Report on Bachelor / Master Thesis

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

Student:	**Bc. Vijayshekhar Nerva**
Advisor:	**doc. PhDr. Tomáš Havránek Ph.D.**
Title of the thesis:	**Impact of Public Health-care Expenditure on economic growth**

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

The thesis examines the relationship between health expenditures and economic growth. It further distinguishes between public and private health expenditures while comparing two sub-samples of developed and developing countries. The research questions proposed in the thesis are not new, but the author explores a large global sample of data and a new methodological approach. The study reports that public expenditures are negatively related with economic growth irrespective of the level of development. On the contrary, private expenditure has a positive impact on economic growth.

Contribution
The thesis claims threefold contribution:

1. Using the BMA to address model uncertainty in growth regressions
2. Employing a large global dataset
3. Distinguishing simultaneously between public and private health expenditures

I acknowledge the niche author identifies in the literature, but I am doubtful that s/he fulfills the goals s/he sets to an acceptable extent to claim the contributions mentioned above truly. I express my reservations in more detail below.

Methods
The text does not convince whether either type of health expenditures is a good proxy for society's overall health. Since the literature review identifies human capital (and healthy population) as a significant theoretical link between health and economic growth, I can easily imagine other, in my opinion, better proxies - morbidity, sick days, child mortality, nutrition, or life expectancy. At least some of the data is available from the World Bank and should cover the examined sample.

As for the control variables, I consider the lack of variables capturing education a critical fault. The United Nations' education index, which combines actual and expected years of schooling, is available, and the World Bank's education expenditures could capture essential effects.

I did not find any reason why the public and private expenditures should be fixed in the model, although the author repeatedly refers to this assumption. I consider this in contrast to addressing model uncertainty, as implicitly, there is a prior belief that these two variables are always part of the examined models—any interpretation of inclusion probabilities of these variables in sections 5.1 and 5.2 is then not very meaningful. It would be interesting to see the posterior inclusion probabilities if this prior was relaxed.

Another methodological point lies in using the approximate posterior model distribution. If we abstract from the individual fixed effects, the remaining number of independent variables is relatively low, 13 or 15 depending on whether we count the fixed health expenditure variables. Under these circumstances, the overall number of models is not so high and allows estimation of all possible covariate combinations. It would be much more robust in terms of BMA results if the models were 'fully enumerated', i.e. all the possible models examined and averaged. I can imagine forcing the inclusion of the fixed effects in all models or, since the fixed effects themselves are not of interest, relying on time-demeaning of variables to get rid of them and then running the estimation with fewer covariates.

The interpretation of the presented results is mostly correct. Nevertheless, some errors and imprecisions remain. For example, I am unsure about the interpretation of the results in Table 6. It

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seems to me that the absolute effect of public expenditure is smaller in developed countries than in developing countries. In Table 8, the posterior means of both models (developing/developed) for private health-expenditures countries contain 0 and the author interprets it as insignificant effects. I would argue that commenting on the difference between the coefficients is then generally meaningless. These issues could perhaps be cleared if the author demonstrated how s/he computes credible intervals, particularly in the case of the differential between the estimates for developed and developing countries.

Given the results, higher life expectancy negatively affects economic growth in developing countries. How would the author interpret it? As life expectancy is a traditional measure of population health and human capital, shouldn't we expect the coefficient to be positive? I believe a comment on the coefficient is in order.

I am also unsure about the interpretation of the import and export share of the GDP. A positive posterior mean on the share of imports seems counterintuitive as the imports should, by definition, decrease the GDP. A much better alternative seems to look at the overall trade (imports+export)/GDP to measure openness and its effects on growth.

I am not convinced that robustness checks are correctly understood. One of the examples:

"For developing countries, private health expenditures do not have robust effects on economic growth for Model without lag (Model 1), while it does have robust effects for the Model with lag (Model 2)." (p. 44)

The previous can be an unfortunate formulation, but it is confusing for the reader and does not have anything to do with robustness. Pooled OLS seems a better option, although the relatively small number of covariates along with abolition of country effects unsurprisingly yields different results from the baseline. I would not consider using additional variable in the estimation as a true robustness check, especially in within the realm of BMA, where alternative model and parameter priors are of interest. I would concentrate the efforts addressing robustness there.

Literature
The literature coverage is exhaustive given the vast volume of papers which examine growth determinants. The author correctly concentrates on the literature that is closely related to the topic and only discusses work which also focuses on health-growth nexus.

Manuscript form
The thesis follows a standard structure and it is organized well. One minor issue is the extensive literature summary which combines papers that document positive or negative effects and also those studying reverse causality and other related issues. It would be helpful to split the literature review perhaps into a few respective sections.

Since the thesis distinguishes between private and public health expenditures, it would be useful to make sure that the reader has a good understanding of the definition of respective terms. Still, I was not able to find it within the text.

Minor issues:

- Sometimes the formulations are cumbersome and complicate understanding of the text.
  "Notably, only a few Eastern European countries have incomplete health policies, resulting in pocket expenses, which their economies also reflect." (p.20)

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- Pronoun “I” is not always not capitalized.
- The coefficients in the equation 4.5.3.1 (and 4.5.3.2), shouldn’t the variables also be lagged by one period, i.e. have index t-1?

Summary and suggested questions for the discussion during the defense

The results of the Urkund analysis do not indicate significant text similarity with other available sources. In summary, I want to appreciate the work put into the thesis. The topic is interesing and could be relevant for policy makers. The choice of advanced methodology was undoubtably a challenge and required non-trivial self-study. Nevertheless, given the concerns expressed in the report, I am unsure that the conclusions reached by the author are fully and comprehensively supported by the methods and results presented in the theses. I consider it bordeline acceptable for the defense at master level at the IES, Faculty of Social Sciences, Charles University. I propose that the committee thoroughly examines candidate’s understanding and interpretations of the results during the defense. I recommend it for defense with suggested grade E.

Questions for the defense:

Given the results, higher life expectancy negatively affects economic growth in developing countries. How would the author interpret it? As life expectancy is a traditional measure of population health and human capital, shouldn't we expect the coefficient to be positive?

Why should we expect different effect of public and private health expenditures? Is there a theory that could back the different effects?

What is the reasoning behing fixing both types of health expenditures in all explored models?

Has the author tried alternative model and parameter priors within BMA? Did it affect the results?

How do you construct credible intervals, especially in the case of coefficient differentials?

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

CATEGORY		**POINTS**
Contribution	*(max. 30 points)*	15
Methods	*(max. 30 points)*	12
Literature	*(max. 20 points)*	17
Manuscript Form	*(max. 20 points)*	10
TOTAL POINTS	*(max. 100 points)*	**54**
GRADE	**(A – B – C – D – E – F)**	**E**

NAME OF THE REFEREE: Jan Mareš
DATE OF EVALUATION: 8.9. 2020

Digitally signed (8. 9. 2020):
Jan Mareš

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.*

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.*

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

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.*

Overall grading:

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