time

We now explore how several socio-demographic factors are associated with commuting time in the fifteen European countries considered. The EWCS data allows us to define certain variables that may be correlated with commuting time. Characteristics such as gender, education, and the presence of children at home have been shown to be related to the commuting behavior of workers, although some of these variables are not defined for all the waves of the EWCS. For instance, education, and household composition (e.g., presence of children) are not available for the 1990s and the 2000s. As a consequence, this part of the analysis is restricted to the 2010s decade (2010 and 2015).

We consider the gender of individuals with a dummy variable that takes value 1 if respondents are males, and 0 if they are females. The analysis shown in the previous Section indicated that gender may be a relevant factor in some countries. We also consider the age of respondents, measured in years. The EWCS includes information about the household composition of respondents, including the presence of others in the household, their ages,

gender, and the relation with the respondent.[6] We use such information to define, first, the presence of a married or unmarried partner of the respondent, as these workers usually commute longer time/distance, relative to single workers (Roberts, Hodgson and Dolan, 2011; McQuaid and Chen, 2012; Gimenez-Nadal, Molina and Velilla, 2018a). In doing so, we define a dummy variable that takes value 1 for individuals who cohabit with a married spouse or unmarried partner, and value 0 for single workers. Second, we identify the number of children in the household, which is set to zero for respondents without children. The number of children may be an important variable to take into account while analyzing commuting time, as prior research has shown commuting time may be linked to childcare, especially among women (Hanson and Johnston, 1985; Lee and McDonald, 2003; McQuaid and Chen, 2012; Gimenez-Nadal and Molina, 2016).

We also consider the maximum education level achieved by individuals. Highly educated individuals (e.g., white collar workers) may search for more specialized jobs and, therefore, their commuting behaviors may differ from their lower educated counterparts (Ross and Zenou, 2008; Gimenez-Nadal, Molina and Velilla, 2018b). The EWCS defines education in terms of 7 codes, including: 0) "pre-primary education", 1) "primary education or first stage of basic education", 2) "lower secondary or second stage of basic education", 3) "(upper) secondary education", 4) "post-secondary non-university education" 5) "first stage of university education", and 6) "second stage of university education". In that context, we define three dummies. Primary education takes value 1 for individuals whose education category is 0 or 1 (0 otherwise); secondary education takes value 1 for individuals whose category is 2, 3 or 4 (0 otherwise); finally, University education takes value 1 for individuals whose education category is 5 or 6 (0 otherwise).

We define some labor attributes of workers. Specifically, as self-employed workers have been found to have different commuting behaviors than employees (van Ommeren and van der Straaten, 2008; Gimenez-Nadal, Molina and Velilla, 2018a; Albert, Casado-Díaz and Simón, 2019), we define a dummy that takes value 1 for the self-employed, 0 for employees. We also define a dummy that takes value 1 for full-time workers (0 for their part-time counterparts), as workers may not be willing to commute longer distances for short work schedules. Furthermore, the EWCS includes information about the occupation of workers, defined in terms of the International Standard Classification of Occupations (ISCO) 88 (1

[6] Information about the relation with the respondent includes the following categories: 1) "Spouse/partner"; 2) "Son/daughter of respondent or cohabiting partner"; 3) "Parent, step-parent or parent in law"; 4) "Daughter or son-in-law"; 5) "Grandchild"; 6) "Brother/sister (including half- and step-sibling)"; 7) "Other relative"; 8) "Other non-relative". Spouses and unmarried partners are identified from category (1), and children are identified from category (2).

digit) codes, which has been found to be linked to worker commuting behavior (Hanson and Johnston, 1985; Gordon, Kumar and Richardson, 1989). This classification identifies 10 types of occupations: 0) "armed forces"; 1) "managers"; 2) "professionals"; 3) "technicians and associate professionals"; 4) "clerical support workers"; 5) "service and sales workers"; 6) "skilled agricultural, forestry and fishery workers"; 7) "craft and related trades workers"; 8) "plant and machine operators, and assemblers"; and 9) "elementary occupations".[7]

Summary statistics of commuting time and socio-demographic characteristics are shown in Table A3 in Appendix A, by country. Regarding commuting time, countries can be grouped in four clusters, according to a k-medians cluster analysis. The first cluster is composed of Italy and Portugal, with average commuting times of 29.1 and 29.5 minutes per day. The second cluster is formed of Austria, Greece and Spain, with average commuting times between 33.8 minutes per day and 35.7 minutes per day. France and Luxembourg constitute the third cluster, with average commutes of 38.6 and 39.0 minutes per day, respectively. That leaves Belgium, Denmark, Finland, Germany, Ireland, the Netherlands, Sweden, and the UK in the fourth cluster, which comprises commuting times well above 40 minutes per day. For instance, within this group, Denmark shows the lowest average daily commute at 42.2 minutes, while the United Kingdom is the country where workers have the longest commute, according to the sample, with an average 45.6 minutes per day.[8]

Empirical strategy

Let $k = 1, \ldots, 15$ represent each of the countries considered for the analysis. We estimate the following equation, by Ordinary Least Squares (OLS), by country:[9]

$$C_{ik} = \beta_{0k} + \beta_{1k} S_{ik} + \beta_{2k} F_{ik} + \beta_{3k} L_{ik} + \alpha + \varepsilon_{ik}, \quad (1)$$

where, for each individual "i" and omitting the sub-index k that identifies countries, C_i represents commuting time, S_i represents the sociodemographic attributes of "i" (gender,

[7] Despite that the EWCS includes information about the urban/rural status of the region where respondents reside, it is only available for 2015, and thus we do not include this characteristic in the analysis. This characteristic has been found to be a significant predictor of commuting (see, e.g., Hamilton, 1982, 1989; Gordon, Kumar and Richardson, 1989; Cropper and Gordon, 1991; Small and Song, 1992; Mieszkowski and Mills, 1993; Kahn, 2000; van Ommeren and van der Straaten, 2008; Gimenez-Nadal, Molina and Velilla, 2018a).

