

Does Daylight Saving Save Energy?

A Meta-Analysis

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Estimating the Effect of DST

When using econometric analysis, researchers typically estimate the following model:

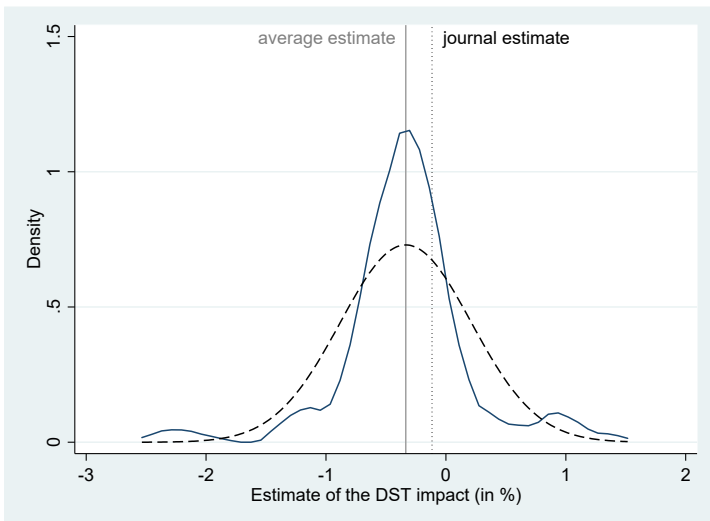
$$\ln\text{Consumption}_t = \alpha + \text{DST} \cdot \text{Treatment effect}_t + \text{Controls}_t + \epsilon.$$

- *Consumption*: the average energy consumption during time t for a given hour, day, and year.
- *Treatment effect*: equals 1 for all hours when daylight saving time applies.
- *Controls*: seasonality and holidays, weather, the intensity of sunlight, heterogeneity among consumption units, etc.

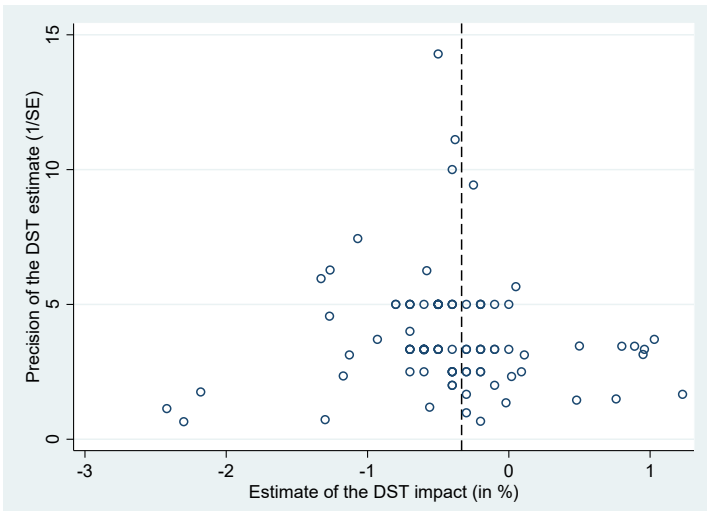
No Consensus in the Literature



Journals Report Smaller Savings



Publication Bias? Probably Not



Funnel Asymmetry Tests

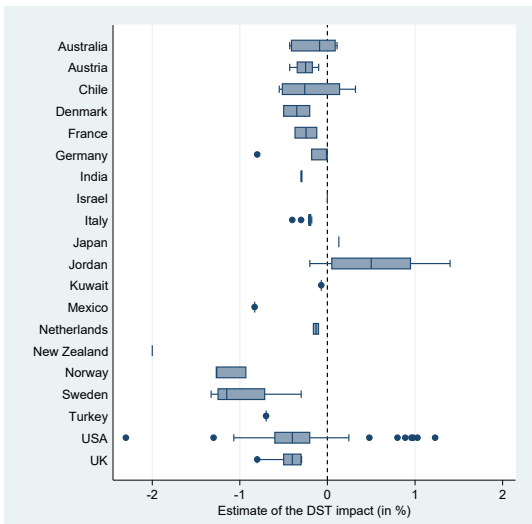
If the ratio of the point estimate to its standard error has a t -distribution, then the two quantities should be independent:

$$\text{estimate}_i = \underbrace{\beta}_{\text{true effect}} + \underbrace{\beta_0 SE_i}_{\text{publication bias}} + \mu_i.$$

