

Report on Bachelor / Master Thesis

Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague

Student:	Kúdel'a Peter
Advisor:	PhDr. Mgr. Havránková Zuzana, Ph.D.
Title of the thesis:	Does Daylight Saving Time Save Energy? Evidence from Slovakia

OVERALL ASSESSMENT (provided in English, Czech, or Slovak):

The bachelor thesis is intended to estimate whether daylight saving time (DST) reduces energy consumption in Slovakia.

The thesis contains a short descriptive section of 11 pages including the introduction, history of daylight saving time and literature review, and a 22 page empirical section, including methodology, results and conclusion.

The introduction in the descriptive section provides a good motivation for the thesis. The author notes that the EC has recently questioned the benefits of harmonised DST, and surmises that the heterogeneity of results of studies as to whether DST reduces electricity consumption is likely to be because the results are country specific. In this context, the absence of a Slovak specific study in the literature leaves a gap to be filled by this thesis.

A very brief history of DST is provided, drawing on several different papers, describing the motivation for introducing DST as being to reduce energy consumption and describing the current state of DST whereby more countries are abolishing it than adopting it. This section then describes the history of DST in Slovakia and, finally, very briefly describes the Slovak wholesale power market. Although very brief, the history of DST is clear and adequate for the thesis. I would have liked to see a more in depth discussion about the Slovak electricity market. This could have explained that wholesale prices are determined for each hour, discussed whether consumers of electricity are able to react to price (short term demand elasticity tends to be very low) and provided more information about the use of electricity (e.g. lighting, heating cooking, and other applications in the household) since this is relevant for understanding how DST might affect consumption.

For the discussion of the literature review, please see below.

The section discussing non-energy related effects of DST appears not to be very relevant for this paper. The author motivates this section by using it to show that the effect on energy is only one aspect of the effects of DST. One of the papers describes a reduction in household accidents prior to the DST shift, which the author states may be due to an increase in people's awareness of the riskier period (i.e. the DST shift). It wasn't clear whether this explanation was the opinion of the author of this thesis or whether the explanation was stated in the paper being cited.

The methodology section follows closely that of Mirza & Bergland (2011), as is clearly stated. Although following the same approach, this thesis generally provides a clearer and more detailed explanation than provided by Mirza & Bergland (2011).

The thesis motivates the need to use the difference in difference approach for Slovakia. It then compares hourly consumption over the working days immediately prior to and immediately after the DST shift. The author should clearly state that the figure compares consumption for *working* days (if this is the case). The first section discusses the selection of the control hours and the possible biases introduced depending on the choice of selection and an approach to help understand the bias. This section is very clear.

Data is then described. Rather than use the same data as Mirza & Bergland (2011), the author could have looked to studies of the drivers of electricity consumption and considered other data. The description of consumption and whether related data is clear. Price is a factor in driving demand but because many consumers don't receive immediate price information or do not have their consumption

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metered on an hourly basis, they may not respond to hourly price. The data section should have discussed insights such as this. Finally, no motivation was provided as to why Brent was chosen as an indicator of the market performance and economic conditions in Slovakia, and the relevance of this for electricity consumption. In general, the data section relied heavily on Mirza & Bergland (2011) and did not provide sufficient motivation or own analysis.

The choice of variables to include in the model appears reasonable, subject to the point above about Brent prices. Although the coefficients of the control variables are not the interest of the analysis, it is likely that multicollinearity of control variables will make the interpretation of their coefficients difficult. For example, I wonder whether the sine function is necessary when each month is given a dummy variable.

The discussion of the weather effects is particularly good. Here, I was left wondering why the author didn't investigate the effect of using different base temperatures for the calculation of heating and cooling degrees – later this sensitivity is discussed in the results section. Like Mirza & Bergland (2011) the thesis includes an hourly effects model in addition to the overall effects model, which is well motivated by the different effects of DST throughout the course of the day.

The results section begins with the test for stationarity, for which the Brent variable is removed from the model. The model fails the heteroskedasticity test and test for serial correlation of the residuals, and an appropriate adjustment is made. The discussion of the test of the control hours is clear, finding that the night time control hours are indeed affected by DST. The author explains the adjustments to the model but does not provide the final model formulation.

The author compares the findings on the effects of DST with other studies and with prior expectations, and finds that they are consistent. The author also provides a clear explanation of the coefficients on the control variables although doesn't comment on the coefficients of the dummy variables. Comparing Figure 4.2, the reduction in consumption from 5am to 7am is surprising. The author states that this is in line with other studies but does not explain why the reduction occurs. Finally, the author estimates the value of the reduction in electricity consumption due to DST. This appears to have been done using average power prices. However, given systematic patterns in hourly prices over the day, a more accurate estimate would have been to use hourly prices.