[8] The analysis includes individuals who may work from home and report zero commuting time, including home-based workers and telecommuters. In our sample, 4.83% report zero commuting, a magnitude well below the US (about 13%, according to Gimenez-Nadal, Molina and Velilla, 2019). See Table A4 in the Appendix for a summary of zero commuters, by country.

[9] Additional estimates with the pooled sample, where standard errors are clustered at the country level, are available upon request. Results are robust to this alternative specification.

age, education), F_i represents household variables (the presence of a partner, family sizes, the number of children under 5 years, and the number of children between 5 and 17 years), L_i represents the labor attributes of "*i*" (being a self-employed worker, full-time status, occupation), and ε_i represents unmeasured factors. Estimates include demographic weights, and standard errors are robust.

Regarding the econometric model used to estimate Equation (1), the dependent variable may take value 0 for some workers (e.g., home-based workers, or telecommuters). However, OLS estimates have been found to be preferred over other models, such as the Tobit model (Tobin, 1958), when studying time allocations and, in particular, commuting time (Frazis and Stewart, 2012; Gershuny, 2012; Foster and Kalenkoski, 2013; Gimenez-Nadal and Molina, 2014, 2016). Then, we rely on OLS models for the empirical analysis. The use of Tobit models leads to similar results, available upon request.

We must emphasise that the R-squared statistics shown in all the regressions are below 0.1, with the exceptions of Ireland (0.123) and the Netherlands (0.132). This suggests that, as prior research has concluded, commuting behaviors may be the outcome of a process conditioned by several stochastic and/or non-observable conditions, such as weather, traffic congestion, or communications infrastructure (White, 1986; Rouwendal and Rietveld, 1994; Benito and Oswald, 1999; Van Ommeren, Rietveld and Nijkamp, 1999; Ross and Zenou, 2008; Van Ommeren and Van der Straaten, 2008; Gimenez-Nadal, Molina and Velilla, 2018a).

Results for Nordic countries

Columns (1), (2) and (3) of Table 3 show estimates of Equation (1) for Denmark, Finland, and Sweden, respectively. Estimates show some differences among these countries, as the signs and statistical significance of coefficients associated with explanatory variables vary from one country to the next. Being a male worker is associated with more commuting time in Sweden, while the coefficients are not significant in Denmark and Finland. Age is not significant in Denmark and Finland, while in the case of Sweden, older workers seem to have shorter commutes than their younger counterparts, given that the coefficient is negative and statistically significant at standard levels. Regarding the education level of workers, it does not appear to be correlated with commuting time in Denmark and Sweden, as no significant differences are found among individuals with primary education, secondary education, or university education. However, in Finland, individuals with university education seem to

have commuting times similar to individuals with primary education, while workers with only secondary education commute, on average, about 7 minutes less than their counterparts.

Living with a married or unmarried partner does not appear to be significantly correlated with commuting in any Nordic country studied, while family size is negatively correlated with commuting time only in Finland, and is not statistically significant in Denmark and Sweden. The number of children under 5 years old is negative and statistically significant in Sweden, but positive and not statistically significant at standard levels in Denmark and Finland. On the other hand, the number of children between 5 and 17 years old is positively correlated with commuting time in Finland, and not statistically significant in Denmark and Sweden. The only variable that seems to have a similar impact on commuting time for all three Nordic countries is that identifying self-employed workers. On average, the self-employed commute about 25 minutes less in Denmark, 13 minutes less in Finland, and 18 minutes less in Sweden, with these coefficients being statistically significant. This result is consistent with the results of van Ommeren and van der Straaten (2008) for Germany, and Gimenez-Nadal, Molina and Velilla (2018a) for the US. Part-time workers also commute shorter distances than their full-time counterparts, but only in Denmark (6 more minutes) and Finland (4 more minutes), as the coefficient for Sweden is small and not statistically significant at standard levels.

Finally, focusing on the nine occupational categories included in the regressions (the tenth category, "armed forces", is taken as reference), estimates show different results for the three Nordic countries. First, none of the coefficients associated with occupations is statistically significant in the case of Sweden, suggesting that workers in different occupations do not have different commuting behaviors. However, coefficients are highly significant in Denmark and Sweden. Specifically, Danish workers in services and sales; agriculture, forestry and fishery; craft and related trade; operators; and elementary occupations report shorter commuting times than their counterparts in the remaining occupation categories. In the case of Finland, however, all the occupations are positive and highly significant, revealing that workers in armed forces have the shortest commuting times among all the occupations. Furthermore, the longest commutes are estimated among managers and technicians, suggesting that working in different occupations may be correlated with different commuting behaviors in both Denmark and Finland.

Results for Anglo-Saxon countries

Columns (5) and (6) of Table 3 show estimates of Equation (1) for Ireland and the United Kingdom, respectively. Estimates show some similar results. For instance, male workers commute about 7 more minutes than their female counterparts, net of observed heterogeneity, in Ireland, while the analogous magnitude for the UK is 5 more minutes, both coefficients being statistically significant. The remaining sociodemographic coefficients are not significant at standard levels, with the exception of university education in the UK, indicating that workers with university education commute about 9 more minutes than their counterparts. This coefficient is not significant for Ireland. Furthermore, self-employed workers commute about 23 fewer minutes than their employee counterparts in Ireland, and about 13 fewer minutes in the UK. Similarly, full-time workers commute about 7 and 10 more minutes than part-time workers in Ireland and the UK, respectively.

