

Time-use analysis of work patterns, leisure activities and resulting energy use for Finland and France

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Abstract

We investigate how work time relates to leisure activity structures and associated energy use. To that end an analysis of time-use diary data is performed for Finland and France. Novel elements are (1) a differentiation between occupational groups, (2) the use of distinct energy intensities of activities by household type, and (3) allowing for non-linear relationships between work and other activities. We find that employment group differences are more pronounced in France than in Finland. Furthermore, activity duration is not always adjusted linearly to changes in hours worked, leading to different compositions of leisure activities when work time increases.

Extended summary

Studies of socio-economic impacts of climate and energy policies tend to focus on income and expenditure effects. For analyses that go beyond monetary dimensions, time-diary data has proven to be useful. Here we investigate how work time relates to leisure activity structures and associated energy use for different types of employees. The relationship between work patterns and environmental impacts has been addressed especially in the context of work time reduction scenarios (e.g. Schor, 2005; Rosnick and Weisbrot, 2007; Knight et al., 2013). Recently, a strand of literature has emerged that uses a microeconomic framing to analyse the marginal effects of a work time reduction on energy use and emissions (Nässén and Larsson, 2015; Buhl and Acosta, 2016). So far household heterogeneity in terms of employment patterns as well as energy intensity per time unit of an activity remains neglected in these studies. Our study builds on the above mentioned microeconomic approaches to analysing energy use through activities. Four research questions are guiding our analysis:

- (i) Which activities are undertaken more or less when comparing different levels of work time?
- (ii) How do people change duration of their leisure activities in response to changing work time?
- (iii) Does a person's employment status moderate the allocation of leisure time?
- (iv) How does the energy use of leisure activities change in response to different work hours?

To answer these questions, an analysis of time-use diary data is undertaken for Finland and France. We combine diary data from the harmonised multinational MTUS data base (see Gershuny et al., 2013) with estimates of energy intensity of various activities from the literature. These estimates stem from Jalas and Juntunen (2015) for Finland and De Lauretis et al. (2017) for France. They vary by activity and household type, where a household type is determined through household size, age and family status. Our econometric analysis consists of several multiple regression models, estimating the duration of various non-work activities and energy use during leisure on the time individuals spend at work.

$$Y_{i,j,d} = \beta_0 + \beta_1 WT_j + \beta_2 WT_j^2 + \beta_3 WT_j * PT_j + \beta_4 PT_j + \beta_n C_{n,j,d} + \mu_d + u_{i,j}$$

Where $Y_{i,j,d}$ is the time person j spends on activity i ($i=1, \dots, 23$) on day d . Each model includes a squared term of working time (WT^2) to allow for non-linear changes, as well as an interaction term between a part-time dummy and work hours ($WT*PT$) to observe potentially different effects for full-time and part-time employees. $C_{n,j,d}$ is a vector of n person-specific control variables, including age, gender, household size, education and income group and a work day dummy (1 if respondent worked at least 30 minutes on the diary day). μ_d is a vector of time-specific fixed effects for month and day of the week, accounting for the idea that many social practices differ between days or month. The sample size after data preparation is 3,290 observations for Finland and 12,295 for France.

Our results suggest that a limited number of activities are significantly, affected by average daily work hours. Generally, most activities are reduced in absolute duration and as a share of non-work time (relatively). Time is shifted towards sleep in both countries, and to personal care, eating/drinking and leisure in Finland. Overall, the estimates for different activities are closer to each other in terms of size in the French sample. These estimates also tend to be more significant compared to the Finish sample.

Regarding the shape of the relationship, we find significant non-linear coefficients for four activities per country. Most activities change strongly with the first hours of work, with the effect wearing off for people with longer work hours.

Part-time and full-time workers not only engage in different non-work activities, but the employment status also seems to work as a moderator for a number of activities. This means an additional hour of work leads to different adjustment between these two types of employees. This affects care or household tasks, as well as certain leisure activities. The differences between the two types are much more pronounced in France than in Finland.

Regarding energy use we are only accounting for energy outside of paid work. Hence it is not surprising that we find a significant reduction of energy use when work time increases for both countries. Interestingly though in France, the change in energy use is significantly different between part-time and full-time workers. We also assess energy intensity of leisure as a dependent variable, but the main coefficient from this regression does not meet our set level of significance. To conclude, our study shows that a more disaggregated analysis of time-use data can add relevant insights for evaluation, and possibly design, of energy, climate and labour-market policies.

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