Report on **Master Thesis**

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

Student:	**Bc. Jean-Baptiste Marigo**
Advisor:	**Vilém Semerák, Ph.D.**
Title of the thesis:	**Where did people die? An international assessment of a potentially positive relationship between economic development and the severity of COVID-19 outbreaks.**

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

Please provide a short summary of the thesis, your assessment of each of the four key categories, and an overall evaluation and suggested questions for the discussion. The minimum length of the report is 300 words.

Short summary

The author attempts to test to what extent different countries (countries differing in their level of development, demographic statistics, or even form of government response) experienced statistically significant differences in the relative number of deaths caused by Covid-19. The author has opted for Bayesian Model Averaging (BMA) as the main (and, in fact, the only) method of finding out which variables out of a moderately broad set (21) of potential candidates matter. The analysis was carried out on country-level cross-sectional data. Multiple versions of the BMA framework were tested, they slightly differed in the set of variables included (and, based on that, also in the number of available countries/observations) in the analyzed sample.

   The results do not appear to be quite reliable, it seems that the author not only did not take into account possible additional relationships between the existing explanatory variables and Covid-19 statistics, but the initial set of variables used for the BMA procedure also did not include some variables that previous literature found to be potentially significant, thus creating a risk of omitted-variable biases in all the compared regressions done within the described BMA framework.

Contribution

The thesis provides a piece of clear evidence that the author was capable of collecting data, analyzing them in R and providing a basic interpretation of the results. Some examples of relevant critical thinking also appear in the thesis - e.g. I appreciate the discussion of possible reversed causality as an explanation for the paradoxical results for stringency (p. 55).

   However, the text does not provide convincing evidence that the author really attempted to analyze relevant factors and the obtained results sufficiently deeply and critically (see the following sections for details). In fact, the thesis appears to be more similar to an econometric exercise – where the student gets some data, uses a pre-specified method to analyze them, but does not really discuss the suitability or weaknesses of the approach in-depth. All-in-all, I would describe the quality of the analysis as being closer to the level typically associated with bachelor theses defended at the IES.

   In terms of the broader added value of the text, the author himself admits that results for three out of the six selected candidate variables (six variables that were found to be relevant) have questionable interpretation (p. 58). Even more importantly, if my understanding of what the author did (and did not do) and at least some of my objections described in the next section are correct, even the results for the remaining variables are not necessarily rock-solid, at least as far as the values of coefficients are concerned.

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Methods

The thesis completely relies on Bayesian Model Averaging (BMA); the author selected 21 variables (categorized into 6 groups) and then used a script (R code) to run estimates of log-linear specification, which included the log of "Covid-19 severity" (the response variable) and all possible combinations of the 21 variables. A cross-sectional dataset with 159 (or 124 for specifications with Gini coefficient) was used.

The approach would, in general, work for this situation, and I also appreciated that the author tried to take care of some possible issues typical for such applications, such as the existence of possible endogeneity and problems caused by multicollinearity:

- The author attempts to eliminate endogeneity by using covariates from periods preceding the crisis (e.g. five-year average for 2014-2018 is used)
- The author uses BMA with a dilution prior as an attempt to deal with multicollinearity.

While I accept the approach as quite relevant for this analysis (if implemented correctly), I still would have preferred to see a deeper comparison with possible alternative ways how to address the research questions set by the author.

Even more importantly, the approach also remains vulnerable to several issues, the relevance of which was not only not tested by the author (that would not be such an unusual issue at the Master level), but which were not even mentioned or included in the discussion of the results.

The first problem:
The possible existence of additional forms of relationship between the response variable and some of the right-hand side variables, for example GDP per capita, democracy, and press freedom. Indeed, we have some reasons to assume that the collection of statistics on Covid-19 might not have been up to the same standards in all countries (see the literature section for some examples). Specifically, it seems that at least some notable non-democratic countries might have tried to reduce the officially reported numbers for various reasons. This issue would not only turn the author's explanation of the role of democracy upside down (democracies can be perhaps slower in the implementation of restrictive measures, but they can report more reliable data), but it has obvious implications for the reliability of results.

The second problem:
The procedure used by the author might work well if all possibly relevant variables are indeed included in the original set of variables. If not, all tested specifications might be suffering from omitted variable bias, and some of the tested variables can act as proxies for the actual causes. It seems to me that at least two additional categories of variables not included in the model might lead to similar worries:

1. The effect of restrictive measures depends not only on what measures were implemented and when; they also depend on whether people respected the measures. There is indeed some evidence (see the literature section for references) that cultural variables related to e.g. individualism/collectivism might be related to the efficiency of anti-Covid measures. The evidence (and the data) are often not too strong but good enough to consider the inclusion of such variables in the tested set of variables or at least to dedicate some space to explaining why the author decided not to do it.

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2. Epidemics/pandemics spread unevenly; countries with significant trading and tourism hotspots are often likely to be hit as the first ones (e.g. the well-known fate of Venice during the Black Plague in mid-14th century). Different waves of diseases can also differ in mortality – which might lead to some spurious patterns showing that some types of countries were hit stronger while the actual mechanism is hidden. I appreciate that the author realizes that some countries were hit later than others (p. 20), but he does not discuss possible implications for mortality or for including variables that might address this issue.

What I also find disturbing is the confidence with which the author claims that his results did not just identify correlations but that the results indeed indicate causal relations (p. 41). Especially for the specifications which only include pre-Covid covariates, he seems to assume that "causation directly stems from the temporal sequence of the data" (p. 40). This is a very bold claim – especially if we take into account the possible presence of omitted variable biases.

