

# Free associations of citizens and scientists with (green) economic growth: A computational linguistics analysis

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## Extended abstract

The debate about the relationship between economic growth and environmental sustainability involves many dimensions as well as much diversity in terminology. While often summarized in terms of dichotomous pro- and anti-growth positions, several studies indicate that additional views exist. These tend to differ between experts and general public, while also people may have distinct positive and negative associations to associated concepts.

The majority of quantitative studies of attitudes and beliefs draws on closed-ended survey questions. More recently, some studies have analyzed freely formulated associations to specific terms or concepts. Such associations deliver additional information to the responses to pre-formulated, closed questions or statements. Based on it, one can explore more deeply the cognitive content of individuals' attitudes and beliefs. The technique of free associations has been used to study a variety of environmental and non-environmental topics, such as 'climate change' (Leiserowitz, 2006; Lorenzoni et al., 2006; Moloney et al., 2014), 'peak oil' (Becken, 2015), 'fracking' (Clarke et al., 2015) and 'financial/economic crisis' (Gangl et al., 2012). To our knowledge, there is only one study that has examined associations to 'economic growth' (Mohai et al., 2010). Using data for China and the US collected in 2002, it found that "improvements in standard of living" was the category with the most frequently mentioned associations, though with considerable differences between countries (67% versus 32%).

The data in the above-mentioned studies on free associations has traditionally been coded manually by researchers. An alternative approach is a computer-based analysis using the technique of structural topic modeling. Only a few studies have used it to examine associations to 'climate change' (Tvinnereim and Fløttum, 2015; Tvinnereim et al., 2017a) and 'air pollution' (Tvinnereim et al., 2017b). Among the advantages of this technique is that it allows processing large amounts of information in very short time, avoids any systemic bias/inconsistency between human coders working on the same data, and incorporates into the topic model additional information about the surveyed person such as her gender, education or political affiliation (Roberts et al., 2014).

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The motivation of this paper is twofold. First, to examine what the general public and scientists associate with the term ‘economic growth’. To this end, we will draw on two data sets from surveys among the general public (Drews and van den Bergh, 2016) and scientists with a variety of backgrounds (Drews and van den Bergh, 2017). In addition, we will examine associations to the term ‘green growth’, a popular term in both academia and public media. A second objective is to investigate how associations vary with individual characteristics. To this end, we build on previous research which found that currently three different population segments exist with respect to attitudes and beliefs regarding economic growth and the environment (Drews et al., 2019; Tomaselli et al., 2019): green growth, or believing that economic growth can be sustainable; degrowth, or arguing that – for the sake of preservation of environment – growth is to be stopped or turned into decline; and an intermediate segment, agrowth, or indifference about growth. To validate these segments, we are interested in studying whether free associations to ‘economic growth’ and ‘green growth’ differ between them.

We find that the general public (in Spain during 2015) is very critical of the notion of economic growth, much more on average than academics. People stress problems of corruption, social inequality, unemployment and poverty. These topics dominate in the opinions of the majority of responders with relatively little variation among the three segments of people with different stances towards the growth-vs-environment debate. The academics, in contrast, stress more the role of environmental problems associated with economic growth and show a much stronger variation in topics between the three segments of people. For example, people from green growth segment are more likely to stress the benefits associated with economic growth and the role of renewable energy for sustainable development, while people from the degrowth segment mention the environmental and social (poverty, corruption) problems related to economic growth while questioning the very possibility of sustainable growth (using the term “greenwashing”). From this study we conclude that the technique of structural topic modeling can be useful in determining the most sensitive issues for different stakeholders (general public/voters, academics/experts, policy makers, etc.). In turn, this might help to better frame environmental policy initiatives so that these can count on considerable political and voter support.

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