The conclusion from the study is clear, and it suggests an extension to investigate the other (non-energy) effects of DST.

Contribution

The main contribution of the thesis is to apply to Slovakia the approach for investigating the effects of DST used by Mirza & Bergland (2011). This is relevant because the effects are likely to be country specific and Slovakia specifically has not been investigated before. However the thesis closely follows Mirza & Bergland (2011) with little extension.

Methods

The method used is appropriate for the thesis. Nonetheless, I would suggest providing more thorough explanation of the choice of each variable in the model (in particular the rationale for including Brent and the sine function).

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Literature

The literature review appears thorough, generally relevant and clear. It is organised into two sections, the first discussing DST and energy consumption and the second discussing other effects of DST.

The author highlights a general problem with DST studies – the lack of a control – and how this problem has been solved using differences of differences (as is applied by this thesis). The author describes other approaches to estimating the effect of DST on energy consumption, e.g. simulations using engineering models, and natural experiments. The author describes the results of the various studies, some of which show a reduction in energy consumption due to DST, others show inconclusive results and others show an increase in consumption. The thesis discusses two papers that attempt to explain the different results in DST studies, with latitude and country specific factors being relevant, which helps to provide motivation for this thesis.

In discussing the results of previous papers, the author states that the financial savings related to the reduction in energy consumption due to DST are a 'considerable amount'. This is a value judgement. The author should objectively describe results and describe them in the context of relevant comparators, e.g. GDP, the total amount spent per year on electricity, the cost of establishing DST etc. In discussing the results for Chile, the reduction in each region is lower than the overall reduction for the country. This is perplexing and is left unexplained.

Finally, the results of the literature review would have been clearer if the author had included a table categorising previous papers by their conclusions, i.e. positive, negative or inconclusive effects.

Manuscript form

The thesis is generally well organised, clear and relevant. As noted the literature review would have been clearer if it had included a summary table of previous results. In addition, the final form of the model should have been presented. The thesis has a few minor spelling mistakes that should have been picked up as part of a final review.

Summary and suggested questions for the discussion during the defense

For summary please refer to the overall assessment.

As discussed above, price is a factor in driving demand but because many consumers don't receive immediate price information or do not have their consumption metered on an hourly basis, they may not respond to hourly price. This seems to be one of the key aspects that should have been considered in the thesis. I wonder what's the proportion of consumers metered on an hourly basis (i.e. only those would be affected by DST) and why this hasn't been taken into account?

As mentioned in this review, no motivation was provided as to why Brent was chosen as an indicator of the market performance and economic conditions in Slovakia, and the relevance of this for electricity consumption there. While including this indicator made perfect sense in Mirza & Bergland (2011) on which the author relied, I wonder why this should be relevant in Slovakia?

The choice of variables to include in the model appears reasonable, subject to the point above about Brent prices. Although the coefficients of the control variables are not the interest of the analysis, it is likely that multicollinearity of control variables will make the interpretation of their coefficients difficult.

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For example, I wonder whether the sine function is necessary when each month is given a dummy variable?

SUMMARY OF POINTS AWARDED (for details, see below):

CATEGORY	POINTS
<i>Contribution</i> (max. 30 points)	17
<i>Methods</i> (max. 30 points)	25
<i>Literature</i> (max. 20 points)	19
<i>Manuscript Form</i> (max. 20 points)	19
TOTAL POINTS (max. 100 points)	80
GRADE (A – B – C – D – E – F)	C

NAME OF THE REFEREE:

DATE OF EVALUATION:



Referee Signature

EXPLANATION OF CATEGORIES AND SCALE:

CONTRIBUTION: *The author presents original ideas on the topic demonstrating critical thinking and ability to draw conclusions based on the knowledge of relevant theory and empirics. There is a distinct value added of the thesis.*

<i>Strong</i>	<i>Average</i>	<i>Weak</i>
30	15	0

METHODS: *The tools used are relevant to the research question being investigated, and adequate to the author's level of studies. The thesis topic is comprehensively analyzed.*

<i>Strong</i>	<i>Average</i>	<i>Weak</i>
30	15	0

LITERATURE REVIEW: *The thesis demonstrates author's full understanding and command of recent literature. The author quotes relevant literature in a proper way.*

<i>Strong</i>	<i>Average</i>	<i>Weak</i>
20	10	0

MANUSCRIPT FORM: *The thesis is well structured. The student uses appropriate language and style, including academic format for graphs and tables. The text effectively refers to graphs and tables and disposes with a complete bibliography.*

<i>Strong</i>	<i>Average</i>	<i>Weak</i>
20	10	0

Overall grading:

TOTAL	GRADE
91 – 100	A
81 - 90	B
71 - 80	C
61 – 70	D
51 – 60	E
0 – 50	F