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From the Concept to the Measurement of Sustainable Competitiveness: Social and Environmental Aspects

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ABSTRACT

Objective: This article offers an extensive review of Sustainable Competitiveness as an integrating concept bridging current understandings around sustainable development and encompassing the aspects of economic, social and environmental sustainability.

Research Design & Methods: Concepts related to sustainable development are reviewed and their relationships to Sustainable Competitiveness are considered. The concept of Sustainable Competitiveness is related to a set of effective metrics.

Findings: The Sustainability Adjusted Global Competitiveness Index (SGCI), which comprehensively measures cross-country sustainable competitiveness, is identified as a credible synthetic metric for measuring separate aspects of sustainable development across a range of countries.

Implications & Recommendations: The approach enables disaggregation between three separate elements which have an impact on sustainable competitiveness, namely Basic Conditions, Efficiency Enhancers and Innovation Conditions. It is concluded that extending the measurement from GCI to SGCI offers a potential for considering international competitiveness performance from the environmental and social sustainability perspectives. Extensions to SGCI are also proposed.

Contribution & Value Added: The conceptual discussion indicates that the main features relevant to sustainable development appear in the concept and the measure of sustainable competitiveness. The application of the measure to a time-series of data would permit an analysis of the relationships between economic, social and environmental aspects (separately) with measured sustainable competitiveness.

Article type:	conceptual paper
Keywords:	sustainable development; economic, social and environmental sustainability
JEL codes:	Q56, Q20, Q32

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INTRODUCTION

The Commission on the Measurement of Economic Performance and Social Progress (Stiglitz, Sen, & Fitoussi, 2009) identifies that traditional indicators (i.e. GDP, CO2 emissions) present a narrow view of what sustainable development should achieve, highlighting the need for more comprehensive, integrated and holistic approaches. A number of metrics on aspects of sustainable development compete for policy space and attention, and effective metrics assist in steering the transition to sustainability. Such metrics highlight current status, areas where goals are achieved – and areas that need improving. This article addresses the lack of clear and manageable metrics for sustainable development.

The contribution of this conceptual article is its consideration of the intersections between economic performance and environmental and social sustainability. It aims to identify, given current theoretical and conceptual understandings, the impact of economic performance, comprised as a set of distinct elements of economic performance, i.e. 'competitiveness pillars', on environmental and social sustainability. These issues are relevant across the context of international measurement potentials, across countries at different levels of development.

The research identifies how data available from the Global Competitiveness Project (GCP) of the World Economic Forum (WEF: www.weforum.org) could be complemented with environmental and social data from multiple sources. The GCP data covers 144 countries and included social- and environmental-sustainability adjusted measures of competitiveness only since 2015. The measures are derived from international data-gathering efforts contributing to e.g. the evolution of the Millennium Development Goals (2000) of the UN into the Sustainable Development Goals (2015) and build on frontier research. The approach selected here presents a comprehensive assessment of sustainable development which can be applied to aid in guiding the transition towards smart and green economy developments.

The focus on competitiveness outlined in the second section stems from understanding that economic performance is steered by a set of basic fundamentals, the relationships between them and the enterprise (or micro-economic) environment. In the third section, the review details extensively the conceptual and theoretical underpinnings of the Sustainability-adjusted GCI proposed by the WEF. Both the concept and the measurement are placed in the wider context of related research and measures of environmental and social sustainability, the latter theme only recently of research focus. From this review we identify strengths, weaknesses and potential areas for enhancement of the WEF approach and outline these in the fourth section.

Implications of the review point to alternative approaches which exist for measuring competitiveness, environmental and social sustainability, and compare these to the sustainability adjustments proposed by the WEF. The sixth section concludes with the main outcomes of the review of concepts and measurements for sustainable development.

LITERATURE REVIEW AND THEORY DEVELOPMENT

Sustainable Competitiveness – An Integrating Definition and Approach

Underlying & Interrelated Concepts

The World Economic Forum (WEF, 2015) extended its definition of competitiveness to encompass sustainability, defining sustainable competitiveness as the set of institutions, pol-

icies, and factors that make a nation productive over the longer term while ensuring social and environmental sustainability. Within the policy and research spaces key related concepts of 'circular economy' and 'inclusive growth' increasingly point to consumption and production systems that are in harmony with society and the environment (Corrigan, Crotti, Hanouz, & Serin, 2014; Piketty & Goldhammer, 2014). A trade-off between environmental quality and economic growth no longer dominates research or policy narratives – now simultaneous targets are identified for growth, sustainability and societal development (Ambec, Cohen, Elgie, Lanoie, Canada, Chabot, & Thornton, 2010; Porter & Van der Linde, 1995).

Competitiveness in this context refers to the level of local (national or regional) productivity (Delgado, Ketels, Porter, & Stern, 2012) rather than market-share or cost-competitiveness which focus on cost-efficiency or the ability of nations to compete in the international market. The level of productivity sets the level of prosperity that can be reached by an economy – where prosperity is related to the value of economic output and the quality of that output (Porter *et al.*, 2008), and where the productive capacity contributes to a general rise in living standards, freeing people to make choices, and enabling a more equal distribution of opportunities (Commission on Growth and Development, 2008). For Porter (1990), productivity is the only meaningful concept of competitiveness asit determines the rates of return obtained by investments, and these are the fundamental drivers of an economy's output and income growth rates.

Sustainable competitiveness includes several interrelated aspects of the concept of sustainable development. Environmental sustainability has received a lot of attention within sustainability debates and the general understanding is that economic development must be decoupled from intensive use of natural resources to avoid surpassing the carrying capacity of the natural environment (United Nations, 2002). Within the economic growth research, an increasing emphasis on human development, polarisation and inequality impacts prevails (Karabarbounis & Neiman, 2013; Piketty & Goldhammer, 2014). Much of this work focuses on developing nations, where economic growth is expected to significantly reduce poverty (Commission on Growth and Development, 2008). Coming out of deep recession has increased. the focus on social injustice and inequality in mainstream public policy in more advanced economies (Stiglitz *et al.*, 2009).

