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HEALTH STATUS AND THE ALLOCATION OF TIME: CROSS-COUNTRY EVIDENCE IN EUROPE[*]

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Abstract:

This paper analyzes the relationship between health status and time allocation decisions in 6 European countries. Using the Multinational Time Use Study, we find that a better perception of own health is associated with less time devoted to sleep, personal care, and non-market work, and with less time in leisure for men, while it is associated with more time in market work. We also find that the relationship across the activities is very similar across countries, and that market work has a relationship of substitution with sleep, personal care, non-market work and leisure, with mixed evidence for the rest of relationships. This analysis of the relationship of health status and time allocation decisions represents a first step to understand cross-country differences in the relationship between health status and time devoted to activities different from market work, which has been shown to be important for well-being.

Keywords: Health, Time Allocation, Multinational Time Use Study

JEL: D13, J16, J22

1. INTRODUCTION

In this paper we analyze the relationship between self-reported health status and the time devoted to different activities for 6 European countries. Since Grossman's seminal work on the concept of health capital and the demand for health (Grossman, 1972a,1972b), a number of papers have studied health within the field of labour economics, with many of them focusing on the relationship between health status and the labour market outcomes of older workers (Currie and Madrian; 1999; Au et al., 2005; Disney et al., 2006; Barnay, 2010; Jones et al., 2010). However, little is known about the relationship between health and other uses of time, such as home production or leisure. It can be that better health is associated with higher productivity at home production, leading to a substitution effect that increases the time devoted to this activity, despite the income effect associated to more time in the labour market (e.g., higher income may lead to more outsourcing of domestic goods). The understanding of the relationship between health and time allocation decisions is important, as time is scarce and important for well-being (e.g., Kahneman et al., 2004; Kahneman and Krueger, 2006; Krueger, 2007; Stiglitz et al., 2009).

To the best of our knowledge, only 2 papers have directly analyzed the relationship between health and time allocation decisions other than market work time. Podor and Halliday (2012) analyze the relationship between health and time allocation in the US, and find that better health is associated with large positive effects on home production and larger positive effects on market production, but less consumption of leisure. Gimenez-Nadal and Ortega (2013) analyze the relationship between health status and the time devoted to both market and non-market work in Spain, and find that better health is associated with an increase in the hours of market work and a decrease in the time devoted to non-market work. Thus, evidence on the relationship between health and time allocation decisions of individuals is scarce, and more research in this issue is needed.

We contribute to the literature by analyzing the relationship between self-reported health status of individuals and the time devoted to sleep, personal care, market work, non-market work and leisure in 6 European countries. An important concern in this literature is that health may be endogenous to time allocation decisions (e.g., in the

labour supply literature, we find Stern (1989), Kreider (1999), Dwyer and Mitchell (1999). Benitez-Silva et al. (2004), and Cai and Kalb (2006), among others) and hence self-reported health may introduce a source of endogeneity that may affect the estimated relationship between health and time allocation decisions (Kerkhofs and Lindeboom, 1995; Crossley and Kennedy, 2002; Lindeboom and Van Doorslaer, 2004; Lindeboom and Kerkhofs, 2009). Given the difficulty of finding a good instrument for health in our dataset, and in general as argued by Podor and Halliday (2012), we acknowledge that the approach adopted here is very descriptive, and we cannot talk about causations but about relationships.

We examine diary data for the following European countries: France (1998), Germany (2001), Italy (2002), the Netherlands (2000 and 2005), Spain (2000) and the United Kingdom (2000 and 2005). We offer descriptive evidence on the relationship between health and time devoted to the different activities, together with estimated partial correlations while controlling for common confounding factors. In doing so, we also allow for correlations in the unobserved determinants of the activities by allowing the error terms in regressions to be jointly normally distributed, with no restrictions on the correlation (e.g., Seemingly Unrelated Regression, SURE). We find that in general a better perception of own health is associated with less time devoted to sleep, personal care, and non-market work, and with less time in leisure for men, while it is association with more time in market work for both men and women. We also find that the relationship across the activities is very similar across countries, and that market work has a relationship of substitution with sleep, personal care, non-market work and leisure, with mixed evidence for the rest of relationships

In particular, we find that the difference in the time devoted to sleep between men reporting "poor health" and those reporting "very good health" is 1.282, 0.383, 1.307, 1.316, 1.199 and 0.582 in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. For the time devoted to personal care, the difference in the time devoted to this activity between individuals reporting "poor health" and those reporting "very good health" is 0.686, 0.159, 0.503, 0.291, 0.374 and 0.435 in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. For the time devoted to non-market work, the difference in the time devoted to this activity between individuals reporting "poor health" and those reporting "very good health" is

0.432, 0.353, 0.722, 1.998, 0.737 and 0.772 in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. For the time devoted to leisure, the difference in the time devoted to this activity between individuals reporting "poor health" and those reporting "very good health" is 1.218, 1.092, 1.116, 2.578, 1.851 and 3.304 in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. In the case of the time devoted to market work, we consistently find that individuals with "very good health" devote, compared to individuals with "poor health", 3.618, 1.983, 3.649, 6.184, 4.161 and 5.142 more hours per day in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively.

In the case of women, we find that the difference in the time devoted to sleep between women reporting "poor health" and those reporting "very good health" is 1.352, 0.378, 0.896, 1.416, 0.936 and 0.585 in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. For the time devoted to personal care, the difference in the time devoted to this activity between individuals reporting "poor health" and those reporting "very good health" is 0.523, 0.353, 0.345, 0.282 and 0.344 in France, Germany, the Netherlands, Spain and the United Kingdom, respectively. For the time devoted to non-market work, the difference in the time devoted to this activity between individuals reporting "poor health" and those reporting "very good health" is 0.453, 0.746, and 0.665 in France, Italy and Spain, respectively. For the time devoted to leisure, the difference in the time devoted to this activity between individuals reporting "poor health" and those reporting "very good health" is 0.724, 0.456, 0.286, 1.034, 0.596 and 1.850 in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. In the case of the time devoted to market work, we consistently find that individuals with "very good health" devote, compared to individuals with "poor health", 3.052, 1.428, 1.853, 2.926, 2.480 and 2.954 more hours per day in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively.

Once that we control for other confounding factors, for men we find that in all countries better health is associated with decreases in the time devoted to sleep, personal care, non-market work and leisure, while they are associated with increases in the time devoted to market work. These results are consistent with the results obtained by Podor and Halliday (2012) for market work and leisure in the US, but not for non-market work. For women we observe that in all countries better health is associated with

decreases in the time devoted to sleep, personal care, and non-market work, while they are associated with increases in the time devoted to market work. These results are consistent with the results obtained by Podor and Halliday (2012) fort the US regarding market, but not for non-market work and leisure. Exceptions to these patterns are found in Italy, where personal care and better health are positively related, and better health has a non-statistically significant association with the time devoted to market work. In the case of leisure, the results for the relationship between health status and the time devoted to this activity are mixed, and while in Italy we find a positive association, we find a negative association in the United Kingdom and no statistically significant associations for the rest of the countries.

Considering the relationships between the activities (e.g., correlations), for men we obtain negative correlations between market work and the rest of activities, especially for non-market and leisure, and smaller correlations are found between market work, on the one hand, and sleep and personal care on the other. Personal care and sleep have very small correlations, and we find a positive correlation between personal care and sleep, on the one hand, and non-market work on the other, although such correlations are very small. For the rest of relationships, we find mixed evidence. In the case of women, we obtain negative correlations between market work and the rest of activities, especially for non-market and leisure. Smaller negative correlations are found between market work, on the one hand, and sleep and personal care on the other. Small negative correlations are found between sleep, on the one hand, and personal care, non-market work and leisure, on the other. Non-market work seems to be positively correlated with personal care, and negatively correlated with leisure.

By studying several countries our work crucially adds to the study of the relationship between health status and time allocation decisions, including the most recent work by Podor and Halliday (2012) and Gimenez-Nadal and Ortega (2013). Specifically, we are able to improve our understanding of how better health status relates to market and non-market work activities, leisure, and personal care, and compare our results for a broad group of industrialized economies with previous results for the US (Podor and Halliday, 2012). In contrast to the previously reported relationship between health and time allocation decisions in the US, where better health is associated with large positive effects on home production and market production, but less consumption of leisure, we

fail to find such relationships for home production and leisure in the 6 countries, which indicates that the relationship between health and time allocation decisions is genuine of the country. Our paper also expands recent cross-country studies such as Burda, Hammermesh and Weil (2008), Gershuny (2009), Hook (2006), Gauthier, Smeeding, and Furstenberg (2004), and Gimenez-Nadal and Sevilla (2012) among others. These studies generally analyze the use of time for a variety of developed economies, and our paper extends these cross-country comparisons by additionally documenting for the first time the relationships between the different time use activities.

The paper is organized as follows. Section 2 describes the data and the variables. Section 3 presents the empirical evidence. Section 4 describes the empirical strategy. Section 5 presents the main results. Section 6 presents a discussion of the results. Section 7 sets out the main conclusions.

2. DATA

For the analysis of the relationship between health status and time allocation decisions, we use the Multinational Time Use Survey (MTUS).[1] The MTUS is an ex-post harmonized cross-time, cross-national, comparative time use database, coordinated by the Centre for Time Use Research at the University of Oxford. It is constructed from national randomly-sampled time-diary studies, with common series of background variables, and total time spent in 41 activities (Gershuny, 2009). The MTUS provides us with information on individual time use, based on diary questionnaires in which individuals report their activities throughout the 24 hours of the day. The advantage of time-use surveys over stylized-questions, such as those included in the data bases ECHP, the BHPS, and the SOEP (where respondents are asked how much time they have spent, for example, in the previous week, or normally spend each week, on market work or housework) is that diary-based estimates of time use are more reliable and accurate than estimates derived from direct questions (Juster and Stafford, 1985; Robinson and Godbey, 1997; Bianchi et al., 2000; Bonke, 2005; Yee-Kan, 2008).

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[1] Information on the variables, and on how to access the data, is available on the MTUS website: http://www.timeuse.org/mtus. See Fisher, Gershuny and Gauthier (2011) for a full description of the MTUS documentation. We use version W53 (accessed in October 2010) of the MTUS.

In the labour supply literature, Klevmarken (2005) argues that information on actual hours of work from time-use surveys is more relevant than normal hours or contracted hours generally reported in stylized questions. The author shows that time-use data yields much smaller estimates of wage-rate effects compared to measures of normal hours of work, which may have important implications for tax policy design, among other things. Thus, in the same way that money-expenditure diaries have become the gold standard in the consumption literature, so have time-use diaries become the preferred method of gathering information on time spent on market work, non-market work, and leisure. Most studies documenting how individuals use their time are now based on these data sets, including recent studies of the analysis of trends in time use (Aguiar and Hurst, 2007; Guryan, Hurst and Kearney, 2008; Gimenez-Nadal and Sevilla, 2012; Sevilla et al., 2012).[2]

The MTUS includes 41 activities, defined as the 'primary' or 'main' activity individuals were doing at the time of the interview. Thus, we are able to add up the time devoted to any activity of reference (e.g., paid work, leisure, TV watching) as 'primary' activity. It is important to acknowledge that, in this paper, the fact that most of our analysis is based on the comparison of broad classification of activities (i.e., sleep, personal care, market work, non-market work and leisure) provides a good basis to run meaningful comparisons across countries. As Gimenez-Nadal and Sevilla (2012) point out however, the harmonization exercise by the CTUR team addresses differences in survey methodologies such as different response rates (especially the lower response rate of some of the surveys), whether they covered or not the twelve months of the year, the sampling frame, and differences in activity codes. All the surveys provide weights designed to ensure that the surveys are nationally representative.

