

# The Welfare Effects of Time Reallocation

## Evidence from Daylight Saving Time

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**M**ore than 70 countries around the world currently observe daylight saving time (DST) to reduce energy demand. However, recent studies have shown that DST does not save energy and may actually increase electricity consumption. Furthermore, opponents of DST argue that even a one-hour time change can have long-term consequences for individuals. DST transition has been linked to increased risks of car accidents, heart attacks, and depressive symptoms in studies. According to our findings, the spring DST transition has a negative impact on individuals' welfare, specifically a decrease in life satisfaction. Investigating a broad range of outcomes, we show that this decline in life satisfaction can be explained by a decrease in sleep following the transition and

an increase in time pressure, which significantly affect individuals' physical and emotional health in subsequent days.

The DST policy has become increasingly contentious in recent years, with the European Parliament voting in March 2019 to repeal it. However, the process has so far been halted. This is due primarily to the COVID-19 pandemic but also because some countries, such as the United Kingdom and Ireland, argue that ending DST will result in a patchwork of time zones, further destabilizing the European Union. At the time of writing in July 2021, no negotiations had begun, and it may be some time before DST is phased out in the European Union. DST has been in place in most U.S. states since 1966, and it was extended as part of the Energy Policy Act of 2005. While the rationale for implementing DST has been to align



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day-to-day activities more closely with sunlight and reduce energy consumption, DST can also have many other impacts on people's lives. To shed light on this debate, it is crucial that policymakers have at their disposal overall estimates of the welfare costs and benefits associated with DST.

Our research focuses on the first-order effect of DST—its impact on people's well-being. So far, the majority of DST literature has focused on the effects of DST on specific outcomes in isolation (energy consumption, car accidents, heart attacks, workplace injuries, etc.). However, to assess the welfare costs and benefits of DST, we must also consider how people experience the transition.

DST has the potential to affect a population's well-being via two primary mechanisms. First, it causes a reallocation of time, which can have a significant impact on people's sleep schedules. According to some research, sleep duration decreases by 40 minutes on Mondays following the spring transition. Sleep deprivation can cause fatigue and attention issues as well as impair cognitive abilities and work performance. Second, by moving clocks forward one hour, the transition to DST reduces total time available and strengthens the time constraint in the days following the transition. Even if this increase in time constraints is only a short-term effect, it is likely to increase people's feelings of being rushed by time and have an impact on their emotional health. Furthermore, as time constraints increase, people may devote less time to restorative activities such as eating, socializing, and exercising, which are critical to health and emotional well-being.

There is little evidence of the impact of DST on individuals' well-being. Only two studies on subjective well-being have been conducted, and both suggest that the spring DST transition is associated with lower levels of life satisfaction. Our research makes three contributions. First, we use a model to estimate the effects of DST on people's well-being. We compare the average well-being of individuals on the days immediately preceding the DST transition with their well-being on the days following the transition, but we also compare this well-being change with the average well-being of individuals on the days immediately preceding and following the last Sunday of the month in the previous and subsequent months (January, February, April, and May) as a counterfactual. Second, we examine the effects of DST on a variety of outcomes to decompose the overall impact on well-being into a sleep-and-time-pressure component. This

includes looking into the effects of the spring DST transition on sleep, feeling rushed by time, satisfaction with day-to-day activities, and respondents' physical and emotional health. Finally, we use our estimates to conduct a cost-benefit analysis and discuss how repealing the DST could be welfare-efficient, providing policymakers with guidance on the welfare costs and benefits associated with this policy.

To identify the impact of DST on individuals' well-being, we use individual panel data from the German Socio-Economic Panel from 2008 to 2018 in which the same individuals are repeatedly interviewed every year. We first implement a regression-discontinuity design, exploiting the changes between standard time and DST on the last Sunday of the month in March. Then, using the previous and subsequent months as counterfactuals, we compare the average well-being of individuals around the spring DST with the average well-being of individuals on the counterfactual day around the last Sunday of the month in other months.

We find a decrease in life satisfaction following the DST transition. Our lower estimates indicate a decrease of 0.055 standard deviations (SD)—equivalent to a 1.25 percent decrease—while the other estimates report larger negative effects of around 0.069 SD—equivalent to a 1.57 percent decrease. The results are robust to the use of different model adjustments, time windows, and alternative control groups. By contrast, we find no discontinuity in life satisfaction around the last Sunday of the month in previous and subsequent months (January, February, April, and May).

We also investigate the persistence of these effects and find that the negative effects of the spring DST transition on individuals' life satisfaction persist for about six days after the nighttime shift and then dissipate. Interestingly, on the first weekend following the spring transition, there is a positive effect on life satisfaction, which could suggest that at least temporarily people enjoy having one extra hour of daylight in the evening once they have adjusted to the new time schedule. We then examine potential mechanisms. The results suggest that the spring DST transition significantly decreases sleep satisfaction by 0.15 SDs and increases reported time pressure by 0.17 SDs. Moreover, individuals tend to report lower physical and emotional health following the spring DST transition, as well as lower satisfaction with day-to-day activities. Once we control for sleep variables, the impact of DST on life satisfaction falls by about

64 percent, which suggests that sleep reduction is one of the main drivers explaining the decrease in life satisfaction.

In contrast, the fall DST transition, which involves turning the clocks back one hour, increases the total amount of available time. As a result, sleep patterns may adjust to the fall transition more quickly. We replicate our empirical strategy on the fall DST and show a significant increase in life satisfaction following the nighttime shift at the end of October. These findings support the notion that people may sleep longer or have more time to complete their activities on the Sunday following the fall transition. This also casts some doubts on the idea that respondents report lower levels of well-being after the spring transition simply because they do not like schedule changes.

These results are timely, given the recent debate on the DST policy. Our work suggests that the nighttime shift occurring at the end of March decreases individual well-being by the equivalent of an income loss of €393 per year. If we add to our analysis the positive effects associated with the fall transition,

ending DST would be equivalent to a small income loss of €32 (\$32) per capita. Next, we compare the potential benefits in terms of energy savings. Considering there is a decrease in energy consumption of about 0.5 percent over the year with DST, a number accepted by other researchers, our estimates suggest that putting an end to DST would then save approximately €27, or \$28, *per capita annually*. However, note that this is a lower estimation, as evidence that DST allows energy saving at all is increasingly challenged. This simple cost–benefit analysis suggests that ending DST would encompass some welfare improvement.

## NOTE

This research brief is based on Joan Costa-i-Font, Sarah Fleche, and Ricardo Pagan, “The Welfare Effects of Time Reallocation: Evidence from Daylight Saving Time,” IZA Institute of Labor Economics Discussion Paper no. 14570, July 2021.



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