For policy, efforts are directed at decoupling economic development from environmental degradation, while leveraging innovation and skill upgrading to foster prosperity for all, especially the most vulnerable (see for example European Commission, 2010). Thus, while the sustainability narrative binds the three key elements of sustainable development – economic, environmental and social – the environmental and social elements of sustainable development are often studied entirely separately in conjunction with economic growth – despite the core message that sustainability of the social and the environmental are deeply embedded in each other. Thus, sustainable competitiveness as a concept and as an approach bridges this gap.

Significant challenges remain when considering how environmental- and eco-innovations contribute to enhancing the three elements of sustainable competitiveness. Vallance, Perkins and Dixon (2011) review how the social and the environmental domains of sustainable development interact in the context of environmentally friendly products and services. They identify three prominent research areas which shed light on dynamics around consumer demand for environmentally friendly products.

1. *Sustainability and Basic Needs.* Research has largely focused on developing nations and on how to meet basic needs in an environmentally sustainable way (Commission on Growth and Development, 2008). Featuring large in studies on barriers to the uptake of more sustainable technologies and products is poverty (Crabtree, 2005).
2. *Behavioural Change.* Non-transformative changes, such as recycling schemes, lead to stronger environmental ethics through the provision of information and services which do not have a major impact on everyday life (Vallance *et al*., 2011). Transformative approaches require changes to perception – the way the environment and society are socially constructed.
3. *Preservation of Socio-cultural Characteristics.* Maintenance of social sustainability is founded upon traditions, practices, preferences and places people would like to see sustained or improved, such as low-density suburban living, the use of the private car, and the natural landscapes. Initiatives with limited effect on behaviour run contrary to socially constructed values and habits (Assefa & Frostell, 2007).

Implications

- Sustainable *competitiveness* emphasises economic competitiveness as a driver of prosperity and long-term growth – taking account of environmental and social concerns. Future competitiveness cannot rely on intensive use of the environment.
- Firms must develop new competitive advantages embodied in the concept of the 'circular economy' to transition from a linear 'take-make-dispose' system.
- Shifting to the circular economy requires preconditions in society if they are to succeed.
- Understanding sustainable competitiveness requires a broad perspective drawing from both social and natural sciences and looking at the relationships between the economic, the social and the environment concurrently.

Measuring Sustainable Competitiveness

Applied work reflects competing views of competitiveness. The measures of competitiveness from market-share and cost-competitiveness views are proposed by organisations such as the OECD, the World Bank, and the European Union. These measures provide macro-economic diagnostics of competitiveness. Other measures of competitiveness that focus on productivity are also developed by the same institutions, and increasingly by countries, with the support from academics (see Ketels, 2016; Cunska, Ketels, Paalzow, & Vanags, 2013). The work of the World Economic Forum can be identified as the most comprehensive effort to date in its production of the Global Competitiveness Index (GCI). Both approaches consider different aspects of competitiveness and while useful in their own enterprise, they fail to explain all aspects of competitiveness. For the purposes of this research review, the productivity view and the GCI are used as the central framework for the study.

Market Share/Cost Approach

Market-share measures of competitiveness propose narrow definitions of competitiveness relating to real exchange rate or price and labour cost-competitiveness comparisons (O'Brien, 2010; Durand & Giorno, 1997; European Commission, 2016).

Some indexes focus on costs from the perspective of firms, often calculated by consultants and private agencies, to identify the most profitable locations for specific

firms or industries. Deloitte´s Global Manufacturing Competitiveness Index focuses on talent, cost competitiveness, workforce productivity and supplier networks (Deloitte, 2016). The Doing Business Report includes additional factors, such as the bottlenecks firms face when setting up new operations (i.e. red tape, institutional transparency, etc.). The index has been extended from 5 to11 sets of indicators across 185 economies in 2012 (World Bank, 2012). These approaches contain an inherent premise of understanding the underlying dynamics that drive productivity – which places them close to productivity-oriented approaches (Ketels, 2016).

A general criticism of market-based measures of competitiveness is the focus on outcomes while failing to identify the ultimate sources of competitiveness (O'Brien, 2010). It is increasingly recognized that changes in the underlying fundamentals driving national productivity cannot be assessed independently from each other but as interactions in the complex dynamics and synergies across reinforcing factors (Ketels, 2006). Improving competitiveness might require changes in the underlying fundamentals of productivity and may involve addressing several interlocking relationships and potential bottlenecks that may not be identified (and consequently addressed) using more aggregated indicators such as employed in the cost/market share approaches. The dominant view is that it is at this level of analysis that policy should be most effective to foster competitiveness. Cost based approaches fail to make a significant contribution in this regard (Delgado *et al.*, 2012; Porter, Delgado, Ketels, & Stern, 2008).

More recently, increasing recognition of region as the key unit of analysis is reflected in growing attention to sub-national regions and agglomeration economies (Huggins, Izushi, & Thompson, 2013; Kitson, Martin, & Tyler, 2004; Snieška & Bruneckienė, 2009). The aggregation level of macroeconomic data and important methodological implications to separate regional from national indicators has led to further strong criticism of the market-share approaches (Huggins & Davies, 2006; Huggins *et al.*, 2013; Ketels, 2006; Kitson *et al*., 2004; Porter *et al*., 2008).

Productivity Approach

The productivity approach to competitiveness focuses on the fundamental factors enabling locational generation of wealth and prosperity. Pioneered by Porter (1990), three key themes of research or pillars which map different levels of interlocking relationships driving productivity are identified. The first pillar is the macroeconomic environment that provides a broad context for growth. The second pillar includes business sophistication and the quality of the business environment labelled as the 'microeconomic environment' by Porter and outlined in Porter's Diamond Model (Porter, 1990), The third pillar considers systemic relationships between the first two pillars.