For the sake of comparison with previous studies (e.g., Aguiar and Hurst 2007), and to minimize the role of time allocation decisions that have a strong inter-temporal component over the life cycle, such as education and retirement, we restrict the sample used throughout the analysis to non-retired/non-student individuals between the ages of 21 and 65 (inclusive), so results should be interpreted as being 'per working-age adult'.

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[2] The MTUS has been widely used across the social sciences (Gershuny, 2000; Gershuny and Sullivan, 2003; Gauthier et al., 2004; Guryan, Hurst and Kearney, 2008; Gershuny, 2009, Gimenez-Nadal and Sevilla-Sanz, 2011;2012; Gimenez-Nadal and Molina, 2013).

For the selection of countries, we choose countries with information about individuals' health. To measure the health of individuals, we use the question about self-reported health status included in the surveys, where respondents typically answer the question 'how is your health in general?' with five possible responses: "very poor health" (1), "poor health" (2), "fair health" (3), "good health" (4) and "very good health" (5). The CTUR team has recoded the categories to include the following values: "very poor/poor health" (1), "fair health" (2), "good health" (3) and "very good health" (4). The availability of information on health in the surveys leaves us with the following countries: France (1998), Germany (2001-02), Italy (2002-03), the Netherlands (2000 and 2005), Spain (2002-03) and the United Kingdom (2000 and 2005). The information gathered with this question is known as "Self-Assessed Health Status" (SAHS) measure.[3]

Although self-assessed health status (SAHS) measures are increasingly common in empirical research (e.g. Deaton and Paxson 1998; Ettner 1996; Podor and Halliday, 2012, Gimenez-Nadal and Ortega, 2012), previous literature has identified a number of reasons why self-reported measures of health status may cause biases (e.g., Bound, 1991). Individual may face incentives, both economic and psychological, that may affect their response to the question, resulting from the possibility that individuals out of the labour force report poor health to justify their non-participation (e.g., the 'justification hypothesis' known in the literature, see Anderson and Burkhauser 1985; Stern 1989; Bound 1991; Dwyer and Mitchell 1999; Kreider 1999). In a recent study, Gimenez-Nadal and Ortega (2013) analyze the relationship between health status and the time devoted to market work and household production, and find that reverse causality bias the coefficients measuring this relationship. Thus, we acknowledge that reverse causality bias the results obtained, and thus the approach that we adopt here is very descriptive, similar to Podor and Halliday (2012).

The conceptualization of time use categories is usually driven by a systematic, principle-driven approach of distinguishing means vs. ends. The so-called third person criterion for example, excludes from the definition of leisure any activity that might be carried out by some third party without losing the intended utility for the final consumer. Unfortunately, the third person criterion involves questionable assumptions

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[3] Table 1 in Appendix shows the technical information of the surveys included in the study.

such that the enjoyment derived from work can legitimately be ignored, and that all leisure is enjoyable. However, one quarter of time that would be considered leisure according to the conventional implementation of the third person criterion, and one third of what would conventionally be considered work, is unexpectedly placed by the diarists (Gershuny, 2013). Certain activities, such as sleeping, eating, personal and medical care, or resting, do not fall comfortably into the means vs. ends classification. These activities cannot be purchased in the market, but they may not be considered leisure in the sense that they are necessary for life.

Nonetheless, some variation in the time spent in these activities may result from conscious choice. Biddle and Hamermesh (1990) show that sleep time responds to economic incentives such as the wage, while Hamermesh (2002) and Hallberg (2003) show that couples tend to synchronize their leisure activities. Decreasing marginal utility of sleep (and of other consumption activities) is indeed shown by Gershuny (2013) using (subsequent) diary reports of enjoyment. Similarly, many of the tasks constituting child care can be purchased in the market, so it could be conceptualized as a part of unpaid production (e.g., Aguiar and Hurst, 2007; Fisher et al., 2007; Guryan, Hurst and Kearney, 2008). However, parents report that the time with their children is among their more enjoyable activities, especially when compared with other standard home production activities (e.g., Juster and Stafford, 1985; Robinson and Godbey, 1997; Kahneman et al., 2004; Kahneman and Krueger, 2006; Krueger, 2007; Guryan, Hurst and Kearney, 2008).

Rather than trying to resolve this debate on theoretical grounds, we adopt an empirical approach, and follow Burda, Hamermesh and Weil (2008) in the definition of time use categories. We define the following time use categories: *sleep*, *personal care*, *market work*, *non-market work*, and *leisure*. *Personal care* refers to things that individuals cannot pay others to do, but must do for themselves, at least to some extent. Examples of these activities include eating, an activity that is necessary for survival. *Market work* refers to those activities in which people would not be working the marginal hour if they were not paid, so that at the margin market work is not enjoyable (or at least is less enjoyable than any non-work activity at the margin). *Non-market work* refers to activities in which individuals engage at home, using their own time and some purchased goods, and have the common characteristic that they could pay another

individual to perform them, while not themselves being paid. Finally, *Leisure* includes all activities that individuals cannot pay others to do, and that do not really have to be done at all.[4]

3. DESCRIPTIVE EVIDENCE

Figures 1-A and 1-B show, for each country, the overall time devoted to the 5 time use activities, according to the health status of men and women, respectively. In doing so, we average for each country and health status the time devoted to the 5 time use activities. For instance, for the United Kingdom, we average the time devoted to sleep, personal care, market work, non-market work and leisure by men and women reporting "poor health", "fair health", "good health" and "very good health". For the computation of average values we use the demographic weights included in the survey. We observe that for all the countries, there are negative relationships between health status of men and women and the time devoted to sleep, personal care, non-market work and leisure, as the overall time devoted to these activities decreases as self-reported health status is better. On the contrary, we find a positive relationship between health status of men and women and the time devoted to market work. Thus, better self-reported health is associated with more market work, and less time in the rest of activities. We also find that there are cross-country differences in the time devoted to personal care and sleep, although such differences seem to compensate to each other leading to no big differences in general personal care. Furthermore, individuals in Italy devote less time to market work but more time in non-market work, which leads to a gap in leisure time favouring Italy compared to the rest of countries, while Germany seems to have less leisure time compared to their European neighbours.

The 2 countries with the highest average time devoted to sleep are France and the Netherlands, while the 2 countries with the lowest time devoted to sleep are Germany and Italy. Regarding personal care, the 2 countries with the highest average time devoted to this activity are Germany and Italy, while the 2 countries with the lowest time devoted to this are the Netherlands and the United Kingdom. If we consider a

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[4] Table A2 in Appendix shows how the activities of the MTUS have been included in the different time use categories.

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category of general personal care, that includes sleep and other personal care, it seems that individuals in the countries with more time in sleep also devote less time to other personal care, which may result in no differences across countries in the time devoted to general personal care.

Regarding the time devoted to market work, here we must consider that we include individuals that are both working and non-working, and thus differences in Labour Force Participation (LFP) rates condition the overall time devoted to market work in the countries. In this sense, we observe that the country with the less time devoted to market work is Italy, consistent with the lower LFP of the country compared to the other countries (EUROSTAT, 2013). For the rest of countries, differences in the time devoted to market work are small in general, and we cannot find out any differential pattern across countries. Considering the time devoted to non-market work, we observe large differences across countries. The countries with the highest time devoted to this activity by women are Italy and Spain, while the countries with the lowest time devoted to this activity by men are also Italy and Spain. For the rest of countries, there are no significant differences in the gender distribution of non-market work. These results are consistent with previous research finding that Mediterranean countries are the most inegalitarian countries among developed countries regarding the gender distribution of household labour (Sevilla, 2010; Gimenez-Nadal, Molina and Sevilla, 2012).

Considering the time devoted to leisure, we observe a large difference between the Netherlands and Spain, and the rest of analyzed countries, with these 2 countries having more leisure time than the others. On the contrary, individuals from Italy seem to have less leisure time compared to their European neighbours. The fact that individuals in the Netherlands have more leisure compared to individuals in France and the United Kingdom is consistent with Gimenez-Nadal and Sevilla (2012). Furthermore, while we find that the dispersion in leisure across countries is smaller for men, in the case of women is larger. This may be due to cross-country differences in social norms regarding the gender distribution of total work, defined as the sum to market and non-market work time (Burda, Hamermesh and Weil, 2012). Additionally, differences in LFP across the countries, especially in the case of women, may also help to explain such differences in leisure time.

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Podor and Halliday (2012) analyze the age-profile of time use for single and married people in the ATUS. In the same spirit, we have analyzed the relationship between self-reported health status and age, to see how perceived health varies with age. Figure 2-A and 2-B shows the average self-reported health status of men and women, respectively, by age of respondent. In doing so we have computed the average value of the variable of self-reported health status for respondents in each age of reference, for both men and women. It can be observed that self-reported health decreases with age, as older individuals report worse health status. This negative association between health status and age can be linked to evidence on the relationship between health status and time allocation decisions. If health decreases with age, we can expect that as individuals become older they increase their time devoted to sleep, personal care, non-market work and leisure, while they decrease the time devoted to market work.

Table 1 shows for each country and self-reported health status the time devoted to the 5 time use activities, the difference in the time devoted to the reference activity between individuals reporting "poor health" and "very poor health", and the p-value of the difference. A p-value lower than .05 indicates that the difference between individuals reporting "poor health" and "very good health" in the overall time devoted to the reference activity is statistically significant at standard levels. We observe clear patterns for the relationship between health status and the time devoted to the 5 activities in all the countries, consistent with the conclusions obtained from Figures 1-A and 1-B. Furthermore, for all countries and activities, the difference in the overall time devoted to the time use activities between individuals with different self-reported health status are statistically significant at the 99% level.[5]

As shown in Table 1, there is a negative relationship between health and the time devoted to sleep, personal care, non-market and leisure, since for the 5 countries we observe a clear decreasing pattern. In this sense, the difference in the time devoted to sleep between individuals reporting "poor health" and those reporting "very good health" is 1.282, 0.383, 1.307, 1.316, 1.199 and 0.582 in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. For the time devoted to

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[5] We have also computed the difference between individuals reporting "very good health" and other health statuses (e.g., "fair health", "good health") and in all cases the differences are statistically significant, results are available upon author's request.

personal care, the difference in the time devoted to this activity between individuals reporting "poor health" and those reporting "very good health" is 0.686, 0.159, 0.503, 0.291, 0.374 and 0.435 in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. For the time devoted to non-market work, the difference in the time devoted to this activity between individuals reporting "poor health" and those reporting "very good health" is 0.432, 0.353, 0.722, 1.998, 0.737 and 0.772 in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. For the time devoted to leisure, the difference in the time devoted to this activity between individuals reporting "poor health" and those reporting "very good health" is 1.218, 1.092, 1.116, 2.578, 1.851 and 3.304 in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. In all cases such differences favours the less healthy, as individuals with "poor health" devoted more time to these activities compared to individuals reporting "very good health". These results are consistent with the analysis shown in Figure 1-A, where we obtained that there is a negative relationship between better self-reported health status of men and the time devoted to sleep, personal care, non-market work and leisure.

