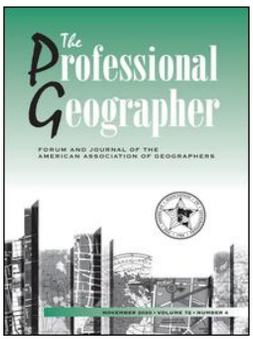

The Professional Geographer

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rtpg20

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To cite this article: Thomas Sigler, Hayley Boyd & Anthony Kimpton (2021): Sociospatial Factors Explaining Daylight Saving Preferences in Australia, The Professional Geographer, DOI: 10.1080/00330124.2021.1933550

To link to this article: https://doi.org/10.1080/00330124.2021.1933550

Sociospatial Factors Explaining Daylight Saving Preferences in Australia

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The regulation of time and time zones is a fundamentally geographical process that receives surprisingly little scholarly attention. Since the widespread adoption of internationally coordinated time during the industrial revolution, there have been only minor adjustments to the global distribution of time zones, most significantly in the implementation of daylight saving. Conceived as a way to adjust for the relatively longer length of summer daylight hours, the practice of daylight saving involves a twice-yearly shift to account for greater human activity in the evening than during early mornings. Recent developments, however, including increasing urbanization and asynchronous work schedules, have prompted many policymakers to reconsider time zone regulation and, in particular, daylight saving as a mechanism for seasonal adjustment. In this study, we examine sociospatial variables that explain preference for daylight saving in eastern Australia, where acrimonious debates scaffold the political and regulatory basis for its implementation. Focusing on a comparative analysis between Queensland—which does not observe daylight saving—and the remainder of the eastern Australian states and territories—which do observe daylight saving—we take an exploratory approach using inferential statistics to analyze which geographic, socioeconomic, lifestyle, and demographic variables explain a stated preference for daylight saving. We find that geographical and lifestyle variables are most influential in predicting daylight saving preference. With the exception of those north of the Tropic of Capricorn, all groups favor daylight saving, most by a large margin. Set against a local movement to implement daylight saving and a global movement to eliminate it, this study has important findings for time zone policy, suggesting that the logics underpinning such policy should be informed by latitudinal and longitudinal alignment, as well as contemporary lifestyle considerations. **Key Words: Australia, daylight saving time, socioeconomic variables, time geography.**

Daylight saving time (DST)—and time zones more broadly—is a fundamentally geographical phenomenon that has received surprisingly little scholarly attention, despite the complex, and often acrimonious, debates involving their regulation (Roenneberg, Wirz-Justice, et al. 2019). In addition to daylight saving, the regulation of time determines shopping hours, school times, curfew times, and closing times for bars and restaurants, all of which have social, financial, and occupational implications involving public opinions across the political spectrum. Whereas Earth's orbit determines where and when the sun shines, it is our time zones and seasonal adjustments through daylight saving that determine at what time this occurs.

Global movements for or against daylight saving are rising, catalyzed by concerns over whether embedded industrial systems such as time zones remain relevant as a globally urbanized society transitions toward a twenty-four-hour, postindustrial productivity cycle. This begs the important question of how effective current time zones are in regulating human activity and, on the extreme end of the spectrum, whether time zones are needed at all (Taylor 2016).

Historically, research on daylight saving has concentrated on its role in producing energy savings and on public health (Monk and Folkard 1976; Holland and Hinze 2000; Lambe and Cummings 2000; Varughese and Allen 2001). More recent debates, however, focus more firmly on the human impacts of DST, including the effects of the biannual shift on circadian rhythms (Young and Kay 2001; Kantermann et al. 2007; Martín-Olalla 2019a), lifestyle preference (e.g., morning sun vs. afternoon sun), and the impacts of asynchronicity on labor productivity (Chauvin, Choudhury, and Pang 2020).

In this article, we test geographical, socioeconomic, lifestyle, and demographic variables to explain the spatial variability of daylight saving preferences in Australia. We draw on primary data collected one week before and one week after the vernal daylight saving shift on the east coast of Australia to determine how each of these sociospatial factors influences individual preferences, with specific regard to the differences between Queensland—which does not observe daylight saving—and the remainder of the eastern Australian states and territories that do. After providing a brief background, we employ *t* tests and chi-square tests to examine bivariate explanations for daylight saving preference, which in turn informs our development of the first multivariate explanation of the daylight saving preferences using stepwise logistic regression. We present our results in a way to inform current and future debates surrounding time and time zone policy.

The Professional Geographer, 0(0) 2021, pages 1–10 © 2021 by American Association of Geographers.
Initial submission, November 2020; revised submissions, March and April 2021; final acceptance, April 2021.
Published by Taylor & Francis Group, LLC.