Specific factors which have been highlighted to drive productivity are presented in Table 1. They are categorised as traditional drivers, recently identified drivers, and more complex drivers that have not yet been fully understood (Delgado *et al*., 2012; Ketels, 2016; Porter *et al*., 2008). Measuring competitiveness from a productivity standpoint requires a broad scope encompassing different interacting dynamics relative to cost-based perspectives.

The GCI is the most recognized index covering 114 countries (2015 edition). The first GCI was published in 2005 with the collaboration of international experts and is largely derived from Porter's contributions until 2009 (e.g. Porter *et al.*, 2008). The GCI identifies twelve pillars driving productivity. The extent to which different elements contribute to driving

productivity depends on the stage of the development of an economy. The approach (in its latest presentation by Delgado *et al.*, 2012) also distinguishes between inherited and created endowments, focusing on the latter to explain changes in economic prosperity.

Table 1. Drivers of competitiveness: the productivity-based approach

Traditional Drivers	Recently Identified Drivers	Complex Drivers
Rules & Regulations	Company sophistication and firm heterogeneity	Individuals: Culture and trust
Financial Markets	Economic geography: Urbanisation and clusters	Institutions: Quality and capacity
Physical Infrastructure	Economic composition: 'Economic Complexity'	Social capital and linkages
Macroeconomic Policy	(Creative) skills and locational attractiveness	–
Institutions and Geography	Different levels of geography (within nation)	–
Economy size	–	–

Source: own study, after Ketels (2016).

The twelve pillars result from an aggregation of 111 indicators. These generate 3 sub-indexes, compiled into one competitiveness score. Both hard statistical data (66%) and microeconomic data gathered through business surveys (34%) are used to measure the 111 indicators. The approach, while not without criticism (Fougner, 2008; Lall, 2001), is widely used and recognized as the most theoretically grounded approach.

The GCI uses weighting systems to account for the relative importance of different drivers of productivity with weights assigned according to different stages of development in line with the theory which stresses that as nations develop, modes of competing and the nature of competitive advantage change (Porter *et al*., 2008). It is increasingly recognized that at different levels of development, locations face different competitiveness challenges, where the relative importance of different dimensions of microeconomic and macroeconomic competitiveness is changing (Porter, 1990). Therefore, the approach of the GCI is considered to propose a comprehensive representation of the key levers of productivity and how their relative importance changes over stages of development (Delgado *et al*., 2012).

The presentation of scores by pillar, by sub-index (Basic Requirements/Efficiency Enhancers/Innovation Factors) and in aggregate, allows for the identification of vulnerabilities and strengths in national competitiveness. Thus, the GCI-productivity approach is associated with sound policies like skill upgrading, infrastructure investment, research and innovation investment that are widely-accepted contributions to development. Development debates focus on what specific policies are best applied to support productivity growth and to diagnose strategies to close gaps as they develop (Ketels, 2006).

Measuring Sustainability: Environmental & Social Aspects

Sustainability arises from the principle that anthropogenic-related environmental pressure (i.e. originating in human activity) is reaching a threshold where the use of environmental resources and services is beyond the capacity of the environment to produce or to re-generate such resources and services. This can lead to irreversible environmental degradation (Middleton, 2013). Decoupling economic activity from environmentally-intensive practices is at the core of sustainability (Moldan, Janouvikov, & Hunk, 2012). Sustainability

also relates to social features which impact wellbeing and relate to judged fairness of resource distribution. It has been the least theorised and explored pillar of sustainable development (Littig & Grießler, 2005). It is also increasingly understood that both environmental and social sustainability are largely interdependent.

Environmental Sustainability Measurement

Ecologically speaking, environmental sustainability is defined by focusing on the natural environment's bio-geo-physical aspects, such as maintaining or improving the integrity of the earth's life-supporting systems (Moldan *et al.*, 2012). Assessing environmental sustainability should concern what is happening to the state of the environment; why is it happening; and what are we doing about it? (Hammond, Adriaanse, Rodenburg, Bryant, & Woodward, 1995). Questions such as if and how efforts for sustainable development are achieving decoupling, and what the reciprocal effects between human influence on the natural environment and economic growth are have also been high on the research agenda (Patil, 1994). Several approaches have been developed to measure and monitor environmental sustainability. These may be classified as (1) State of the Environment (SOE) indicators, (2) Action Indicators (AI) and (3) Composite Index Indicators (CII).

1. SOE indicators measure the state and quality of the environment to make a problem visible (Dahl, 2011). The work carried out on climate change and the Millennium Ecosystem Assessment exemplify relevant achievements (Moldan *et al.*, 2012; OECD, 2008; United Nations, 2015). SOE indicators, in combination with economic data, permit the assessment of the extent to which economies are decoupling growth from resources. Identifications of environmental features to be measured and the scope of SOE metrics largely evolved in line with policy needs (UNEP, 2008; Linster, 2003; Dahl, 2011). Table 2 summarises SOE indicators used by the UNEP, OECD and the European Environment Agency (EEA). There is recognition that there is no universal set of indicators available, but these serve several purposes and audiences (i.e. monitoring purposes in relation to environmental policies (Linster, 2003). Data gaps remain and the robustness of indicators is determined by available data which vary in its quality (UNEP, 2008).
2. Action indicators (AI) measure performance and distance relative to environmental targets (Dahl, 2011; Moldan *et al.*, 2012).[1] AIs aid benchmarking and monitor policy efforts (i.e. they aim to estimate if efforts have the desired impact and how) with current and future focus (Pintér, Hardi, Martinuzzi, & Hall, 2011). The most widely recognized set of AIs are those of the Sustainable Development Goals (SDGs). The SDGs are time-bound quantified targets for addressing extreme poverty in its many dimensions – income poverty, hunger, disease, lack of adequate shelter, and exclusion – while promoting gender equality, education, and environmental sustainability. They are also considered basic human rights, to health, education, shelter, and security (United Nations, 2002). Decoupling indicators of the OECD and EEA can also be classified as key AI globally, regionally and nationally. Table 3 provides a summary of the most widely used AI indicators. AI provide an international framework to benchmark efforts, identifying potential limitations and potential solutions (Mayer, 2007).

