



The sustainable competitiveness of nations



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ABSTRACT

Is it possible for a country to be commercially competitive and at the same time protect the environment and social welfare? The recent (2011) initiative by the World Economic Forum to complement their well-known competitiveness rankings of nations with data on sustainability is here reinterpreted in terms of a general model of social and economic policy, using productivity and sustainability variables as policy goals, and the eleven so-called “pillars” of the Forum as policy instruments. Aiming further than just calculating a simple index, however, we consider the full multi-dimensional problem facing each nation maximizing its social preference for the goals, given its corresponding social policy costs. The solution to this optimization problem splits the nations into two categories: (i) those achieving the maximally doable, tracing the “frontier” or upper envelope to the scatter of data points and (ii) sub-optimal and thus under-achieving nations falling behind the envelope. Using the Forum data for 125 nations in 2013, we identify the frontier and sub-frontier nations. For each suboptimal nation we identify its “peers” on the frontier suggesting how its sustainable competitiveness might be improved.

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1. Introduction

The US Council on Competitiveness located in Washington, DC, was founded during the Reagan administration in 1986. Its professed goal is to increase the economic competitiveness of the United States in the global marketplace. It sponsors conferences, seminars, and special events, and publishes annual reports of its findings.¹ During its early years, the Council compared and ranked the US performance relative to that of other large countries, but more recently has been mainly occupied with in-depth studies of the US economy.

Throughout, the Council defines competitiveness as “productivity”, measured as output per worked man hour. Productivity depends on both the quality and features of the output and the efficiency with which it is produced. Sustained productivity growth requires that an economy continually upgrade its productivity in existing industries by raising product quality, adding desirable features, improving product technology, or boosting production efficiency.

During its early years of operation, the US Council was very much influenced by the ideas of Harvard Professor [Michael Porter](#), the author of *The Competitive Advantage of Nations* (1990).

Porter dismisses many commonly accepted indicators of competitiveness such as labor costs, exchange rates, economies of scale or bountiful natural resources. Instead he finds the true source of competitive advantage on the national level to be productivity.

The World Economic Forum based in Geneva started the calculations of its Global Competitiveness Index in 1979 (see the annual *Global Competitiveness Reports* issued by the Forum). It recognizes twelve “pillars” or causative factors that influence competitiveness such as health and primary education, higher education and training, financial market development, technology and innovation. Each of these categories is broken down into a large number of subgroups. We shall here refer to these pillars as competitiveness “facilitators.” A panel of World Economic Forum advisors in each country affixes a competitiveness “value” (on a 1 to 7 scale) to each subgroup, and a constant weight (the weights are the same for all countries, adding to one). The value for each pillar is obtained as the arithmetic weighted average of the values of the subgroups. Finally, using constant weights for each pillar as well, an overall competitiveness index for the entire country is calculated.

Briefly, the World Economic Forum breaks down the concept of competitiveness into its smallest component causal factors, calculating an overall index as an arithmetic weighted average of the values of the factors.

We do not view the two schools of competitiveness studies now outlined, one pursued on each side of the Atlantic Ocean, as competing

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¹ Commemorating its two first decades of operations, the US Council issued the report *The Competitiveness Index: Where the US stands* (2006). Among recent reports of the council, see in particular the annual 2013 report.

approaches. Instead, we view them as complementary. One of these schools puts the emphasis of the various indications or manifestations of competitiveness, that is, the *outputs* of the competitiveness process, the other on the explanatory factors or the *inputs* into the process.²

2. Sustainable competitiveness

In economics, the term “sustainable” originally referred to the absence of degradation of natural resources. Lately, it has become common to use the term also in relation to the absence of degradation of social and human conditions generally. The 1987 Brundtland report³ defined it in the following manner:

Sustainable development ... meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains ... the essential needs of the world's poor, to which overriding priority should be given... In essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.

In the modern world, the conservation of natural resources is typically obtained through alternative and innovative technology. Fossil fuels are saved through solar or wind power, the fish population of the seas is replenished by fish farms, the release of CO₂ is reduced through the installation of exhaust controls. In brief, sustainability is promoted by innovation and new technology.⁴

In September 2015, world leaders met at the UN in New York adopting a universal agenda setting seventeen SDGs (sustainable development goals).⁵ With these agenda the term “sustainability” is taking on a yet wider and more general political significance. While the universality of the new SDGs is commendable, it must be remembered that no sustainability can endure without a steady flow of new technology. Sustainability requires creativity: an ongoing upgrading of existing technology, new lines of production, the startup of new companies and a gradual phasing-out of obsolete technology (through Schumpeterian creative destruction). Often, sustainability requires the daring introduction of entirely new ways of doing things (the invention of better solar cells or new batteries, the discovery of new vaccines to fight deadly disease).

The ninth SDG goal reads:

“Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.”

That formulation is not good enough. For one thing, the era of industrialization is now approaching its end in the Western world. The number of workers in manufacturing is rapidly falling. New jobs based on entirely new technologies need to be created.

