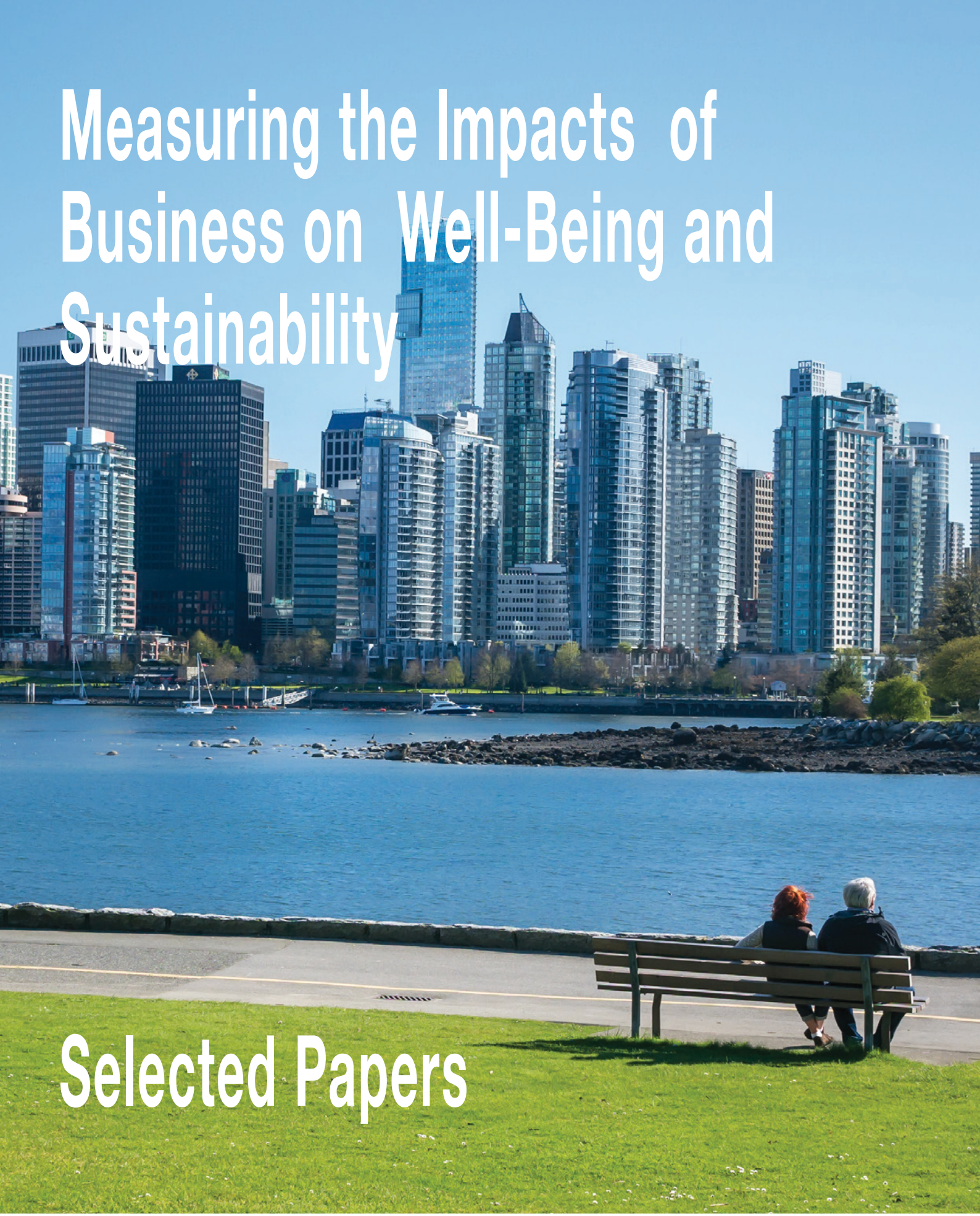
Measuring the Impacts of Business on Well-Being and Sustainability



Selected Papers

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COMPENDIUM

SELECTED PAPERS ON MEASURING THE IMPACTS OF BUSINESS ON WELL-BEING AND SUSTAINABILITY

This compendium presents the papers selected as part of the Call for Papers on Measuring the Impact of Business on Well-being and Sustainability, issued in July 2017 by the OECD and HEC Paris/SnO centre.

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Foreword

The concept of well-being emphasises people's opportunities to thrive in the aspects of life that matter the most to them: their material and non- material conditions, but also inequalities in a wide range of outcomes, and whether these opportunities can last over time. Businesses play a critical role in shaping people's well-being, through the products and services they sell, the way these are produced, their investment decisions, their role as employers, their internal governance, or through their impacts on the physical space and the resources available to society and future generations. But what is exactly the nature of these impacts? Which dimensions of people's life are most affected by business activities? Are impacts circumscribed geographically to where business production takes place or do they extent throughout their supply-chain? Can these impacts be measured in credible ways? And should these measures allow comparisons across different firms, industries, and countries?

Recent OECD research finds that there are no shared answers to these questions. In other words, no agreement currently exists that could allow assessing the contribution of firms to society beyond their creation of financial wealth.

For many years now, the OECD has advanced research on measuring well-being and sustainability, aiming to expand the knowledge and data necessary to monitor people's well-being and to understand how public policies can be leveraged to improve their conditions. But we have also recognised the importance of involving the business community in this discussion, and to better understand how businesses impact on people's lives today and the future. This recognition is the motivation of the stream of work that we started in 2017 on "Measuring the Impacts of Business on Well-being and Sustainability". It complements, and contributes to other OECD initiatives in the areas of Responsible Business Conduct, Social Enterprises and the Business Platform for Inclusive Growth.

In order to enrich the debate and support the work on Measuring the Impact of Business on Well-being with quality research, the OECD Statistics and Data Directorate and HEC Paris/SnO Centre issued a call for papers in July 2017. The call focused on several themes, such as showcasing good examples of existing initiatives and frameworks, selection of indicators, their harmonization across approaches, mapping with the Sustainable Development Goals (SDGs), and the role of national official statistics in assessing business impacts on well-being.

The eight papers that were selected by a selection committee are included in this compendium. These papers will be presented at the 6th OECD World Forum on Statistics, Knowledge and Policy, taking place in Incheon, Korea, in November 2018.

The selected papers make the case for greater standardisation and harmonisation of corporate reporting practices (Strauss and Chlapaty; Delmas and Durand), pointing at the limited disclosure of information on business impacts on the environment and on national communities (Strauss and Chlapaty), and the potential for convergence around SDGs and well-being (Delmas and Durand). In addition, they link existing indicators of business impacts on various dimensions of well-being and propose new ones (Itay-Sarig; Consolandi et al.), and provide evidence on the determinants of employees' job satisfaction (Leung and Liu; Weziak-Bialowolska et al.). Limits of current measures, in particular in terms of their capacity to stimulate new experiences and improve well-being outcomes for specific groups are also examined (Beer and Aujogue). Finally, the papers provide examples of how country-level well-being approaches could be

used as a starting point for business reporting, building on New Zealand's approach to improving government and business interactions through shared concepts of well-being (Burton et al.).

This compendium aims at creating a common language and conceptual understanding on how to measure the impact of businesses on people's well-being, and how to compare existing tools and frameworks. The selected papers provide a point of departure for research and debates in this area. I hope that these papers will promote further discussion on how we can improve our understanding and measurement of the impacts that businesses have on people's well-being and its sustainability.

Martine Durand
OECD Chief Statistician
Director of the OECD Statistics and Data Directorate

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This compendium presents the papers selected as part of the Call for Papers on Measuring the Impact of Business on Well-being and Sustainability, issued in July 2017 by the OECD and HEC Paris/SnO centre. We would like to thank the members of the selection committee for their time, effort and input in the process of selecting the papers: Georges Blanc (HEC), Magali Delmas (UCLA), Martine Durand (OECD), Rodolphe Durand (HEC), Antonella Noya (OECD), Michael Pirson (Fordham University) and Neil Stevenson (IIRC). We gratefully acknowledge the work and effort of all those who submitted abstracts and then full papers to the selection committee. We would also like to thank Anne-Lise Faron, Efrat Shamir, and Michal Shinwell for their work on coordinating the Call for Papers and compiling and editing the compendium.

Measuring Business Impacts on Well-being: A Goal Oriented Approach/ Magali A. Delmas and Rodolphe Durand[i]

Abstract

While there is increasing interest in evaluating the impact of business on well-being, there is not yet a standardized approach to measure this impact. Governmental organizations and the private sector are offering different approaches to measure well-being. As a result of the lack of standardization, the performance of businesses in areas of Environmental, Social and Governance (ESG) and Sustainability, as well as other dimensions of well-being, remain hard to examine and learn from, and many business leaders are still trying to figure out what this means for their companies. The consequence is that most firms are still far from being engaged with measuring well-being. In this paper, we identify the two main logics that prevail in the frameworks proposed to measure the business impact on well-being, and stress their convergent vision but also important differences. Drawing on the academic literature on goal settings, we propose a dual approach to enhance convergence between states' policies regarding SDGs and firms' strategies associated with ESGs and well-being indicators. This approach can help firms develop material well-being goals that are Specific, Measurable, Attainable, Relevant and Timely (s.m.a.r.t). We emphasize that this approach need to be guided and supported by both intergovernmental organizations, rating experts and the research community.

[i] Magali A. Delmas, UCLA (delmas@ucla.edu), Rodolphe Durand, HEC, Paris (durand@hec.fr)

Introduction

Firms play an important role in the well-being of the community in which they operate. They have a strong impact on the life of their employees, their consumers, their suppliers, and on the communities they serve. From determining the working conditions, health coverage, training and employability of workers, to the environmental impact of their operations on the community, and the taxes levied by public authorities, business organizations have a critical impact on people's and society's well-being.