[1] We label them AI in order to reflect a wide array of indicators that respond to an environmental goal without using the specific language different organisations and literature strands use for matters of simplicity.

Table 2. Widely used state-of-the environment (SOE) indicators

Indicators (Sets)	Issues Included	Organisation
Climate Change	Co2 and Greenhouse Gas Emission Intensities	OECD
Ozone Layer	Ozone Depleting Substances	OECD
Air Quality	Sox and Nox Emission Intensities	OECD
Waste Generation	Municipal Waste Generation Intensities.	OECD
Freshwater Quality	Waste Water Treatment Connection Rates	OECD
Freshwater Resources	Intensity of Use of Water Resources	OECD
Forest Resources	Intensity of Use of Forest Resources	OECD
Fish Resources	Intensity of Use of Fish Resources	OECD
Energy Resources	Intensity of Energy Use	OECD
Biodiversity	Threatened Species	OECD
Core Environmental Indicators (Cei)	Several Core Issues Such as Climate Change, Ozone Layer Depletion, Natural Resource Use, Etc.	UNEP/OECD
Key Environmental Indicators (Kei)		UNEP/OECD
Sectoral Environmental Indicators (Sei)		UNEP/OECD
Indicators derived from Environmental Accounting		UNEP/OECD
Decoupling Environmental Indicators (Dei)		UNEP/OECD
APE (Air Pollutant Emissions)	11 Indicators Covering Several Aspects of Air Pollution	EEA
CLIM (Climate State and Impact Indicators)	46 Indicators Covering Several Aspects of Climate Change	EEA
ENER (Energy Indicators)	11 Indicators Covering Several Aspects of Use and Generation of Energy	EEA
LSI (Land and Soil Indicators)	2 Indicators	EEA
MAR (Marine Indicators)	3 Indicators in Fisheries	EEA
SEBI (Streamlining European Biodiversity Indicators)	27 Indicators for Bio-Diversity	EEA
SCP (Sustainable Consumption and Production)	1 Indicators On Consumption Levels	EEA
Term (Transport and Environment Reporting Mechanism)	20 Indicators	EEA
WAT (Water Indicators)		EEA
WREI (Water Resource Efficiency Indicators)	11 Indicators	EEA
WST (Waste Indicators)	2 Indicators	EEA

Source: own study from UNEP, OECD and EEA portals.

3. Composite indexes include both SOE and AI indicators, primarily at national level, appropriate for considering how policies, economics, social and cultural behaviours are shaped. If environmental conditions are monitored with those concerning human systems, a better opportunity exists for understanding feedback between them (Kaly, Pratt, & Mitchell, 2005).

A selection from this research includes (1) The Environmental Vulnerability Index (EVI) prepared by the South Pacific Applied Geoscience Commission (SOPAC), the United Nations

Environment Programme (UNEP) and their partners; (2) The Environmental Performance Index (EPI), from a project led by Yale Center for Environmental Law & Policy (YCELP) and Yale Data-Driven Environmental Solutions Group and partners[2]; and (3) The National Footprint Accounts (NFAs), developed by the Global Footprint Network (GFN).

Table 3. Most commonly used action indicators (AIs)

Indicators (Sets)	Issues Included	Organisation
Climate Change	CO_2 and Greenhouse Gas Emission Intensities	OECD
Ozone Layer	Ozone Depleting Substances	OECD
Air Quality	Sox and Nox Emission Intensities	OECD
Waste Generation	Municipal Waste Generation Intensities	OECD
Freshwater Quality	Waste Water Treatment Connection Rates	OECD
Freshwater Resources	Intensity of Use of Water Resources	OECD
Forest Resources	Intensity of Use of Forest Resources	OECD
Fish Resources	Intensity of Use of Fish Resources	OECD
Energy Resources	Intensity of Energy Use	OECD
Biodiversity	Threatened Species	OECD
APE (Air Pollutant Emissions)	11 Indicators Covering Several Aspects of Air Pollution	EEA
CLIM (Climate State and Impact Indicators)	46 Indicators Covering Several Aspects of Climate Change	EEA
ENER (Energy Indicators)	11 Indicators – Use and Generation of Energy	EEA
LSI (Land and Soil Indicators)	2 Indicators	EEA
MAR (Marine Indicators)	3 Indicators in Fisheries	EEA
SEBI (Streamlining European Biodiversity Indicators)	27 Indicators for Bio-Diversity	EEA
SCP (Sustainable Consumption and Production)	1 Indicators on Consumption Levels	EEA
Term (Transport and Environment Reporting Mechanism)	20 Indicators	EEA
WAT (Water Indicators)	11 Indicators	EEA
WREI (Water Resource Efficiency Indicators)		EEA
WST (Waste Indicators)	2 Indicators	EEA
Core Environmental Indicators (Cei)	Several Core Issues – Climate Change, Ozone Layer Depletion, Natural Resource Use, Etc.	UNEP/ OECD
Key Environmental Indicators (Kei)		UNEP/ OECD
Sectoral Environmental Indicators (Sei)		UNEP/ OECD
Indicators derived from Environmental Accounting		UNEP/ OECD
Decoupling Environmental Indicators		UNEP/ OECD

Source: own study from UNEP, OECD and EEA portals.

[2] Other partners include the Center for International Earth Science Information Network (CIESIN) at Columbia University, in collaboration with the Samuel Family Foundation, McCall MacBain Foundation, and the World Economic Forum.

Both EVI and EPI claim a high degree of scientific rigor, notwithstanding limitations. First, the EPI focuses on politically-identified targets, an area of the debate contested by ecologists and environmentalists. Second, the index may mask 'pollution-haven' practices, making developed counties appear cleaner than they actually are (Morse & Fraser, 2005). Third, the extent to which the EPI effectively deals with trans-boundary environmental issues and limitations to draw meaningful conclusions from the index have been raised (Bohringer & Jochem, 2007; Haberland, 2008; Morse & Fraser, 2005).