In the case of the time devoted to market work, we consistently find that there is a positive difference in the time devoted to this activity between individuals reporting "very good health" and "poor health", with this gap in market work favouring the more healthy as individuals with "very good health" devote, compared to individuals with "poor health", 3.618, 1.983, 3.649, 6.184, 4.161 and 5.142 more hours per day in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. This finding support the previous finding obtained from Figure 1-A, which indicates that there is a positive relationship between health status and the time devoted to market work.

Considering the patterns of changes across health statuses in the time devoted to the 5 time use activities, we can group the countries in 3 groups. The first group, composed by France, Italy, and Spain, where the differences in the time devoted to sleep, personal care, and market work between individuals with "poor health" and "fair health" is large, while the differences between individuals with "fair health", "good health" and very good health" are small. The second group, composed by Germany and the United Kingdom, where the gradient between health and the time devoted to these activities is

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smooth (e.g., the differences between consecutive health groups are very similar). And finally the Netherlands, where the smallest difference is found between individuals with "good health" and "very good health". We cannot establish any clear pattern in the negative relationship between health status, on the one hand, and the time devoted to non-market work and leisure.

In the case of women, we find that the difference in the time devoted to sleep between women reporting "poor health" and those reporting "very good health" is 1.352, 0.378, 0.896, 1.416, 0.936 and 0.585 in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. For the time devoted to personal care, the difference in the time devoted to this activity between individuals reporting "poor health" and those reporting "very good health" is 0.523, 0.353, 0.345, 0.282 and 0.344 in France, Germany, the Netherlands, Spain and the United Kingdom, respectively. For the time devoted to non-market work, the difference in the time devoted to this activity between individuals reporting "poor health" and those reporting "very good health" is 0.453, 0.746, and 0.665 in France, Italy and Spain, respectively. For the time devoted to leisure, the difference in the time devoted to this activity between individuals reporting "poor health" and those reporting "very good health" is 0.724, 0.456, 0.286, 1.034, 0.596 and 1.850 in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. In the case of the time devoted to market work, we consistently find that individuals with "very good health" devote, compared to individuals with "poor health", 3.052, 1.428, 1.853, 2.926, 2.480 and 2.954 more hours per day in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. Considering the patterns of changes across health statuses in the time devoted to the 5 time use activities, we cannot apparently group the countries.

4. EMPIRICAL STRATEGY

We estimate lineal regressions on the time devoted to *sleep*, *personal care*, *market work*, *non-market*, and *leisure*. However, since we observe a high proportion of "zeros" for some time use activities, such as market and non-market work (overall, on 48 and 11 per cent of the days, individuals reported no time devoted to these 2 activities), there can be some controversy regarding the selection of alternative models, such as that of Tobin (1958). According to Frazis and Stewart (2012), linear models are preferred in

the analysis of time allocation decisions, and Gershuny (2012) argues that traditional diary studies can still produce accurate estimates of mean times in activities for samples and subgroups. Foster and Kalenkoski (2013) compare the use of Tobit and linear models in the analysis of the time devoted to childcare activities, finding that the qualitative conclusions are similar for the two estimation methods. Thus, we rely on linear regressions, although results using the Tobit model are consistent and available upon request.

Furthermore, we take into account that the time individuals spend in any activity (e.g., market work) cannot be devoted to any of the other activities. The time constraint binds at 24 hours of day, and individuals have to decide how much time they devote to the different activities, which leads to substitution or complementarity effects between groups of activities. Thus, we need to take into account that the more time individuals devote to any activity, the less time is available for the other uses of time. However, we cannot use individual's time in any specific activity as an explanatory variable of other uses of time, since it would lead to endogeneity problems, and for this reason we estimate a Seemingly Unrelated Regression (SUR) system on the time devoted to *sleep*, *personal care*, *market work*, *non-market*, and *leisure* by the individuals.

The statistical model is as follows. For a given individual 'i' and country "j" (j=1,2...5), let S_{ij}, PC_{ij}, MW_{ij}, NMW_{ij} and $Leisure_{ij}$ represent the daily hours that the individual reports performing *sleep*, *personal care*, *market work*, *non-market*, and *leisure*, let X_{ij} be a vector of socio-demographic characteristics, and let ε_{sij}, ε_{pcij}, ε_{mwij}, ε_{nmwij} and ε_{lij} be random variables that represent unmeasured factors. We estimate the following equations:

$$S_{ij} = \alpha_s + \beta_{s1}SAHS_{ij} + \beta_{s2}X_{ij} + \alpha_s Day_{ij} + \varepsilon_{sij} \tag{1}$$

$$PC_{ij} = \alpha_{pc} + \beta_{pc1}SAHS_{ij} + \beta_{pc2}X_{ij} + \alpha_{pc} Day_{ij} + \varepsilon_{pcij} \tag{2}$$

$$MW_{ij} = \alpha_{mw} + \beta_{mw1}SAHS_{ij} + \beta_{mw2}X_{ij} + \alpha_{mw} Day_{ij} + \varepsilon_{mwij} \tag{3}$$

$$NMW_{ij} = \alpha_{nmw} + \beta_{nmw1}SAHS_{ij} + \beta_{nmw2}X_{ij} + \alpha_{nmw} Day_{ij} + \varepsilon_{nmwij} \tag{4}$$

$$L_{ij} = \alpha_l + \beta_{l1}SAHS_{ij} + \beta_{l2}X_{ij} + \alpha_l Day_{ij} + \varepsilon_{lij} \tag{5}$$

where $SAHS_{ij}$ is the variable indicating the self-reported health status of individual 'i' in country "j", X_{ij} is a vector of personal and household characteristics, and Day_{ij} is a vector of day dummy variables (ref.: Friday). We allow for correlations in the unobserved determinants of the activities by allowing the error terms to be jointly normally distributed, with no restrictions on the correlation. This specification accounts for the time constraint that may require individuals to spend more time in one activity and, therefore, less time on another. We additionally assume that the error components are independent across individuals:

$$
\begin{pmatrix} \varepsilon_{sij} \\ \varepsilon_{pcij} \\ \varepsilon_{mwij} \\ \varepsilon_{nmwij} \\ \varepsilon_{lij} \end{pmatrix} \sim N \begin{pmatrix} \begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}, & \begin{pmatrix} \sigma_{sij}^2 & \rho_{pcijsij}\sigma_{pcij}\sigma_{sij} & \rho_{mwijsij}\sigma_{mwij}\sigma_{sij} & \rho_{nmwijsij}\sigma_{nmwij}\sigma_{sij} & \rho_{lijsij}\sigma_{lij}\sigma_{sij} \\ \rho_{sijpcij}\sigma_{sij}\sigma_{pcij} & \sigma_{pcij}^2 & \rho_{mwijpcij}\sigma_{mwij}\sigma_{pcij} & \rho_{nmwijpcij}\sigma_{nmwij}\sigma_{pcij} & \rho_{lijpcij}\sigma_{lij}\sigma_{pcij} \\ \rho_{sijmwij}\sigma_{sij}\sigma_{mwij} & \rho_{pcijmwij}\sigma_{pcij}\sigma_{mwij} & \sigma_{mwij}^2 & \rho_{nmwijmwij}\sigma_{nmwij}\sigma_{mwij} & \rho_{lijmwij}\sigma_{lij}\sigma_{mwij} \\ \rho_{sijnmwij}\sigma_{sij}\sigma_{nmwij} & \rho_{pcijnmwij}\sigma_{pcij}\sigma_{nmwij} & \rho_{mwijnmwij}\sigma_{mwij}\sigma_{nmwij} & \sigma_{nmwij}^2 & \rho_{lijnmwij}\sigma_{lij}\sigma_{nmwij} \\ \rho_{sijlij}\sigma_{sij}\sigma_{lij} & \rho_{pcijlij}\sigma_{pcij}\sigma_{lij} & \rho_{mwijlij}\sigma_{mwij}\sigma_{lij} & \rho_{nmwijlij}\sigma_{nmwij}\sigma_{lij} & \sigma_{lij}^2 \end{pmatrix} \end{pmatrix}
$$

The vector X_{ij} includes personal and household characteristics (e.g., Hallberg and Klevmarken, 2003; Kalenkoski et al., 2005, 2009; Kimmel and Connelly, 2007; Connelly and Kimmel, 2009; Gimenez-Nadal and Molina, 2013), which are gender, age and its square, secondary and university education, the number of children under 18 in the household, household size, whether the youngest child is under 5, whether the youngest child is 5-12, whether the youngest child is 13-17, civic status (ref.: not in couple), and day-of-week dummies (ref.: Saturday).[6]

One of the limitations that self-reported health status measures have is that of comparability across individuals. Lindeboom and Van Doorslaer (2004) analyze cut-point and index shifts in self-reported health, and find that self-reported health is not perfectly comparable across individuals. In the same spirit that Goryakin et al. (2013), as an alternative analysis we create the "good health" variable that takes value "1" if individuals reported "good" or "very good" health, and value "0" when individual reported "poor" and "fair" health, and include this dummy variable in Equations (1) to (5) as a measure of self-reported health.

We transform the dependent variable to its log form. The reason is that with the log form of the dependent variable we can directly obtain the relationship between the dependent and independent variables as changes in the dependent variables measured in

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[6] We do not include the labour status of respondents, as it may lead to endogeneity problems, as the labour status of individuals probably influences the time devoted to all the time use activities. See Table A3 in the Appendix for summary statistics of the characteristics included in regressions.

percentage points. In the particular case of health status, that is a discrete variable, we can interpret as that dependent variable changes by 100*(coefficient) percent for a one unit increase (e.g., changes from "poor health" to "fair health", from "fair health" to "good health", and from "good health" to "very good health") in the independent variable while all other variable in the model are held constant.

We do the analysis by gender for 2 reasons. First, previous time use literature has shown that time use patterns of men and women are different and the same factors affect men and women differently (Gershuny, 2000; Gauthier et al., 2004; Kalenkoski et al., 2005; Aguiar and Hurst, 2007; Connelly and Kimmel, 2009; Gimenez-Nadal and Sevilla, 2012; Gimenez-Nadal and Molina, 2013). Second, Schneider et al. (2012) find that the answering behaviour to health perception questions varies between males and females respondents, pointing to gender-specific perception and assessment of health. Additionally, Jürges (2007) and Bago d' Uva et al. (2008) have shown that the assessments of health categories differs between countries, which implies that we do the analysis by country.

5. RESULTS OF ESTIMATION

Tables 2-A and 2-B show the SAHS and good health coefficients obtained from estimating Equations (1) to (5) on the time devoted to sleep, personal care, market work, non-market work and leisure, for men and women respectively.[7] Regarding results for men, we observe that in all countries both the SASH and the good health variables are associated with decreases in the time devoted to sleep, personal care, non-market work and leisure, while they are associated with increases in the time devoted to market work, with these associations being statistically significant at standard levels. These results are consistent with the results obtained by Podor and Halliday (2012) for market work and leisure in the US, but not for non-market work. In particular, and focusing on the SAHS variable, an increase of one category in the health status of men is associated with decreases in the time devoted to sleep of 2.8, 1.6, 1.5, 3.1, 2.5 and 1.5 percent in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively, with decreases in the time devoted to personal care of 3.2, 1, 4, 1.3 and 1 percent in France,

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[7] We do not show the coefficients for other controls (e.g., age, education, children, day of the week), and they are available upon request.