Improvement in community well-being provides potential opportunities for businesses to achieve greater commercial success. This is, for example, reflected in public declarations by the global business community, as highlighted by the World Business Council for Sustainable Development: 'Pursuing sustainable development makes firms more competitive, more resilient and nimble in a fast changing world and more likely to win and retain customers. It can also help them find and keep some of the best brains on the market. In addition, it can make them more attractive to investors and insurers, while reducing their exposure to regulatory and other liabilities.'[1] In the same vein, publications offering guidance to business on engagement with the SDGs highlight a range of benefits, from employee retention, customer appreciation, to arguing for public authorities' support for their activities.[2]

While there is increasing interest in evaluating the impact of business on well-being, there is not yet a standardized approach to measure this impact. Governmental organizations and the private sector are offering different approaches to measure well-being. For example, the Organization of Economic Cooperation and Development (OECD) has developed a framework for measuring well-being and progress, and the United Nation has proposed 17 Sustainable Development Goals (SDGs). The SDGs present a novel approach to global governance where goal-setting features as a key strategy but present important challenges in its implementation (Biermann et al., 2017). In the private sector, socially responsible investors have developed a multitude of metrics to measure Environmental, Social and Governance (ESG) indicators. As a result of the lack of standardization, the performance of businesses in areas of Environmental, Social and Governance (ESG) and Sustainability, as well as other dimensions of well-being, remain hard to examine and learn from, and many business leaders are still trying to figure out what this means for their companies. The consequence is that most firms are still far from being engaged with measuring well-being.[3]

In this paper, we identify the two logics that prevail in the analysis of business impact on well-being and stress their convergent vision but also important differences. Drawing on the goal-setting perspective, we then offer pathways to connect the two logics, and make state actions and firms' interests more coherent, to the benefit of countries and firms altogether.

Coherent visions but different logics

There are different overlapping frameworks to address well-being. These are either developed by international governmental organization or by socially responsible investors. The governmental approach includes the OECD framework for measuring well-being and progress. The OECD well-being measurement framework builds upon the work of the Stiglitz et al. report (2010), arguing that GDP as an indicator of economic performance and social progress is limited while well-being is multidimensional, and, therefore, well-being should be measured considering a multitude of indicators. The OECD well-being measurement framework is composed by eleven topics under two main headings (quality of life and material conditions). Furthermore, in 2015, the General Assembly of the United Nations (UN) adopted 17 sustainable

development goals (SDGs). The SDGs are further decomposed into 169 targets, and there are currently about 230 indicators that have been proposed for realizing these targets.

In parallel, the emergence of socially responsible investing has led to the development of a large number of methodologies for rating corporate social responsibility. These include among others MSCI ESG Research, Trucost, and Thompson Reuter Asset4. MSCI ESG Research provides research, ratings and analysis of the environmental, social and governance-related business practices of thousands of companies worldwide.[4] Its ratings (e.g. KLD) have been widely used by academic research over the years. Trucost, assesses risks relating to climate change, natural resource constraints, and broader environmental, social, and governance factors.[5] Thompson Reuter ASSET4, provides environmental, social and governance (ESG) information based on more than 250 key performance indicators (KPIs).[6]

In addition, different sustainability reporting standards are emerging such as SASB and the Global Reporting Initiative (GRI). SASB develops and maintains sustainability accounting standards—for 79 industries in 11 sectors—that help public corporations disclose financially material information to investors in a cost-effective and decision-useful format. GRI has develop standards to helps businesses communicate their impact on sustainability issues such as climate change, human rights, governance and social well-being.

Increased availability of non-financial information about business' programs, actions, outputs and outcomes related to sustainability generates an abundance of riches upon which to base purchasing and investment decisions, but it also raises issues of commensurability, information overload, and confusion. First, there are important differences in the logics used to develop the governmental frameworks and those developed by the private sector. Second, there are important differences in the methodologies used within each framework. For example, research found a low commensurability in the accuracy of SRI ratings (Chatterji et al., 2016), which might indicate low validity of common practices.

Materiality logic

While ESG ratings might differ in terms of their coverage, or the terminology used, there is often a core set of issues that are commonly identified. For example previous research analyzing data from three main purveyors of ESGs found that two dimensions—environmental processes and environmental outcomes—explained roughly 80% of the variance of the data (Delmas et al., 2013). ESGs are based on the notion of "materiality." They are targeted towards investors. The notion of materiality comes from accounting. In accounting, information is deemed material if omitting it or misstating it could influence decisions that users make on the basis of the financial information of a specific reporting entity. Accordingly, to the Financial Accounting Standards Board (FASB), "information is material if omitting or misstating it could influence decisions that users make on the basis of the financial information of a specific reporting entity."[7] In this context, materiality is defined for financial information intended to investors. This is to ensure they investors have access to the relevant information they need in order to make investment decisions in securities.[8]

The idea of materiality has been expanded for nonfinancial information. It includes information that is relevant for decision making in order to increase the firm value. In this context, the emphasis is placed on defining the user of the information, typically described as "stakeholders" rather than "shareholders," and underlining the importance of considering the impact of not providing information (Eccles et al, 2012). The

NGOs AccountAbility, SASB, the Global Reporting Initiative (GRI), and the United Nations have all offered definitions of materiality for nonfinancial information.

Political logic

Goals and metrics developed by government to address and measure well-being respond to a different logic than those developed by investors. For example, the SDGs goals are result of intergovernmental discussions, which was undertaken through a lengthy, open, and transparent process with many actors involved in the various levels of discussions (Stevens & Kanie, 2016; Chasek et al. 2016). As such, these goals constitute a compromise reflecting a multiplicity of concerns and interests, rather than a specific, coherent systemic view of how the socio-economic engine works and delivers outcomes along all the dimensions covered by the goals (Le Blanc, 2015). The weight provided on one criterion might come from the power of a country or a set of actors. The adoption of some goals by some countries might depend on local political agenda and economic interests. The metrics to "follow-up and review" progress towards has not been standardized yet. Since the goals are not binding, economic actors select objectives and actions more connected to their activities and tend to produce output-based measures indicating progress about one SDG (e.g. education –goal 4- inequalities –goal 10- or sustainability –goal 12).

Furthermore, the goals are non-independent. This means that improvement on one goal can count towards the other goals, or impact negatively another. Indeed sustainable development is an outcome of positive synergies between multiple elements, but may be undermined by negative trade-offs between them (Waage et al., 2015). The non-independence across SDGs poses problems of commensuration and identification of effects; i.e. education and inequalities are correlated, and acting in favor of basic education, and job training can be seen too as fighting against inequalities). SDGs are also unequally connected, with some goals having greater overlap with the other goals than others (Le Blanc, 2015). In his analysis, Le Blanc (2015) found that out of the 107 SDGs targets, 60 explicitly refer to at least one other goal than the one to which they belong. 19 targets link three goals or more. For example, target 3.8 under SDG 3, which relates to achieving universal health coverage, refers to both inequality and poverty.

Resulting enthusiasm but confusion of signals

There is great enthusiasm among investors and managers about well-being goals at the country or planet level. For example, Vivina Berla, Co-Managing Partner, Sarona Asset Management, states: "The SDGs are a powerful, visible and colorful set of flags around which investors can gather to learn a common language. Improved communication, complemented by bigger data on the consequences of choices made in the past, will lead to a better understanding and better investment decisions for the future.[9] The ShareAction report provides some empirical evidence on investors' interest in SDGs. For the report, researchers surveyed 52 institutional investors based in every region of the world with over £4trillion assets under management. The results shows that 95% of respondents plan to engage with investee companies about issues covered by the Goals, 84% will allocate capital to investments supporting the Goals, and 89% will support regulatory reforms that promote the Goals. However, most investors are still confused on how to make decisions about SDGs and more than half of surveyed investors worth $5.9trn remain undecided on how to proceed on the SDGs .[10] So far, only few investors committed to using SDGs as an investing framework. This includes Swedish and Dutch pension funds and some global investors such as UBS.[11]

Indeed, out of the 17 SDG goals, only a few map easily to firm activities.[12] For example, goal 9, which aims to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation,

involves the private sector in several ways. Some indicators suggested by the Leadership Council of the Sustainable Development Solutions Network to monitor goal 9 include the "total energy and industry-related GHG emissions by gas and sector," "personnel in R&D" and "employment in industry." This correlates to GRI Disclosure 305, by which companies have to report their GHG emissions and also the presence of emissions reduction initiatives, if any. The impacts of firm actions can be linked to the progress of SDG goals from this perspective. [13]

In the ShareAction report, action by investors to support Goals 8, 9 and 13 (promoting decent work and economic growth; building industry, innovation and infrastructure; and taking action to curb climate change) were those considered by respondents to the survey to have potential to meet their long-term investment objectives.

However, many of the other goals do not match as directly to business practices. For example Goals 4 and 10 mentioned before about education and inequalities are not considered central by many firms who think these goals are indirect outcomes of their actions. Therefore these goals are then less likely to be directly assessed on a regular basis.

Furthermore, the political and corporate logics might be conflicting. The materiality logic is about financial impact, while the political logic is about social welfare. Many economic decision makers think many of the SDG goals (e.g. goal 15 on biodiversity or goal 16 on peace and justice strong institutions) are not their responsibility. Therefore, while SDGs and ESGs converge on some ideals and indicators, they are not fully connected and rely on distinct logics (political and economic) and levels (SDGs are at the country level, ESGs are at the firm level which both operate locally but across many countries).

In addition, the measurements provided by many companies and in many cases validated by consulting companies, do not assess real impact but sheer output –the difference between the two being one of real effect: outputs are simple counts whereas impact assess the effect of action relative to what would have occurred in absence of action. For instance, claiming to provide basic education to 1,000 beneficiaries (output) differs from establishing that in absence of the action only 500 people would have had access to education.

Recommendations for developing robust tools with business relevance

Because of the availability of so many different metrics, managers are confused on how to set-up well-being goals for their firm. There is the need to design strategies to reconcile these logics to select indicators. We present below arguments underlying the choice of indicators in measuring business impact on well-being and sustainability. Based on our analysis of the different frameworks, and drawing on the existing academic literature on goal settings, we propose a dual approach that managers can use to enhance convergence between states' policies regarding SDGs and firms' strategies associated with ESGs and well-being indicators.

Setting up effective organizational goals

We argue that the psychology literature on goal setting can be helpful to overcome some of the challenges to develop methodologies to choose effective business sustainable goals. First, scholars have suggested that appropriate goal setting is important in an organization because it provides focus, increases motivation, improves group cohesion and help in performance measurability (Vigoda-Gadot & Angert, 2007). Effective goals, are those that motivate members of the organization to attain them. Goals are related with

organizational performance enhancement because they organize effort, directs attention and encourages determination and plan development (Reed, 2012). Second, goals have been shown to influence performance, in part, by stimulating the development of task strategies (Earley & Perry, 1987; Locke et al., 1981; Smith, Locke, & Barry, 1990). It has been suggested that goals induce a more careful consideration of the task and the best means to accomplish it. In defining the relationship between goals and performance levels two main concepts have been proposed: the concept of goal difficulty and goal specificity.

