

**Response to the comment 2 "The BIP Trilogy (Bipolarization, Inequality and Polarization):
One Saga but Three Different Stories"**

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First of all, we would like to thank the second anonymous reader for his/her useful comments. We will take his/her suggestions into account when preparing a revised version of the paper.. The report of the second reader included five main points and here below are our replies.

First comment:

"The authors argue that inequality, bipolarization and polarization are three different concepts. However, they do not analyze indeed these three concepts in the paper but rather focus on the role played by the various (income) sources that generate them in some measures of inequality, bipolarization and polarization. As they find (in the empirical application) that these sources play a different role in these measures they conclude that these concepts differ-. First, this should be more clearly stated in the introduction. And second, I find this is not a strong enough argument for such a conclusion."

Answer: We thank the referee for this very useful comment. Following the remarks of the referee, we will clarify the aim of our paper and, stress that several papers in the literature have given expressions for the impact of an income source on overall income inequality. We will also insist on the potential policy implications of our approach (see comment 4 below).

Second comment:

"An important part the work consists on the presentation of the three concepts: inequality, bipolarization and polarization and the Shapley decomposition (Sections 2 and 3). I believe that this part would benefit by presenting the different concepts in a more systematic fashion. That is, for each case concept the authors should provide firstly a formal definition (rather than just similarities with other ideas and/or contexts), secondly a formal description of the properties of the corresponding proposed measure, and finally a formal description of the consequences of applying the Shapley decomposition on these measures (rather than just relegating to the appendix part of this analysis). Thus, after reading Sections 2 and 3, the reader must know which are, a) the main theoretical results, b) the specific hypotheses that are

going to be tested in the empirical application, and c) the contribution of these findings to the relevant literature."

Answer: We will follow the reader's recommendations, trying first to define what each concept refers to and stating clearly afterwards, for each of the three notions of inequality, bi-polarization and polarization, what properties are assumed to hold.

Third comment:

"The choice of the particular measures proposed, and also the decomposition approach seems quite ad hoc. I suggest the authors to provide strong arguments for their choices or at least comment on the extent to which their results would have changed (the impact of different sources of income on each measure differs) had these measures be different to the ones proposed."

Answer: When revising the paper we will better justify the choice of the indexes. As far as the choice of indicators is concerned, we have selected to measure inequality the most popular inequality index, the Gini index, and for polarization, the only available measure (DER) which does not assume that groups are defined a priori. The only choice which might look arbitrary is that of the bi-polarization measure originally proposed by Deutsch et al. (2007). We will stress its similarity to the Foster and Wolfson bi-polarization index, which is certainly the most popular index of bi-polarization. The P_G measure has the great advantage of being invariant to both a multiplication of all incomes by a constant and to equal additions to all incomes. Regarding the Shapley decomposition procedure, Shorrocks (1999; forthcoming) explained at length why such an approach should be attractive especially in solving the very important issue of "path dependency".

Fourth comment:

"I believe there are lots of arguments for studying the role of the various sources of income on the measures proposed per se (that is, for the decomposition analysis undertaken), for instance in terms of policy analysis. However, there is a complete absence of motivation to this analysis. This is important given the topic of the paper."

Answer:

We thank the reader for making this point. We will certainly modify the introduction in order to better stress the potential policy implications of our approach.

Fifth comment:

"One of the interesting parts of the paper, in my view, is the analysis presented in Section 4. I think it is a rather novel approach. In this sense I think that income might be just an application and thus the author could try to provide a more general analysis of decomposition these measures on other variable distributions. Another application might be the study of education results (score) distribution in the population.

However, I also have some concerns regarding the analysis proposed here. In particular, and to check the robustness of their empirical results, the authors propose to consider a wider set of income sources to the one consider in the first study, namely, seven instead of just three. I suggest the authors to better explain their robustness strategy (why would one expect the results to be different?) before proceeding to describe their results. In addition the author should clarify to what extent the result depends on other particular properties of the income distribution (dispersion, symmetry, etc.)"

Answer: There is no doubt that our approach may be also applied to the more general case of an income generating function. In other words after regressing total household income on a certain number of explanatory variables, such as the gender, age, ethnic group, educational level, ... of the head of the household, the regression coefficients obtained would allow us to consider each of the explanatory variables (as well as the residual of the regression) as an income source. One could then check the marginal impact of, say, education, on inequality, bi-polarization and polarization. We plan to mention this in the conclusion of the revised version of our paper.

As far as a more detailed breakdown of the income sources is concerned, we thought it useful to also give an illustration based on a wider set of income sources because, for example, transfers may have a very different impact on the income distribution. Some transfers may lead to a decrease in bi-polarization while at the same time they may lead to an increase in polarization if their introduction implies the appearance of an additional local pole. This is, for example, the case of unemployment benefits which at the margin decrease bi-polarization but increase polarization (compare Tables 3 and 4).

The reader mentioned also the fact that the results of our empirical investigation may depend on other particular properties of the income distribution such as its dispersion, symmetry, etc....We certainly agree with this remark. Berrebi and Silber (1987) proved, for example, that the Gini index was related to a measure of the asymmetry of a distribution. Similarly Deutsch et al. (2007) derived their index of bi-polarization from a measure of the skewness of the distribution originally proposed by Berrebi and Silber (1989).

The minor remarks will certainly be taken into account in the new version of the paper.