Daylight Saving Time in Context

Demand for a rigid time discipline (Thompson 1967) is the product of modernity and the industrial revolution, which required uniform times for coordinated activities such as factory work and mass transit. Standardized time zones were gradually implemented around the world in the late nineteenth century, with Greenwich Mean Time adopted as the de facto global convention in 1884, because there had been an urgent need to coordinate railway schedules in Britain, the United States, and elsewhere.

Although Benjamin Franklin had proposed daylight saving in 1784 to save candle wax during summer months, it was not adopted until 1916 as means to reduce energy use during wartime. As advocate William Willet ([1908] 2020) wrote, "Among the commercial advantages [of daylight saving] are that large users of gas and other artificial light would realize a saving of $15,000,000."

Although adoption of time zones was driven by industrialization and long-distance travel, the majority of global society until the mid-twentieth century was tied to highly localized agrarian livelihoods. This could explain why daylight saving did not receive serious consideration until industrialization required an expanding segment of society to work indoors within offices and factories. The implementation of daylight savings was initially gradual, but a rising number of countries began intermittent trials, and adoption eventually became widespread by the 1970s.

Daylight saving is currently observed by more than a billion people in approximately one quarter of the world's states and territories. With the exception of Belarus and Russia, all of continental Europe observes DST, as do several predominantly nontropical countries in which there is wide variation between summer and winter daylight hours. Additionally, there are a number of countries including Australia whose subnational states and territories vary in their observance of DST. Examples include Chile, whose Magallanes region has since 2017 permanently "shifted forward" (Martín-Olalla 2019b); the United States, in which forty-eight states observe DST and two do not (Arizona[1] and Hawaii); and Mexico, where border regions in northern states differ in their observance of daylight saving from the remainder of their territories.

The original justification for daylight saving has now completely vanished (conservation of candle wax), and arguments tied to energy savings have yielded mixed results that are often highly context specific. Although studies reveal that electricity for evening lighting can be rationed (Rivers 2018) by extending daylight hours into the evening, other energy costs such as fuel for cars, electricity for air conditioning, and morning energy consumption can increase (Kellogg and Wolff 2008; Kotchen and Grant 2011). Moreover, arguments that the biannual time change increases road collisions have been inconclusive (Carey and Sarma 2017), with the observed increase following the vernal shift potentially offset by greater evening visibility on the roads throughout the entire period. Evidence also suggests that animal strikes increase in Australia with the early onset of evening darkness (Ellis et al. 2016).

In terms of health and lifestyle impacts, research suggests that daylight saving increases afternoon physical activity (Wolff and Makino 2012) and decreases crime (Doleac and Sanders 2015). Likewise, television viewing routinely drops in the United States after the vernal time adjustment, suggesting that there might indeed be a shift away from indoor activity toward outdoor recreation (Yahr 2015). Goodman et al. (2014) found that longer evening daylight increased physical activity in British and Australian children, and Rosenberg and Wood (2010) found that daylight saving in Western Australia was more successful in promoting physical activity than individually targeted public health interventions.

Accordingly, opponents of daylight saving have shifted their argument from their initial focus on energy and economic savings toward lifestyle preferences and personal choice. Opponents claim that the time shift itself is unnecessary or that brighter mornings are preferable to longer evenings. First, there are those who oppose daylight saving based on their livelihood or religion, such as dairy farmers claiming time shifts disrupt milking times (Richmond 1977), and religious groups that regard time shifts as disruptive to their prayer routines. Second, there are those who regard biannual time shifts as disruptive to the body's natural circadian rhythm (Young and Kay 2001). Some see greater logic in remaining permanently on standard time (Roenneberg, Wirz-Justice, et al. 2019), whereas others advocate a permanent forward shift toward "year-round daylight saving." Third, there is the matter of extreme latitudes, both those in equatorial regions with little variation between summer and winter daylight hours and those in subpolar and polar regions with too much seasonal variation for daylight saving to make a meaningful difference (Martín-Olalla 2019b).

Proponents of daylight saving advocate along inverse lines of argumentation, stressing that delayed sunrises make for cooler, darker early mornings and later sunsets making for warmer, lighter afternoons. A variety of rationales are deployed in support of daylight saving, including the impacts on energy saving, outdoor activity, road safety, and alignment with human activities, among many others. More broadly, campaigns around the world are unified by their focus on lifestyle considerations tied to a fundamental shift in human diurnal patterns over the

past century. As widespread urbanization and industrialization have required increasing proportions of the Earth's population to conform to global temporal conventions (e.g., nine-to-five workday), proponents contend that contemporary waking hours are misaligned with daylight hours established according to agrarian or industrial work schedules.