The literature proposes that setting harder to reach, or 'stretch,' goals results in greater and more sustained behavior change toward that goal (Locke & Latham, 2006; Kerr & Landauer, 2004). Murphy (2013) suggested that ambitious goals can contribute to the motivational increase of individuals and thus enhance the overall performance levels. Notably, stretch goals have been recommended specifically in the domain of sustainability, although they have not yet been tested empirically (Fischer, 2008; Manning, Lindenmayer, & Fischer, 2006). On the other hand, some research demonstrates that comparison to high-performing reference groups can be demoralizing. For example, the Self-Evaluation Maintenance model posits that when individuals find out that others are performing better than they are on a given task, they start to view the task as less important to their self-definition, which in turn could cause them to exert less effort in that domain (Tesser & Campbell, 1980; Tesser, & Cornell 1991). In a demonstration of the "ostrich effect," investment data illustrate that people are motivated to engage with their portfolios when they are performing well, but in fact disengage and ignore their portfolios in response to feedback that they are performing poorly (Karlsson, Loewenstein, & Seppi, 2009).

The second factor that influences goal effectiveness is goal specificity. Locke et al. (1981) defined goal specificity as "the degree of quantitative precision with which the aim [goal] is specified" (p. 126). Increasing the specificity of a goal increases the consensus regarding the interpretation of that goal (Locke et al., 1989). That is, as goal specificity increases, room for interpretation decreases as does the number of outcomes that are consistent with the goal. The problem with SDGs is that they are ambitious but not specific. There is therefore no consensus on what they should be.

Against this background, a well-known goal-setting technique in the organizational behavior literature encourage firms to develop goals that are specific, measurable, attainable, relevant and timely (S.M.A.R.T) (Doran, 1981). This framework can be useful to develop effective business goals for well-being.

Specific and Measurable. When goals are specific, companies must spell out precisely what indicators they track, what measures are to be used in order for third parties to crosscheck the attainment (or not) of the objectives.

Attainable. While goals should be difficult, they should also be based in reality. In other words, if a goal is viewed as impossible to reach, it will not have any motivational value. In fact, setting impossible goals and then punishing people for not reaching these goals is absurd and counterproductive. The targets needs to be credible, which means striking a balance between what can be practically achieved while setting the bar at a level where real improvements will accrue. If the targets cannot be achieved, the company's sustainability track record will appear as weak. But targets that are too soft could be derided as meaningless, and could attract accusations of "green"- or "social-washing."

Relevant. Meaningful goals cannot be set in isolation from the world at large. Collaboration with external organizations, NGOs and partners is necessary to advance a sustainability agenda. The best sustainability strategies involve working with a number of external stakeholders to identify needs and to create new

opportunities and solutions for some of the world's toughest challenges. Companies need support from NGOs and other relevant third-party 'watchdogs' to advance sustainability causes and communicate with the public at large in a credible and authentic manner.

Timely. Clarity is about knowing exactly what you are trying to achieve and by when. The goal should contain a statement regarding when the proposed performance level will be reached.

The acronym has also expanded to incorporate additional areas of focus for goal-setters. s.m.a.r.t.e.r for example, includes the criteria of evaluation and review of the goals. This incorporate the appraisal of whether the goals have been achieved and the reflection and adjustment of the approach taken to reach the goals.

From economic to political logic: Connecting s.m.a.r.t goals for well-being to materiality

For firms, the objective of pursuing SDGs associated with well-being cannot be taken as a realistic assumption for expressing and explaining their raison d'etre and their decisions. As mentioned earlier, the economic logic on which they rely obeys different principles. This is not because these principles are distinct, that they necessary misaligned with the political logic of the SDGs. The crucial pathway connecting the two appears to us to be materiality, and the capacity to develop s.m.a.r.t goals for well-being tailored to each organization that have positive and material impacts.

Existing frameworks strive to connect the materiality of firms' actions with superordinate impacts such as those formulated by SDGs. For instance, the Integrating Reporting (IR) framework "proposes three steps that companies ought to follow in their materiality determination process. The first is the identification of relevant matters; the second is the determination of the importance of the matters; the third is the prioritization of material issues" (Fasan & Mio, 2017:291). By including a materiality analysis in the process of defining s.m.a.r.t. goals, firms perform a stakeholder review that turn certain phenomena and demands into salient issues, worthy of consideration and of becoming a goal and way of progress. As shown, both issue salience and cost-benefit analysis of action and inaction relative to a goal explain why firms will act in a substantial or only symbolic way (Durand, Hawn, and Ioannou, 2017). Indeed, companies seek out the interests of their stakeholders (customers, suppliers, community members and employees) to help the company prioritize its material issues but can react differently for a same level of salience on two distinct goals or identically for different levels of salience depending on the materiality of the issue itself.

In their effort to identify the relevant issues, firms can generate a materiality map by asking stakeholders what issues they consider as most material. The materiality analysis within the sustainability reporting process can be defined as "the specific activity by which an organization identifies and prioritizes its own material aspects, thus determining the materiality matrix" (Bellantuono et al., 2016:3). As an example, Nestle completed a materiality matrix in 2016 to compare issues that stakeholders were most interested in, with the risks and opportunities that would have the greatest potential to impact the business. In 2016, food safety, water stewardship and safety and health were the three most important factors for Nestlé's stakeholders[14], which also represented the three significant risks identified by the company. With the matrix, Nestle was able to set its priorities to focus on food safety and to assure the quality of Nestlé's products to its customers. At the same time, and not unsurprisingly, these issues can lead to enunciating s.m.a.r.t goals for the organization which are aligned with SDGs 2 (hunger and food security) and 3 (health).

Organizational relevance is a key component of s.m.a.r.t. goals but so are their specificity, measurability and attainability. For this, firms need the support of inter-governmental agencies.

From political to economic logic: Connecting national statistics with firms' impact

Goal specificity, measurability and attainability require the development of specific indicators but also that firms can compare their progress with other firms, and their impact towards the goal. Corporate Sustainability involves leading change not just within a company's boundaries, but in the wider industry and society beyond (Lyon et al., 2018). However, the lack of standardization of well-being metrics can be used strategically by firms to greenwash or lobby against environmental and social regulation behind closed doors, while taking public sustainability stances (Delmas et al., 2016).

Governments and inter-governmental agencies can play a major role to elaborate a set of standardized well-being indicators that have the potential to demonstrate which goals are on track, and where further effort should be expended. Let's take the example of the SDG 9: "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation." The target is by 2030, to upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities. One proposed indicator that is relevant for firms is "CO_2 emission per unit of value added." However, firms need to be able to compare their CO_2 emissions per unit of value added to their competitors, and understand how much their sector contributes to the target. Clearly, "metrics need to be developed to measure progress towards the targets on local, national, regional and global levels and across sectors. Monitoring and evaluation procedures and standards need to be set up" (Lu et al. (2015): 432).

Goals must also have a defined time frame. Improvement in environmental performance is a long process. It might take a few years before changes can be implemented. Looking at trends provides insights into companies' commitment to improvement of their environmental performance. Indicators that are based on multi-year data are more robust. Businesses are often criticized for their short-term perspective (Bansal and Desjardine, 2014). Providing goals with different time frames might guide them towards improvement over time. But firms have been focusing on short-term and individual gains rather than long-term sustainability.

In addition, in order to reach as many SDGs as possible in as many countries as possible, it is necessary to connect the political logic that underpins SDGs with the economic imperatives that weigh on firms. The task for countries to define, measure, track, and report on sustainability goals is sensitive to many aspects. Politically, identifying and measuring health, education, and many other issues at the national level may not be in the interest of the country leaders; it could shed a crude light on unspoken problems, be perceived as representative of a foreign domination on internal affairs, and fuel opposition to current leadership. Operationally, national statistics offices may lack resources and competences to follow indicators that they do not or cannot position at the top of their list. These difficulties and others reinforce the role of transnational institutions, either governmental or non-governmental, as playing the conveyor belt role between firms' impacts and SDGs.

Time is prime for more coordination and better integration of the data produced by firms at the local level to be aggregated by the national statistics institutes or on their behalf by other organizations. Alongside national politics and sponsorship targeted at alleviating environmental and social problems, the complementary and sometimes very substantial impact of local and multinational companies' ESG policies

builds the case for a well-thought combination that country authorities can report to the international organizations such as UN and to their population as well. We see this dual movement as converging and promising: a first movement starts from governments aiming at tackling identified problems among and beyond the SDGs list and devising public policies within which the private economic sector plays a key role; a second movement proceeds from small-scale local firms and multinationals that define s.m.a.r.t goals connected with the broader SDGs and follow-up and measure appropriately their impacts that could be aggregated at the national level.

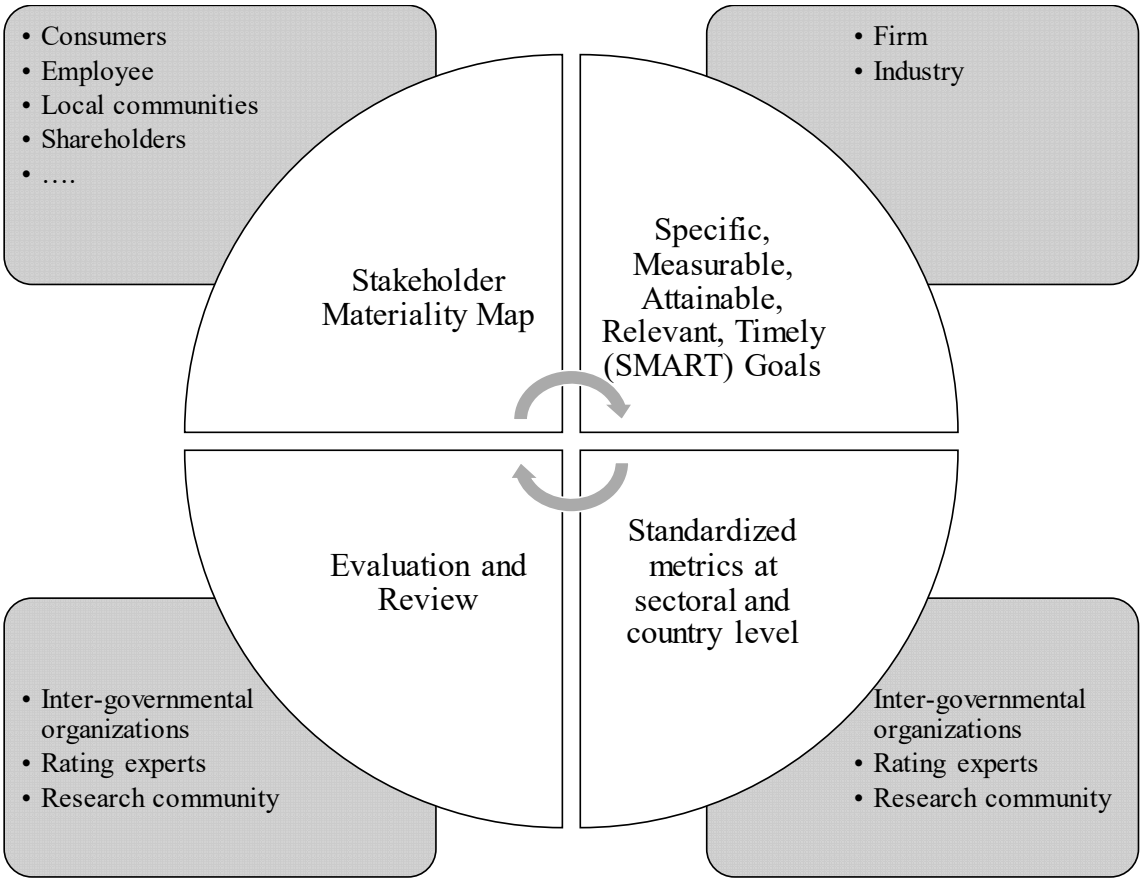
We therefore advocate for more consistency and coordination among and between institutions and organizations that aim at helping this dual movement to converge and complement each other. At the more macro-level, for instance under the OECD's auspices, the creation of an "Intergovernmental Panel on Well-Being" could gather policy makers and national statistics officers, rating experts and management scholars specialized in firms' environmental and social strategies. Based on a deep knowledge on what states can commit to and what firms do, this panel would help coordinate at a global scale the rapprochement between SDGs and ESG indicators and suggest harmonization among the many existing referential. At the more micro-level, i.e. the level of companies, there is a need to set standards that favor commensurability across firms' impact. The OECD in isolation or in collaboration with other public or private organizations could provide the broader framework as well as metrics that firms can use to evaluate their progress. A higher level of standardization is required in this space, so that comparability across firms is enhanced, and that investments are well-oriented, rewards and returns from actions benefit the right-doers instead of the loud-speakers, and that overall global coherence takes place toward alleviation of the plagues of our time.