Nonetheless, the EPI has been incorporated into not only the GCI approach to adjusting competitiveness scores for environmental and social sustainability (Bilbao-Osorio, Blanke, Campanella, Crotti, Drzeniek-Hanouz, & Serin, 2013; Corrigan *et al.*, 2014) but also Deloitte's Global Manufacturing Competitiveness Index (Deloitte, 2013), and replicated in several regional environmental assessments (see Fischer, Foerster, & Hartmann, 2009; Ihobe, 2013). With a lack of alternatives that competently integrate rigor and reporting simplicity, the EPI has increasingly become the preferred approach for assessing environmental sustainability.

Criticism of the NFA centres on the explanatory power of the indicators beyond a strong warning of current unsustainable practices. Ideally, the indicators should include all human demand related to environmental resources and services – not possible due to lack of data (Borucke, Moore, Cranston, Gracey, Iha, Larson, & Galli, 2013). Secondly, the approach assumes a carrying capacity based on ecological modelling which fails to include non-renewable resources for which the regeneration approach may not apply, nor changes in decoupling-enabling technology (Stiglitz *et al.*, 2009). Thirdly, the worldwide ecological deficit emphasised by the NFAs may not convey the message it is said to. One can show that the worldwide imbalance is mostly driven by CO_2 emissions. By definition, the worldwide demand placed on cropland, built-up land and pasture cannot exceed the world's bio-capacity (Stiglitz *et al*., 2009).

Social Sustainability Measurement

The social is the least theorised and explored pillar of sustainable development and, to date, the most complex to operationalise (Littig & Grießler, 2005; Murphy, 2012). The alignment of the social domain with sustainability was unheard of prior to the 1990s (Omann & Spangenberg, 2002; Colantonio & Lane, 2007; Littig & Grießler, 2005; Magis, 2010).

Colantonio (2009) identifies at least *27* approaches to social sustainability from essentially three overarching categories (Chiu, 2003). The first views the natural environment as an enabler of social relations and dynamics. The second is environmentally oriented, i.e. focusing on necessary social preconditions to achieve environmental sustainability. The third is people-oriented, focusing on improving wellbeing, including distribution of resources, reducing social exclusion and destructive conflict. Table 4 provides a summary of the most commonly used approaches. Analytical frameworks are usually applied at regional or community levels (Magee, Scerri, James, Scerri, & James, 2012; Omann & Spangenberg, 2002; Woodcraft, 2012).

For Colantonio (2009) current social sustainability approaches at the national level largely leverage traditional criteria and themes from the literature on social development and new themes emerging from sustainability concerns. Traditional themes mainly focus on hard policy areas of social development.

The Human Development Index (HDI) published by the United Nations Development Program (UNDP, 2016) is the most widely recognized framework relying on traditional

Table 4. Themes & features of social sustainability

Feature/Theme	Author
- Livelihood - Equity - Capability to withstand external pressures - Safety nets - Inclusion	Chambers & Conway (1992)
- Equity - Poverty - Livelihood - Equity	DFID (1999)
- Democracy - Human rights - Social homogeneity - Equitable income distribution - Employment - Equitable access to resources and social services	Sachs (1999)
- Paid and voluntary work - Basic needs - Social security - Equal opportunities to participate in a democratic society - Enabling social innovation	Hans-Böckler-Stiftung (2001)
- Social justice - Solidarity - Participation - Security	Thin *et al.* (2002)
- Education - Skills - Experience - Consumption - Income - Employment - Participation	Omann & Spangenberg (2002)
- Basic needs - Personal disability - Needs of future generations - Social capital - Equity - Cultural and community diversity - Empowerment and participation	Baines & Morgan (2004); Sinner *et al*. (2004)
- Interactions in the community/social networks - Pride and sense of place - Community participation - Community stability - Security (crime)	Bramley *et al*. (2006)

Source: after Colantonio (2009, p. 6).

themes of social development (Omann & Spangenberg, 2002). The HDI was first published in 1990 as a measure of human achievements across several basic capabilities, in what people can do, and be. The HDI has been an instrumental tool in social development to monitor and compare levels of human achievement. It has been presented as an evolving method, improved since its first publication, adding other aspects of human development in adjacent indexes such as the inequality-adjusted HDI and the Gender Development Index. Limited understanding of the social domain proposed by the HDI has attracted criticism, in addition to methodological issues (Kovacevic, 2011).

The MDGs has expanded the view of social development to include explicit goals for several aspects of human development. Eight goals and initially 18 targets (measured by 48 indicators) were laid out to harmonise reporting on the Millennium Declaration (UN, 2000). Table 5 presents the MDGs directly focusing on social sustainability, incorporated in the Sustainable Development Goals (UN, 2015). To some extent, the MDG's attempted to place social development within the framework of sustainability. While serving to expand the agenda of human development as initially proposed by the HDI, the agenda largely centred on traditional themes and criteria based on basic needs and opportunities (Omann & Spangenberg, 2002).

Table 5. Social sustainable development indicators

Social Sustainability Indicators	Source
- Proportion of population living below national poverty line,	UN
- Ratio of share in national income of highest to lowest quintile,	UN
- Proportion of population using improved water source,	UN
- Percentage of population using solid fuels for cooking,	UN
- Proportion of urban population living in slums,	UN
- Number of intentional homicides per 100,000 population,	UN
- Life expectancy at birth,	UN
- Percent of population with access to primary health care facilities,	UN
- Contraceptive prevalence rate,	UN
- Prevalence of tobacco use,	UN
- Morbidity of major diseases such as HIV/AIDS, malaria, tuberculosis,	UN
- Net enrolment rate in primary education,	UN
- Lifelong learning Population growth rate Dependency ratio,	UN
- Percentage of population living in hazard prone areas,	UN
- Percentage of population having paid bribes,	UN
- Under- five mortality rate,	UN
- Healthy life expectancy at birth,	UN
- Immunisation against infectious childhood diseases,	UN
- Nutritional status of children,	UN
- Suicide rate,	UN
- Gross intake into last year of primary education,	UN
- Adult secondary (tertiary) schooling attainment level,	UN
- Adult literacy rate,	UN
- Total fertility rate,	UN
- Ratio of local residents to tourists in major tourist regions and destinations,	UN
- Human and economic loss due to natural disasters.	UN

Source: UN (2007). Indicators for 2015 are still under development.