The Australian Daylight Saving Debate

Australia has roughly followed the same trajectory as other parts of the world in its engagement with daylight saving, with early attempts during both World Wars and widespread adoption since 1971. Of Australia's six states, four (New South Wales, South Australia, Tasmania, and Victoria) currently observe daylight saving, whereas Queensland and Western Australia do not. Likewise, the Australian Capital Territory—an enclave surrounded by New South Wales—does, whereas the Northern Territory (situated primarily in the tropics) does not. This produces some interesting anomalies, such as South Australia being a half-hour ahead of Queensland during summer despite its state capital of Adelaide being located 1,400 kilometers west of Brisbane and Western Australia being two-and-a-half hours behind South Australia despite sharing a state border.

As such, the main territorial body of Australia that includes Tasmania observes three distinct time zones in the winter and five in the summer. Furthermore, Christmas Island, Norfolk Island, Cocos (Keeling) Islands, and Lord Howe Island all observe their own time zones. There are further aberrations in isolated communities within several states; for example, in Broken Hill—which is on Central Australian Time despite being in New South Wales—and through an observed yet unofficial time zone in several towns along the eastern border of Western Australia (Universal Coordinated Time [UTC] + 8:45). There is also a consideration regarding the relatively small size of the southern states that do observe daylight saving and the large size of the northern states that do not; although 69 percent of the national population observes the biannual time shift, this population occupies just 27 percent of the large national territory.

The daylight saving debate in Australia centers on a vexatious geographical problem considering the country's extensive north–south (3,600 km) and east–west (4,000 km) span against a backdrop of low overall population density that concentrates along the country's coastlines. In the northernmost part of the country (Cape York Peninsula, Queensland), sunlight hours vary between eleven hours, thirty minutes in the winter and twelve hours, forty-five minutes in the summer. In contrast, Tasmanian daylight hours vary from just over nine hours in late June to fifteen hours, fifteen minutes in December. However, given the trajectory of the sun, it is perhaps east–west variation that matters most. The two states in which is the issue is most contentious—Western Australia and Queensland—span 19° to 15°, respectively. This produces enormous within-state variation. For example, in Queensland, the earliest summer sunrise time is 4:41 a.m. on the Gold Coast but not until 5:52 a.m. in Mount Isa.

In the Australian political and media spheres, daylight saving is debated annually, most palpably during the period leading up to the annual shifts. Unlike other countries, the regulation of time zones is primarily the responsibility of individual states and territories. All Australian states have undergone some form of public debate prior to trials and experimented with the concept prior to widespread implementation in the case of the southern states (Pearce 2017b). Western Australia and Queensland have both trialed daylight saving, but the issue was rejected by voters in both states, most recently in 2009 and 1992, respectively. Despite this outcome, both states still have lobby groups supporting daylight saving, and recent polls have shown the inverse preference: A majority of the population in both states supports daylight saving (Passmore and Pierce 2018). The issue is perhaps less contentious in Western Australia than in Queensland, because the population is concentrated in the state's southwest corner, meaning that the impacts of early sunrises and sunsets are less extreme than in Queensland.

Within Queensland, the debate is particularly vexatious given that the time zone boundary effectively bifurcates the Gold Coast (Queensland)–Tweed (New South Wales) urban region. The town of Coolangatta is bisected by the aptly named Boundary Street, with eastbound traffic observing UTC+10 and westbound traffic in UTC+11 in the summer months. Figure 1 demonstrates this shift.

Conversely, Queensland's strongest opposition to daylight saving is generally from the state's tropical northwestern regions.

Analysis of Daylight Saving Preference

This article tests stated preference for DST on the east coast of Australia against four sets of sociospatial variables, each reflecting a key theme in arguments for or against its implementation. It focuses on contrasting Queensland to the remaining eastern Australian states (New South Wales, Victoria, and Tasmania, plus the Australian Capital Territory) with which it shares a time zone (Australian Eastern Standard Time) for part of the year. The binary dependent variable reveals whether participants do support daylight savings (non-Queensland respondents) or would support daylight savings (Queensland respondents). The analysis is structured around four