Literature

The list of references is relatively long. However, it seems that the author completely omitted some areas of literature that might be very relevant for both specification of the model and for the interpretation of the results. It seems as if the author only focused on some types of texts and forgot to do a wider search that might provide him with a broader view of the problem.

Here are the most important omissions:

(i) The literature which discusses possible reliability issues with Covid mortality data or with the reliability of statistical reporting of non-democratic or developing countries, in general, is not discussed in the text.

Such texts exist, and even a brief look at their abstracts might have warned the author about possible issues with his methodology, for example:
- Kilani, A. (2021). Authoritarian regimes' propensity to manipulate Covid-19 data: a statistical analysis using Benford's Law. Commonwealth & Comparative Politics, 59(3), 319-333.

Even if the author decided not to use them (some such texts might have been published in less credible journals), just acknowledging the possible existence of this issue might have been useful.

(ii) Literature discussing roles of international differences in "culture" and attitudes. Indeed, there were attempts to explain differences in the effects of Covid-related restrictive measures by the willingness to take them seriously and truly implement them. At least some such attempts might be easy to criticize e.g. because of their reliance on e.g rather specific Hofstede' data, simplistic methodology or because of the journal in which they were published. However, acknowledging that there might be another class of country/nation characteristics with a significant relationship to Covid mortality should have been mentioned. Again a few examples:

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- Güss, C. D., & Tuason, M. T. (2021). Individualism and egalitarianism can kill: how cultural values predict coronavirus deaths across the globe. Frontiers in Psychology, 12
- Maaravi, Y., Levy, A., Gur, T., Confino, D., & Segal, S. (2021). "The tragedy of the commons": How individualism and collectivism affected the spread of the COVID-19 pandemic. Frontiers in public health, 9
- Lu, J. G., Jin, P., & English, A. S. (2021). Collectivism predicts mask use during COVID-19. Proceedings of the National Academy of Sciences, 118(23)

(iii) Literature discussing (and testing) possible changes in Covid-related mortality in time and of the reasons why some countries might be hit earlier and some later. This is arguably a less important omission but still relevant with respect to the afore-mentioned issue with the effect of sequencing.

Finally, there is a rather specific issue related to the references used by the author to explain why he opted for the BMA methodology and how it should be implemented. The author relies on several texts, e.g. Bajzik et. al (2020), Havránek & Sokolova (2020), which are definitely fine papers written with the use of BMA and which were published in very good journals, but which appear to have focused on meta-analysis and they, in my opinion, can neither be considered truly methodological papers in a sense relevant for this texts nor texts discussing a directly related topic.

While a similar attitude (and inspiration in methods used by other top researchers) is neither uncommon nor wrong per se, I would prefer that texts at the level of Master theses actually go deeper and find support for their claims in texts intended for this use (e.g. texts comparing various types of priors with the use of Monte Carlo methods).

Admittedly, the author goes in the right direction in some cases – and refers e.g. to George (2010) – but it seems to me that his decision to excessively rely on inspiration from meta-analysis-focused texts might have prevented him from realizing that there might also be other methods available for the problem that he attempted to tackle with the use of BMA. Similarly, the reliance on meta-analysis-focused texts might have contributed to the lack of concern about the inclusion of additional relevant variables to the initial pool of potential determinants – meta-analytical texts typically do not have this problem because they rely on variables preselected by the original authors.

Manuscript form

The text is written in an appropriate style, the author also apparently invested enough time and effort into proof-reading. Appearance and the use of graphics and tables are relatively standard (with some minor opportunities for improvement in some of the appendices), and equations are typeset in an adequate and legible form. Some readers might appreciate a bit deeper numbering of section and subsection titles.

As far as the structure of the text is concerned, some sections appear a bit lengthier than necessary and perhaps even a bit repetitive (e.g. some paragraphs in the additional discussion on pages 60-65). Editing and trimming the text and using the additional space for actual deeper analysis would probably be welcomed by many readers of the text.

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Overall evaluation and suggested questions for the discussion during the defense

The results of the Turnitin analysis do not indicate significant text similarity with other available sources.
In my view, the thesis still fulfills the requirements for a Master thesis at IES, Faculty of Social Sciences, Charles University, I recommend it for the defense and I suggest a grade D.

Questions for the defense:

1. Which other methods could we use when we want to select a few of many potentially relevant (and possibly correlated) variables suspected in being useful in explaining e.g. Covid mortality out of a large set of many possible determinants? What would be their advantages and disadvantages relative to the method that you have used in your thesis.
2. What if we assume that your sample includes e.g. a few non-democratic countries where Covid data would either be deliberately manipulated or at least the quality of their collection would be substandard. Or if it includes e.g. a number of developing countries with very noisy statistics due to the lack of capacity to verify the causes of death? What could this mean for the possible relationship between Covid statistics and e.g. level of development or democracy? What would this imply for your results?
3. What is your opinion on the suggested relationship between cultural differences across countries and the efficiency of anti-covid measures?

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

CATEGORY		POINTS
Contribution	*(max. 30 points)*	15
Methods	*(max. 30 points)*	15
Literature	*(max. 20 points)*	13
Manuscript Form	*(max. 20 points)*	18
TOTAL POINTS	*(max. 100 points)*	**61**
GRADE	**(A – B – C – D – E – F)**	**D**

NAME OF THE REFEREE: *Vilém Semerák*

DATE OF EVALUATION: *Digitally signed, June 16th, 2023*

_____
                                                                                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