

Advisor's Report on Dissertation Thesis

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Author:	Mgr. Lukáš Rečka
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Title of the Thesis:	Three essays in energy and environmental economics
Type of Defense:	DEFENSE
Date of Pre-Defense:	December 5, 2018

Conclusion of my report on this dissertation thesis submitted for the defense is qualitatively the same as the one prepared for the version submitted for the pre-defense.

This thesis presents a nice summary of research conducted by Lukáš Rečka that I have been supervising, and that practically started with his bachelor thesis. The thesis consists of three integrated chapters that address the main factors of emission stemming from energy transformation, economic modelling of this transformation within the nation-wide energy system, and analysis of the effect of using one group of technology to transform energy (renewable energy) to generate electricity on networks that ensure delivery of electricity. This research nicely covers key components of the whole chain by utilising economic thinking linked to other disciplines.

This thesis includes in particular a finalised version of the first paper on LMDI decomposition and revised version of remaining two articles that incorporates comments raised during the pre-defense. In my opinion, all raised comments have been satisfactory considered in the final version and the section on LMDI has been appropriately finalised.

a) *Can you recognize an original contribution of the author?*

The first chapter summarizes whole thesis and connects the three pieces together.

In the second, now finalised, chapter, main factors of air quality emissions are examined using **index-based decomposition method**. Following the literature, this analysis relies on the state-of-the-art Log-Mean Divisia Index decomposition. His specific contribution presents the decomposition of three air quality pollutants into five factors, covering a long period from 1990 till 2016. This enrichment with respect to the number of factors and the period covered has been only possible thanks to the unique database compiled by Lukas. Second part of this chapter performs a sensitivity analysis of the LMDI covering two issues. This sensitivity analysis is particularly addressing different numbers of factors the emission are decomposed to (that are, 3-, 4- and 5-factors) and then different sectoral detail of the economy. The results from this research has been accepted for presentation at the 42nd International Association for Energy Economics (IAEE) Annual Conference in Montréal, May 29 - June 1, 2019. This research is co-authored by myself and hence the applied approach has reflected all my

recommendations and advices. Although this chapter has not be published yet, I think there is a high potential to publish this part of his research in very good field journal.

The third chapter presents **energy system modelling**. This research follows his previous work based on another energy system - a linear - optimization model MESSAGE (Rečka & Ščasný, 2013). The presented modelling framework is here significantly enriched by building a partial equilibrium, technology more rich, model TIMES. This model describes the whole energy system of the Czech Republic and it is further adapted to allow assess the impact of various policy, technology regulation, or fuel constraints up to the year 2050. Recently, this is only one model being developed and built for the Czech Republic. Moreover, this model has been applied for several policy impact assessment studies commissioned by various Czech authorities, such as Ministry of Industry and Trade, Ministry of Finance, or Ministry of the Environment. Results from this research have been published in several peer-reviewed journals with WoS IF, including *Energy* (R&Š 2016; Q1 IF=5.0), *Energie* (R&Š 2017; Q2 IF=2.7) and *Fuel* (R&Š 2017; Q1 IF=4.9). Preliminary work was also presented at University of Cape Town, CERGE-EI, and at many international scientific conferences worldwide.

The last chapter is using **model ELMOD to analyse the effect of renewable energy to generate electricity in neighborhood countries on transmission networks** in Central Europe. This research for the first time applied a network model for specific electricity market in Central Europe. Results were also published in three peer-reviewed journals with two having high IF, specifically in *Energy Policy* (JMR 2017; Q1 IF=4.0); *Energy Efficiency* (MRJ 2018; Q3 IF=1.6), and *Politická ekonomie* (JMR 2017; Q3 IF=0.4).

b) *Is the thesis based on relevant references?*

Yes, the thesis is referring to relevant literature, citing the key articles and materials relevant for each of the three topics.

c) *Is the thesis defensible at your home institution or another respected institution where you gave lectures?*

Yes, I think this thesis is of high quality and can be defensible at IES and it could be also potentially defensible at Environmental Science PhD program at FHS CUNI or University of Economics in that I was a member of doctorate state committees. I believe this thesis might be also defensible at similar departments such as Scholl of Economics at University Cape Town, where the preliminary work was presented and discussed with my presence.

d) *Do the results of the thesis allow their publication in a respected economic journal?*

Yes, six articles have already been published in peer-reviewed journals. The decomposition analysis has also a large potential to be published in a very good field journal (it has been accepted for the presentation at the prestigious 42nd IAEE annual conference).

e) *Are there any additional major comments on what should be improved?*

do not have any comments.

f) *What is your overall assessment of the thesis? (a) I recommend the thesis for defense without substantial changes, (b) the thesis can be defended after revision indicated in my comments, (c) not-defendable in this form.*

The thesis presents excellent piece of research, already published in several peer-reviewed journals with high IF. Publications based on two out of three chapters were co-authored by myself and I recognize significant and major contribution of Lukáš in all of this research. These research has already been receiving considerable response in the scientific community.

During his PhD studies, Lukáš Rečka has been also a member of various research consortia, including several projects funded by European Commission's Framework Programmes, Technology Agency of the Czech Republic, CUNI's Grant Agency and PRIMUS project, or Czech Science Foundation (GAČR), including very recently funded Excellence program GAČR EXPRO-2019.

I recommend this thesis for defense without any further substantial requests on its revision.

Date:	April 7, 2019
Opponent's Signature:	
Opponent's Affiliation:	Mgr. Milan Ščasný PhD. IES FSV UK