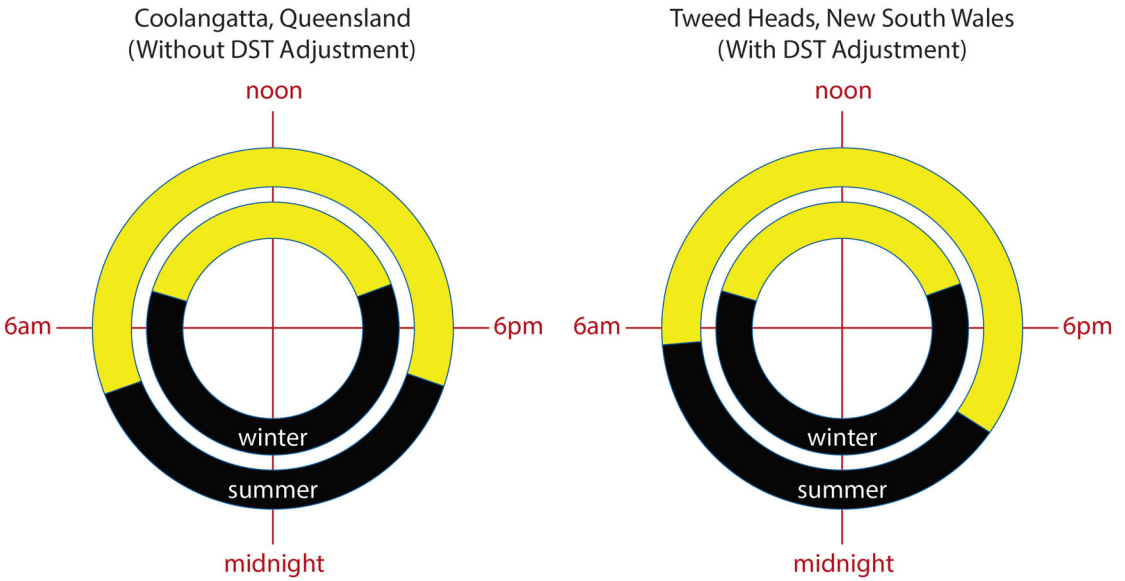

Figure 1 *Illustration of DST shift on either side of the Queensland–New South Wales boundary. DST = daylight saving time.*

groupings around which arguments for or against daylight saving have been deployed.

First, there has been evidence to suggest that geographical location plays a large role in the degree to which daylight saving is useful, and therefore desirable. Equatorial regions, for example, vary little in seasonal daylight, and polar regions vary too much. In Queensland, for example, large north–south and east–west differences account for the fact that support for daylight saving is strongest in the state's southeast corner where it would have the greatest impact in mitigating early sunrises and sunsets. Furthermore, because the east coast of Australia extends from temperate to tropical climate zones, there is great variation in summer diurnal temperatures. Accordingly, we test the following geographic variables: Queensland State (yes = 1), latitude (continuous), longitude (continuous), and tropical location (yes = 1).

The second group of factors is *socioeconomic*, because past research suggests occupation might influence preference for morning or evening daylight. Outdoor workers such as farmers (Pearce 2017a) might prefer early morning daylight, whereas office workers might prefer daylight saving more than others because they are less likely to work outdoors and more likely to work with interstate clients or customers, which is disrupted by the current time zone regime (with Queensland an hour behind in summer months). Full-time employees with regular work schedules might also prefer daylight saving. We tested the following socioeconomic variables: full-time employment (full-time = 1), blue-collar industry (manufacturing; construction; agriculture, forestry, and fishing; wholesale trade; electricity, gas, water, and waste services; transport, postal, and warehousing; or mining = 1), mostly labor-intensive work (at least 50 percent of work week engaging in intensive labor), and student (yes = 1).

Third, we tested lifestyle factors, which increasingly appear in the literature as rationale for supporting or opposing daylight saving. In particular, there are arguments that those who rise earlier (early birds), exercise earlier, or get to work earlier are less likely to want daylight saving; conversely, those rising later, exercising later, or working later would support the measure. We tested the following lifestyle variables: regular work schedule (weekly work start time variance below average = 1); average wake time, start morning exercise, start work, finish work, start afternoon exercise, and sleep time throughout the week (decimal hours); and, finally, weekly morning and afternoon exercise duration (minutes). These average time variables are coded as indicator variables for the multivariate analysis where *early* indicates that the activity occurs earlier in the day than the sample mean.

The fourth grouping of factors is demographic, because there may be age-based or gender-based preferences. Age in particular is hypothesized to play a strong role. The proportion of the Australian population supporting daylight saving has grown over time, meaning that younger voters might have a stronger affinity than older voters. Finally, we tested the following demographic variables: age (years) and gender (female = 1).

