

PUBLISHED NOVEMBER 20, 2012

## The downside of interdependent networks

BY [BORIS PODOBNIK AND GENE STANLEY](#)[PRINT](#) | [EMAIL THIS ARTICLE](#)

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opportunities usually do not choose between say, Singapore and Vietnam, but between Singapore and a comparably rich market, such as Japan or Hong Kong. Hence, it is important for each nation to compare its level of competitiveness relative to GDP per capita.

Recently, we led a research group from Boston University and co-authored a paper in Nature Scientific Reports entitled The Competitiveness Versus the Wealth of a Country. In it, we explored the Global Competitiveness Index (GCI), which reflects both the macroeconomic and the business aspects of competitiveness.

Switzerland and Singapore led the ranking as the two most competitive economies in the world. The GCI provides a raw score that ranges between 0 and 6, where GCI = 6 corresponds to the most competitive country. Generally, the larger GCI, the better. However, which country has better potential, the one with GCI equal to 5 and GDP per capita of 20,000 dollars or another country with something smaller GCI, say 4.6 and GDP per capita of say, 10,000 dollars? One might guess at first sight that even if the first country is more competitive in an absolute sense, the second one has greater potential in the long run.

This reasoning motivated us to define a new measure in order to quantify a nation's performance which we call relative competitiveness (RC). This is defined as competitiveness measured by the GCI relative to country's wealth, measured by GDP per capita. The RC is calculated by running a regression between GDP per capita and GCI and calculating the difference between actual and expected GCI for a given country. We find that, generally, the larger the RC, the better the country's performance. A positive RC is associated with good performance and negative RC with poor relative performance.

The new measure, RC, seems to provide new insights on why all the European Union's southern countries are now faced with more severe debt crises. Indeed, we find that each Mediterranean country except France is relatively non-competitive, because each country has a negative RC value. We found that for all European and EU countries during the 2008-2011 economic downturn, the drop in GDP per capita in relatively more competitive countries (those with a larger RC) was substantially smaller than in relatively less competitive countries (those with a smaller RC).

Our research found that the countries that are best performers in relative competitiveness are primarily Asian countries - ranging from developing to highly developed countries - such as Vietnam, China, Malaysia, Saudi Arabia, Hong Kong and Singapore. The Podobnik-Stanley team also studied the Corruption Perceptions Index (CPI) introduced by Transparency International. A large value of the CPI indicates that the country is not perceived to be very corrupt. The authors find that the countries with the sharpest drops in CPI over the last decade, eg, Greece and Italy, now face the most dangerous public debt crises. This is important information for financial institutions since such countries become increasingly risky financially over time. Finally, we found that interdependent groups of countries, especially heterogeneous groups such as the EU, seem to be more vulnerable to financial and economic fluctuations than independent single countries. This finding becomes especially plausible in the light of recent studies of interdependent networks. Such studies found that these networks - such as financial networks of different countries - behave very differently from single networks and become significantly more vulnerable compared to their non-interacting counterparts.

In interdependent networks, the failure of a node in one network may trigger a catastrophic cascade of events and lead to a global cascade of failures. Moreover, interdependent networks are difficult to defend by strategies such as protecting "high degree nodes", which have been found useful to improve the robustness of single networks.

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IN a globalised economy, every nation competes with every other. The most important goal for every nation is to be better than its principal competitors, which are frequently countries with a similar GDP per capita. Foreign investors looking for the best investment

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