Regarding occupations, coefficients are not significant in Ireland, indicating that different occupations are not associated with heterogeneous commuting behaviors, net of observables. For the UK, taking armed forces as reference, managers, professionals, technicians, clerical support workers, and craft and trade workers commute more than 50 more minutes than their counterparts. In addition, service and sales workers, operators, and elementary occupations commute between 40 and 50 more minutes than their armed forces counterparts; and workers in agriculture, fishery and forestry, about 36 more minutes.

Results for Mediterranean countries

Table 4 shows estimates of Equation (1) for Greece, Italy, Portugal and Spain, respectively. First, none of the coefficients associated with occupations is significant at standard levels for any of the four Mediterranean countries considered. Therefore, commuting times do not appear to be different for workers in different occupations, as is the case for Denmark and Sweden.

In terms of sociodemographics, being male is significantly correlated with commuting time only in Italy, where male workers commute, on average, about 3 more minutes than their female counterparts, net of observed heterogeneity. The coefficient associated with age is not significant, suggesting that commuting behaviors do not depend on the age of workers. However, education seems to be correlated with commuting for all the countries, but differentially. In Greece, Italy and Spain, individuals with secondary education and individuals with primary education have similar commuting times. However, individuals with university education commute, on average, 9 more minutes in Greece, 7 more minutes in

Italy, and 4 more minutes in Spain, relative to workers without a university education. In Portugal, university education is not correlated with commuting, indicating that workers who have attended university have commuting times similar to workers with primary education. However, workers with secondary education level commute 5 more minutes than their counterparts.

Household composition does not appear to be significantly correlated with commuting time in any of the Mediterranean countries, as coefficients associated with living with a partner, the number of children, and family size are not significant at standard levels. However, self-employed workers commute shorter distances than employees, with differences of 18, 11, 12, and 13 minutes in Greece, Italy, Portugal and Spain, respectively. These differences are all highly significant. Finally, the full-time status of workers is negative but not statistically significant in Greece and Spain, and positive and statistically significant in Italy and Portugal, where full-time workers commute about 5 more minutes than part-time workers.

Results for Continental countries

Table 5 shows estimates for Austria, Belgium, France, Germany, Luxembourg, and the Netherlands. We observe that being male is positively correlated to commuting time in all the Continental countries, with the exception of Luxembourg. Specifically, net of observed heterogeneity, male workers commute 6, 10, 5, 3, and 4 more minutes relative to female workers in Austria, Belgium, France, Germany, and the Netherlands, respectively. Thus, differences in socio-demographic characteristics between male and female workers in these countries do not explain the gender gap in commuting time.

Regarding age, older workers in Austria and Belgium seem to commute longer distances than younger workers, as one more year of age is associated with about 0.1 more minutes commuting. However, the coefficient for age is negative and statistically significant at standard levels in France, suggesting that younger workers have longer commutes. In terms of education, workers with primary and secondary education levels seem to commute similar distances, as the coefficient for secondary education is not statistically significant in all countries. University educated workers commute about 9 more minutes and 7 more minutes than their counterparts in Belgium and the Netherlands, with these coefficients being statistically significant, while no differences are found in the rest of the countries.

In terms of household composition, none of the coefficients are significant in France and Germany, suggesting that living with a partner, the number of children, and household size are not associated with commuting behaviors. However, workers who cohabit with a married or unmarried spouse commute about 4 more minutes than singles in Austria and the Netherlands, but 4 fewer minutes in Luxembourg. Household size is only significantly correlated with commuting time in Luxembourg, where the associated coefficient is positive and significant at standard levels. The number of children, on the other hand, does not appear to be correlated to commuting in a significant way for any of the countries.

Regarding the labor attributes of workers, self-employed workers report shorter commutes than their employee counterparts in all the countries, as relative to employees they commute 25 fewer minutes in Austria, Belgium and the Netherlands, 19 fewer minutes in France, 18 fewer minutes in Germany, and 22 fewer minutes in Luxembourg. The coefficient associated with being a full-time worker is positive for all the countries, but not significant in the case of Luxembourg, suggesting that, in general, full-time workers commute for longer times than their part-time counterparts.

Finally, in terms of occupations, no coefficients are significant in the case of France, suggesting that commuting times are not influenced by working in different occupations in this country. Similarly, the only significant coefficient in Luxembourg is that associated with agriculture, forestry and fishery, suggesting that workers in this occupation commute about 15 fewer minutes, on average, than their counterparts. The remaining coefficients are not significant at standard levels in Luxembourg.

In Austria, all the coefficients are negative, indicating that the longest commutes are those of workers in armed forces occupation. However, they are significant at standard levels only in the case of managers, services and sales, agriculture, forestry and fishery, craft and related trade, operators, and elementary occupations, who commute between 22 and 31 fewer minutes than their counterparts. Belgium shows similar trends, as all the coefficients associated with occupations are negative, relative to armed forces. However, they are significant among professionals, services and sales, agriculture, forestry and fishery, craft and related trade, operators, and elementary occupations; and the variation is larger than in Austria, between 14 and 34 fewer minutes than their counterparts. Germany shows, again, similar results, as workers in services and sales, agriculture, forestry and fishery, craft and related trade, operators, and elementary occupations commute between 17 and 23 fewer minutes than their counterpart. Finally, for the Netherlands, coefficients show the largest commuting differences in terms of occupations. Specifically, workers in services and sales,

agriculture, fishery and forestry, craft and related trade, operators, and elementary occupations commute 67, 80, 62, 70 and 68 fewer minutes, respectively.