Data Collection and Methods

The research method used throughout this study was a survey that collected information about the

Table 1 *Stated preference for DST by region in eastern Australia*

Region	% Support DST (*n*)			Chi-square *p* value
	Yes	No	Total	
Brisbane	70 (88)	30 (37)	100 (125)	0.00
Queensland (except Brisbane)	48 (58)	52 (62)	100 (120)	
Eastern Australian capital cities (except Brisbane)	88 (87)	12 (12)	100 (99)	
Eastern Australia outside capital cities (except Queensland)	85 (144)	15 (26)	100 (170)	

DST = daylight saving time.

timing of respondent's daily activities and a final question on their preference for daylight saving. The survey was deployed twice: once prior to the commencement of DST (23 through 29 September 2019) and again after (10 through 17 October 2019). The survey consisted of ninety-two questions with expansive skip logic to maximize the completion rate by minimizing demands on the participant's time. Furthermore, the questions specifically targeted information surrounding the individual's time use activities including when they wake, start work, finish work, participate in physical activity, and go to sleep. Respondents were recruited from community noticeboards on Facebook, with a spatially stratified approach attempting to capture proportional numbers of Queensland and non-Queensland respondents, split between the two sample periods.

To contrast Queensland against the states and territories that are longitudinally aligned, approximately half of the survey respondents were sampled within Queensland (245), and the remainder (269) were distributed across Australian Capital Territory, New South Wales, Tasmania, and Victoria. The first survey deployment saw a total of 250 survey responses and the second recorded a total of 277. Personal information was not collected to assure anonymity, and each respondent was geographically enumerated to their postal area's centroid and aggregated to Greater Capital City Statistical Areas (Australian Bureau of Statistics 2020) when contrasting regions.

To condense the analysis, sociospatial variables are grouped according to whether the measure was continuous and categorical. To examine bivariate explanations for supporting DST, *t* tests were used for continuous explanatory variables and chi-square tests for categorical variables. Following that, a stepwise logistic regression was used to examine a multivariate explanation of supporting DST with this formula:

$$\log_b \frac{P(Y=1)}{1-P(Y=1)} = \beta_0 + \beta_1 x_1 + \beta_2 x_2,$$

where $Y = 1$ indicates support for DST and $Y = 0$ indicates not supporting DST, and $\log_b \frac{P(Y=1)}{1-P(Y=1)}$ is therefore the log odds of supporting DST. Further, β_0 is the *y*-intercept, and $\beta_1 x_1$ is the first parameter included in the model for predicting support for DST. Last, these log odds were exponentiated as odds ratios to simplify interpretation.

Results

The survey results indicate that a clear majority of respondents favors DST but with some degree of geographical variation. Throughout Greater Brisbane, 70 percent of respondents are in support of DST, whereas just 48 percent of the remaining Queensland respondents are in support of DST. In contrast, 88 percent of respondents from Sydney, Melbourne, Canberra, and Hobart are in support of DST, whereas 85 percent of regions outside of these capital cities are also in support, thus suggesting that the urban–nonurban divide in opinions occurs primarily within Queensland, which has considerably more latitudinal and longitudinal range. Table 1 describes these differences.

The chi-square test confirms that support for DST varies by region and that this variation is unlikely to be attributable to sampling error ($p < 0.01$). Figure 2 shows variation in responses by state, with the number of survey responses by region corresponding to circle size.

A descriptive comparison of mean values among the continuous explanatory variables reveals that respondents who support DST are roughly the same age, start and finish work slightly later, spend more time engaging in labor-intensive tasks at work, dedicate more time to exercise throughout their week, go to bed later, and reside farther west than other respondents. To contrast these population means, however, *t* tests reveal that these distinctions are not statistically significant. It is possible, though, that there are combinatorial associations between multiple explanatory variables and support for DST that will be revealed by the statistical model.

In contrast, *t* tests reveal that certain geographical variables are statistically significant. Respondents who support DST reside 4.36° farther south (32.09° compared to 27.73°) on average than respondents who do not. In the following part of the analysis we therefore test the effect and significance of location within the northern state of Queensland, tropical climate, and proximity to the equator. Table 2 summarizes these results.

Analysis of categorical explanatory variables reveals that lifestyle and geographical factors influence daylight saving preference. Respondents who have regular work schedules (the bottom half for work start time variance) are more likely to support DST (78 percent) than those who do not (71