Key strengths provided in the MDG framework are:

1. a clear focus on national policy efforts,
2. a set of clear, simple, quantitative and easily communicable targets,
3. a starting point for improved accountability through simple but robust indicators.

In addition it also served as a tool for advocacy to strengthen international development cooperation (UN, 2012). Main weaknesses include inadequate early incorporation of other important issues for social development, such as environmental sustainability, productive employment and decent work, inequality, etc.

More recent research on integrating the social with sustainability focussed on soft policy criteria (Colantonio, 2009) operationalised by process-oriented indicators for monitoring progress towards specific objectives in a more interactive way than traditional social indicators like the HDI and MDGs. However, the gap between the SDGs and research concerned with social sustainability remains. The 2015 revision of the SDGs (UN, 2015) attempts to bridge this gap.

Two concepts are at the core of recently developed social sustainability approaches. Quality of Life has been widely proposed for inclusion in sustainability assessments (Stiglitz *et al.*, 2009). Sustainability of Community is concerned with the viability and functioning of society as a collective entity including its physical environment (Douvlou, Papathoma, & Turrell, 2008; Magis, 2010).

The updated SDGs offer a more comprehensive framework which acknowledge all three pillars of sustainable development and its interactions that lead to better Quality of Life. In addition, the emphasis is placed on making cities and urban settlements inclusive, safe, resilient and sustainable. This includes the promotion of sustainable consumption and production patterns and focuses on society and its institutional aspects such as, justice, accountability inclusiveness. The new SDGs are organised under 17 headings with 169 associated targets which are integrated and indivisible (UN, 2015). Updated social sustainability SDGs are presented in Table 6.

Table 6. Social sustainability – updated SDGs

Social Sustainability in Renewed Sustainable Development Indicators
Goal 3: Ensure healthy lives and promote wellbeing for all at all ages
Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5: Achieve gender equality and empower all women and girls
Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation
Goal 10: Reduce inequality within and among countries
Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12: Ensure sustainable consumption and production patterns
Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Source: UN (2015).

Effective implementation of the SDGs requires further work. As new themes and criteria are included, improvements in measuring sustainable development are

needed. The Sustainable Development Solutions Network identified several areas requiring improved data reporting practices – and significant investment (SDSN, 2015). The extent to which the SDG realises its potential is likely to be determined by whether nations are able and willing to make such improvements.

The emphasis on Quality of Life and Wellbeing as outcomes of social sustainability is increasingly endorsed by academics and practitioners. Analytical approaches are being developed to grasp the multiple dimensions of a yet undefined concept.[3] Several recently-developed approaches for assessing Quality of Life and Wellbeing are available, such as the OECD's Quality of Life Index or Better Life Index (BLI) (OECD, 2015), The World Happiness Index (WHI, 2016), The European Social Survey (ESS) and Gallup's World Poll. Most of this work is largely regarded as explorative – with limited policy influence yet.

A further related development is the redefinition of social progress. The Social Progress Index (SPI) produced by a consortium of stakeholders including academics, multilateral organisations and the private sector is leading this vein of research where social progress as a concept bridges traditional hard policy issues with soft policy priorities. Social progress is defined as "the capacity of a society to meet the basic human needs of its citizens, establish the building blocks that allow citizens and communities to enhance and sustain the quality of their lives, and create the conditions for all individuals to reach their full potential" (Porter, Stern, & Green, 2016, p. 4). This definition references three broad elements or dimensions of social progress: Basic Human Needs, Foundations of Wellbeing, and Opportunity. Each of these dimensions is further broken down into four underlying components, as presented in Table 7. The SPI was first published in 2013, and in its 2016 publication, it included 133 nations.

Table 7. Dimensions of the social Progress Index (SPI)

Basic Human Needs	Foundations of Wellbeing	Opportunity
Nutrition & Basic Medical Care	Access to Basic Knowledge	Personal Rights
Air, Water, and Sanitation	Access to Infor. & Comms	Access to Higher Education
Shelter	Health and Wellness	Personal Freedom & Choice
Personal Safety	Ecosystem Sustainability	Equity and Inclusion

Source: Fehder & Stern (2013).

The SPI emphasises outcome indicators rather than input measures. The SPI, therefore, allows individual countries to identify specific areas of strength or weakness in terms of its social progress, and also allows countries to benchmark themselves against peers, both at the level of individual indicators as well as in terms of an aggregate measure of social progress (Fehder & Stern, 2013). The approach has been well received in academic and policy circles with several organisations operationalising the finding of the SPI for aiding policy making. In Europe the approach has been adapted and extended to sub-national level in Spain.

[3] As Stiglitz *et al.* (2009, p. 143) put it, "what constitutes a 'good life' has occupied leading philosophers since Aristotle, and dozens of definitions of the 'good life' are discussed in the literature: none of these definitions commands universal agreement, and each corresponds to a different philosophical perspective. In general terms, quality of life as a concept is used to refer to those aspects of life that shape human well-being beyond the command of economic resources (Stiglitz *et al.*, 2009).

Measuring Sustainable Competitiveness – The WEF Approach

The *World Economic Forum* defined sustainable competitiveness as the set of institutions, policies, and factors which make a nation productive over the long term while ensuring social and environmental sustainability (WEF, 2015). The extension of their analytical application includes a novel set of metrics which intends to bridge a wide range of dynamics, often covered by several disparate disciplines into a single index.[4] They report on measures of sustainable competitiveness in both 2014 and 2015.