In addition, we argue that the research community has an important role to play, to help measure genuine progress, align the goals with existing governance arrangements, and facilitate the integration of economic, social, and environmental dimensions. While the United Nations' Sustainable Development Goals emphasize the importance of evidence-based decision-making, there is currently no forum to coordinate the research on corporate sustainability with intergovernmental initiatives. Corporate sustainability researchers have shown that a lack of transparency about environmental processes and performance has allowed firms to undertake symbolic rather than substantive actions and to resist progress in the regulatory arena. They can help devise methodologies, in concert with intergovernmental agencies to meet the challenge of substantive progress in corporate sustainability. Furthermore, because of potential trade-offs between the economic, social and environmental dimensions of well-being, it is imperative that the research communities approaches devises metrics and measures progress through inter- and transdisciplinary research projects. The food-water-energy nexus is an example of an integrated approach for sustainability, as well as a stronger focus on the social dimension (Biermann et al., 2017).

In summary, we argue for an approach where firm establish a list of smart goals through a stakeholder materiality map and where intergovernmental agencies with the support of researchers devise standardized metrics at the sectoral and country level that help firms benchmark their progress. Firm transparency on well-being metrics will need to be required for data comparison and standardization. Finally these metrics will be evaluated and review periodically in collaboration with researchers. Our framework is portrayed in

Figure 1 below.

Figure 1 s.m.a.r.t Pathways to Measuring Business Well-being



Conclusion

Despite their different logics, SDGs and ESG indicators are prime to converge and bring about positive results on many aspects contributing to well-being. We argued that s.m.a.r.t (specific, measurable, attainable, relevant and timely) goal setting along the various SDGs can provide a compass to managers who need clear, comparable targets that can steer them and their organization in an agreed direction. By benefitting firms in their market positioning and competitiveness, impactful ESG policies contribute to well-being as well. We advocate for better measurement, standardization of indicators, and an increased comparability across firms. For such an objective, better pathways are required that combine and compare impacts, that associate impacts at the national level to nurture country-based reporting on SDGs attainment. Transnational governmental and nongovernmental organizations are at the crux of this challenge resolution, and scholars can help to find the best trails that lead to the best complementarity between the political and economic logics around well-being.

Notes

1. World Business Council for Sustainable Development. WBCSD FAQ. http://wbcsdpublications.org/faq/.
2. GRI, UN Global Compact and WBCSD (2015). SDG Compass: The Guide for Business Action on the SDGs; Corporate Citizenship (2015). From My World to Our World: What the Sustainable Development Goals Mean for Business. http://sdgcompass.org/wp-content/uploads/2015/12/019104_SDG_Compass_Guide_2015.pdf.
3. https://www.edie.net/news/7/PwC--Businesses-still-not-meaningfully-engaging-with-SDGs.
4. https://www.msci.com/esg-integration.
5. https://www.trucost.com/.
6. https://www.sri-connect.com/index.php?option=com_comprofiler&Itemid=4&task=userProfile&user=1007283.
7. https://www.iasplus.com/en/standards/other/materiality.
8. Financial Accounting Standards Board. Statement of Financial Accounting Concepts No. 8, http://www.fasb.org/cs/BlobServer?blobcol=urldata&blobtable=MungoBlobs&blobkey=id&blobwhere=1175822892635&blobheader=application%2Fpdf. Likewise, For the US Securities and Exchange Commission (SEC), materiality concerns the significance of an item to users of a registrant's financial statements. A matter is "material" if there is a substantial likelihood that a reasonable person would consider it important (Securities and Exchange Commission. SEC Staff Accounting Bulletin: No. 99 – Materiality, http://www.sec.gov/interps/account/sab99.htm, accessed March 2012).
9. THE SDG INVESTMENT CASE_PRI, https://www.unpri.org/download?ac=1436.
10. https://shareaction.org/press-release/investors-can-play-a-central-role-in-achieving-the-sustainable-development-goals/.
11. https://www.2degreesnetwork.com/groups/2degrees-community/resources/esg-stepping-stone-direct-contribution-sdgs/, http://sdg.iisd.org/news/dutch-financial-institutions-recommend-sdg-investment/.
12. https://shareaction.org/press-release/investors-can-play-a-central-role-in-achieving-the-sustainable-development-goals/.
13. Goal 14 can also be naturally linked to firm activities. Goal 14 strives to protect, restore and promote sustainable use of terrestrial ecosystems. Firms that operate in a particular area have direct impact on land use. Firm impacts on this goal can be monitored by GRI Disclosure 304, by which companies report on the impacts of their operational sites on biodiversity activities, products and services.
14. https://www.nestleusa.com/csv/what-is-csv/materiality-and-stakeholder-engagement.

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The Relationship between Investor Materiality and the Sustainable Development Goals/ Gianni Betti, Costanza Consolandi and Robert G. Eccles[ii]

Abstract

The world has great expectations for how the private sector, both companies and investors, can support the 17 Sustainable Development Goals (SDGs). In fact, it is generally believed that these goals cannot be achieved without strong support from the private sector. But will making the world a better place hurt financial returns? The answer is "No" if companies focus on the SDGs and their associated targets that benefit from strong performance on the material environmental, social, and governance (ESG) issues that matter to investors. In this paper we map the 30 generic ESG issues identified by the Sustainability Accounting Standards Board (SASB) to the SDGs and their targets. We show that some SASB issues are more material for a given SDG than others. We also show that some SASB issues are more important to the SDGs in general than others. We also map the material ESG issues for each of SASB's 79 industries to the SDGs and to their targets. For each sector, there are particular SDGs where it has high impact and for each SDG there are particular sectors that have a high impact on it, and some sectors are more important to the SDGs in aggregate than others. The same is true at the target level. This mapping can be used as a guide for both companies and investors who want to understand how value-creating ESG performance can contribute to the SDGs. This paper is divided into four parts. Part I explains the motivation for this study. Part II explains our methodology and Part III the results. Part IV concludes with a summary of our results and some reflections on how our mapping methodology can be improved.

Introduction

The 17 Sustainable Development Goals (SDGs), ratified by the United Nations on 15 September 2015, have been described as "the closest thing the Earth has to a strategy" (PwC, 2017). It is also widely acknowledged that the goals set for 2030 cannot be achieved by the public sector alone[1]. The investment community is increasingly seeing the SDGs as creating investment opportunities and corporations are looking for the business opportunities they create.

Besides measures on SDG implementations at a country level[2], in order to track progress towards the goals and their associated 169 targets at a company level, a large number of tools and "business indicators," have been proposed. The World Business Council for Sustainable Development (WBCSD) together with Global Reporting Initiative (GRI) and the UN Global Compact (Global Compact) have created SDG Compass, a guide with associated tools and knowledge resources to help companies align their business strategies with the SDGs and to measuring and managing their contribution, including an inventory that maps more than 1,500 existing business indicators against the 17 SDGs and their respective 169 Targets.[3] GRI and the Global Compact have also published a document [4] to help companies understand the SDGs and their targets.

ii. Gianni Betti, Department of Economics and Statistics, University of Siena, e-mail: gianni.betti@unisi.it; Costanza Consolandi (corresponding author), Department of Business and Law, University of Siena, e-mail: costanza.consolandi@unisi.it; Robert. G. Eccles, Said Business School, University of Oxford, e-mail: robert.eccles@sbs.ox.ac.uk.

Also consulting firms such as EY, KPMG, and PricewaterhouseCoopers have developed their own tools to help companies interested in understanding how their strategies can support the SDGs.

The SDGs are about "impact" and in these measures the unit of analysis is not the company but something outside of the company whose operations affect it, such as reduced gender inequality in a community or replenishment of fishing stocks. However, many of the metrics are about a company's operations and the impact must be inferred or further calculated, often based on data that lies outside the company's control. Indeed, true impact measurement is still at an early stage of development.

In this paper, we present a framework which will enable investors and companies to contribute to the SDGs by identifying the material issues (what investors care about) by sector that also contribute to the SDGs (what the world cares about). Starting from the evidence of how ESG materiality positively affects financial performance (see Khan *et al*., 2016; Grewal *et al.*, 2017), we aim at providing a new framing able to answer to the long-standing question of "Can a company do well by doing good?" In particular, will contributing to the SDGs be good for a company's financial performance or will creating these positive externalities actually hurt financial performance? The somewhat unsatisfying but honest answer is "It depends." Our thesis is that good performance on ESG issues which are material from the perspective of the Sustainability Accounting Standards Board (SASB) but which also have impact on one or more SDGs will be a situation where doing good means doing well.

