# Oponent review for the dissertation thesis

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**Title**: The demographic revolution in developing countries with special regards to Africa and Zimbabwe

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The doctoral thesis of Collet Muza deals with a complex topic of demographic transition and provides a new summary of the theories accompanied by insights from developing countries. Additionally, detailed aspects of demographic change in Zimbabwe are presented based on new types of data sources and analyses. The thesis is structured in four distinct parts. The first part focuses on historical trends with respect to the particularities of the demographic transition in developing countries. The second part focuses on spatial disparities and similarities of mortality and fertility change in Africa. The third part then looks at determinant of fertility decline based on DHS data for Zimbabwe. Lastly, determinants of under 5 mortality are being studied.

In the introductory part the lack of research is addressed and the knowledge gap to be filled is stated. The aims of the study are clear and are well covered throughout the thesis. The overview of the demographic transition is very detailed, although repetitive and unstructured in some parts. The author deals very well with controversial findings about causes of mortality and fertility decline (and its puzzled relationship to experienced infant and child mortality).

Chapter 2 gives a very exhaustive and well processed overview of mortality and fertility decline among developed countries. The author cites both recent and historical literature and provides a well-thought synthesis and discussion. Chapter 3 views the demographic transition from the perspective of developing countries, and again, the author discusses an impressive amount of literature and avoids repetition of what was said in the second chapter. I appreciate, among other, the discussion around the role of GDP in mortality levels and the role of family planning policies.

The introductory part of Chapter 4 is largely a repetition of what has already been said on developing countries, although with more focus on Africa. The literature review could have been included in previous chapter about developing countries, as they largely overlap. Chapter 4 could then include only the analysis itself. Next in Chapter 4 is the cluster analysis of selected African countries according to fertility indicators. In this analysis, countries according to CBR, TFR and NRR are clustered. However, the selected indicators are highly correlated (e.g., according to data provided in Table 5 on page 95, the correlation coefficients between CBR and TFR are 0.8, 0.97 and 0.98 in 1960, 1990 and 2010 respectively (the correlation coefficients between TFR and NRR are 0.68, 0.94 and 0.98 respectively). In such design, the assumption of non-correlated variables for clustering is violated and the cluster analysis results do not give much more insight over a simple ranking according to any of these variables. Although it is not a major mistake or fallacy, it would have been more interesting to include some non-correlated variables in the fertility clustering, especially after a very rich overview of fertility-related measurable factors previously provided, such as the GDP, education, contraception use, infant mortality rates or similar (which would of course require that such data or estimates are potentially available).

Chapter 5 deals with population ageing in Africa and points at the challenges of Africa's ageing face to the opportunities offered by demographic dividend. The particular, population trends in Africa result in double epidemiological burden of both communicable and non-communicable diseases, accompanied by still low socioeconomic development and still high population growth rate. The literature review is again a little repetitive, although adding some more detail about Africa compared to the previous chapters. The description of cluster analysis is reprinted from Chapter 4. In the cluster analysis, seven variables are selected, with an outlook to the future represented here as period 2025-2030 based on UN projections. Results of the cluster analysis are commented but are rather difficult to read, due to numerous typographic errors and sometimes incomplete or unprecise formulations. The comments also go very little behind technical results and readers are left with unmet expectations of what the cluster analysis actually brought in terms of new knowledge. An interesting outcome here is the geographical stability of the clusters in time, a clear sign of coexisting various stages of demographic transition in Africa representing each a different governmental challenge.

Chapter 6 is devoted to Zimbabwe and starts with an overview of the history of the country, followed by thorough description of population and health related issues. Another puzzling burden of African countries is shown here – the simultaneous prevalence of underweight and obesity, among others. A thorough outlook on Zimbabwe history of mortality is provided including causes of death and stressing the role of HIV in particular dynamics of south African populations. In the last part of the chapter, fertility transition is described and documented by numerous data sources.

Chapter 7 stands for demographic transition in Zimbabwe as such. A concept of crisis-driven fertility decline is introduced, which provides another example why demographic transition in Africa is an outlier to the existing systematization. The chapter is then focused at the analysis of proximate fertility determinants based on data from ZDHS 1988-2015. The analytical framework is based on Bongaarts study from 1982. It should be noted that Bongaarts revised his results and published a revised method in "Demographic research" in 2015, so I would suggest the author to read his new paper. The first equation on page 143 misses one multiplier (the indices should be multiplied by TF). The second equation should have $C_a$ as a multiplier. In the 2015 Bongaarts estimates, based on DHS 2010-2011, the indices estimates slightly differ for $C_c$ (0.64 versus 0.47), for Ci (0.61 versus 0.66), and $C_a$ (0.89 versus 1, but this is given by the fact that the author assumes hypothetical non-existence of abortions).

Chapter 8 presents an analysis of under-five mortality and its determinants in Zimbabwe. The child mortality is assessed indirectly from the census based on question about last birth survival status, and although there might be an underestimation of reported births and deaths, the data can provide valuable insight into the child mortality determinants. In the regression model, it is surprising to find age 40-49 at first birth as reference category and to see that this group had the best child survival. Also, highest education is usually taken as reference, similar for safe water. As a recommendation, I would suggest to use urban/rural distinction additionally or instead of regions.

The last chapter provides a clear and thoughtful summary of findings and limitations.

The thesis has several remarkable strengths. The manuscript represents a huge amount of scientific literature and information processed, and the resulting text is clearly presented, informative and genuinely pleasant to read. Each chapter ends with a short summary, which improves the reading and creates a connection between individual parts of the text. The author processed a multitude of data from international and national sources (UN WPP 2017, Global Burden of Disease, DHS, Census). Graphical representations are well chosen and properly placed. The use of terminology, as well as

the use of language, is very good. In analytical parts, the author has demonstrated knowledge and understanding of advanced demographic and statistical methods including multivariate.

Regarding weaknesses, the thesis is conceived as a compilation of several self-standing chapters, where each has its own literature review, data and methods section, and discussion, which leads to numerous repetitions. A non-negligible amount of typographic and syntactic errors have been left in the text, which decrease the quality of the manuscript. Several further minor remarks can be raised, such as: On page 65, Preston curves are mentioned but no reference is given to the Preston paper. On page 79, Figure 18 is numbered as Figure 1. The correct term for logistic regression, not logistic. Meulan is written instead of Melun on page 47. On page 102, Chapter 5 is named Chapter 4. On Figure 36 it is not clear whether age standardized death rate or absolute deaths are displayed (the title of the y-axis is different from the title of the graph).

In broad summary, the dissertation thesis of Collet Muza on "The demographic revolution in developing countries with special regards to Africa and Zimbabwe" represents a professional, innovative and good quality work which includes both respectful approach to existing knowledge and novelty represented by bringing original results based on own analysis of previously unexplored data sources. The work also has practical implications, especially for the author's country family and health policy stakeholders.

Therefore, I recommend the dissertation thesis for being submitted.

In Prague, the 23. September 2019

Signature:

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