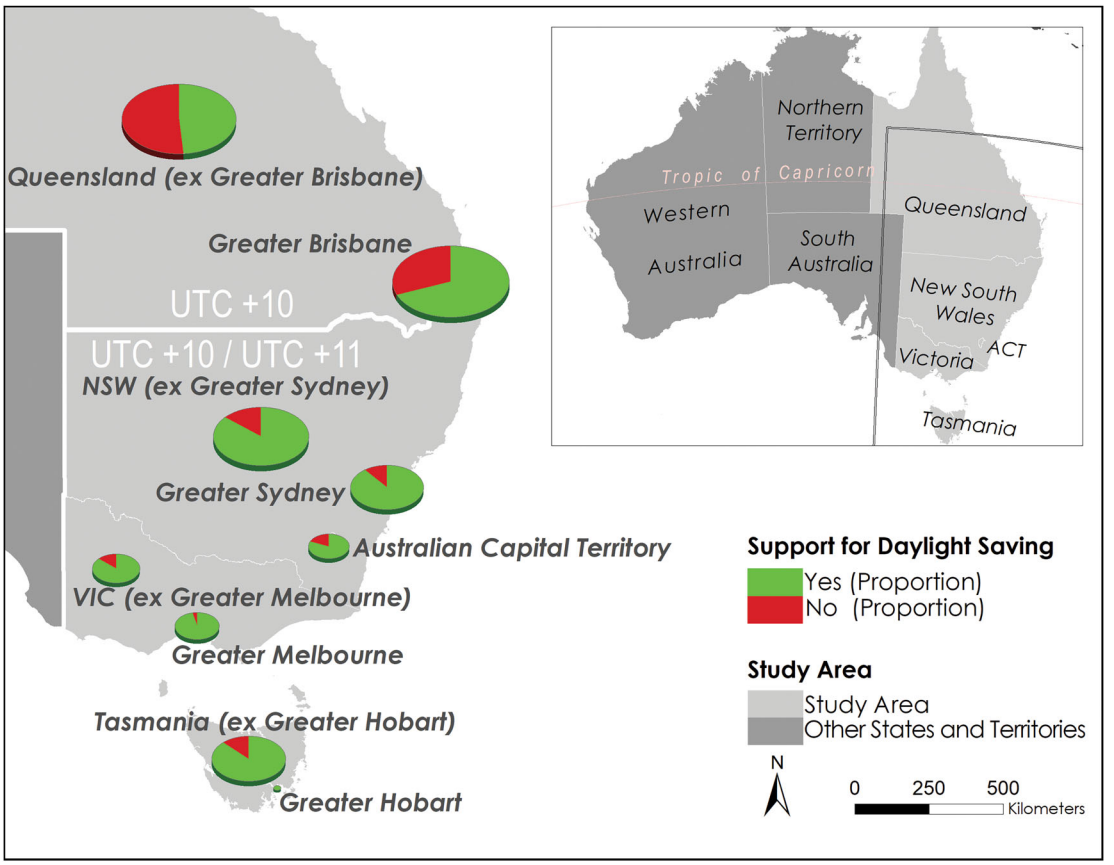

Figure 2 *Support for daylight saving time by Greater Capital City Statistical Area (circle size represents number of responses by geographical area).*

Table 2 *Stated preference for DST explained according to the continuous explanatory variables*

	Support DST (*M*)		*t* Test	
Explanatory variable	**Yes**	**No**	***p* Value**	***t* Statistic**
Age (years)	43.17	43.13	0.98	–0.03
Wake time (decimal hours)	6.32	6.11	0.14	–1.49
Morning exercise start (decimal hours)	5.87	5.95	0.68	0.42
Morning exercise duration (minutes per week)	28.84	23.04	0.50	–0.67
Work start (decimal hours)	8.61	8.45	0.48	–0.71
Labor-intensive work (%)	56.26	54.29	0.76	–0.30
Work finish (decimal hours)	16.47	16.03	0.12	–1.58
Afternoon exercise start (decimal hours)	17.75	17.75	0.98	0.02
Afternoon exercise duration (minutes per week)	71.77	55.75	0.25	–1.15
Sleep time (decimal hours)	22.37	22.06	0.12	–1.57
East (degrees)	150.13	150.26	0.66	0.44
South (degrees)	32.09	27.73	0.00	–7.27

DST = daylight saving time.

percent), suggesting that workplace routines have an influence ($p = 0.1$). Additionally, those residing in Queensland were less likely to support DST (60 percent) than respondents in the remainder of the study area (86 percent), which was a statistically robust finding ($p < 0.001$), and this distinction widened when examining those residing in the tropics (46 percent for DST) compared to the remaining regions of eastern Australia (77 percent), even when nontropical parts of Queensland were included. This finding was also statistically robust ($p < 0.001$), suggesting that geographical location has a vital role in explaining support for DST.

We also find that respondents indicating that they are female are less likely (73 percent) to support DST than those who do not (78 percent), although this finding is not statistically significant ($p = 0.48$). In contrast, students are more likely to

Table 3 *Stated preference for DST explained according to the categorical explanatory variables*

