

Economiccomplexity: Methods Used in the Economic Complexity Literature

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Summary

Economic complexity is a state-of-the-art line of research that started back nearly ten years ago and introduces network theory concepts to study different social sciences issues related to international trade and income inequality. Its approach starts from representing international trade data as a bipartite network that connects countries to the products that they export.

Seminal papers in economic complexity are Hidalgo, Klinger, Barabási, & Hausmann (2007) that introduces graphs to explore trade diversification and export opportunities, and Hidalgo & Hausmann (2009) that develops dedicated metrics of complexity. These two articles are expanded and interpreted in Hausmann et al. (2014), whose typesetted equations were translated to code in the R package **economiccomplexity**.

This R package provides different methods to compute complexity metrics to ease access to this line of research for social scientists. `economiccomplexity` depends on the `tidyverse` package (Wickham, 2017), and follows the same design philosophy, grammar, and data structures from it.

Recent articles such as Hartmann, Guevara, Jara-Figueroa, Aristarán, & Hidalgo (2017) introduce the question whereas a country's mix of products could predict its pattern of diversification and income inequality, but do not include linked and executable code and data. This separation between the research, this is the complete process that produced the results, from its presentation, makes it difficult for others to verify the findings in the study.

`economiccomplexity` might help to evaluate research findings in this particular area, helping to produce less studies that are not reproducible, or partially reproducible with some discrepancies, conditional on the availability of data, metadata, and computing power that may be unavailable to all researchers.

The central contribution of this package is to be the first that provides functions to use the recursive linear algebra methods from Hidalgo & Hausmann (2009) in R and adds tests and full documentation to offer the best possible package on CRAN.

Tacchella, Cristelli, Caldarelli, Gabrielli, & Pietronero (2012) presents non-linear iterative methods that extend the linear approach from Hidalgo & Hausmann (2009) in order to capture the link between the export basket of different countries and their industrial competitiveness. This approach is also implemented in `economiccomplexity` but following the formulation in Mariani, Vidmer, Medo, & Zhang (2015) that introduces extremality parameters that generalize the original formulation.

Peng (2011) states that reproducibility has the potential to serve as a minimum standard when full independent replication of a study is not possible, and that becomes even more important to evaluate scientific claims in studies with public policy implications. A tenet of the scientific method holds that every research finding should be reproducible before it becomes accepted as a genuine contribution to human knowledge (Stodden (2009)).

Complexity methods are also used outside its original research area. In particular, the fitness method from Tacchella et al. (2012) has been used in ecology to study species interaction (see Domínguez-García & Munoz (2015)) and, more directly related, to study the scientific competitiveness of nations (See Cimini, Gabrielli, & Sylos Labini (2014)).

The application widespread of economic complexity shall be looked with a bit of caution. Any theoretical or computational implementation shall be far from becoming a keystone if reproducibility is ignored. The extent to which code in computational research would build with reasonable effort is lower than 20% (Collberg et al., 2014). A desirable growth pattern should focus on reproducibility, and I hope this package means a contribution to transparent research practices.

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