6. Conclusions

This paper addresses the evolution of commuting time during the 1990s, 2000s and 2010s in Austria, Belgium, Denmark, Finland, Germany, Greece, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom, using data from the EWCS. Our results suggest that commuting time has increased during the last three decades in Denmark, Finland, Sweden, Ireland, Italy, Spain, Belgium, France, and the Netherlands, and we find decreasing trends in commuting time in Austria, Germany, Greece and Portugal. Our analysis represents the first empirical study of the evolution of commuting trends in fifteen European countries, using the same data source.

We also analyze the gender gap in commuting time, following prior research showing the existence of a gender gap in commuting, where male workers commute more (in time or distance) than do female workers. Our results indicate that, in general, this gap exists in Anglo-Saxon and Continental economies (Ireland, Austria, Belgium, France, Germany, Ireland, the Netherlands and the UK), while it is not found in Nordic and Mediterranean countries (Denmark, Finland, Greece, Portugal, Spain and Sweden). When we consider gender differences in the socio-demographic and labor market characteristics of workers, such gaps in commuting time do not disappear, indicating that the difference in commuting time is not motivated by differences in socio-demographic characteristics and jobs.

We analyze the predictors of commuting time during the 2010s, finding that there is some level of heterogeneity in the countries analyzed. For instance, the impact of sociodemographics and household composition vary from one country to another, but in general terms results suggest that part-time workers and self-employed workers have shorter commutes than their counterparts (Van Ommeren and Van der Straaten, 2008; Gimenez-Nadal, Molina and Velilla, 2018a). Occupation also has a varying impact on commutes, as only in certain countries do different occupations lead to different commuting behaviors, which only partially coincides with prior research (e.g., Hanson and Johnston, 1985; Gordon, Kumar and Richardson, 1989).

The study of commuting time is important for planners and policy makers, and the results of this study may help planners to understand the determinants of commuting times in the countries studied and, therefore, improve the efficacy and efficiency of future policies.

Results reveal that commutes have increased significantly in most of the countries in our sample, but have decreased in Portugal and Germany. It will be interesting to determine how and why commuting times have decreased in these two countries (better transport infrastructure, different urban structure, lower moving costs, better information about labor and housing markets…), which is left for future research. Our results also reveal a significant (and increasing) gender gap in commuting time in certain countries. As a consequence, policy makers should make an additional effort not only to reduce commuting, but also to reduce the gender gap in the corresponding regions. Finally, given that there is a wide range of heterogeneity among the potential factors that predict commuting time, politicians, policy makers and transportation planners should consider that the same plans might not operate equally for every economy, and specific measures may be required for each country.

Our analysis has certain limitations. First, the first waves of the EWCS include a limited set of variables and, as a consequence, we could not replicate the study of the determinants of commuting time for the entire three decades. Second, as the data is a cross-section, the analysis is based on conditional correlations, and no causal links can be estimated. Finally, estimates reveal low accuracy, and commuting times seem to be determined by a strong stochastic and/or non-observable component.

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Table 1. Evolution of commuting time, 1995-2015

	AVERAGE			DIFFERENCE		
COUNTRY	1990s	2000s	2010s	90s-00s	00s-10s	90s-10s
NORDIC						
Denmark (n = 5,221)	38.863	40.191	47.171	1.329	6.980***	8.309***
	(1.246)	(0.857)	(0.932)			
Finland (n = 5,135)	41.146	40.724	44.573	-0.423	3.849***	3.426**
	(1.207)	(0.745)	(0.945)			
Sweden (n = 5,314)	38.804	39.319	46.507	0.516	7.188***	7.704***
	(1.022)	(0.767)	(1.098)			
ANGLO-SAXON						
Ireland (n = 4,952)	39.087	39.136	46.143	0.050	7.006***	7.056***
	(1.238)	(0.863)	(1.198)			
United Kingdom (n = 6,182)	46.409	40.448	49.035	-5.961***	8.587***	2.626
	(1.627)	(0.915)	(0.960)			
MEDITERRANEAN						
Greece (n = 5,149)	37.861	33.163	31.843	-4.698***	-1.320	-6.018***
	(1.503)	(0.848)	(0.804)			
Italy (n = 5,597)	23.615	32.362	29.977	8.747***	-2.384**	6.362***
	(0.925)	(0.821)	(0.685)			
Portugal (n = 4,901)	36.027	32.995	25.886	-3.033*	-7.109***	-10.14***
	(1.517)	(0.697)	(0.704)			
Spain (n = 7,243)	31.673	32.422	34.550	0.749	2.128**	2.877**
	(1.160)	(0.729)	(0.577)			
CONTINENTAL						
Austria (n = 5,110)	37.957	32.829	35.827	-5.128***	2.998**	-2.130
	(1.425)	(0.774)	(0.942)			
Belgium (n = 9,049)	40.285	40.723	46.743	0.438	6.020***	6.458***
	(1.422)	(0.909)	(0.616)			
France (n = 7,398)	35.909	34.083	41.663	-1.826	7.580***	5.754***
	(1.249)	(0.678)	(0.656)			
Germany (n = 8,104)	49.235	41.961	44.261	-7.273***	2.299**	-4.974***
	(0.917)	(0.789)	(0.641)			
Luxembourg (n = 3,275)	40.720	38.710	40.387	-2.010	1.677	-0.333
	(1.617)	(1.132)	(0.858)			
Netherlands (n = 5,239)	42.739	38.487	45.944	-4.251***	7.456***	3.205**
	(1.238)	(0.777)	(1.060)			

Note: Robust standard errors in parentheses; "n" represents the number of observations. The sample (EWCS) is restricted to employed workers in countries with information for the period 1995-2015. Commuting time is measured in minutes per day. Estimates computed using demographic weighting (Katz and Murphy, 1992; Aguiar and Hurst, 2007; Gimenez-Nadal and Sevilla, 2012), to ensure a constant representation of types of workers (e.g., age cohorts, gender, and full-time status), years, and countries. Reference period: 2000s.