Explanatory variable	Response	% Support DST (*n*)			Chi-square *p* value
		Yes	No	Total	
Female	No	78 (43)	22 (12)	100 (55)	0.48
	Yes	73 (335)	27 (126)	100 (461)	
Student	No	73 (368)	27 (136)	100 (504)	0.64
	Yes	83 (10)	17 (2)	100 (12)	
Regular work schedule	No	71 (231)	29 (96)	100 (327)	0.10
	Yes	78 (147)	22 (42)	100 (189)	
Full-time employment	No	72 (206)	28 (79)	100 (285)	0.65
	Yes	74 (172)	26 (59)	100 (231)	
Blue-collar industry	No	73 (340)	27 (124)	100 (464)	1.00
	Yes	73 (38)	27 (14)	100 (52)	
Which survey	Before DST	74 (182)	26 (64)	100 (246)	0.80
	During DST	73 (196)	27 (74)	100 (270)	
In Queensland	No	86 (231)	14 (38)	100 (269)	0.00
	Yes	60 (146)	40 (99)	100 (245)	
In Tropics	No	77 (349)	23 (104)	100 (453)	0.00
	Yes	46 (28)	54 (33)	100 (61)	

DST = daylight saving time.

support DST (83 percent) than nonstudents (73 percent), but again this finding is not statistically significant ($p = 0.64$). We find little impact of those reporting full-time employment and type of employment (e.g., blue collar or white collar). Table 3 summarizes the categorical variable responses.

Given the potential for covariance (e.g., residing in Queensland and the tropics) and combinatorial effects (e.g., degrees east and degrees south when most Australians reside along the angled eastern coast), a multivariate analysis is required. A stepwise approach is used to determine whether introducing the regional variables improves the explanatory power of the model. The model confirms that having a regular work schedule increases the likelihood of supporting DST by 53 percent (odds ratio [OR] = 1.53, $p < 0.1$), although it is notable that this finding is no longer significant once the regional effect is observed. Furthermore, having employment that is full time, mostly labor intensive, or in a blue-collar industry does not influence support for DST ($p > 0.1$), nor does waking time, morning exercising, or sleeping early ($p > 0.1$), although those starting exercise early in the afternoon are 54 percent more likely to support DST, which could suggest that these are respondents who generally exercise outside and in sunlight (e.g., field sports) rather than later and indoors (e.g., gyms). In addition, the model confirms that age, gender, and student status have no discernible influence once all other explanatory variables are observed ($p > 0.10$).

Akaike's information criterion (AIC) confirms that introducing the regional variables improves the explanatory power of the model (AIC = 559.069) beyond a model that includes just personal and lifestyle explanatory variables. The regional model has the capacity to explain 14 percent ($R^2 = 0.140$) of the variation observed within the convenience sample, whereas personal and lifestyle explanatory variables alone can explain just 2 percent ($R^2 = 0.021$) of this variance.

When all of the geographical variables are examined, residing each degree east increases the likelihood of supporting DST by 16 percent (OR = 1.16, $p < 0.05$) and each degree south increases the likelihood by 15 percent (OR = 1.15, $p < 0.05$). Residing in Queensland or the tropics provides no further explanation for supporting DST ($p > 0.01$) once latitude and longitude are considered. These multivariate regional findings are particularly interesting given that Brisbane, the capital of Queensland, is located approximately 2° east of Sydney, 4° east of Canberra, 6° east of Hobart, and 8° east of Melbourne. In other words, it is possible that political geography has no influence whatsoever or that the relatively lower preference for DST in nonurban Queensland is explained by latitude and longitude alone. Table 4 summarizes the results of the multivariate model.

Discussion

Time geography offers a valuable lens into a critical dimension of human activity. Time is superimposed on us, yet determines to such a large extent when we wake, work, recreate, eat, sleep, and perform other daily activities. Locally, there are coupling constraints that limit the efficacy of time regimes. As Hägerstrand (1970) famously wrote, people in industrial societies

> follow predetermined time-tables, often the same, weekday after weekday. This principle, which exists in the factory and the school, generally operates over the head of the participating individual. After that, he has to obey the choreography of his superior, as long as he wants to maintain a contractual arrangement … families have to adjust to compulsory timetables. (15)

Some diurnal activities are reliant on daylight (e.g., outdoor sports and work), whereas others are not

Table 4 *Stated preference for DST explained according to multiple explanatory variables using logistic regression*