Italy, the Netherlands, Spain and the United Kingdom, respectively, with decreases in the time devoted to non-market work of 3.3, 3.7, 3.7, 10.3, 5.8 and 5.1 percent in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively, and with decreases in the time devoted to leisure of 3.9, 2.4, 6.9, 6.3 and 10.2 percent in France, Germany, the Netherlands, Spain and the United Kingdom.

We observe that the largest associations between health status and the time devoted to sleep and personal care are found in France, the Netherlands and Spain, while the largest associations between health status and the time devoted to market work, non-market and leisure are found in the Netherlands, Spain, and the United Kingdom. On the contrary, the smallest associations between health status and the time devoted to all the time use activities are found in Italy and Germany. Such differences point toward to a 3-group classification of countries based on results for men: the group that includes the Netherlands, Spain and the United Kingdom, the group of Germany and Italy, and the group that includes France only.

Regarding results for women, we observe that in all countries both the SASH and the good health variables are associated with decreases in the time devoted to sleep, personal care, and non-market work, while they are associated with increases in the time devoted to market work, with these associations being statistically significant at standard levels. These results are consistent with the results obtained by Podor and Halliday (2012) fort the US regarding market, but not for non-market work and leisure. Exceptions to these patterns are found in Italy, where personal care and better health are positively related, and better health has a non-statistically significant association with the time devoted to market work. In the case of leisure, the results for the relationship between health status and the time devoted to this activity are mixed, and while in Italy we find a positive association, we find a negative association in the United Kingdom, and no statistically significant associations for the rest of the countries.

In particular, and focusing on the SAHS variable, an increase of one category in the health status of women is associated with decreases in the time devoted to sleep of 2.5, 1.3, 1, 3.8, 1.9 and 1.6 percent in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively, with decreases in the time devoted to personal care of 2.2, 2.2, 2.1, 0.5 and 1.3 percent in France, Germany, the Netherlands, Spain and the United Kingdom, respectively, and with decreases in the time devoted to non-market

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work of 2, 2.7, 2.7, 2.3, 1.1 and 1.8 percent in France, Germany, Italy, the Netherlands, Spain and the United Kingdom, respectively. with decreases in the time devoted to leisure of 3.9, 2.4, 6.9, 6.3 and 10.2 percent in France, Germany, the Netherlands, Spain and the United Kingdom. An increase of one category in the health status of women is associated with an increase of 1.4 and 2.7 percent in the time devoted to personal care and Leisure in Italy, and with a decrease of 3.9 percent in the time devoted to leisure in the United Kingdom. Considering the reported associations between health status and the time devoted to all the time use activities, we cannot obtain clear patterns to group countries according to such associations. If we focus on leisure, we would have three groups of countries: a general group of countries composed by France, Germany, the Netherlands and Spain, and Italy and the United Kingdom that each one comprises a group.

We have additionally estimated the associations between health status and the time devoted to non-market work and leisure by decomposing each activity in several sub-categories (results are shown in Tables A4 and A5 of the Appendix).[8] For non-market work we consider "housework", "childcare", "shopping" and "other housework", and for leisure we consider "TV watching", "out of home leisure", "reading/listening", "other leisure" and "civic/voluntary". For men, the channels through which better health is related to less time in non-market work are housework, shopping and other housework, while childcare time seems to be non-sensitive to the health status of men. In the case of leisure, the channels through which better health is related to less time in this activities work are TV watching and other leisure. In the case of women, the channel through which better health is related to less time in non-market work is housework, while for leisure we observe that better health is related to less time watching TV but more time reading/listening and our of home leisure.

Finally, Tables 3-A and 3-B show for each country and gender the correlation matrix of residuals from estimating Equations (1) to (5) using the SAHS variable. According to Table 3-A, for men we obtain negative correlations between market work and the rest of activities, especially for non-market work and leisure. In this sense, the correlation of residuals between market work and non-market work is -0.47, -0.49, -0.43, -0.50, -0.44 and -0.51 for France, Germany, Italy, the Netherlands and the United

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[8] See Table A2 for a description of the activities included in each time use category.

Kingdom, and the correlation of residuals between market work and leisure is -0.64, -0.49, -0.60, -0.50, -0.64 and -0.60 for France, Germany, Italy, the Netherlands and the United Kingdom. Smaller negative correlations are found between market work, on the one hand, and sleep and personal care on the other. Personal care and sleep have very small correlation, and we find a positive correlation between personal care and sleep, on the one hand, and non-market work on the other, although such correlations are very small. For the rest of relationships, we find mixed evidence.

For women we obtain negative correlations between market work and the rest of activities, especially for non-market work and leisure. In this sense, the correlation of residuals between market work and non-market work is -0.61, -0.47, -0.57, -0.50, -0.52 and -0.52 for France, Germany, Italy, the Netherlands and the United Kingdom, and the correlation of residuals between market work and leisure is -0.55, -0.44, -0.46, -0.46, -0.54 and -0.52 for France, Germany, Italy, the Netherlands and the United Kingdom. Smaller negative correlations are found between market work, on the one hand, and sleep and personal care on the other. Small negative correlations are found between sleep, on the one hand, and personal care, non-market work and leisure, on the other. Non-market work seems to be positively correlated with personal care, and negatively correlated with leisure.

6. CONCLUSIONS

This paper analyzes the relationship between health status and time allocation decisions in 6 European countries. Using the Multinational Time Use Study, we find that a better perception of own health is associated with less time devoted to sleep, personal care, and non-market work, and with less time in leisure for men, while it is associated with more time in market work. We also find that the relationship across the activities is very similar across countries, and that market work has a relationship of substitution with sleep, personal care, non-market work and leisure, with mixed evidence for the rest of relationships. Endogeneity issues may affect the estimated relationship between health and time allocation decisions, and thus the approach adopted here is very descriptive, and we cannot talk about causations but about relationships. Our conclusions are

different to Podor and Halliday (2012) for the US, which may indicate that the relationship between health and time allocation decisions is genuine of the country.

Several factors may affect the relationship between health status and time allocation decisions. García-Gomez (2011) shows that there is a significant effect running from health to the probability of employment, and that cross-country differences in Social Security arrangements may help to explain differences in the estimates for the effects of the health shocks, such as differences in mechanisms of early retirement or disability policies. Although we can exert general patterns from our analysis, we find differences in the size of these relationships, especially for women. Second, to the extent that time allocation decisions seem to be less dependent of health status for women, especially in the case of leisure, social norms may be behind the relationship between health status and time allocation decisions, and may help to explain cross-country differences (Burda et al. 2012). In Mediterranean countries, more entrenched gender roles may lead to time allocation decisions to be less dependent on health status. Third, Apps and Rees (2005) argues that tax treatment of the female partner helps to explain cross-country differences in time allocation decisions over the life-cycle. We have shown that self-assessed health varies with age, and thus tax systems may also help to explain gender and cross-country differences in the relationship between health and time allocations decisions. All these factors are worth to analyze, and thus our analysis identifies lines for future research.

Our paper will be of interest for economists and policymakers. To the extent that leisure time has value (as studies measuring instant satisfaction have shown, i.e., Kahneman and Krueger, 2006), the evidence presented in this paper may provide a promising line of research for understanding cross-country differences in well-being. Additionally, as unhealthy people work less, our results help to explain a possible source of income inequality, both at the individual and country level. These issues are important to analyze, and thus we argue that health as an important factor to consider in future research.

REFERENCES

Aguiar, M. and E. Hurst (2007). "Measuring trends in leisure: The allocation of time over five decades," *Quarterly Journal of Economics* 122, 969–1007.

Anderson, K.H., and R.V. Burkhauser (1985). "The retirement-health nexus: a new measure of an old puzzle," *Journal of Human Resources* 20, 321–330

Apps, P., and R. Rees (2005). "Gender, time use, and public police over the life cycle," *Oxford Review of Economic Policy* 21: 439-461.

Au, D., T. Crossley and M. Schellhorn (2005). "The effects of health shocks and long-term health on the work activity of older Canadians," *Health Economics* 14, 999-1018.

Bago d'Uva, T., E. Van Doorslaer, M. Lindeboom, and O. O´Donnell (2008). "Does Reporting Heterogeneity Bias the Measurement of Health Disparities?" *Health Economics* 17: 351-375.

Barnay, T. (2010). "In which ways do unhealthy people older than 50 exit the labour market in France?" *European Journal of Health Economics 1*1, 127-140

Benitez-Silva, H., M. Buchinsky, H.M Chan, S. Cheidvasser and J. Rust (2004). "How large is the bias in self-assessed disability?" *Journal of Applied Econometrics* 19, 649–670.

Bianchi, S.M., M.A. Milkie, L.C. Sayer, and J.P. Robinson (2000) "Is Anyone Doing the Housework? Trends in the Gender Division of Household Labor," *Social Forces* 79: 191-228.

Biddle, J., and D. Hamermesh (1990). "Sleep and the allocation of time," *Journal of Political Economy* 98: 922–943.

Bonke, J. (2005). "Paid work and unpaid work. Diary information versus questionnaire information," *Social Indicators Research* 70: 349–368.

Burda, M., D. Hamermesh and P. Weil (2008). "The Distribution of Total Work in the US and EU," in *Working Hours and Job Sharing in the EU and USA: Are Americans Crazy? Are Europeans Lazy?* Boeri, Burda and Kramarz (eds.), Oxford Univ. Press.

Burda, M., D. Hamermesh and P. Weil (2012). "Total work and gender: facts and possible explanations*," Journal of Population Economics* 26: 239–261.

Bound, J. (1991). "Self-reported versus objective measures of health in retirement models," *Journal of Human Resources* 26, 106–138.

Cai, L., and G. Kalb (2006). "Health status and labour force participation: evidence from Australia," *Health Economics* 15, 241–261.

Connelly, R., and J. Kimmel (2009). "Spousal influences on parents' non-market time choices," *Review of Economics of the Household* 7: 361-394.

Crossley, T.F., and S. Kennedy (2002). "The reliability of self-assessed health status," *Journal of Health Economics* 21, 643-658.

Currie, J., and B. Madrian (1999). "Health, Health Insurance and the Labor Market," in *Handbook of Labor Economics*, Vol 3, Ashenfelter and Card (Eds.), Elsevier: Amsterdam.

Deaton, A.S., and C.H. Paxson (1998). "Ageing and inequality in income and health," *American Economic Review, Papers and Proceedings* 88, 248–253.

Disney, R., C. Emmerson and M. Wakefield (2006). "Ill health and retirement in Britain, A panel data-based analysis," *Journal of Health Economics* 25, 621-649.

Dwyer, D.S., and O.S. Mitchell (1999). "Health problems as determinants of retirement: are self-rated measures endogenous?" *Journal of Health Economics* 18, 173–193

Ettner, S.L. (1996). "New evidence on the relationship between income and health," *Journal of Health Economics* 15, 67–85.

EUROSTAT (2013). Statistics, http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes

Fisher, K., M. Egerton, J. Gershuny, and J. Robinson (2007). "Gender Convergence in the American Heritage Time Use Study," *Social Indicators Research* 82: 1–33.

Fisher K, Gershuny J, Gauthier A (2011) Multinational Time Use Study: User's Guide and Documentation. http://www.timeuse.org/files/cckpub/858/mtus-user-guide-r4.pdf. Accessed 1 September 2012.

Foster, G., and C. Kalenkoski (2013). "Tobit or OLS? An empirical evaluation under different diary window lengths," *Applied Economics* 45: 2994-3010.