Table 2. Evolution of commuting time gender gap, 1995-2015

		AVERAGE			DIFFERENCE		
COUNTRY		1990s	2000s	2010s	90s-00s	00s-10s	90s-10s
NORDIC							
Denmark	Women (n = 2,588)	38.678	39.910	46.782			
	Men (n = 2,633)	38.959	40.353	47.423			
	Gap	0.281	0.443	0.641	0.162	0.197	0.359
Finland	Women (n = 2,726)	41.926	40.885	45.384			
	Men (n = 2,409)	40.554	40.574	43.797			
	Gap	-1.372	-0.311	-1.587	1.061	-1.276	0.215
Sweden	Women (n =2,679)	37.153	38.871	44.970			
	Men (n = 2,635)	39.705	39.616	47.701			
	Gap	2.552	0.745	2.730	-1.807	1.985	0.178
ANGLO-SAXON							
Ireland	Women (n =2,247)	38.464	40.867	40.030			
	Men (n = 2,705)	39.299	38.395	49.801			
	Gap	0.835	-2.472	9.771***	-3.307*	12.244***	8.936***
United Kingdom	Women (n = 3,047)	37.269	34.739	43.142			
	Men (n = 3,135)	50.498	43.440	52.542			
	Gap	13.229***	8.701***	9.400***	-4.528**	0.699	-3.829*
MEDITERRANEAN							
Greece	Women (n = 2,067)	35.658	32.193	31.037			
	Men (n = 3,082)	38.449	33.529	32.196			
	Gap	2.791	1.335	1.159	-1.455	-0.177	-1.632
Italy	Women (n = 2,512)	23.028	31.145	27.616			
	Men (n = 3,085)	23.774	32.707	31.234			
	Gap	0.746	1.563	3.618***	0.817	2.056*	2.872**
Portugal	Women (n = 2,575)	35.646	34.249	26.342			
	Men (n = 2,326)	36.283	32.094	25.331			
	Gap	0.636	-2.155*	-1.012	-2.792	1.144	-1.648
Spain	Women (n = 3,263)	29.828	33.389	34.295			
	Men (n = 3,980)	32.021	32.122	34.708			
	Gap	2.193	-1.267	0.413	-3.460**	1.680	-1.780

CONTINENTAL							
Austria	Women (n = 2,630)	32.851	29.663	32.398			
	Men (n = 2,480)	39.976	34.477	38.355			
	Gap	7.125***	4.814***	5.956***	-2.311	1.143	-1.169
Belgium	Women (n = 4,222)	36.304	37.814	41.140			
	Men (n = 4,827)	41.480	41.927	49.717			
	Gap	5.176**	4.113***	8.577***	-1.063	4.464***	3.401*
France	Women (n = 3,812)	36.453	34.434	39.314			
	Men (n = 3,586)	35.636	33.888	43.520			
	Gap	-0.817	-0.546	4.206***	0.271	4.753***	5.024***
Germany	Women (n = 3,806)	44.239	40.056	40.476			
	Men (n = 4,298)	51.060	42.701	46.247			
	Gap	6.821***	2.644**	5.771***	-4.176***	3.126**	-1.050
Luxembourg	Women (n = 1,458)	39.307	34.834	39.241			
	Men (n = 1,817)	41.023	39.790	40.976			
	Gap	1.716	4.956**	1.735	3.240	-3.221*	0.019
Netherlands	Women (n = 2,527)	36.543	34.292	39.914			
	Men (n = 2,712)	44.979	41.152	50.574			
	Gap	8.436***	6.859***	10.660***	-1.577	3.801**	2.224

Note: "n" represents the number of observations. The sample (EWCS) is restricted to employed workers in countries with information for the period 1995-2015. Commuting time is measured in minutes per day. Average commutes are computed using demographic weighting (Katz and Murphy, 1992; Aguiar and Hurst, 2007; Gimenez-Nadal and Sevilla, 2012), to ensure a constant representation of types of workers (e.g., age cohorts, gender, and full-time status), years, and countries. Gaps are defined as the average for men, minus the average for women. *** Significant at the 99%; ** significant at the 95%; * significant at the 90%, according to t-type tests.