To get things right, sustainability needs to be anchored to the idea of increased labor productivity. The World Economic Forum in Geneva is on the right track when it proposes examining the “sustainable

competitiveness” of nations, defined as “the set of institutions, policies, and factors that determine the level of productivity of a country while ensuring the ability of future generations to meet their own needs”.⁶ The sustainable competitiveness index (SCI) of the Forum widens the calculation of its standard competitiveness index to include characteristics of demographics, social cohesion and environmental stewardship. The statistics covers nine social sustainability factors and ten environmental sustainability factors.⁷

The great merit of the Forum approach is to break down the competitiveness concept into its underlying technologies, examining each one of these in terms of its social and environmental impact.

Following the Forum, we have for our empirical work chosen four of its social factors (the Gini index, youth unemployment, access to sanitation, access to improved drinking water) and four environmental factors (agricultural water intensity, CO₂ intensity, the overexploitation of fish stocks, forest cover change). The Forum obtains data for these factors from opinion surveys carried out worldwide.

To measure the sustainable competitiveness achievements of a nation — the manifestations or *outputs* of the competitiveness process, we follow the US Council of Competitiveness in turning first to a conventional measure of productivity (GDP per employee) but tempering it by the Forum sustainability records. In effect, this means constructing a joint performance index. For the *inputs* promoting the competitiveness of a nation, we shall simply use the twelve “pillars” used by the Forum in its standard competitiveness index. For both the outputs and the inputs, an index of the component factors has to be constructed. Parting ways with conventional index calculations, however, rather than using fixed and predetermined weights throughout, we shall determine the optimal weight to be given to each factor, thus enabling us to form the ratio between the optimally weighted outputs and the optimally weighted inputs.

Before turning to these particulars, we briefly explain how our approach should be understood as an instance of a general theory of economic and social policy-making in a turbulent world.

3. A measure of the effectiveness of social and economic policy⁸

Social and economic policy deals with the control of policy parameters or instruments of policy that are employed in order to reach some list of policy aims or goals. Quite generally, we shall define the effectiveness of social and economic policy as the ratio between the index of all policy goals achieved and a corresponding index of all policy instruments employed. The competitiveness of a nation will then be measured as the ratio thus obtained.

In order to demonstrate what has now been said, let us assume that a policy-maker has agreed on a list of reasonable policy indicators and collected statistics measuring them, say Y_r , $r = 1, 2, \dots, s$. Also, define a weight to be attached to each such indicator, μ_r , $r = 1, 2, \dots, s$. The resulting goal index would then be $\sum_r \mu_r Y_r$. Similarly, assume that the policy-maker has identified a list of competitiveness policy instruments, say X_i , $i = 1, 2, \dots, m$ with the weights of each instrument ν_i , $i = 1, 2, \dots, m$ to be determined. The index of policy instruments is then $\sum_i \nu_i X_i$.

Consider a situation where data for the vectors X and Y have been collected for $j = 1, 2, \dots, n$ countries, writing the observations for country j more fully as (Y_{rj}, X_{ij}) . We wish to determine the effectiveness ratio (or

² For further discussion, see Thore and Tarverdyan (2015, pp. 87–90).

³ See World Commission on Environment and Development (1987). The Rio + 20 Conference held in June 2012 in Rio de Janeiro was a further important milestone strengthening the institutional framework for policies aiming at sustainable development. See the concluding document UN (2012). More recently, during the celebration of the 70th anniversary of the United Nations, the Sustainable Development Summit 2015 was held from 25 to 27 September 2015, in New York. After the successful conclusion of the negotiations on the post-2015 development agenda at the high-level plenary meeting of the General Assembly an outcome document entitled “Transforming Our World: the 2030 Agenda for Sustainable Development” was agreed by consensus. “A plan of action for people, planet and prosperity” and a set of global “Sustainable Development Goals and targets” was unanimously confirmed by the heads of state of the members of the UN. See UN (2015b).

⁴ See F. Phillips, “Toward a Sustainable Technopolis”, in Oh and Phillips, eds., *Technopolis* (2014, pp. 169–184).

⁵ See the 2015a UN *Global Sustainable Development Report*.

⁶ World Economic Forum, *The Global Competitiveness Report* (2011–2012, p. 54).

⁷ With a media blitz in April 2015, Porter launched his new social progress index (SPI), an impressive attempt to outdo the World Economic Forum, capturing the full dimensions of “social happiness” even extending the calculations to reflect personal freedom and choice. Enlisting the contributions of a worldwide team of economists, the SPI collects statistics on 52 indicators from 133 countries.

⁸ The presentation here represents a simplified version of the general theory of economic and social policy presented in Thore and Tarverdyan (2015, pp. 12–18), assuming that the social preference function for all goals can be written as a linear index, and that the social cost function of employing all policy instruments similarly takes the form of a simple linear index.

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