The WEF identifies the relationship between sustainability and competitiveness as multifaceted. Several channels are identified, including the efficient use of natural resources, improved health, the relationship between biodiversity and innovation, the impact of competitiveness on social sustainability and how more socially sustainable nations might generate more competitive businesses. The WEF framework to support policies that balance economic prosperity with social inclusion and environmental stewarding is presented in Figure 1.

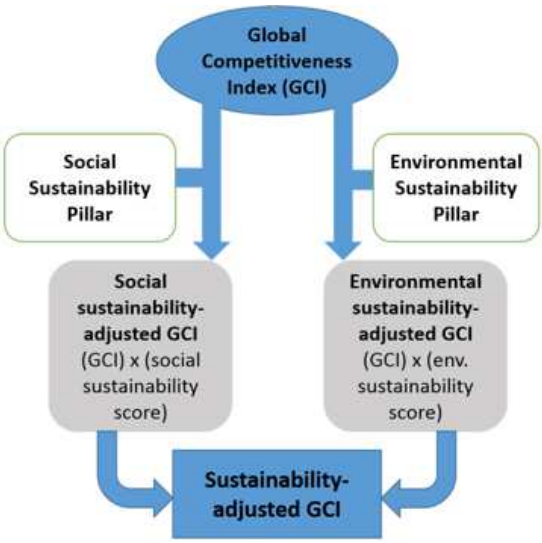

Figure 1. SGCI Framework
Source: Bilbao-Osorio *et al.* (2013).

The pillars representing the environmental and social sustainability domains serve to illustrate the interaction between sustainability and competitiveness and, therefore, are used to adjust the competitiveness score obtained through the estimation of the Global Competitiveness Index (GCI). In this way, a sustainability-adjusted GCI, or SGCI, is obtained. The framework emphasises that competitiveness on its own does not necessarily lead to sustainable levels of prosperity (Bilbao-Osorio *et al.*, 2013).

The WEF adjustment for environmental sustainability recognizes that the state of the natural environment affects competitiveness both at the national and at the firm level.

[4] The IMD *World Competitiveness Yearbook* reports it is also in the process of developing relevant adjustments to take count of environmental and employment creation dimensions of competitiveness.

Allied to this institutions, policies and other factors concerning the environment are also important (Corrigan *et al.*, 2014). Environmental sustainability is defined as a "set of institutions, policies, and factors that ensure an efficient management of resources to enable prosperity for present and future generations" (Bilbao-Osorio *et al.*, 2013, p. 58). The environmental sustainability adjustment of the GCI framework is composed of three pillars encompassing (1) environmental policy, (2) use of renewable resources and (3) degradation of the environment. Table 8 lists the indicators underlying each pillar.

Table 8. Pillars of environmental sustainability adjustment

Environmental Policy	Use of Renewable Resources	Degradation of Environment
Environmental regulations (stringency & enforcement)	Agricultural water intensity	Particulate matter concentration
No. of ratified international environmental treaties	Forest cover change	CO2 intensity
Terrestrial biome protection	Fish stocks' overexploitation	Quality of natural environment

Source: Bilbao-Osorio *et al.* (2013).

An environmental sustainability score is obtained using a similar method as used in the GCI. Data are normalised into a 1 to 7 scale, followed by a second normalisation based on the distribution of the sustainability component on a scale of 0.8 to 1.2. This process transforms the normalised means into a sustainability score that is lowest for the lowest performer and highest for the top performer. Thus, the adjustment is carried out by multiplying the GCI score by an environmental sustainability coefficient. Data include a mix of SOE indicators, distance to target indicators and qualitative indicators obtained from the *Executive Opinion Survey* used for the GCI.

Social sustainability is defined as "institutions, policies and factors that enable all members of society to experience best possible health, participation, and security, and to maximise their potential to contribute and benefit from the economic prosperity of the country in which they live" (Bilbao-Osorio *et al*., 2013, p. 59). The three pillars which comprise the social sustainability adjustment are (1) access to basic necessities, (2) vulnerability to shocks, and (3) social cohesion. The variables for each pillar are provided in Table 9.

Table 9. Pillars of social sustainability adjustment

Access to Basic Necessities	Vulnerability to Shocks	Social Cohesion
Access to sanitation	Vulnerable employment	Income Gini index
Access to improved drinking water	Extent of informal economy	Social mobility
Access to healthcare	Social safety net protection	Youth unemployment

Source: Bilbao-Osorio *et al.* (2013).

Calculating the social sustainability adjustment is similar to environmental sustainability. The lowest performer scores the least (scaled by 0.8) while the top performer would score the highest (scaled by 1.2). The adjustment is carried out by multiplying this social sustainability coefficient by the GCI score. A final SGCI is obtained by the average of the environmental sustainability and social sustainability adjustment scores (Corrigan *et al.,* 2014).

DISCUSSION AND IMPLICATIONS

Environmental Sustainability Adjustment Limitations

As the sustainability adjustment approach is influenced by the EPI, its limitations are relevant here. In summary:

1. Targets used to assess environmental performance may not correspond to natural environmental thresholds and, therefore, the adjusted SGCI for environmental sustainability fails to include the carrying capacity of the environment (Barnett, Lambert, & Fry, 2008; Kaly *et al*., 2005).
2. Conceptual underpinnings relating environmental sustainability to resource use within national boundaries largely fail to take account of the effects of consumption and international trade. More developed countries can shift pollution and more polluting industries to other nations with less environmentally stringent regulation, ultimately making developed countries appear 'cleaner' than they actually are (Morse & Fraser, 2005).

The *2014-2015 Global Competitiveness Report* stresses that the approach remains a work-in-progress and the set of variables might not cover all relationships between economic activity and the environment. It would be interesting to cover areas such as consumption-related environmental demand while including additional distance-to-target indicators in an expanded range of environmental services and resources. While environmental vulnerability and how this can affect socio-economic systems is explicitly discussed in the report, it remains largely absent from the index. Our research proposes that an expanded set of indicators covering vulnerability would further enhance the approach. Problems of data availability and data quality are often common themes in most methods in producing assessments of the environment, especially for cross-country analyses. To some extent, this is also true for the GCI.