Table 3. Estimates on Nordic and Anglo-Saxon countries

VARIABLES	(1) Denmark	(2) Finland	(3) Sweden	(4) Ireland	(5) UK
Gender	2.265	-1.762	4.142*	6.901***	4.657**
	(1.996)	(2.182)	(2.363)	(2.540)	(2.114)
Age	-0.008	0.033	-0.181*	0.012	-0.037
	(0.086)	(0.083)	(0.101)	(0.112)	(0.088)
Secondary ed.	0.896	-6.906**	-1.102	-3.429	1.414
	(3.296)	(3.477)	(4.334)	(3.714)	(2.595)
University ed.	5.004	-3.867	6.401	-1.763	9.109***
	(3.663)	(4.071)	(4.784)	(4.265)	(2.580)
Partner	3.964	3.376	-4.748	3.062	-2.112
	(2.587)	(2.834)	(3.253)	(2.666)	(2.256)
Family size	-1.683	-4.010*	2.320	1.058	-0.462
	(1.314)	(2.158)	(2.048)	(1.278)	(1.021)
N. children under 5	0.839	4.901	-5.321*	4.750*	0.753
	(2.091)	(3.187)	(3.063)	(2.426)	(2.061)
N. children 5-17	0.588	4.231*	-3.474	0.905	0.633
	(1.544)	(2.523)	(2.202)	(1.625)	(1.412)
Self employed	-25.144***	-12.894***	-17.973***	-22.762***	-12.640***
	(3.214)	(3.412)	(3.836)	(3.324)	(3.671)
Full time worker	6.447***	4.142**	0.452	6.619***	9.628***
	(2.023)	(2.104)	(2.520)	(2.065)	(1.927)
Occupations:					
Managers	-8.407	32.067***	1.296	-5.139	54.286***
	(9.669)	(6.087)	(11.864)	(38.387)	(3.942)
Professionals	-8.845	26.896***	-6.621	-16.125	54.585***
	(9.300)	(4.998)	(11.421)	(38.350)	(4.277)
Technicians	-10.201	29.365***	-1.581	-8.840	56.374***
	(9.327)	(5.199)	(11.791)	(38.395)	(4.100)
Clerical support	-8.745	27.370***	-5.014	-23.792	50.629***
	(9.803)	(5.807)	(12.196)	(38.157)	(3.655)
Service and sales	-21.207**	16.155***	-13.374	-29.321	45.128***
	(9.407)	(5.163)	(11.864)	(38.096)	(3.296)
Agriculture/forest/fish	-25.911**	15.773**	-12.204	-37.018	36.115***
	(11.190)	(7.622)	(14.298)	(38.230)	(6.648)
Craft/related trade	-16.148*	27.975***	-1.386	-8.743	59.382***
	(9.417)	(5.453)	(12.478)	(38.291)	(5.764)
Operators	-20.686**	20.441***	-7.888	-27.077	40.276***
	(9.697)	(5.272)	(12.165)	(38.161)	(3.900)
Elementary occ.	-17.778*	21.166***	-10.938	-32.390	47.903***
	(9.936)	(5.760)	(12.452)	(38.081)	(3.956)
Constant	54.152***	26.728***	55.757***	54.279	-10.630**
	(10.969)	(7.897)	(13.365)	(38.584)	(4.744)
Observations	1,967	1,882	1,833	1,847	2,903
R-squared	0.077	0.047	0.037	0.123	0.059

Note: Robust standard errors in parentheses. The sample (EWCS 2010-2015) is restricted to employed workers. Commuting time is measured in minutes per day. Coefficients estimated using demographic weighting (Katz and Murphy, 1992; Aguiar and Hurst, 2007; Gimenez-Nadal and Sevilla, 2012), to ensure a constant representation of types of workers (e.g., age cohorts, gender, and full-time status), years, and countries. Reference category for occupation: Armed forces. *** Significant at the 99%; ** significant at the 95%; * significant at the 90%.

Table 4. Estimates on Mediterranean countries

VARIABLES	(1) Greece	(2) Italy	(3) Portugal	(4) Spain
Gender	1.997	3.252**	0.333	1.052
	(1.669)	(1.443)	(1.481)	(1.282)
Age	0.101	0.016	-0.066	-0.043
	(0.095)	(0.073)	(0.077)	(0.061)
Secondary ed.	2.623	0.575	4.637**	1.011
	(1.901)	(1.849)	(1.982)	(1.464)
University ed.	8.714***	6.896**	4.664	3.855**
	(2.585)	(2.969)	(3.009)	(1.853)
Partner	0.780	-0.133	-2.289	0.422
	(2.040)	(1.660)	(1.650)	(1.265)
Family size	0.188	0.262	-0.616	-0.062
	(1.044)	(0.707)	(0.801)	(0.634)
N. children under 5	-1.661	-1.472	1.524	0.367
	(1.907)	(2.094)	(1.979)	(1.584)
N. children 5-17	-0.897	0.506	2.135	1.055
	(1.246)	(1.117)	(1.339)	(0.983)
Self employed	-17.779***	-10.999***	-12.284***	-12.693***
	(2.040)	(1.901)	(2.709)	(1.744)
Full time worker	-0.581	4.869***	5.090**	-0.767
	(2.064)	(1.402)	(2.008)	(1.360)
Occupations:				
Managers	3.019	-4.546	-5.097	-0.953
	(9.862)	(9.510)	(19.737)	(4.192)
Professionals	2.230	-5.746	-5.957	6.459
	(9.647)	(9.567)	(19.325)	(3.975)
Technicians	3.101	-2.387	-12.076	4.231
	(9.906)	(9.345)	(19.191)	(3.876)
Clerical support	-0.506	-3.875	-10.134	2.480
	(9.695)	(9.392)	(19.193)	(3.787)
Service and sales	-4.297	-4.933	-11.674	-2.818
	(9.575)	(9.393)	(19.168)	(3.761)
Agriculture/forest/fish	3.552	-5.892	-10.983	1.886
	(9.844)	(9.650)	(19.235)	(5.281)
Craft/related trade	5.774	-3.391	-10.715	3.384
	(9.770)	(9.411)	(19.044)	(3.899)
Operators	-5.055	-7.068	-13.921	0.205
	(9.665)	(9.465)	(19.051)	(4.073)
Elementary occ.	2.428	-8.953	-5.798	1.342
	(10.002)	(9.423)	(19.173)	(3.784)
Constant	27.862***	28.044***	35.387*	34.427***
	(10.406)	(10.427)	(20.153)	(5.125)
Observations	1,886	2,371	1,671	4,017
R-squared	0.099	0.044	0.061	0.040

Note: Robust standard errors in parentheses. The sample (EWCS 2010-2015) is restricted to employed workers. Commuting time is measured in minutes per day. Coefficients estimated using demographic weighting (Katz and Murphy, 1992; Aguiar and Hurst, 2007; Gimenez-Nadal and Sevilla, 2012), to ensure a constant representation of types of workers (e.g., age cohorts, gender, and full-time status), years, and countries. Reference category for occupation: Armed forces. *** Significant at the 99%; ** significant at the 95%; * significant at the 90%.

