# The Weighted DHC Theorem and Its Application on World Trade Web

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The backbone of world economy system is constructed by the World Trade Web. Identifying influential countries in such a network and their evolution over time is crucial in studying network structure and function which could make us better understanding the world economic development. Here we tackle this issue through analyzing 20 year's global export and import trade data in commodities, employing a weighted DHC approach by extending the DHC theorem [1] to directed and/or weighted networks. The DHC theorem correlates the Degree, H-index and Coreness (DHC) in a same network decomposition process, and can be used to measure the importance of nodes. Then, we show the rankings of influential countries measured by several methods and discuss the differences between them. The evolution of countries' influence over time is presented, and the heterogeneity among some typical countries which can't be captured by a conventional analysis is reported. The empirical results show that the ranking of one country's influence is strongly correlated with the diversity of its economic structure [2]. Finally, we show the impaction and robustness of our method against noisy data in terms of the decline of trade volume. The results suggest our method to be a good indicator when quantifying node influence in directed and weighted networks [3].

[1] Lü L, Zhou T, Zhang Q-M, et al. The H-index of a network node and its relation to degree and coreness[J]. Nature Communications, 2016, 7:10168.
[2] Eagle N, Macy M, Claxton R. Network Diversity and Economic Development[J]. Science, 2010, 328(5981):1029.
[3] Lü L, Chen D, Ren X-L, et al. 2016. Vital Nodes Identification in Complex Networks[J]. Physics Reports, 2016, 650: 1–63.

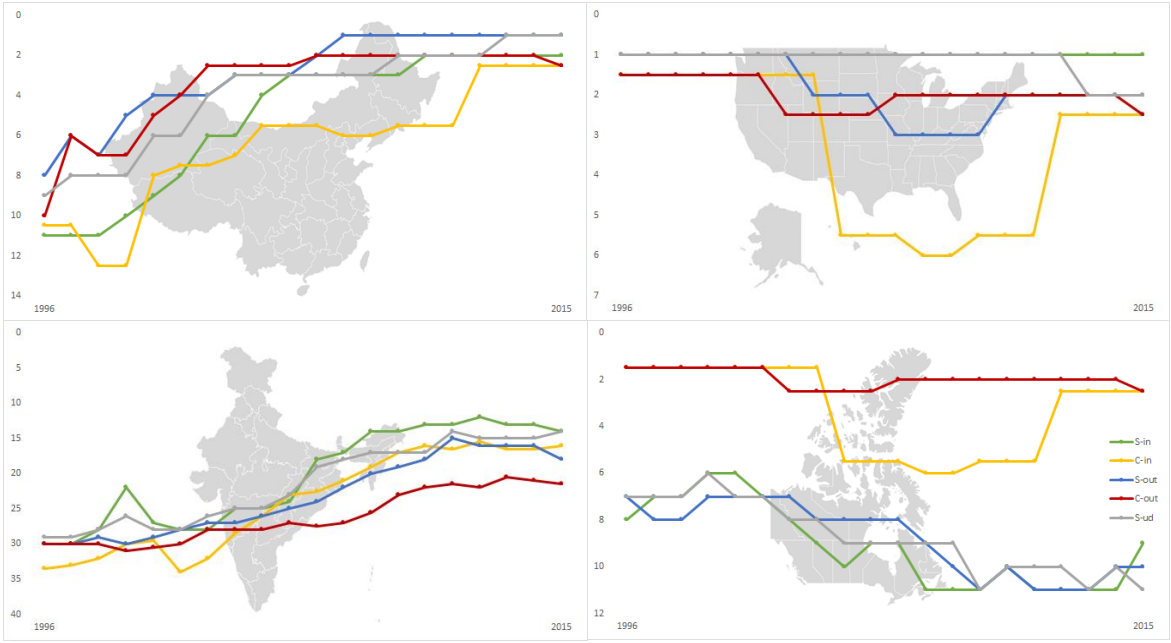


**Figure 1: The evolution of the rankings of four countries over time.** The four graphs stand for China, United States, India and Canada, respectively. Lines with different colors in one graph represent different measurements of influence. (Source: amCharts. The map of China should include South China Sea Islands, Diaoyu Islands and South Tibet.)