A noted strength of the WEF method is its bridge between the macro and micro levels of analysis, rooted in the literature of competitiveness and economic development. This, however, is largely absent when considering environmental and social sustainability. As Section 3 outlines, there are important lessons to be learned from studying firms' responses to pressures emerging externally and internally to firms and how the characteristics of the business environment and internal resources of the firm enable better environmental performance of products, processes and organisations. Indicators considering these dynamics could further enhance the pillars concerning environmental policy and the use of renewable resources (i.e. pillars 1 and 2 of the environmental sustainability module).

Social Sustainability Adjustment Limitations

The theoretical underpinnings of the three pillars and indicators of the social adjustment are largely derived from the basic needs and social inclusion approach to social sustainability. The authors state that further indicators could be added, such as social participation and respect for core human rights and treatment of minorities (Corrigan *et al*., 2014).

Quality of Life indicators could further enhance the sustainability pillars. Section 2.2.2 reviews some potential aspects which can be incorporated into the GCI. The OECD Better Life Index (BLI) could generate improvements. Data, however, only cover OECD members in addition to two non-OECD countries and computing the BLI for all countries included in the GCI would be challenging. The World Happiness Index (WHI) (Layard & Sachs, 2012)

would potentially offer complementarities to the GCI. In this case, data can be gathered for all the nations included in the GCI (114 in its 2015 edition). In addition, approaches emerging from the literature on social sustainability in relation to community resilience could contribute to the social inclusion and vulnerability sub-pillars (Magis, 2010).

SGCI – Composite Sustainability Adjustments

A significant contribution of the GCI is its identification that as nations develop, they leverage different aspects of competitiveness (Porter *et al*., 2009). Research on the environmental intensity of economic growth and social development also suggests that a similar process occurs in relation to environmental and social domains; a process that is formalised in the environmental literature as the Environmental Kuznets Curve (EKC) (Grossman & Krueger, 1991; Stern, 2004). While the foundations of this relationship have been contested, the existence of different environmental and social relationships in the process of economic development have not (Stern, 2004). Researchers increasingly call for rethinking this relationship, largely omitted in the sustainability adjustment approach (Dietz, Rosa, & York, 2009).

The current construction of the SGCI might, therefore, present biased measures for developed economies. Dos Santos and Brandi (2014) find a strong correlation between key environmental indicators and GCI scores suggesting that in some cases, environmental and social indicators may be used as proxies of competitiveness. This implies that environmental and social performance is related to the development level of an economy. Comparing all economies against the same criteria may introduce biases against less developed nations in the way the index is currently constructed. For Stojanovska (2015), the competitiveness of emerging economies is vulnerable (i.e. prone to show low performance) when sustainability components are considered, which should motivate these nations to take action. An alternative conclusion might be that emerging economies might be vulnerable to these adjustments because these adjustments take account of the very factors that define them as developing or *emerging economies*. Thus, the extent to which adjustments add any significant insight for less developed economies is brought into question. The SGCI may provide better insights for developing economies if an approach that also takes account of the level of development is adopted and countries can compare themselves with other nations at similar stages of development.

CONCLUSIONS

To operationalise the concept of sustainable competitiveness the article focuses on how the concept bridges the interconnected, but often separately considered, pillars of sustainability across its economic, social and environmental elements. A range of different approaches to measuring the individual pillars of sustainability are provided to indicate the scope of such analyses. Our primary focus remains on economic development as a central pillar and how the economic element interacts with the social and environmental domains of sustainability.

We identify that competitiveness defined as productivity is most appropriate for understanding the foundations of economic development. This productivity-based definition, and measurement, enables identification of potential bottlenecks and potential policy interventions, in comparison to less comprehensive partial approaches that consider competitiveness from the market-share or cost-comparison perspectives. The GCI produced by the WEF is identified as the approach which implements the productivity perspective most

effectively and comprehensively. This is because it benefits from roots in the literature on economic growth and competitiveness and, therefore, includes the most commonly agreed competitiveness pillars and sources. A key feature is that it allows for comparisons of nations across different development stages, indicating that as economies develop, different elements of competitiveness play different roles as nations transition from basic requirements, through to efficiency requirements and finally to innovation drivers of development. The extent to which this is evident from empirical examinations will be considered in the estimations to be conducted in the next phase of this research. Furthermore, the presentation of a final index built up from a set of twelve separate pillars allows comparisons to identify bottlenecks and potential roadblocks to competitiveness. The review also identifies limitations specific to the GCI, and to the overall productivity approach.

The review reports on how the environmental and social elements of sustainability are researched and measured, and reflects on how the extended metrics of the GCI includes most prominent themes and topics in an aggregated Sustainability Adjusted Competitiveness Index (SGCI). Productivity remains central to the sustainability adjusted measures of competitiveness considered, both environmental and social. Understanding that the SGCI is a work-in-progress, some suggestions on how to improve on the method are identified. The understanding is that some novel metrics have the potential to aid policymaking in different countries, and are, therefore, selected as the preferred approach in applied research.

The insights obtained from this review point to how policy-relevant research questions may complement conceptual interest in the drivers of and barriers to sustainable competitiveness performance. Our conceptual and measurement interests extend to now turning to answer questions similar to those raised in Hammond *et al*. (1995) which focused on environmental sustainability. These questions concern what is happening to the state of the productive economy, the social environment and the ecological environment. To understand why-type questions the potential interactions between these spheres must be considered. This informs the next phase of drawing implications from the research in terms of what we are doing about it and what can be done.

We propose to develop a panel of data to examine SGCI patterns across a broad range of economies, leveraging the WEF approach and encompassing data from available sources identified above. Examining countries at different stages of development permits consideration of whether and to what extent stage of development features for environmental and social sustainability. Drilling into the components of SGCI will allow the identification of those levers most relevant to impacting the economic-environment-social nexus, useful for the identification of potential policy interventions.

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