

**Reply to Referee Report 2 of the paper with the title: “The nexus between unemployment rate and shadow economy: A comparative analysis of developed and developing countries using a simultaneous-equation model”**

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We thank the reviewer for revising our manuscript carefully. We are especially grateful for the constructive comment, which helped improving our research.

## **Comment**

Suppose one would try to estimate the relationship between factor X and an index Y, where Y is created using a list of factors that includes factors X, A, and B. Would that make sense? No, it would not. Suppose one would then investigate ... how factors A or B influence the relationship between X and Y. Would that make more sense? No, it would not. However, I fear that this is in essence what the analysis in this paper is about.

The authors do not provide any details about the main indicator “Shadow Economy” except that it is drawn from Medina & Schneider (2018). That paper presents an estimate of the size of the shadow economy using the MIMIC approach for 158 countries 1991-2015. This approach boils down to estimating one latent measure for the size of the (unobserved) shadow economy by estimating the relationship between various “causes” and “indicators.” In the case of Medina & Schneider (2018) the “causes” are trade openness, unemployment, size of government, fiscal freedom, rule of law, control of corruption, and government stability, and the “indicators” are change in local currency per capita, labor force participation rate, and growth of GDP per capita.

To be specific, the measure of the shadow economy used in this paper directly builds on the variation in unemployment (and other factors) across time and space. As such, it cannot be used to investigate the relationship between unemployment and the shadow economy.

## **Reply**

Thank you for the very relevant remark.

Concerning the relationship between factor X and a shadow economy, where SHADOW ECONOMY is created using a list of factors including factors X, A and B. We insist that SE is already determined not only by A and B but by several other variables C, D, E (SHADOW ECONOMY = X+A+B+ C +D +E). In this way, the problem of endogeneity can be solved, in addition we applied the “Durbin-Wu-Hausman test” which aims to control the endogeneity and the result of this test is significant.

Also, if we interpret in this way, we can not use the SE in models (example: effect of shadow economy on the GDP since the SE is already correlated with the GDP) or there are several

publications that have already used the SE index calculated by Medina and Schneider (2018) and estimated the relationship of SE with GDP (example: Baklouti and Boujelbene, 2018).

This can be justified by the integration of several variables in the SE index that make it possible to absorb the problem of endogeneity.