Frazis, H., and J. Stewart (2012). "How to Think About Time-Use Data: What Inferences Can We Make About Long- and Short-Run Time Use from Time Use Diaries?" *Annals of Economics and Statistics* 105/106: 231-246.

Garcia-Gómez, P. (2011). "Institutions, health shocks and labour outcomes across Europe," *Journal of Health Economics* 30: 200-213.

Gauthier, A., T.M. Smmeding, and F.F.J. Furstenberg (2004). "Are parents investing less in children? Trends in selected industrialized countries," *Population and Development Review* 3: 647–671.

Gershuny, J. (2000). *Changing times, work and leisure in post industrial society*. Oxford: Oxford University Press.

Gershuny, J.I. (2009). "Veblen in Reverse: Evidence from the Multinational Time-Use Archive," *Social Indicators Research* 93: 37–45.

Gershuny, J.I. (2012). "Too Many Zeros: A Method for Estimating Long-term Time-use from Short Diaries," *Annals of Economics and Statistics* 105/106: 247-270.

Gershuny, J.I. (2013). "National Utility: Measuring the Enjoyment of Activities," *European Sociological Review*, forthcoming.

Gershuny, J., and O. Sullivan (2003). "Time use, gender, and public policy regimes," *Social Politics: International Studies in Gender, State and Society* 10: 205–228.

Gimenez-Nadal, J.I., and J.A. Molina (2013). "Parents' Education as a Determinant of Educational Childcare Time," *Journal of Population Economics* 26: 719-749.

Gimenez-Nadal, J.I, and R. Ortega (2013). "Health status and time allocation in Spain," *Applied Economics Letters* 20: 1435-1439.

Gimenez-Nadal, J.I., and A. Sevilla (2011). "The Time-Crunch Paradox," *Social Indicators Research* 102: 181-196.

Gimenez-Nadal, J.I., and A. Sevilla (2012). "Trends in time allocation: A cross-country analysis," *European Economic Review* 56: 1338-1359.

Gimenez-Nadal, J.I., A. Sevilla, and J.A. Molina (2012). "Social Norms, Partnerships and Children," *Review of Economics of the Household* 10: 215-236.

Goryakin, Y., L. Rocco, M. Suhrcke, B. Roberts and M. McKee (2013): "The effect of health on labour supply in nine former Soviet Union countries," *European Journal of Health Economics*, forthcoming.

Grossman, M. (1972a). "On the concept of health capital and the demand for health," *Journal of Political Economy* 80, 223-255.

Grossman, M. (1972b). *The Demand for Health: A Theoretical and Empirical Investigation* (Columbia University Press for the National Bureau for Economic Research).

Guryan, J., E. Hurst, and M. Kearney (2008). "Parental education and parental time with children," *Journal of Economic Perspectives* 22: 23–46.

Hallberg, D. (2003). "Synchronous leisure: Jointness and household labour supply," *Labour Economics* 10: 185–203.

Hallberg, D., and A. Klevmarken (2003). „Time for children: A study of parent's time allocation," *Journal of Population Economics* 16: 205–226.

Hamermesh, D. (2002). "Timing, togetherness and time windfalls," *Journal of Population Economics* 15: 601–623.

Hook, J.L. (2006). "Care in Context: Men's Unpaid Work in 20 Countries, 1965–2003," *American Sociological Review* 71, 639–60.

Jones. A., N. Rice and Roberts (2010). "Sick of work or too sick to work? Evidence on self-reported health shocks and early retirement from the BHPS," *Economic Modelling* 27, 866-880.

Juster, T., and F.P. Stafford (1985). *Time, Goods, and Well-Being*. Ann Arbor, MI: Institute for Social Research.

Jürges, H. (2007). "True Health vs Response Styles: Exploring Cross-Country Differences in Self-Reported Health," *Health Economics* 16: 163-178.

Kahneman, D. and A.B. Krueger (2006). "Developments in the Measurement of Subjective Well-Being," *Journal of Economic Perspectives* 20, 3-24.

Kahneman, D., A.B. Krueger, D. Schkade, N. Schwarz and A. Stone (2004). "A Survey Method for Characterizing Daily Life Experience: The Day Reconstruction Method," *Science* 3, 1776-1780.

Kalenkoski, C., D. Ribar and L. Stratton (2005). "Parental Childcare in Single Parent, Cohabiting, and Married Couple Families: Time-Diary Evidence from the United Kingdom," *American Economic Review* 95: 194-198.

Kalenkoski, C., D. Ribar, and L. Stratton (2009). "The influence of wages on parents' allocations of time to child care and market work in the United Kingdom," *Journal of Population Economics* 22: 399-419.

Kerkhofs, M., and M. Lindeboom (1995). "Subjective Health Measures and State Dependent Reporting Errors," *Health Economics* 4, 221-235.

Kimmel, J., and R. Connelly (2007). "Mothers' Time Choices: Caregiving, Leisure, Home Production, and Paid Work," *Journal of Human Resources* 42: 643–661.

Klevmarken, N.A. (2005). "Estimates of a labour supply function using alternative measures of hours of work," *European Economic Review* 49: 55–73.

Kreider, B. (1999). "Latent work disability and reporting bias," *Journal of Human Resources* 34, 734–769.

Krueger, A.B. (2007). "Are We Having More Fun Yet? Categorizing and Evaluating Changes in Time Allocation," *Brookings Papers on Economic Activity* 2, 193-217.

Lindeboom, M., and E. Van Doorslaer (2004). "Cut-point shift and index shift in self-reported health," *Journal of Health Economics* 23: 1083-1099.

Lindeboom, M., and M. Kerkhofs (2009). "Health and Work of the Elderly: Subjective Health Measures, Reporting Errors and the Endogenous Relationship Between Health and Work," *Journal of Applied Econometrics* 24: 1024-1046.

Podor, M., and T.J. Halliday (2012). "Health Status and the Allocation of Time," *Health Economics* 21, 514-527.

Robinson, J.P. and G. Godbey (1997). *Time for Life: The Surprising Ways Americans Use their Time.* University Park, Pennsylvania: The Pennsylvania State University Press.

Schneider, U., C. Pfarr, B. S. Schneider, and V. Ulrich (2012). "I feel good! Gender differences and reporting heterogeneity in self-assessed health," *European Journal of Health Economics* 13: 251-265.

Sevilla, A. (2010). "Household division of labour and cross-country differences in household formation rates," *Journal of Population Economics* 23: 225-249

Sevilla, A., J.I. Gimenez-Nadal, and J.I. Gershuny (2012). "Leisure inequality in the United States: 1965–2003," *Demography* 49: 939-964

Stern, S. (1989). "Measuring the effect of disability on labour force participation," *Journal of Human Resources* 24, 361–395.

Stiglitz, J., Sen, A., & Fitoussi, J.P. (2009). Report by the commission on the measurement of economic performance and social progress.

Tobin, J. (1958). "Estimation of relationships for limited dependent variables," *Econometrica* 26: 24–36.

Yee-Kan, M. (2008). "Measuring housework participation: The gap between ''stylised'' questionnaire estimates and diary-based estimates," *Social Indicators Research* 86: 381–400.

Figure 1-A.Time allocation and health status of respondents, males

Notes: The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the

Netherlands, Spain and the United Kingdom. *Time use activities* are measured in hours per day, see Table A1 for definitions of time-use categories.

Figure 1-B.Time allocation and health status of respondents, females

Leisure

Notes: The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the Netherlands, Spain and the United Kingdom. *Time use activities* are measured in hours per day, see Table A1 for definitions of time-use categories.

Figure 2-A. Health status by age of respondents, males

Notes: The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the Netherlands, Spain and the United Kingdom. *Time use activities* are measured in hours per day, see Table A1 for definitions of time-use categories.

Figure 2-B. Health status by age of respondents, females

Health status by age of respondents

Notes: The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the Netherlands, Spain and the United Kingdom. *Time use activities* are measured in hours per day, see Table A1 for definitions of time-use categories.

Table 1-A. Sum stats of time devoted to time use categories, by self-reported health status, males.

Males		(1) Sleep	(2) Personal Care	(3) Market work	(4) Non-Market work	(5) Leisure
France (N=4,443)	**Poor health**	9.662	2.909	2.511	2.120	6.798
	Fair Health	8.883	2.504	4.799	1.999	5.815
	Good Health	8.443	2.317	5.949	1.776	5.516
	Very Good Health	8.380	2.223	6.129	1.689	5.580
	Diff Very Good Health-Poor Health	-1.282	-0.686	3.618	-0.432	-1.218
	P-Value Difference	(<0.01)	(<0.01)	(<0.01)	(0.01)	(<0.01)
Germany (N=9,511)	**Poor health**	8.179	2.639	4.116	2.766	6.300
	Fair Health	7.961	2.578	5.321	2.857	5.278
	Good Health	7.871	2.498	5.890	2.543	5.192
	Very Good Health	7.796	2.480	6.099	2.413	5.207
	Diff Very Good Health-Poor Health	-0.383	-0.159	1.983	-0.353	-1.092
	P-Value Difference	(<0.01)	(0.03)	(<0.01)	(0.02)	(<0.01)
Italy (N=13,155)	**Poor health**	9.247	3.240	2.849	2.010	6.645
	Fair Health	8.072	2.793	6.373	1.677	5.079
	Good Health	8.003	2.769	6.717	1.505	5.002
	Very Good Health	7.940	2.737	6.498	1.288	5.529
	Diff Very Good Health-Poor Health	-1.307	-0.503	3.649	-0.722	-1.116
	P-Value Difference	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
The Netherlands (N=7,155)	**Poor health**	9.282	2.089	0.475	4.136	8.019
	Fair Health	8.721	2.193	3.367	2.981	6.736
	Good Health	8.100	1.901	6.318	2.316	5.363
	Very Good Health	7.965	1.798	6.658	2.137	5.441
	Diff Very Good Health-Poor Health	-1.316	-0.291	6.184	-1.998	-2.578
	P-Value Difference	(<0.01)	(0.07)	(<0.01)	(<0.01)	(<0.01)
Spain (N=13,198)	**Poor health**	9.407	2.837	2.611	2.327	6.817
	Fair Health	8.542	2.565	5.496	1.961	5.436
	Good Health	8.314	2.449	6.528	1.756	4.953
	Very Good Health	8.207	2.463	6.773	1.590	4.967
	Diff Very Good Health-Poor Health	-1.199	-0.374	4.161	-0.737	-1.851
	P-Value Difference	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
The United Kingdom (N=6,104)	**Poor health**	8.692	2.055	1.255	3.150	8.741
	Fair Health	8.248	1.668	4.689	2.648	6.683
	Good Health	8.103	1.662	6.004	2.384	5.784
	Very Good Health	8.110	1.620	6.397	2.378	5.437
	Diff Very Good Health-Poor Health	-0.582	-0.435	5.142	-0.772	-3.304
	P-Value Difference	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)