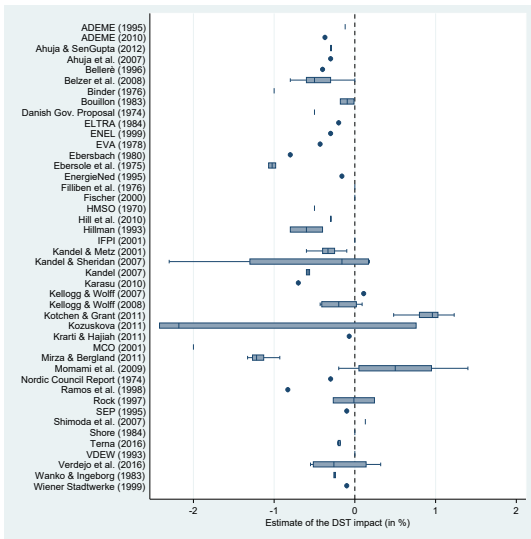
The no. of obs. can be used as an instrument for SE.

	OLS	FE	BE	Country	ME	IV
SE (<i>publication bias</i>)	-0.410 (0.265)	-1.217 (0.790)	-0.410 (0.757)	-0.496 (0.805)	-0.449 (0.688)	0.226 (1.088)
Constant (<i>true effect</i>)	-0.293*** (0.000778)	-0.222*** (0.0700)	-0.294*** (0.00812)	-0.278*** (0.0459)	-0.291*** (0.00731)	-0.445* (0.243)
Observations	101	101	101	101	101	90

Country Heterogeneity



Method Heterogeneity



What Explains the Differences in Conclusions? (1)

Data characteristics

Data period	The number of years used in the estimation.
Main estimate	= 1 if the estimate is preferred by the authors of the study.
Hourly data	= 1 if the data are examined on hourly or higher than hourly granularity.
Daily data	= 1 if the data are examined on a daily basis.
Daylight hours	Average time between sunrise and sunset on the longest day for the country or region under examination.
Europe	= 1 if European countries are examined.
USA	= 1 if US data are examined.

Design of the analysis

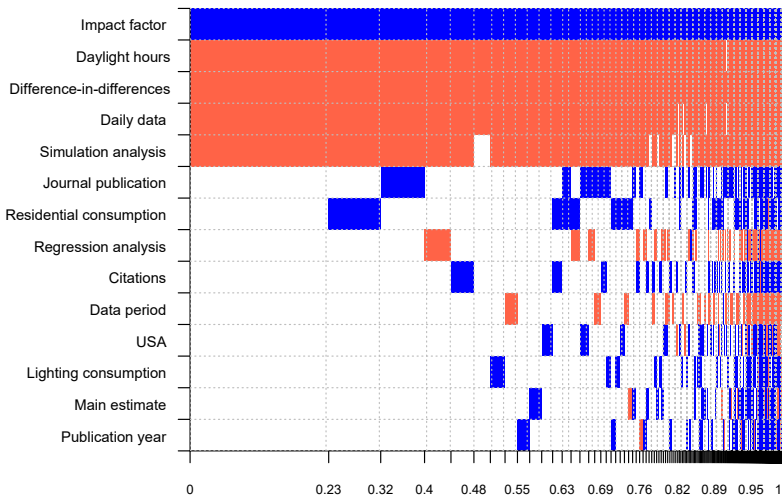
Regression analysis	= 1 if the primary study is based on regression analysis.
Simulation analysis	= 1 if the study is based on simulation.
Difference-in-diff.	= 1 if the difference-in-differences approach is employed.
Residential cons.	= 1 if only residential consumption is examined.
Lighting cons.	= 1 if total energy savings are reported as a result of lighting reduction.

What Explains the Differences in Conclusions? (2)

Publication characteristics

Publication year	The publication year of the study (base = 1970).
Journal article	= 1 if the study was published in a peer-reviewed journal.
Impact factor	The recursive RePEc impact factor of the outlet.
Citations	The logarithm of the total number of citations of the study in Google Scholar.

Bayesian Model Averaging



Results




Main Findings

- 1 The mean reported estimate suggests energy savings of 0.34% due to DST.
- 2 The results are driven by the method employed (simulation vs. regression).
- 3 Energy savings are larger for countries farther away from the equator.

Project Website

www.meta-analysis.cz/dst

For Further Reading

-  Stanley, T. D. & C. Doucouliagos (2012): *Meta-Regression Analysis in Economics and Business*.
Routledge, 1st. edition.
-  Brodeur, A., M. Sangnier & Y. Zylberg (2016):
Star Wars: The Empirics Strike Back.
AEJ Applied 8(1): pp. 1–32.
-  Havranek, T. (2015): *Measuring Intertemporal Substitution: The Importance of Method Choices and Publication Bias*.
JEEA 13(6): pp. 1180–1204.

Reading list on RePEc: Google “meta-analysis in economics.”