Methodology

The concept of materiality we adopt in this paper is the one used by SASB that was established to identify the material ESG issues at an industry level that are financially relevant for investors, as they affect financial performance.[5] SASB is a San Francisco-based nonprofit organization established in 2011[6]. SASB's mission is to develop measurement standards for reporting on material environmental, social, and governance (ESG) issues—often called "nonfinancial information"—that are of the same relevance and reliability as accounting standards for financial information. Because the material ESG issues of interest to investors vary by industry, SASB has established a 10-sector classification system which subdivides into 79 industries[7]. Industry Working Groups comprised of companies, investors, and industry experts of various kinds work to identify the material issues for each industry and the appropriate key performance indicator for measuring and reporting on them. It has issued a set of "Provisional Standards" for which is has received public comment and is now working on incorporating this feedback into them.[8]

Following Phadke and DeMates (2017), we started with a mapping of SASB's 30 generic ESG issues organized in terms of the categories of environment, social capital, human capital, business model and innovation, and leadership and governance to the SDGs[9]. Furthermore, as it is intuitive that different issues might have a different degree of impact on the SDGs, we increased the detail of our analysis by mapping SASB's 30 generic ESG issues to the target level for each SDG.

These mappings represent the basis of our framework as they allowed us to calculate two different sets of indices (both at a goal and a target level):

a) a set of indices that measure the ability of SASB's issues to impact the SDGs and the relevance of SASB's issues to the SDGs

b) a set of indices that measure the ability of each industry and each sector to impact the SDGs.

In our analysis, we considered 107 targets. The 169 targets also include *means of implementation* targets to facilitate outcomes. SDG17, which covers global partnership, comprises 19 such targets, and there is a total of 43 more under SDGs 1-16 (where they are separately identified using small letters after the Goal number, e.g. 16.b: Promote and enforce non-discriminatory laws and policies for sustainable development). (OECD, 2016). Target selection are shown in Table 1.

For the first group of indices a), at a goal level for each SASB issue *i* (*i*: 1 to 30) we identified the number (G) of SDG(s) impacted; in other words, a generic SDG *j* could be impacted ($imp_{i,j} = 1$) and a generic SDG *l* could not be ($imp_{i,l} = 0$).

We then calculated for each SASB issue the *SDG Relevance Index* (*SRI*) as the ratio between the number of SDGs impacted by a specific material issue to the total number - 16 -of SDGs:

$$SRI_{\ i} = \frac{\sum_{j=1}^{16} imp_{i,j}}{16} \qquad (1)$$

At a target level, for each SASB issue *i* (*i*: 1 to 30) we identified the number (T) of Targets impacted in a specific SDG *j*; in other words, a generic Target *t* in SDG *j* could be impacted ($imp_{i,j,t} = 1$) and a generic Target *s* in the same SDG *j* (*t*, *s*: 1 to T_j) could be not ($imp_{i,j,s} = 0$).

We then computed for each SASB issue the *Target Relevance Index* (*TRI*) as the ratio between the number of Targets impacted by a specific material issue on the total number of Targets**,** that shows the ability of each SASB's issue to impact Targets. This could be written by generalizing equation (1), in the following way:

$$TRI_{\ i} = \frac{\sum_{j1}^{16} \sum_{t=1}^{T_j} imp_{i,j,t}}{107} \qquad (2)$$

A very first useful empirical implication of this detailed mapping is that it allows us to measure the intensity of impact on a given SDG of each issue: for each SASB issue and for each SDG_j we therefore calculated a *Target Specific Relevance Index* (*TSRI*). If a SASB issue *i* impacts on a generic SDG *j* (i.e. $imp_{i,j} = 1$), then the TSRI is the ratio between the number of SDG_j Targets impacted by a specific material issue to the total number of Targets of SDG_j. The TSRI is defined as:

$$TSRI_{\ i,j} = \frac{\sum_{t=1}^{T_j} imp_{i,j,t}}{T_j} \qquad (3)$$

By symmetry with the previous step, we also look at the number of SASB's generic ESG issues that impact each of the SDGs (*MI*) and calculate an *ESG Relevance Index* (*ERI*) for each SDG *j* to measure the extent to which the SDG is impacted by the 30 SASB issues:

$$ERI_j = \frac{\sum_{i=1}^{30} imp_{j,i}}{30} = \frac{MI}{30} \qquad (4)$$

At target level, to measure the extent to which the single target is impacted by the 30 SASB's issues, we looked at the number of SASB's issues affecting each target and calculated an *ESG Target Relevance Index (TERI):*

$$TERI_j = \frac{\sum_{i=1}^{30} imp_{j,i}}{30} \qquad (5)$$

For each SDG we then calculated an *ESG Target Specific Relevance Index (TSERI)* averaging the *TERI*s related to each SDG:

$$TSERI_{i,j} = \frac{\sum_{i=1}^{T_j} TERI_j}{T_j} \qquad (6)$$

However, from a company perspective, and investors in the company, the critical question is which SDGs are impacted by the material ESG issues determined by SASB for its industry and how a focus on ESG material issues can contribute to the SDGs.

We therefore calculated a second set of indices that provide a measure of the ability of each industry and sector to impact the SDGs. For each SDG $_j$ and for each industry n_k (n_k : 1 to N_k) in a given sector k (k: 1 to 10)[10], we counted the number of industry-specific material issues impacting the SDG (MI_k) and calculate the *SDG Industry Impact Index* (*ISII*) as the ratio (multiplied by 100) between the number of industry-specific material issues and the total number of SASB general ESG issues (above defines as *MI*) affecting the single SDG *j*; in formula:

$$ISII_{j,n_k} = \frac{\sum_{i=1}^{30} imp_{j,i,n_k}}{\sum_{i=1}^{30} imp_{j,i}} 100 = \frac{MI_k}{MI} 100 \qquad (7)$$

At the target level, for each industry n_k (n_k : 1 to N_k) in a given sector k (k: 1 to 10), we counted the number of industry-specific material issues impacting each Target t_j in each SDG *j* (TMI_k) and for each Target we calculate the *Industry Target Impact Index* (*ITII*) as the ratio (multiplied by 100) between TMI_k and the total number of SASB general ESG issues (defines as *TMI*) affecting the single Target t_j in SDG *j*; in formula:

$$ITII_{j,T_j,n_k} = \frac{\sum_{i=1}^{30} imp_{j,T_j,i,n_k}}{\sum_{i=1}^{30} imp_{j,T_j,i}} 100 = \frac{TMI_k}{TMI} 100 \qquad (8)$$

Also in this case, for each SDG we calculated an Industry SDG Target Impact Index (ISTII), as the ratio (multiplied by 100) between the sum over Targets in SDG *j* of the number of industry-specific material issues impacting each Target t_j in each SDG (TMI_k), and the sum over Targets in SDG *j* of the total number of SASB general ESG issues affecting the single Target t_j in SDG *j*; in formula:

$$ISTII_{j,n_k} = \frac{\sum_{t=1}^{T_j} \sum_{i=1}^{30} imp_{j,T_j,i,n_k}}{\sum_{t=1}^{T_j} \sum_{i=1}^{30} imp_{j,T_j,i}} 100 \qquad (9)$$

At a sector level k and at a goal level, the *Sector SDG Impact Index* was computed averaging the single *ISII*s:

$$SSII_{j,k} = \frac{\sum_{n_k=1}^{N_k} ISII_{j,n_k}}{N_k} \qquad (10)$$

At a target level, for each sector k, the Target t_j in SDG *j* Impact Index (*STII*) was computed averaging the single *ITII*s:

$$STII_{j,T_j,k} = \frac{\sum_{n_k=1}^{N_k} ITII_{j,T_j,n_k}}{N_k} \quad (11)$$

Furthermore, for each sector *k*, the *Sector SDG j Target Impact Index (SSTII)* was computed averaging the single *ISTIIs*:

$$SSTII_{j,k} = \frac{\sum_{n_k=1}^{N_k} ISTII_{j,n_k}}{N_k} \quad (12)$$

An Average SDG Impact Index was finally computed both at industry (*AISII*) and sector (*ASSII*) level, averaging the *ISIIs* and *SSII*s, respectively:

$$AISII_{n_k} = \frac{\sum_{j=1}^{16} ISII_{j,n_k}}{16} \quad (13)$$

$$ASSII_{n_k} = \frac{\sum_{j=1}^{16} SSII_{j,n_k}}{16} \quad (14)$$

An *Average SDG Target Impact Index* was finally computed both at the industry *(AISTII)* and sector *(ASSTII)* level, averaging the single *ITII*s and *SSTIIs*:

$$AISTII_{,n_k} = \frac{\sum_{j=1}^{16} \sum_{t=1}^{T_j} \sum_{i=1}^{30} imp_{j,T_j,i,n_k}}{\sum_{j=1}^{16} \sum_{t=1}^{T_j} \sum_{i=1}^{30} imp_{j,T_j,i}} 100 \quad (15)$$

$$ASSTII_{,n_k} = \frac{\sum_{j=1}^{16} \sum_{t=1}^{T_j} \sum_{i=1}^{30} imp_{j,T_j,i,n_k}}{\sum_{j=1}^{16} \sum_{t=1}^{T_j} \sum_{i=1}^{30} imp_{j,T_j,i}} 100 \quad (16)$$

A synthesis of the calculated indices is presented in Table 2

Results

The SDG Relevance Indices and the ESG Relevance Indices

Table 3 presents the values of the SDG Relevance Indices obtained mapping SASB sustainability issues to the SDGs both at a goal (SRI) and a target (TRI) level defined by (1) and (2) in the Methodology section, respectively.

We can observe a substantial variation in the ability of the SASB issues to impact the SDGs. On a goal level, the SRI ranges from 6.3% to 87.5% with a mean of 34.2% and a standard deviation of 17%; business ethics and transparency of payments and data security and privacy are only relevant to SDG 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) whereas supply chain management impacts 14 of the SDGs (the exceptions are SDG 2 on ending, hunger and SDG 4 on inclusive and equitable quality education). This shows that some SASB issues are much important to the SDGs in terms of scope than others but also that the SASB issues are in general relevant to the SDGs.

At a target level, values of the TRI range from 0.93% to 33.64% with an average value of 12.95% and a standard deviation of 7%; data security and privacy is relevant only for Target 16.4 (by 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime) whereas supply chain management is relevant for 36 out of the 107 targets considered in our analysis.

When we consider the aggregate values for each SASB dimension, we find that business model and innovation present the highest values for both indices, with a SRI of 46.88% and a TRI of 15.98% (Table 4).