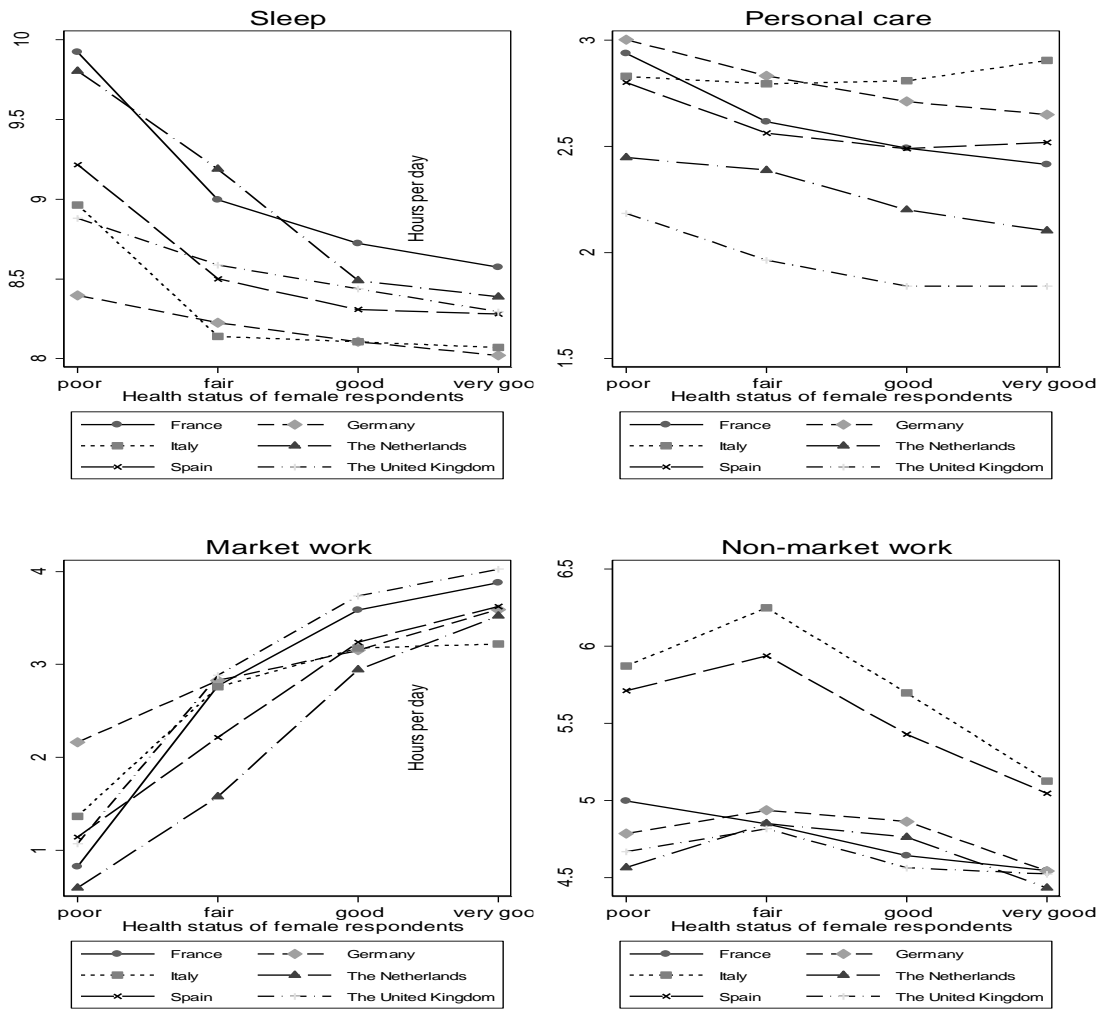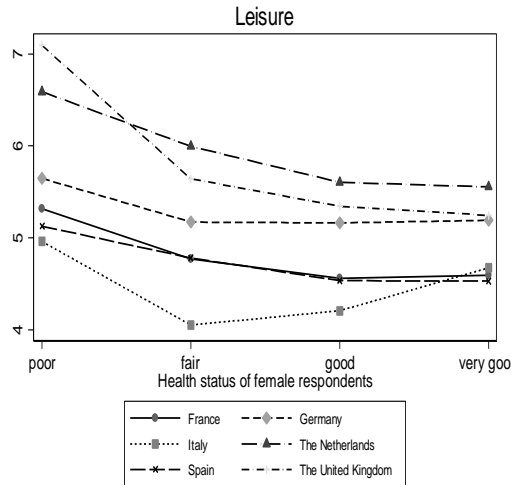*Notes*: Standard deviations in parenthesis. The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the Netherlands, Spain and the United Kingdom. Time use activities are measured in hours p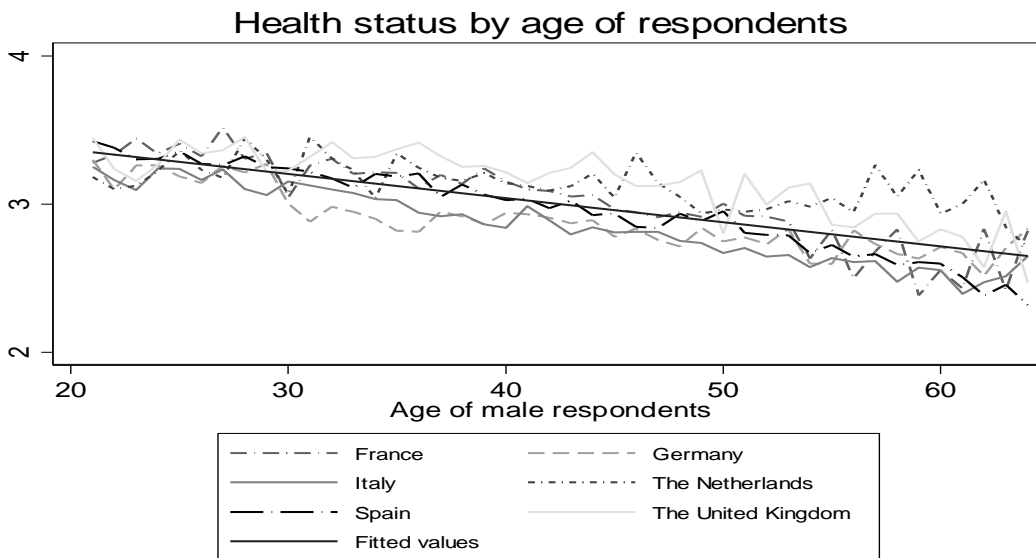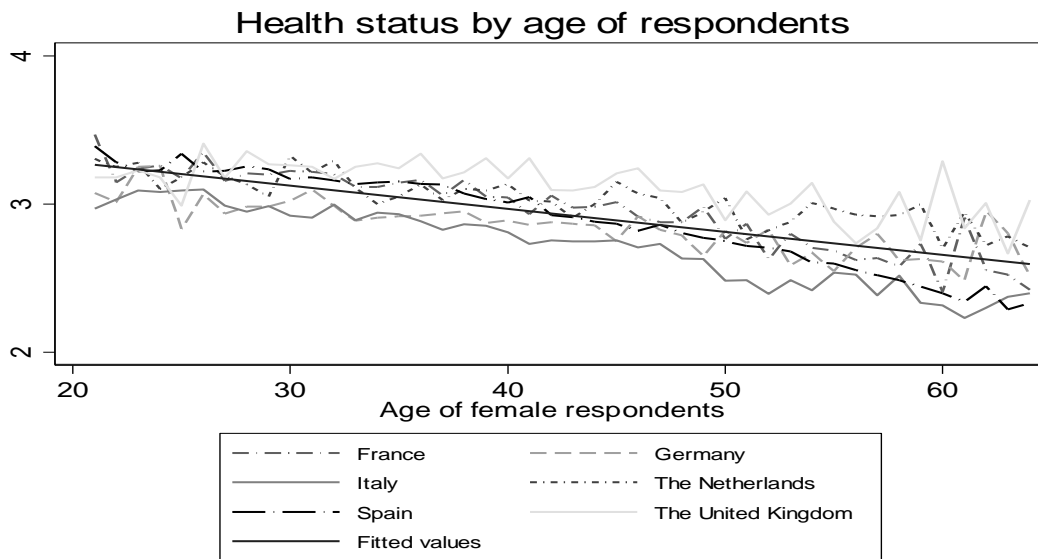er day, see Table A1 for definitions of time-use categories. Diff Very Good Health-Poor Health indicates the difference in the time

devoted to the reference time use activity between individuals reporting "very good health", and individuals reporting "poor health", p-value of such difference in parentheses.

Table 1-B. Sum stats of time devoted to time use categories, by self-reported health status, females.

Females		(1) Sleep	(2) Personal Care	(3) Market work	(4) Non-Market work	(5) Leisure
France (N=4,977)	Poor health	9.924	2.938	0.826	4.996	5.315
	Fair Health	8.997	2.617	2.768	4.848	4.770
	Good Health	8.722	2.491	3.585	4.642	4.560
	Very Good Health	8.572	2.415	3.878	4.543	4.592
	Diff Very Good Health-Poor Health	-1.352	-0.523	3.052	-0.453	-0.724
	P-Value Difference	(<0.01)	(<0.01)	(<0.01)	(0.06)	(<0.01)
Germany (N=11,381)	Poor health	8.398	3.002	2.164	4.785	5.647
	Fair Health	8.225	2.832	2.828	4.936	5.172
	Good Health	8.106	2.711	3.152	4.863	5.163
	Very Good Health	8.020	2.650	3.592	4.541	5.191
	Diff Very Good Health-Poor Health	-0.378	-0.353	1.428	-0.243	-0.456
	P-Value Difference	(<0.01)	(<0.01)	(<0.01)	(0.13)	(<0.01)
Italy (N=14,371)	Poor health	8.965	2.829	1.367	5.871	4.961
	Fair Health	8.139	2.795	2.759	6.249	4.053
	Good Health	8.105	2.809	3.176	5.696	4.208
	Very Good Health	8.069	2.905	3.220	5.125	4.674
	Diff Very Good Health-Poor Health	-0.896	0.076	1.853	-0.746	-0.286
	P-Value Difference	(<0.01)	(0.24)	(<0.01)	(<0.01)	(0.07)
The Netherlands (N=10,691)	Poor health	9.804	2.447	0.596	4.564	6.589
	Fair Health	9.188	2.387	1.577	4.849	5.996
	Good Health	8.489	2.201	2.943	4.761	5.605
	Very Good Health	8.388	2.102	3.522	4.432	5.555
	Diff Very Good Health-Poor Health	-1.416	-0.345	2.926	-0.132	-1.034
	P-Value Difference	(<0.01)	(<0.01)	(<0.01)	(0.56)	(<0.01)
Spain (N=15,425)	Poor health	9.216	2.801	1.144	5.711	5.127
	Fair Health	8.500	2.563	2.216	5.938	4.782
	Good Health	8.307	2.489	3.241	5.428	4.535
	Very Good Health	8.280	2.519	3.624	5.046	4.531
	Diff Very Good Health-Poor Health	-0.936	-0.282	2.480	-0.665	-0.596
	P-Value Difference	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)
The United Kingdom (N=7,090)	Poor health	8.879	2.185	1.071	4.668	7.094
	Fair Health	8.587	1.964	2.882	4.816	5.643
	Good Health	8.438	1.841	3.737	4.563	5.345
	Very Good Health	8.295	1.841	4.025	4.523	5.245
	Diff Very Good Health-Poor Health	-0.585	-0.344	2.954	-0.145	-1.850
	P-Value Difference	(<0.01)	(<0.01)	(<0.01)	(0.40)	(<0.01)

Notes: Standard deviations in parenthesis. The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the Netherlands, Spain and the United Kingdom. Time use activities are measured in hours per day, see Table A1 for definitions of time-use categories. Diff Very Good Health-Poor Health indicates the difference in the time

devoted to the reference time use activity between individuals reporting "very good health", and individuals reporting "poor health", p-value of such difference in parentheses.