Table 5. Estimates on Continental countries

VARIABLES	(1) Austria	(2) Belgium	(3) France	(4) Germany	(5) Luxembourg	(6) Netherlands
Gender	6.376***	9.720***	5.078***	2.648*	1.772	4.329*
	(1.977)	(1.291)	(1.462)	(1.598)	(1.895)	(2.216)
Age	0.146*	0.121**	-0.139**	0.070	0.044	0.082
	(0.083)	(0.061)	(0.063)	(0.060)	(0.093)	(0.090)
Secondary ed.	-2.574	0.031	-2.924	-0.691	-0.154	0.135
	(2.721)	(1.707)	(1.824)	(4.200)	(2.459)	(2.475)
University ed.	2.386	9.105***	3.003	-2.603	1.156	6.975**
	(4.226)	(1.970)	(2.334)	(4.196)	(3.104)	(3.058)
Partner	3.567*	1.656	2.125	0.607	-4.011*	4.419*
	(2.093)	(1.480)	(1.635)	(1.781)	(2.336)	(2.300)
Family size	-1.257	-0.085	-0.541	0.449	2.739**	-1.029
	(0.941)	(0.764)	(0.959)	(1.044)	(1.128)	(1.019)
N. children under 5	2.747	1.798	1.255	1.315	3.663	3.003
	(2.436)	(1.468)	(1.612)	(2.226)	(2.477)	(2.418)
N. children 5-17	1.322	0.792	0.068	-1.486	-1.151	-0.447
	(1.433)	(0.951)	(1.180)	(1.337)	(1.331)	(1.266)
Self employed	-24.825***	-25.236***	-19.031***	-18.265***	-21.859***	-24.759***
	(2.838)	(1.848)	(2.086)	(2.647)	(2.667)	(3.113)
Full time worker	4.513**	4.032***	3.749**	10.197***	2.719	8.490***
	(1.872)	(1.253)	(1.465)	(1.588)	(2.121)	(2.236)
Occupations:						
Managers	-24.391**	-11.061	2.291	-9.603	-2.602	-51.653
	(11.834)	(8.132)	(8.787)	(9.789)	(4.506)	(35.089)
Professionals	-14.230	-14.147*	2.025	-7.137	-3.893	-57.455
	(11.641)	(8.051)	(8.667)	(9.587)	(3.848)	(34.984)
Technicians	-14.023	-11.681	-0.822	-11.310	-2.103	-51.654
	(11.733)	(8.043)	(8.576)	(9.393)	(3.983)	(35.020)
Clerical support	-18.135	-12.766	2.692	-10.367	3.414	-55.757
	(11.493)	(7.987)	(8.599)	(9.386)	(5.020)	(35.009)
Service and sales	-21.676*	-22.108***	-9.131	-16.771*	-2.491	-66.705*
	(11.396)	(7.977)	(8.544)	(9.437)	(4.501)	(34.953)
Agriculture/forest/fish	-31.410***	-33.855***	-14.639	-23.207**	-15.345*	-80.121**
	(11.817)	(8.762)	(9.095)	(9.762)	(7.838)	(35.009)
Craft/related trade	-23.885**	-17.208**	-2.781	-17.030*	-5.536	-62.190*
	(11.551)	(8.058)	(8.651)	(9.340)	(4.484)	(35.064)
Operators	-27.763**	-24.332***	-8.024	-19.921**	-2.868	-70.009**
	(11.625)	(8.069)	(8.665)	(9.522)	(5.409)	(35.176)
Elementary occ.	-29.576**	-22.953***	-5.558	-18.476*	-6.970	-67.570*
	(11.527)	(8.085)	(8.630)	(9.448)	(4.706)	(34.975)
Constant	48.228***	46.245***	46.132***	47.977***	34.591***	94.833***
	(12.211)	(8.642)	(9.352)	(10.908)	(6.273)	(35.515)
Observations	1,836	5,946	4,192	3,780	1,825	1,902
R-squared	0.108	0.093	0.059	0.050	0.066	0.132

Note: Robust standard errors in parentheses. The sample (EWCS 2010-2015) is restricted to employed workers. Commuting time is measured in minutes per day. Coefficients estimated using demographic weighting (Katz and Murphy, 1992; Aguiar and Hurst, 2007; Gimenez-Nadal and Sevilla, 2012), to ensure a constant representation of types of workers (e.g., age cohorts, gender, and full-time status), years, and countries. Reference category for occupation: Armed forces. *** Significant at the 99%; ** significant at the 95%; * significant at the 90%.

Appendix A: Additional tables and figures

Table A1. Sample sizes, by country and year

YEAR	1995	2000	2005	2010	2015	Total
COUNTRY						
Austria	974	1,431	869	891	945	5,110
Belgium	832	1,399	872	3,572	2,374	9,049
Denmark	880	1,444	930	1,033	934	5,221
Finland	953	1,306	994	958	924	5,135
France	886	1,422	898	2,733	1,459	7,398
Germany	1,960	1,439	925	1,942	1,838	8,104
Greece	941	1,415	907	955	931	5,149
Ireland	831	1,379	895	927	920	4,952
Italy	906	1,461	859	1,258	1,113	5,597
Luxembourg	436	474	540	866	959	3,275
Netherlands	961	1,403	973	963	939	5,239
Portugal	912	1,402	916	874	797	4,901
Spain	884	1,426	916	960	3,057	7,243
Sweden	994	1,483	1,004	893	940	5,314
United Kingdom	947	1,420	912	1,409	1,494	6,182
Total	14,297	20,304	13,410	20,234	19,624	87,869

Note: The sample (EWCS) is restricted to employed workers in countries with information for the period 1995-2015.