The intensity of impact on a given SDG of each issue is provided by the Target Specific Relevance Index (TSRI), as defined in (3). Detailed results are reported in Annex 1. The TSRI ranges from 10% to 100% with a mean of 39.1% and a standard deviation of 21.4%. If on a goal level, our analysis shows that not all the SDGs are impacted by the same SASB issues, on a target level we can add that not all SASB issues that impact the same SDG do it with the same intensity. For example, SDG 7 has three targets. Supply chain management impacts all of them (100%), GHG emissions two of them (66.67%), and access and affordability only one of them (33.33%). In this regard, it is important to notice that the number of targets varies across the SDGs, ranging from three in SDG 7 and SDG 13 to 10 in SDG 8 and SDG 16.

The extent to which each SDG is impacted by the 30 SASB issues, is measured, at a goal level, by the *ESG Relevance Index* (*ERI*), as defined in (4). Values of the ERI presented in Table 5 show that also for this index we have a variation similar to the SRI. The number of SASB issues impacting single SDG ranges from four for SDG 4 (inclusive and equitable quality education) to eighteen for SDG 3 (healthy lives and well-being) and consequently the ERI ranges from 13% to 60% with a mean of 36%. This shows that, on a simple count basis, that doing well on material issues will be more important for some SDGs than for others which suggests that the private sector can make more contributions to some SDGs than others

At a target level, the corresponding index we calculated is the *Target ESG Relevance Index (TERI)*, defined in (5). Detailed values of the index are reported in Annex 2. The *TERI* ranges from 46.7% for Target 3.9 (by 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination) to 0% for 17 targets not impacted by any SASB issue, with a mean of 12.65%, meaning that on average each target is impacted by less than four SASB's issues.

Averaging the TERIs across each SDG, as defined in (6), we calculated the *Target Specific ESG Relevance Index (TSERI)*. Table 5 shows that whereas on a goal level the SDG most impacted by SASB's issues is SDG 3 (60%), at a target level it is SDG 7 (26%). The *TSERI* ranges from 4% for SDG 4 to 26% for SDG 7, with a mean of 12.95%.

The SDG Impact Indices and the Target Impact Indices

The second group of indices we created allows to assess the specific ability of the issues that are financially material for an industry. It is based on the assumption that that the number of SDGs and targets impacted by all SASB issues represent the theoretical maximum effect that can be obtained by the private sector (i.e. the impact on SDGs that a theoretical company operating in a theoretical industry for which all the issues are material on a financial perspective might have). We therefore set this value equal to 100.

On the basis of SASB's Materiality Map[11], we considered only the issues that are material for each industry in SASB's Sustainable Industry Classification System™. In essence, with different degrees of detail, the SDG Impact Index family measures the extent to which a company doing well on the material issues for its sector is doing good by contributing to each SDG.

At a goal level, the *Industry SDG Impact Index (ISII)* – defined by (7) - measures the ability of an industry to affect a given SDG through its material issues. In general, the ISIIs present noticeable variation and for each industry there is a particular SDG where it has high impact. It is too cumbersome to present all of the data since it would a table of 79 (number of SASB industries) by 16 (number of SDGs). Table 6 illustrates this for the biotechnology industry with the highest score of 75.00 for SDG 4 and the lowest of 36.36 for SDG 16.

At a target level, the Industry *Target Impact Index (ITII)*, defined by (8), presents similar variations. Providing the data would be even more cumbersome, a table of 79 by 107 (the number of targets). For illustration, Table 7 shows the data for the targets in in SDG 8 for the Biotechnology industry, with the highest score of 100.00 for Target 8.6 and the lowest of 0.00 for Target 8.2.

The target level mapping allowed us to calculate a target- weighted SDG impact index for each industry, the Industry *SDG Target Impact Index (ISTII)*, defined by (9). Again, using the Biotechnology industry as example, values presented in Table 8 shows a similar variation to the previous index. Nevertheless, while SDG 4 remains the SDG most affected by the industry, SDG 13 (take urgent action to combat climate change and its impact) is in this case the goal with the lowest value.

At a sector level, averaging the industry SDG impact indices both at a goal and a target level, we calculated for each SDG (or each target) three other indices: The *Sector SDG Impact Index (SSII)*, the *Sector Target Impact Index (STII*) and the *Sector SDG Target Impact Index (SSTII)*, respectively defined by (10), (11), and (12) formulas.

Using the Health Care Sector as example, Table 9 shows the data for the targets in SDG 8, with a maximum of 33.33 also in this case for Target 8.6 and a minimum value of 0.00 for Target 8.2.

Values of *SSII*s and *SSTII*s are presented in Table 10. We can observe that for each sector there are particular SDGs where it has high impact (in bold in Table 10) and for each SDG there are particular sectors that have a high impact on it. At a goal level, SDG 4 is the goal where the highest number of sectors (four out of ten) presents the highest SSII, whereas at a target level (SSTII) this also applies to SDG 14.

The last indices we calculated measure the ability of SASB industries and sectors to impact SDGs in general. These are represented by the *Average Industry SDG Impact Index (AISII),* the *Average Sector SDG Impact Index (ASSII)* and the corresponding indices at a target level, *Average Industry SDG Target Impact Index (ASTII)* and the *Average Sector SDG Target Impact Index (ASSTII)*, described by formulas (13)-(16) in the Methodology section.

For reason of space we do not present tabulated data of the above-mentioned indices at industry level. Using the industries in the Health Care sector as an example, the AISII ranges from 15.00 in the Health Care Distribution industry to 50.34 for the Biotechnology and Pharmaceuticals industries, whereas the AISTII ranges from 13.79 in the Managed Care industry to 53.69 in the Biotechnology and Pharmaceutical industries, showing that some industries in the Health Care sector are more relevant to the SDGs than others. This pattern is constant in all sectors, and the average standard deviation of the AISII is 15.31% whereas for the AISTII is equal to 17.27. Values are presented in Table 11.

Finally, in Table 12 are presented the values for the *Average Sector SDG Impact Index (ASSII)* and the *Average Sector SDG Target Impact Index (ASSTII)*. In both cases, Health Care and Consumption are the two sectors that have the highest overall impact on the SDGs. This result is not surprising. Table 10 shows that these two sectors are among the four most important sectors for almost all the goals, followed by Resource Transformation Non-renewable Resources. The lowest value both at a goal and a target level of the impact index for overall the SDGs is of the Financial sector, that is (see Table 10) among the three most important sectors only for SDG 10 and SDG 16. Nevertheless, it must be noticed that our framework takes into account only the direct relevance of a sector for SDGs. Indeed, the Financial sector plays a crucial role on the achievement of the goals also through the "indirect" impact it can have (i.e., credit scoring based on SDG relevant issues, investment in companies/industries with high SDG impact, etc.). In general, adopting the SDGs as a unified framework for investment and credit policies, the Financial sector can enhance the SDG relevance for all sectors.

Conclusion

Our research shows that for each sector, there are particular SDGs where it has high impact and for each SDG there are particular sectors that have a high impact on it, and some sectors are more important to the SDGs in aggregate than others. The same is true at the target level.

None of these findings are surprising since it would be expected that some sectors would be more relevant to a particular SDG than others. What perhaps is surprising is to see that a few sectors stand out in terms of their impact on the SDGs and that some SDGs are more impacted by SASB's ESG topics than others. The former means that the success of a few sectors will largely determine whether the SDG goals are met. The latter means that while some SDGs will substantially benefit from the private sector "doing well," others will benefit to a lesser extent.

However, we should add a caveat to this conclusion. Our analysis is based simply on counts of various kinds. It does not take into account the fact that a material SASB issue in one sector could be more important than another due to the absolute value of the topic. For example, the total amount of GHG emissions is likely to vary across sectors. If we had a credible weighting scheme, the results could be different. This same caveat applies to our analysis at the target level.

Another caveat is that we treat the impact of a material ESG issue as equal if it is relevant to an SDG. Just how important a material issue is to a SDG could vary according to its nature. Again, GHG emissions could be more important to achieving the success of some SDGs than others even though it has an impact on all of them. This too applies at the target level.

We think this analysis is helpful for two broad audiences. The first is the corporate community. For it, they can use it to determine which SASB issues are most congruent for them in terms of both doing well and doing good. In particular, since we have mapped the material ESG issues in each industry to the target level of the SDGs. This provides a company a well-structured narrative. It can simply point to its performance on its material ESG issues and the SDG targets for which these issues are relevant.

The second audience is investors. Again, assuming that ESG performance metrics are available, an investor can assess the implications at the target level to the relevant SDGs. The same can be done in a portfolio basis. At both a company and portfolio level, the above caveats apply. To this we would add adjustments based on company size (such as by revenues or market cap) and perhaps the location of their operations. While investors must put investment returns first, they are increasingly recognizing that the system-level impacts of their portfolios will affect their ability to generate these returns over the long term[12].

In order to serve both audiences, we are looking for ways to provide our detailed mapping in the public domain.

We would like to conclude with one final reflection. If good metrics existed for company performance on their material issues, one could use these ESG measures as proxies for SDG impact. They obviously wouldn't be impact measures. For the most part, the key performance indicators recommended by SASB are output measures which have outcomes that lead to impacts[13]. True measures of impact are difficult to obtain since they require data from outside the company. Impact measures are about positive and negative externalities being created by a company's operations. Most work to date on impact measurement has been done in the private markets. Developing methodologies for doing so in the public markets will be important for achieving the SDGs.

Notes

Table 1: SDG Targets in the Analysis

Original SDG targets:	169
Less: Targets of SDG 17:	19
Less: "resources" Targets:	43
Number of Targets included in the analysis:	107

1. The greater burden falls on the private sector with estimates that it will have to close the funding gap of $2.5 trillion per year and to ensure that the private sector provides the expected 50% of the total $115 trillion cost of funding the SDGs (PRI, 2017)
2. See, for example, the SDG Index and Dashboard of UN Sustainable Development Solutions Network (UN-SDSN), http://www.sdgindex.org/.
3. https://sdgcompass.org/

4. “An Analysis of the Goals and Targets” https://www.globalreporting.org/SiteCollectionDocuments/2017/GRI_UNGC_Final-Draft_An-Analysis-of-the-Goals-and-Targets_July2017.pdf

5. https://www.sasb.org/materiality/important/

6. Robert G. Eccles was the Founding Chairman of SASB.

7. SASB’s Sustainable Industry Classification System™ (SICS) categorizes companies that share similar resource intensity, as well as sustainability risks and opportunities

8. https://www.sasb.org/download-the-standards/

9. We do not consider SDG 17 since this is an overarching one covering all SDGs

10. SASB’s classification considers 79 industries grouped into 10 sectors.

11. https://www.sasb.org/materiality/sasb-materiality-map/

12. For example, The Investment Integration Project (TIIP) (http://www.tiiproject.com/), under the leadership of Steve Lydenberg (Founder and CEO) and William Burckart (President and COO) is a research services firm that provides guidance to investors on system-level issues. Its mission is “to help institutional investors understand the feedback loops between their investments and the planet’s overarching systems that make profitable investment opportunities possible.” Just as modern portfolio theory extended analysis of individual stocks to a basket of stocks, TIIP helps investors to move their level of analysis beyond just portfolios to include the context in which these portfolios exist (Eccles, 2018).