Model	Demographic, socioeconomic, lifestyle			Geographic		
Explanatory variables	**Odds ratio**	**Log-odds**	***SE***	**Odds ratio**	**Log-odds**	***SE***
Age (years)	1.00	0.00	0.01	1.00	0.00	0.01
Female (yes = 1)	0.73	–0.32	0.36	0.58	–0.54	0.38
Student (yes = 1)	2.12	0.75	0.81	1.51	0.41	0.86
Regular work schedule (yes = 1)	1.53*	0.42	0.26	1.51	0.41	0.27
Full-time employment (yes = 1)	0.95	–0.05	0.26	0.87	–0.13	0.28
Blue-collar industry (yes = 1)	0.92	–0.08	0.35	0.88	–0.13	0.37
Mostly labor intensive (yes = 1)	1.10	0.10	0.27	0.99	–0.01	0.29
Early wake time (yes = 1)	0.90	–0.10	0.27	1.01	0.01	0.30
Early morning exercise (yes = 1)	1.24	0.22	0.53	2.06	0.72	0.55
Early work start (yes = 1)	0.92	–0.09	0.30	0.97	–0.03	0.32
Early work finish (yes = 1)	0.56	–0.58	0.61	0.85	–0.17	0.67
Early afternoon exercise time (yes = 1)	1.58**	0.45	0.23	1.54*	0.43	0.24
Early sleep time (yes = 1)	1.05	0.05	0.87	1.37	0.32	0.93
East (degrees)				1.16**	0.15	0.07
South (degrees)				1.15**	0.14	0.06
In Tropics (yes = 1)				2.53	0.93	0.75
In Queensland (yes = 1)				0.51	–0.68	0.45
N		514			514	
R^2		0.021			0.140	
AIC		613.266			561.067	

DST = daylight saving time; AIC = Akaike's information criterion.
*$p < 0.1$.
**$p < 0.05$.
***$p < 0.01$.

(e.g., office work), yet only slowly have we witnessed a decay of traditional activity patterns (e.g., nine-to-five workdays) that create such tensions. Globally, coupling constraints are made even more challenging, because unique time zones and time disciplines render geographical coordination difficult. The widespread public debate surrounding daylight saving draws into question the suitability of globally standardized time zones, as well as adjustments thereto. The observance of daylight saving reflects an adaptation to the time discipline associated with modernity and industrialization. By syncing annual and diurnal rhythms to locally specific conditions, daylight saving allows for an ephemeral deviation from UTC to more closely align biological and social times tied to circadian rhythms. Although some feel that daylight saving is an unnecessary adjustment (Roenneberg, Winnebeck, and Klerman 2019), this divergence requires careful rethinking of current time regimes, because potential for an enhanced regulatory burden emerges among those caught between the competing regimes.

Conclusion

In this study, we have explored a broad range of geographic, socioeconomic, lifestyle, and demographic variables against hypotheses derived from prevailing ideals regarding those who favor daylight saving preference. Overall, the majority of respondents in the eastern time zone of Australia favor daylight saving, suggesting support for the status quo in the Australian Capital Territory, New South Wales, Tasmania, and Victoria and a strong case for daylight saving in Queensland. Despite a relatively lower proportion of respondents supporting DST in Queensland, the majority (60 percent) nonetheless favored the measure. Strong within-state variation, however, suggests that a nuanced approach is warranted.

The statistical analysis indicates that geographical variables are by far the most influential in explaining daylight saving preference. Respondents farther north and west were less likely to favor DST, indicating that less seasonal variation and delayed sunrises and sunsets contribute to respondents' opposition. Respondents in Queensland were also less likely to favor DST than other states, although it is apparent that this variation is largely geographical, rather than political, given the strong influence of responses in the tropics. Additional lifestyle variables were shown to be influential—those with a regular work schedule were shown to be supportive of DST, presumably because respondents were committed to work fixed hours and could not as easily base nonwork activities (e.g., outdoor recreation) on sunrise or sunset times. Given the near ubiquity of artificial lighting and an occupational shift toward asynchronous work, however, such practices merit reconsideration, as might the hours during which daylight is observed (Martín-Olalla 2019c).

Several U.S. states and European countries have either proposed or ratified legislation that would effectively push their jurisdiction forward year-round, yet these are contingent on widespread adoption by neighboring territories. Global movements to abandon the biannual time shift in favor of

permanent daylight saving reflect postindustrial production regimes in which there has been a divergence between activities with highly prescribed time disciplines on one hand and those that can be performed anytime and in any place. Thus, what might appear as a banal topic of inquiry in fact underlies acrimonious debates that merit deep thinking.

The Australian debate surrounding daylight saving incorporates a variety of perspectives that—as we have demonstrated—go beyond simple circadian patterns, occupational circumstances, and socioeconomics. Preference for daylight saving is in fact a rather complex decision, of which geographical location and lifestyle are revealed to be key determinants. Australia has more time zones per capita than any other major country,[2] and although respondents overwhelming favor the implementation of daylight saving, the idiosyncrasies of divergent geographies and lifestyles in a large geographical territory have produced a political stalemate. Future work could investigate the role of variables such as daytime temperature, continentality, and political affiliation in greater detail or examine shifting attitudes over time. Further research is required to better understand how consensus can be achieved and how the political impasses can be informed by empirical evidence directed toward considered decision making. ■

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Notes

[1] Arizona's Navajo Nation, located in the state's northeast, does observe DST.
[2] Excluding overseas territories.

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