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Table 2-A. Estimates of the effect of health status on various time use categories using MTUS data, males

Males	(1) Sleep SAHS	(2) Sleep GOOD HEALTH	(3) Personal Care SAHS	(4) Personal Care GOOD HEALTH	(5) Market work SAHS	(6) Market work GOOD HEALTH	(7) Non-Market work SAHS	(8) Non-Market work GOOD HEALTH	(9) Leisure SAHS	(10) Leisure GOOD HEALTH
France (N=4,443)	-0.028***	-0.052***	-0.032***	-0.063***	0.176***	0.349***	-0.033***	-0.078***	-0.039***	-0.077***
	(0.004)	(0.007)	(0.007)	(0.013)	(0.019)	(0.037)	(0.013)	(0.024)	(0.011)	(0.021)
Germany (N=9,511)	-0.016***	-0.019***	-0.005	-0.014*	0.084***	0.121***	-0.037***	-0.072***	-0.024***	-0.025**
	(0.003)	(0.005)	(0.005)	(0.007)	(0.013)	(0.021)	(0.010)	(0.015)	(0.007)	(0.011)
Italy (N=13,155)	-0.015***	-0.016***	-0.010***	-0.007	0.086***	0.125***	-0.037***	-0.048***	-0.008	-0.031***
	(0.003)	(0.004)	(0.004)	(0.006)	(0.012)	(0.018)	(0.008)	(0.013)	(0.006)	(0.010)
The Netherlands (N=7,155)	-0.031***	-0.063***	-0.040***	-0.072***	0.264***	0.638***	-0.103***	-0.235***	-0.069***	-0.181***
	(0.004)	(0.007)	(0.007)	(0.013)	(0.017)	(0.032)	(0.013)	(0.024)	(0.010)	(0.019)
Spain (N=13,198)	-0.025***	-0.039***	-0.013***	-0.028***	0.216***	0.380***	-0.058***	-0.100***	-0.063***	-0.115***
	(0.002)	(0.005)	(0.003)	(0.006)	(0.011)	(0.021)	(0.008)	(0.015)	(0.006)	(0.012)
The United Kingdom (N=6,104)	-0.015***	-0.028***	-0.010**	-0.009	0.250***	0.514***	-0.051***	-0.105***	-0.102***	-0.199***
	(0.003)	(0.007)	(0.005)	(0.011)	(0.014)	(0.031)	(0.010)	(0.022)	(0.008)	(0.017)

Notes: Robust standard errors in parenthesis. The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the Netherlands, Spain and the United Kingdom. Regressions include gender, age and its square, secondary and university education, the number of children under 18 in the household, household size, whether the youngest child is under 5, whether the youngest child is 5-12, whether the youngest child is 13-17, civic status (ref.: not in couple), and day-of-week dummies (ref.: Saturday). *Time use activities* are measured in hours per day, see Table A1 for definitions of time-use categories. *Significant at the 90% level. **Significant at the 95% level. ***Significant at the 99% level.

Table 2-B. Estimates of the effect of health status on various time use categories using MTUS data, females

Females	(1) Sleep SAHS	(2) Sleep GOOD HEALTH	(3) Personal Care SAHS	(4) Personal Care GOOD HEALTH	(5) Market work SAHS	(6) Market work GOOD HEALTH	(7) Non-Market work SAHS	(8) Non-Market work GOOD HEALTH	(9) Leisure SAHS	(10) Leisure GOOD HEALTH
France (N=4,977)	-0.025***	-0.040***	-0.022***	-0.038***	0.136***	0.237***	-0.020*	-0.038**	-0.003	-0.012
	(0.003)	(0.006)	(0.006)	(0.010)	(0.018)	(0.033)	(0.010)	(0.018)	(0.010)	(0.019)
Germany (N=11,381)	-0.013***	-0.017***	-0.022***	-0.034***	0.091***	0.100***	-0.027***	-0.028**	0.002	0.007
	(0.002)	(0.004)	(0.004)	(0.007)	(0.012)	(0.019)	(0.007)	(0.011)	(0.006)	(0.010)
Italy (N=14,371)	-0.010***	-0.007**	0.014***	0.016***	0.012	0.022	-0.027***	-0.044***	0.027***	0.034***
	(0.002)	(0.003)	(0.003)	(0.005)	(0.012)	(0.017)	(0.007)	(0.010)	(0.006)	(0.009)
The Netherlands (N=10,691)	-0.038***	-0.074***	-0.021***	-0.034***	0.167***	0.347***	-0.023***	-0.051***	-0.012*	-0.015
	(0.003)	(0.005)	(0.005)	(0.009)	(0.013)	(0.024)	(0.008)	(0.015)	(0.007)	(0.013)
Spain (N=15,425)	-0.019***	-0.029***	-0.005*	-0.013***	0.086***	0.159***	-0.011*	-0.027**	-0.008	-0.019*
	(0.002)	(0.004)	(0.003)	(0.005)	(0.010)	(0.018)	(0.006)	(0.011)	(0.006)	(0.010)
The United Kingdom (N=7,090)	-0.016***	-0.028***	-0.013***	-0.028***	0.167***	0.332***	-0.018**	-0.052***	-0.039***	-0.079***
	(0.003)	(0.006)	(0.005)	(0.010)	(0.013)	(0.028)	(0.008)	(0.017)	(0.007)	(0.014)

Notes: Robust standard errors in parenthesis. The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the Netherlands, Spain and the United Kingdom. Regressions include gender, age and its square, secondary and university education, the number of children under 18 in the household, household size, whether the youngest child is under 5, whether the youngest child is 5-12, whether the youngest child is 13-17, civic status (ref.: not in couple), and day-of-week dummies (ref.: Saturday). *Time use activities* are measured in hours per day, see Table A1 for definitions of time-use categories. *Significant at the 90% level. **Significant at the 95% level. ***Significant at the 99% level.

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Table 3-A. Correlation matrix of residuals, males

Males		(1) Sleep	(2) Personal Care	(3) Market work	(4) Non-Market work	(5) Leisure
France (N=4,443)	*Sleep*	1.00	-	-	-	-
Germany (N=9,511)		1.00	-	-	-	-
Italy (N=13,155)		1.00	-	-	-	-
The Netherlands (N=7,155)		1.00	-	-	-	-
Spain (N=13,198)		1.00	-	-	-	-
The United Kingdom (N=6,104)		1.00	-	-	-	-
France (N=4,443)	*Personal care*	0.06	1.00	-	-	-
Germany (N=9,511)		0.00	1.00	-	-	-
Italy (N=13,155)		0.01	1.00	-	-	-
The Netherlands (N=7,155)		-0.01	1.00	-	-	-
Spain (N=13,198)		0.01	1.00	-	-	-
The United Kingdom (N=6,104)		-0.02	1.00	-	-	-
France (N=4,443)	*Market work*	-0.39	-0.25	1.00	-	-
Germany (N=9,511)		-0.35	-0.32	1.00	-	-
Italy (N=13,155)		-0.37	-0.31	1.00	-	-
The Netherlands (N=7,155)		-0.36	-0.22	1.00	-	-
Spain (N=13,198)		-0.39	-0.26	1.00	-	-
The United Kingdom (N=6,104)		-0.34	-0.11	1.00	-	-
France (N=4,443)	*Non-market work*	0.07	0.15	-0.47	1.00	-
Germany (N=9,511)		0.05	0.10	-0.49	1.00	-
Italy (N=13,155)		0.02	0.09	-0.43	1.00	-
The Netherlands (N=7,155)		0.10	0.12	-0.50	1.00	-
Spain (N=13,198)		0.02	0.05	-0.44	1.00	-
The United Kingdom (N=6,104)		0.05	0.11	-0.51	1.00	-
France (N=4,443)	*Leisure*	-0.04	-0.06	-0.64	0.08	1.00
Germany (N=9,511)		-0.07	0.00	-0.49	-0.08	1.00
Italy (N=13,155)		-0.05	0.06	-0.60	0.01	1.00
The Netherlands (N=7,155)		-0.07	-0.10	-0.50	-0.05	1.00
Spain (N=13,198)		0.05	0.05	-0.64	0.03	1.00
The United Kingdom (N=6,104)		-0.03	-0.08	-0.60	0.01	1.00

Notes: Correlation matrix of residuals obtained from SURE model estimated according to Equations (1) to (5). The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the Netherlands, Spain and the United Kingdom. Regressions include gender, age and its square, secondary and university education, the number of children under 18 in the household, household size, whether the youngest child is under 5, whether the youngest child is 5-12, whether the youngest child is 13-17, civic status (ref.: not in couple), and day-of-week dummies (ref.: Saturday). *Time use activities* are measured in hours per day, see Table A1 for definitions of time-use categories.

Table 3-B. Correlation matrix of residuals, females

Females		(1) Sleep	(2) Personal Care	(3) Market work	(4) Non-Market work	(5) Leisure
France (N=4,977)	*Sleep*	1.00	-	-	-	-
Germany (N=11,381)		1.00	-	-	-	-
Italy (N=14,371)		1.00	-	-	-	-
The Netherlands (N=10,691)		1.00	-	-	-	-
Spain (N=15,425)		1.00	-	-	-	-
The United Kingdom (N=7,090)		1.00	-	-	-	-
France (N=4,977)	*Personal care*	0.01	1.00	-	-	-
Germany (N=11,381)		-0.03	1.00	-	-	-
Italy (N=14,371)		-0.05	1.00	-	-	-
The Netherlands (N=10,691)		-0.05	1.00	-	-	-
Spain (N=15,425)		-0.04	1.00	-	-	-
The United Kingdom (N=7,090)		-0.08	1.00	-	-	-
France (N=4,977)	*Market work*	-0.29	-0.29	1.00	-	-
Germany (N=11,381)		-0.27	-0.30	1.00	-	-
Italy (N=14,371)		-0.22	-0.30	1.00	-	-
The Netherlands (N=10,691)		-0.29	-0.21	1.00	-	-
Spain (N=15,425)		-0.27	-0.24	1.00	-	-
The United Kingdom (N=7,090)		-0.25	-0.12	1.00	-	-
France (N=4,977)	*Non-market work*	0.05	0.23	-0.61	1.00	-
Germany (N=11,381)		-0.01	0.02	-0.47	1.00	-
Italy (N=14,371)		-0.01	0.04	-0.57	1.00	-
The Netherlands (N=10,691)		-0.02	0.12	-0.50	1.00	-
Spain (N=15,425)		-0.08	0.02	-0.52	1.00	-
The United Kingdom (N=7,090)		-0.01	0.08	-0.52	1.00	-
France (N=4,977)	*Leisure*	-0.08	-0.09	-0.55	0.04	1.00
Germany (N=11,381)		-0.10	-0.02	-0.44	-0.18	1.00
Italy (N=14,371)		-0.12	0.07	-0.46	-0.10	1.00
The Netherlands (N=10,691)		-0.09	-0.11	-0.46	-0.12	1.00
Spain (N=15,425)		-0.02	0.05	-0.54	-0.05	1.00
The United Kingdom (N=7,090)		-0.10	-0.13	-0.52	-0.08	1.00

Notes: Correlation matrix of residuals obtained from SURE model estimated according to Equations (1) to (5). The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the Netherlands, Spain and the United Kingdom. Regressions include gender, age and its square, secondary and university education, the number of children under 18 in the household, household size, whether the youngest child is under 5, whether the youngest child is 5-12, whether the youngest child is 13-17, civic status (ref.: not in couple), and day-of-week dummies (ref.: Saturday). *Time use activities* are measured in hours per day, see Table A1 for definitions of time-use categories.