13. Vörösmarty *et al.* (2018) propose a new approach to evaluate corporate products and services within broader environmental or human beneficiary settings.

Table 2- Definition of the Calculated Indices

SDG Mapping					Target Mapping				
Acronym	**Full name**	**Measured for**	**Description**	**Number of Related Formula**	**Acronym**	**Full name**	**Measured for**	**Description**	**Number of Related Formula**
SRI	SDG relevance Index	Each SASB's issue	Number of SDG impacted by each SASB's issue/16	(1)	TRI	Target Relevance Index	Each SASB's issues	Number of targets the SDGs impacted by each SASB's issues /107	(2)
					TSRI	Target Specific Relevance Index	Each SDG impacted by each SASB's issues	Number of targets impacted in the single SDG / total number of targets in the SDG	(3)
ERI	ESG Relevance Index	Each SDG	Number of SASB's issue impacting the SDG/30	(4)	TERI	ESG Target Relevance Index	Each target	Number of SASB's issue impacting the target/30	(5)
					TSERI	Target Specific ESG Relevance Index	Each SDG	Average of the single TERIs	(6)
ISII	Industry SDG Impact Index	Each SDG in each industry	Ratio (multiplied by 100) between the number of industry-specific material issues impacting the SDG and the total number of SASB issues impacting the SDG	(7)	ITII	Industry Target Impact Index	Each target in each industry	Ratio (multiplied by 100) between the number of industry specific material issues impacting the target on the total number of SASB issues impacting the target	(8)
					ISTII	Industry SDG Target Impact Index	Each SDG and in each industry	Ratio (multiplied by 100) between the number of industry specific material issues impacting each target in each SDG and the total number of SASB general ESG issues affecting the single Target tj in SDG j	(9)
SSII	Sector SDG Impact Index	Each SDG in each sector	Average of ISIIs across industries in the sector	(10)	STII	Sector Target Impact Index	Each target in each sector	Average of ITIIs across industries in the sector	(11)
					SSTII	Sector SDG Target Impact Index	Each SDG in each sector	Average of the ISTIIs across industries in the sector	(12)
AISII	Average Industry SDG Impact Index	All SDGs in each industry	Average of ISIIs of all SDGs	(13)	AISTII	Average Industry SDG Target Index	All SDGs in each industry	Average of the ISTIIs	(14)
ASSII	Average Sector SDG Impact Index	All SDGs in each Sector	Average of SSIIs of all SDGs	(15)	ASSTII	Average Sector SDG Target Index	All SDGs in each sector	Average of the SSTIIs	(16)

Table 3: SDG Relevance Index (SRI) and Target Relevance Index (TRI)

SASB GENERAL ISSUE CATEGORY	# of SDGs Impacted	#of Targets Impacted	SRI	TRI
Environment				
GHG emissions	3	4	18.75%	3.74%
Air quality	3	7	18.75%	6.54%
Energy management	5	13	31.25%	12.15%
Fuel management	4	11	25.00%	10.28%
Water and wastewater management	7	24	43.75%	22.43%
Waste and hazardous materials management	7	20	43.75%	18.69%
Biodiversity impacts	6	17	37.50%	15.89%
Social Capital				
Human rights and community relations	6	24	37.50%	22.43%
Access and affordability	9	18	56.25%	16.82%
Customer welfare	5	12	31.25%	11.21%
Data security and customer privacy	1	1	6.25%	0.93%
Fair disclosure and labeling	4	8	25.00%	7.48%
Fair marketing and advertising	4	10	25.00%	9.35%
Human Capital				
Labor relations	4	16	25.00%	14.95%
Fair labor practices	7	18	43.75%	16.82%
Employee health, safety and wellbeing	3	13	18.75%	12.15%
Diversity and inclusion	4	17	25.00%	15.89%
Compensation and benefits	3	8	18.75%	7.48%
Recruitment, development and retention	5	14	31.25%	13.08%
Business Model and Innovation				
Lifecycle impacts of products and services	11	27	68.75%	25.23%
Environmental, social impacts on assets & operations	9	19	56.25%	17.76%
Product packaging	6	10	37.50%	9.35%
Product quality and safety	4	9	25.00%	8.41%
Leadership and Governance				
Systemic risk management	5	7	31.25%	6.54%
Accident and safety management	7	13	43.75%	12.15%
Business ethics and transparency of payments	1	2	6.25%	1.87%
Competitive behavior	4	9	25.00%	8.41%
Regulatory capture and political influence	5	12	31.25%	11.21%
Materials sourcing	8	17	50.00%	15.89%
Supply chain management	14	36	87.50%	33.64%

Table 4: SDG Relevance Index and Target Relevance Index for Each SASB Dimension

	Environment	Social Capital	Human Capital	Business Model and Innovation	Leadership and Governance
SRI	31.25%	30.21%	27.08%	46.88%	39.29%
TRI	12.82%	11.37%	13.40%	15.19%	12.82%

Table 5: ESG Relevance Index (ERI) and Target Specific ESG Relevance Index (TSERI)

SDG	# of SASB's Issues Impacting the SDG	ERI	TSERI
SDG 1	11	37%	15%
SDG 2	10	33%	13%
SDG 3	18	60%	19%
SDG 4	4	13%	4%
SDG 5	7	23%	10%
SDG 6	13	43%	18%
SDG 7	10	33%	26%
SDG 8	14	47%	16%
SDG 9	9	30%	12%
SDG 10	10	33%	10%
SDG 11	10	33%	9%
SDG 12	15	50%	13%
SDG 13	9	30%	10%
SDG 14	9	27%	10%
SDG 15	8	40%	15%
SDG 16	11	37%	8%

Table 6 – Industry SDG Impact Index (ISII) for the Biotechnology Industry

Biotechnology Industry			
SDG	**ISII**	**SDG**	**ISII**
SDG1	40.00	SDG2	50.00
SDG3	55.56	SDG4	75.00
SDG5	57.14	SDG6	53.85
SDG7	40.00	SDG8	50.00
SDG9	55.56	SDG10	40.00
SDG11	60.00	SDG12	42.86
SDG13	37.50	SDG14	57.14
SDG15	54.55	SDG16	36.36

Table 7 – Industry Target Impact Index (ITII) for the Biotechnology Industry

Biotechnology Industry	
SDG 8 Targets	**ITII**
Target 8.1	40.00
Target 8.2	0.00
Target 8.3	50.00
Target 8.4	42.86
Target 8.5	50.00
Target 8.6	100.00
Target 8.7	50.00
Target 8.8	50.00
Target 8.9	50.00
Target 8.10	n.a.*

*None of SASB's issues impact Target 8.10 and so the ITII cannot be calculated.

Table 8 – Industry SDG Target Impact Index for the Biotechnology Industry (ISTII)

Biotechnology Industry			
SDG	**ISTII**	**SDG**	**ISTII**
SDG1	40.00	SDG2	60.00
SDG3	52.94	SDG4	87.50
SDG5	55.55	SDG6	66.66
SDG7	43.48	SDG8	45.83
SDG9	66.66	SDG10	50.00
SDG11	68.42	SDG12	54.83
SDG13	33.33	SDG14	65.00
SDG15	48.78	SDG16	43.47

Table 9 – Sector Target Impact Index for the Health Care Sector

Health Care Sector	
SDG 8 Targets	**STII**
Target 8.1	26.67
Target 8.2	0.00
Target 8.3	20.83
Target 8.4	30.95
Target 8.5	20.83
Target 8.6	33.33
Target 8.7	16.67
Target 8.8	20.83
Target 8.9	25.00
Target 8.10	n.a.*

*None of SASB's issues impact Target 8.10 and so the STII cannot be calculated.

Table 10: Sector SDG Impact Index and Sector SDG Target Impact Index

Panel A: ***Sector SDG Impact Index (SSII)***

	All SDGs	***SDG #1***	***SDG #2***	***SDG #3***	***SDG #4***	***SDG #5***	***SDG #6***	***SDG #7***	***SDG #8***	***SDG #9***	***SDG #10***	***SDG #11***	***SDG #12***	***SDG #13***	***SDG #14***	***SDG #15***	***SDG #16***
HEALTHCARE	34.95	25.00	39.58	39.81	**54.17**	33.33	38.46	31.67	29.76	38.89	21.67	38.33	29.76	33.33	35.71	40.91	28.79
FINANCIALS	14.49	20.00	17.86	11.11	**25.00**	10.20	12.09	20.00	10.20	22.22	21.43	18.57	2.04	7.14	4.08	10.39	19.48
TECHNOLOGY & COMMUNICATION	22.35	11.67	8.33	20.37	12.50	30.95	19.23	26.67	23.81	**35.19**	25.00	21.67	22.62	25.00	26.19	21.21	27.27
NON- RENEWABLES RESOURCES	26.66	20.00	26.56	30.56	0.00	16.07	31.73	30.00	25.00	26.39	12.50	41.25	43.75	23.44	**48.21**	34.09	17.05
TRANSPORTATION	16.89	15.00	6.25	23.61	6.25	16.07	16.35	22.50	19.64	19.44	10.00	15.00	**28.57**	18.75	23.21	20.45	9.09
SERVICES	16.87	15.00	21.88	19.44	**31.25**	21.43	17.31	11.25	17.86	13.89	15.00	11.25	16.96	14.06	17.86	18.18	14.77
RESOURCE TRANSFORMATION	26.99	8.00	20.00	34.44	5.00	20.00	29.23	32.00	25.71	33.33	6.00	30.00	**45.71**	42.50	42.86	41.82	25.45
CONSUMPTION	34.33	21.25	51.56	41.67	**53.13**	28.57	37.50	28.75	23.21	25.00	12.50	23.75	41.96	48.44	39.29	47.73	25.00
RENEWABLE RESOURCES AND ALTERNATIVE ENERGIES	22.97	13.33	18.75	22.22	0.00	21.43	30.77	23.33	22.62	22.22	10.00	**33.33**	32.14	33.33	30.95	28.79	17.05
INFRASTRUCTURE	20.34	12.50	20.31	22.92	6.25	8.93	25.00	26.25	16.96	26.39	6.25	31.25	23.21	25.00	**32.14**	27.27	14.77