Table A2. Commuting time in the EWCS questionnaire

Year	Question #	Label	Codes
2015	Q36	In total, how many minutes per day do you usually spend travelling from home to work and back?	Number minutes per day
2010	Q31	In total, how many minutes per day do you usually spend travelling from home to work and back?	Number minutes per day
2005	Q13	In total, how many minutes per day do you normally spend travelling from home to work and back?	Number minutes per day
2001	Q12	In total, how many minutes per day do you normally spend travelling from home to work and back?	Number minutes per day
2000	Q15	In total, how many minutes per day do you normally spend travelling from home to work and back?	Number minutes per day
1995	Q13	How many minutes per day do you normally spend travelling from home to work and back in total?	Number minutes per day
1991	-	-	-

Source: EWCS questionnaire concordance grid 1991-2015, historical overview, Eurofound.

Table A5. Social welfare regimes

COUNTRY	WELFARE REGIME
Austria	Conservative/Corporatist
Belgium	Conservative/Corporatist
Denmark	Social democratic/Nordic
Finland	Social democratic/Nordic
France	Conservative/Corporatist
Germany	Conservative/Corporatist
Greece	Conservative/Corporatist
Ireland	Liberal/Anglo-Saxon
Italy	Conservative/Corporatist
Luxembourg	Conservative/Corporatist
Netherlands	Conservative/Corporatist
Portugal	Conservative/Corporatist
Spain	Conservative/Corporatist
Sweden	Social democratic/Nordic
United Kingdom	Liberal/Anglo-Saxon

Note: "Welfare State" refers to "the set of interventions organised by the state which are aimed at guaranteeing the provision of a minimum level of services to the population via a system of social protection". Source: http://www.learneurope.eu/files/6713/7526/7222/Welfare_State_models_in_Europe_en.jpg.

Table A3. Averages of variables

VARIABLES	Commuting time	Male	Age	Primary ed.	University ed.	With partner	N. of children
A. Nordic countries							
Denmark	42.186	0.531	40.458	0.153	0.391	0.731	0.935
Finland	42.430	0.510	41.677	0.105	0.476	0.706	0.818
Sweden	42.807	0.515	41.852	0.091	0.383	0.670	0.870
B. Anglo-Saxon countries							
Ireland	42.808	0.551	38.728	0.173	0.392	0.665	1.031
United Kingdom	45.582	0.529	39.619	0.341	0.351	0.695	0.827
C. Mediterranean countries							
Greece	33.767	0.603	40.472	0.246	0.368	0.678	0.967
Italy	29.055	0.594	40.899	0.246	0.189	0.666	0.856
Portugal	29.527	0.516	40.407	0.587	0.167	0.729	0.842
Spain	35.689	0.583	39.570	0.308	0.305	0.664	0.810
D. Continental countries							
Austria	34.498	0.530	38.954	0.117	0.136	0.676	0.848
Belgium	42.489	0.550	39.681	0.142	0.461	0.726	1.111
France	38.601	0.528	39.960	0.124	0.413	0.712	1.004
Germany	43.740	0.542	41.270	0.097	0.508	0.710	0.635
Luxembourg	39.000	0.570	39.474	0.244	0.386	0.736	1.164
Netherlands	43.200	0.555	39.357	0.247	0.391	0.693	0.979

Note: The sample (EWCS 2015) is restricted to employed workers. Averages are computed using sample weights. Commuting time is measured in minutes per day. Male takes value 1 for men, 0 for women. Age is measured in years. Primary education takes value 1 for individuals whose maximum level of education is "pre-primary education", "primary education", or "first stage of basic education"; 0 otherwise. University education takes value 1 for individuals whose maximum level of education is "first stage of university education", or "second stage of university education"; 0 otherwise. With partner takes value 1 for individuals who cohabit with a married or unmarried partner, 0 for singles. Urban area takes value 1 for individuals who reside in urban areas, classified by the Eurostat in terms of NUTS 3 regions, 0 otherwise. Information for education and for the presence of partner and children is available for 2005, 2010 and 2015. Information for living in urban areas is available for 2015.

Table A4. Zero commuters, by country

COUNTRIES	Number of zero commuters	% of zero commuters
A. Nordic countries		
Denmark	191	3.658
Finland	183	3.564
Sweden	138	2.597
B. Anglo-Saxon countries		
Ireland	331	6.684
United Kingdom	323	5.225
C. Mediterranean countries		
Greece	189	3.671
Italy	262	4.681
Portugal	193	3.938
Spain	371	5.122
D. Continental countries		
Austria	335	6.556
Belgium	521	5.758
France	572	7.732
Germany	257	3.171
Luxembourg	137	4.183
Netherlands	244	4.657

Note: The sample (EWCS 1995-2015) is restricted to employed workers.

Appendix B: Demographic weighting

We report trends in commuting time over the last two decades holding constant the demographic composition of the sample, following Aguiar and Hurst (2007) and Gimenez-Nadal and Sevilla (2012). Specifically, we divide the sample into demographic cells defined by five age cohorts (16 to 25 years, 26 to 35 years, 36 to 45 years, 46 to 55 years, and 56 to 65 years, all inclusive), two sex categories (male and female), and whether or not workers are full-time workers (vs part-time workers). We do not create separate cells distinguishing education categories or household composition (e.g., the presence of children), due to the availability of such information in the EWCS data. This division yields twenty demographic cells for each country. To calculate the constant weights used for our demographic adjustments, we pool together all the waves of the EWCS data for each country, and compute the percentage of the population that resides in each demographic cell for each country. Following Katz and Murphy (1992), we use these fixed weights to calculate weighted means for commuting time in each year.

Since our analysis is based on gender, age cohorts, and full-time employment, we follow Gimenez-Nadal and Sevilla (2012) in calculating means for each subsample, and scale weights to sum exactly one. When pooling the different countries in the EWCS data together to compute the percent of the population in each of our cells, we used the sample weights provided by the EWCS to ensure the data is representative of the total population. We adjusted these weights so that each population cell is equally represented in the overall sample.