APPENDIX

Table A1. Description of time use surveys

Country	Year	Survey coverage	Original sample size	Analysis sample size
France	1998	16 February 1998 - 14 February 1999	15,441 diaries	9,420 diaries
Germany	2001	April 2001 - March 2002	35,813 diaries	20,892 diaries
Italy	2002	April 2002 - March 2003	51,206 diaries	27,526 diaries
The Netherlands	2000	Oct-00	15,428 diaries	8,454 diaries
	2005	Oct-05	12,691 diaries	9,392 diaries
Spain	2002	October 2002- October 2003	46,774 diaries	28.623 diaries
The United Kingdom	2000	June 2000 - August 2001	19,400 diaries	11,127 diaries
	2005		4,941 diaries	2,067 diaries

Source: Multinational Time Use Study (MTUS, www.timeuse.org) version 553 and harmonized surveys by authors. "Analysis sample size" refers to the number of observations from each survey that we use in our main empirical analysis. We restrict the sample to include only those individuals who had time diaries that summed to a complete day (i.e., 1440 minutes). All surveys include sample weights, and weights are adjusted to ensure each day of the week and each survey are uniformly represented.

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Table A2. Classification of time use activities

Time use categories	Time use activity codes
Sleep	"Sleep"
Personal Care	"Dress/personal care", "Consume personal services", "Meals and snacks"
Market work	"Paid work", "Paid work at home", "Paid work, second job", "Travel to/from work", "School, classes", "Study, homework"
Non-Market work	"Cook, wash up", "Housework", "Odd jobs", "Gardening", "Shopping", "Childcare", "Domestic travel"
Housework	"Cook, wash up", "Housework"
Childcare	"Childcare"
Shopping	"Shopping"
Other housework	"Gardening", "Shopping", "Domestic travel"
Leisure	"Free time travel", "Excursions", "Active sports participation", "Passive sports participation", "Walking", "Cinema or theatre", "Dances or parties", "Social clubs", "Pubs", "Restaurants", "Visit friends at their homes", "Listen to radio", "Watch television or video", "Listen to records, tapes, cds", "Read books", "Read papers, magazines", "Relax", "Conversation", "Entertain friends at home", "Knit, sew", "Other leisure", "Religious activities", "Civic activities"
TV watching	Watch television or video
Out of home leisure	"Free time travel", "Excursions", "Active sports participation", "Walking", "Cinema or theatre", "Dances or parties", "Social clubs", "Pubs", "Restaurants", "Visit friends at their homes".
Reading/listening	"Listen to radio", "Listen to records, tapes, cds,", "Read books", "Read papers, magazines"
Other leisure	"Passive sports participation", "Relax", "Conversation", "Entertain friends at home", "Knit, sew", "Other leisure"
Civic/religious	"Religious activities", "Civic activities"

Source: Multinational Time Use Study (MTUS).

Table A3. Sum stats of demographic characteristics of the samples

	France		Germany		Italy		The Netherlands		Spain		The United Kingdom	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Panel A: Males												
Age	40.426	(10.057)	43.741	(10.095)	40.230	(10.694)	42.259	(10.360)	41.668	(11.266)	41.482	(11.377)
Secondary education	0.497	(0.500)	0.474	(0.499)	0.788	(0.408)	0.351	(0.477)	0.540	(0.498)	0.395	(0.489)
University education	0.352	(0.478)	0.455	(0.498)	0.107	(0.309)	0.445	(0.497)	0.260	(0.438)	0.289	(0.453)
number of children <18	0.923	(1.119)	0.807	(0.900)	0.643	(0.914)	0.805	(1.087)	0.710	(0.920)	0.801	(1.086)
Household size	3.204	(1.391)	3.270	(1.269)	3.367	(1.195)	2.829	(1.380)	3.594	(1.297)	2.962	(1.365)
Age youngest child <4	0.182	(0.386)	0.138	(0.345)	0.074	(0.261)	0.173	(0.378)	0.155	(0.362)	0.165	(0.371)
Age youngest child 5-11	0.212	(0.409)	0.255	(0.436)	0.211	(0.408)	0.172	(0.377)	0.172	(0.377)	0.175	(0.380)
Age youngest child 13-17	0.114	(0.318)	0.146	(0.353)	0.105	(0.306)	0.074	(0.261)	0.121	(0.327)	0.093	(0.291)
Living in couple	0.771	(0.420)	0.807	(0.394)	0.656	(0.475)	0.766	(0.423)	0.705	(0.456)	0.759	(0.427)
Panel B: Females												
Age	40.842	(10.726)	42.869	(9.498)	41.226	(11.068)	42.323	(11.236)	42.537	(11.557)	39.822	(10.807)
Secondary education	0.466	(0.499)	0.612	(0.487)	0.728	(0.445)	0.461	(0.498)	0.511	(0.500)	0.391	(0.488)
University education	0.368	(0.482)	0.268	(0.443)	0.101	(0.302)	0.339	(0.474)	0.239	(0.427)	0.285	(0.452)
number of children <18	0.929	(1.125)	0.827	(0.890)	0.641	(0.910)	0.794	(1.051)	0.707	(0.923)	0.957	(1.135)
Household size	3.153	(1.372)	3.119	(1.233)	3.341	(1.163)	2.807	(1.277)	3.545	(1.318)	3.051	(1.333)
Age youngest child <4	0.178	(0.383)	0.128	(0.334)	0.071	(0.257)	0.177	(0.382)	0.150	(0.357)	0.190	(0.392)
Age youngest child 5-11	0.218	(0.413)	0.270	(0.444)	0.210	(0.408)	0.174	(0.379)	0.175	(0.380)	0.218	(0.413)
Age youngest child 13-17	0.117	(0.321)	0.163	(0.369)	0.110	(0.313)	0.076	(0.264)	0.122	(0.327)	0.106	(0.307)
Living in couple	0.773	(0.419)	0.733	(0.442)	0.722	(0.448)	0.769	(0.421)	0.724	(0.447)	0.708	(0.455)

Notes: Standard deviations in parenthesis. The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the Netherlands, Spain and the United Kingdom.

Table A4. Estimates of the effect of health status on components of non-market work and leisure using MTUS data, males

Males	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(8)
	Non-Market work				Leisure				
	Housework	Childcare	Shopping	Other housework	TV watching	Out of home leisure	Reading listening	Other leisure	Civic Voluntary
France (N=4,443)	-0.012	-0.001	-0.013*	-0.018*	-0.083***	-0.006	-0.007	0.001	0.019***
	(0.009)	(0.006)	(0.008)	(0.010)	(0.012)	(0.014)	(0.007)	(0.013)	(0.006)
Germany (N=9,511)	-0.004	-0.008*	-0.006	-0.014*	-0.073***	0.039***	0.001	-0.020**	0.009
	(0.007)	(0.005)	(0.005)	(0.008)	(0.009)	(0.010)	(0.006)	(0.008)	(0.007)
Italy (N=13,155)	-0.016***	-0.002	-0.002	-0.017***	-0.052***	0.050***	-0.007*	-0.016**	0.001
	(0.005)	(0.004)	(0.004)	(0.006)	(0.007)	(0.008)	(0.004)	(0.007)	(0.003)
The Netherlands (N=7,155)	-0.056***	-0.011*	-0.029***	-0.064***	-0.057***	0.014	-0.021**	-0.067***	-0.005
	(0.009)	(0.006)	(0.007)	(0.010)	(0.012)	(0.014)	(0.010)	(0.012)	(0.006)
Spain (N=13,198)	-0.027***	-0.003	-0.017***	-0.040***	-0.060***	-0.019**	-0.020***	-0.033***	-0.007***
	(0.005)	(0.003)	(0.004)	(0.006)	(0.006)	(0.008)	(0.004)	(0.007)	(0.003)
The United Kingdom (N=6,104)	-0.027***	-0.006	-0.024***	-0.029***	-0.103***	-0.018	-0.009	-0.055***	-0.009***
	(0.007)	(0.005)	(0.006)	(0.008)	(0.010)	(0.011)	(0.006)	(0.009)	(0.004)

Notes: Robust standard errors in parenthesis. The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the Netherlands, Spain and the United Kingdom. Regressions include gender, age and its square, secondary and university education, the number of children under 18 in the household, household size, whether the youngest child is under 5, whether the youngest child is 5-12, whether the youngest child is 13-17, civic status (ref.: not in couple), and day-of-week dummies (ref.: Saturday). *Time use activities* are measured in hours per day, see Table A1 for definitions of time-use categories. *Significant at the 90% level. **Significant at the 95% level. ***Significant at the 99% level.

Table A5. Estimates of the effect of health status on components of non-market work and leisure using MTUS data, males

Females	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(8)
	Non-Market work				Leisure				
	Housework	Childcare	Shopping	Other housework	TV watching	Out of home leisure	Reading listening	Other leisure	Civic Voluntary
France (N=4,977)	-0.029***	0.000	0.000	0.016*	-0.063***	0.042***	0.007	0.005	-0.006
	(0.010)	(0.007)	(0.009)	(0.010)	(0.011)	(0.013)	(0.007)	(0.010)	(0.005)
Germany (N=11,381)	-0.011	-0.001	-0.002	-0.016**	-0.054***	0.048***	0.016***	-0.016**	0.019***
	(0.007)	(0.005)	(0.005)	(0.007)	(0.008)	(0.009)	(0.005)	(0.007)	(0.006)
Italy (N=14,371)	-0.028***	-0.005	0.016***	0.007	-0.028***	0.064***	0.009**	0.005	-0.003
	(0.006)	(0.005)	(0.005)	(0.006)	(0.007)	(0.008)	(0.004)	(0.007)	(0.003)
The Netherlands (N=10,691)	-0.010	-0.001	-0.005	-0.008	-0.053***	0.048***	0.012*	-0.041***	0.000
	(0.007)	(0.006)	(0.006)	(0.008)	(0.009)	(0.011)	(0.007)	(0.009)	(0.005)
Spain (N=15,425)	-0.014**	0.003	0.011***	0.006	-0.028***	0.035***	0.006*	-0.017***	-0.003
	(0.006)	(0.003)	(0.004)	(0.005)	(0.006)	(0.007)	(0.003)	(0.006)	(0.002)
The United Kingdom (N=7,090)	-0.009	-0.006	-0.002	0.001	-0.056***	0.027***	-0.013**	-0.045***	0.001
	(0.007)	(0.005)	(0.006)	(0.008)	(0.008)	(0.010)	(0.005)	(0.008)	(0.004)

Notes: Robust standard errors in parenthesis. The sample is restricted to include non-retired/non-student individuals between the ages of 21 and 65 (inclusive) included in the Multinational Time Use Study (MTUS) from France, Germany, Italy, the Netherlands, Spain and the United Kingdom. Regressions include gender, age and its square, secondary and university education, the number of children under 18 in the household, household size, whether the youngest child is under 5, whether the youngest child is 5-12, whether the youngest child is 13-17, civic status (ref.: not in couple), and day-of-week dummies (ref.: Saturday). *Time use activities* are measured in hours per day, see Table A1 for definitions of time-use categories. *Significant at the 90% level. **Significant at the 95% level. ***Significant at the 99% level.