Panel B: ***Sector SDG Target Impact Index (STII)***

	All SDGs	***SDG #1***	***SDG #2***	***SDG #3***	***SDG #4***	***SDG #5***	***SDG #6***	***SDG #7***	***SDG #8***	***SDG #9***	***SDG #10***	***SDG #11***	***SDG #12***	***SDG #13***	***SDG #14***	***SDG #15***	***SDG #16***
HEALTHCARE	34.44	24.24	44.17	37.25	**56.25**	28.70	40.91	31.16	22.22	46.30	27.27	45.61	36.02	29.63	37.50	38.21	24.64
FINANCIALS	14.00	19.70	13.33	12.75	**27.08**	14.81	9.09	18.84	9.38	24.07	21.21	23.68	5.38	9.26	5.00	12.60	19.57
TECHNOLOGY & COMMUNICATION	24.22	19.70	18.33	19.93	12.50	**34.26**	22.73	28.99	26.04	**34.26**	26.52	23.68	27.96	22.22	30.00	21.95	18.12
NON- RENEWABLES RESOURCES	30.67	22.73	34.17	28.10	0.00	19.44	42.42	34.78	22.57	25.00	13.64	38.60	46.24	29.63	**55.00**	34.15	22.46
TRANSPORTATION	19.33	15.15	9.17	26.47	4.17	16.67	17.17	24.64	19.44	16.67	8.33	17.54	**30.11**	18.52	24.17	24.80	7.25
SERVICES	19.83	17.42	30.83	20.59	**37.50**	25.93	20.20	15.94	20.14	20.37	16.67	10.53	18.82	20.37	20.00	19.11	15.22
RESOURCE TRANSFORMATION	23.69	9.09	20.83	28.10	4.17	13.89	25.25	30.43	13.19	27.78	4.55	27.19	**41.40**	29.63	34.17	36.99	10.87
CONSUMPTION	33.58	25.00	**60.00**	40.85	56.25	24.07	39.90	34.78	15.97	28.70	10.61	21.93	44.62	46.30	45.00	44.31	15.22
RENEWABLE RESOURCES AND ALTERNATIVE ENERGIES	23.81	10.61	20.83	24.18	0.00	21.30	28.79	23.91	17.01	23.15	9.85	31.58	35.48	29.63	**35.83**	32.52	18.84
INFRASTRUCTURE	24.10	24.10	9.85	27.50	26.14	8.33	16.67	32.32	16.32	25.93	8.33	40.35	29.03	24.07	**35.00**	30.49	14.49

Table 11 – Average Industry SDG Impact Index (AISII) and Average Industry SDG Target Impact Index (AISTII) for the Health Care Sector

Industry	AISII	AISTII
Biotechnology	50.34	53.69
Pharmaceuticals	50.34	53.69
Medical Equipment	45.60	45.57
Health Care Delivery	29.95	25.62
Health Care Distribution	15.00	14.29
Managed Care	18.46	13.79

Table 12- Average Sector SDG Impact Index (ASSII) and Average Sector SDG Target Impact Index (ASSTII)

Sector	*ASSII*	*ASTII*
HEALTHCARE	34.95	34.44
FINANCIALS	14.49	14.00
TECHNOLOGY & COMMUNICATION	22.35	24.22
NON- RENEWABLES RESOURCES	26.66	30.67
TRANSPORTATION	16.89	19.33
SERVICES	16.87	19.83
RESOURCE TRANSFORMATION	26.99	23.69
CONSUMPTION	34.33	33.58
RENEWABLE RESOURCES AND ALTERNATIVE ENERGIES	22.97	23.81
INFRASTRUCTURE	20.34	24.1

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Annex 1: Target Specific Relevance Index (TSRI)

SASB GENERAL ISSUE CATEGORY	SDG Impacted	Total # of Targets	# of Targets Impacted	TSRI
Environment				
GHG emissions	7	3	2	66.70%
	9	5	1	20.00%
	12	8	1	12.50%
Air quality	3	9	4	44.40%
	11	7	1	14.30%
	12	8	2	25.00%
Energy management	3	9	4	44.40%
	7	3	3	100.00%
	9	5	2	40.00%
	12	8	3	37.50%
	13	3	1	33.30%
Fuel management	3	9	4	44.40%
	7	3	3	100.00%
	12	8	3	37.50%
	13	3	1	33.30%
Water and wastewater management	2	5	5	100.00%
	3	9	1	11.10%
	6	6	6	100.00%
	11	7	2	28.60%
	12	8	3	37.50%
	14	7	4	57.10%
	15	9	3	33.30%
Waste and hazardous materials management	3	9	1	11.10%
	6	6	4	66.70%
	8	10	2	20.00%
	11	7	2	28.60%
	12	8	4	50.00%
	14	7	3	42.90%
	15	9	4	44.40%
Biodiversity impacts	2	5	2	40.00%
	6	6	2	33.30%
	11	7	2	28.60%
	12	8	2	25.00%
	14	7	4	57.10%
	15	9	5	55.60%
Social Capital				
Human rights and community relations	1	5	2	40.00%
	6	6	6	100.00%
	8	10	5	50.00%
	10	7	3	42.90%
	11	7	2	28.60%
	16	10	6	60.00%

Access and affordability	1	5	2	40.00%
	3	9	2	22.20%
	5	6	2	33.30%
	7	3	1	33.30%
	8	10	1	10.00%
	9	5	3	60.00%
	10	7	3	42.90%
	11	7	4	57.10%
Customer welfare	2	5	3	60.00%
	3	9	3	33.30%
	4	7	2	28.60%
	6	6	3	50.00%
	15	9	1	11.10%
Data security and customer privacy	16	10	1	10.00%
Fair disclosure and labeling	2	5	2	40.00%
	3	9	4	44.40%
	4	7	1	14.30%
	16	10	1	10.00%
Fair marketing and advertising	1	5	2	40.00%
	2	5	1	20.00%
	3	9	4	44.40%
	4	7	3	42.90%
Human Capital				
Labor relations	1	5	2	40.00%
	3	9	4	44.40%
	8	10	7	70.00%
	10	7	3	42.90%
Fair labor practices	1	5	3	60.00%
	3	9	2	22.20%
	5	6	3	50.00%
	6	6	1	16.70%
	8	10	5	50.00%
	10	7	2	28.60%
	16	10	2	20.00%
Employee health, safety and wellbeing	3	9	4	44.40%
	5	6	4	66.70%
	8	10	5	50.00%
Diversity and inclusion	5	6	5	83.30%
	8	10	6	60.00%
	10	7	4	57.10%
	16	10	2	20.00%
Compensation and benefits	1	5	3	60.00%
	8	10	3	30.00%
	10	7	2	28.60%
Recruitment, development and retention	4	7	2	28.60%
	5	6	2	33.30%
	8	10	5	50.00%
	9	5	2	40.00%
	10	7	3	42.90%

Business Model and Innovation				
Lifecycle impacts of products and services	3	9	4	44.40%
	6	6	2	33.30%
	7	3	3	100.00%
	8	10	1	10.00%
	9	5	2	40.00%
	11	7	3	42.90%
	12	8	3	37.50%
	13	3	1	33.30%
	14	7	2	28.60%
	15	9	5	55.60%
	16	10	1	10.00%
Environmental, social impacts on assets & operations	1	5	1	20.00%
	2	5	2	40.00%
	3	9	1	11.10%
	6	6	3	50.00%
	7	3	1	33.30%
	9	5	2	40.00%
	11	7	3	42.90%
	13	3	1	33.30%
	15	9	5	55.60%
Product packaging	6	6	2	33.30%
	8	10	1	10.00%
	12	8	1	12.50%
	13	3	1	33.30%
	14	7	1	14.30%
	15	9	4	44.40%
Product quality and safety	2	5	3	60.00%
	3	9	1	11.10%
	12	8	1	12.50%
	15	9	4	44.40%
Leadership and Governance				
Systemic risk management	7	3	2	66.70%
	9	5	1	20.00%
	10	7	1	14.30%
	11	7	1	14.30%
	16	10	2	20.00%
Accident and safety management	1	5	1	20.00%
	3	9	2	22.20%
	6	6	2	33.30%
	8	10	2	20.00%
	12	8	2	25.00%
	14	7	2	28.60%
	15	9	2	22.20%
Business ethics and transparency of payments	16	10	2	20.00%
Competitive behavior	1	5	3	60.00%
	7	3	2	66.70%
	9	5	2	40.00%
	10	7	2	28.60%

Regulatory capture and political influence	2	5	2	40.00%
	7	3	3	100.00%
	12	8	1	12.50%
	13	3	2	66.70%
	16	10	4	40.00%
Materials sourcing	3	9	3	33.30%
	5	6	1	16.70%
	6	6	1	16.70%
	8	10	2	20.00%
	12	8	3	37.50%
	13	3	1	33.30%
	15	9	5	55.60%
	16	10	1	10.00%
Supply chain management	1	5	4	80.00%
	3	9	3	33.30%
	5	6	2	33.30%
	6	6	2	33.30%
	7	3	3	100.00%
	8	10	3	30.00%
	9	5	3	60.00%
	10	7	2	28.60%
	11	7	1	14.30%
	12	8	3	37.50%
	13	3	1	33.30%
	14	7	4	57.10%
	15	9	4	44.40%
	16	10	1	10.00%

Annex 2: Target ESG Relevance Index (TERI)

Target	# of SASB Issues Impacting the Target	TERI
Target 1.1	4	13.33%
Target 1.2	4	13.33%
Target 1.3	3	10.00%
Target 1.4	6	20.00%
Target 1.5	5	16.67%
Target 2.1	4	13.33%
Target 2.2	5	16.67%
Target 2.3	2	6.67%
Target 2.4	6	20.00%
Target 2.5	3	10.00%
Target 3.1	8	26.67%
Target 3.2	8	26.67%
Target 3.3	1	3.33%
Target 3.4	10	33.33%
Target 3.5	4	13.33%
Target 3.6	1	3.33%
Target 3.7	2	6.67%
Target 3.8	3	10.00%
Target 3.9	14	46.67%
Target 4.1	0	0.00%
Target 4.2	0	0.00%
Target 4.3	2	6.67%
Target 4.4	3	10.00%
Target 4.5	2	6.67%
Target 4.6	0	0.00%
Target 4.7	1	3.33%
Target 5.1	5	16.67%
Target 5.2	3	10.00%
Target 5.3	2	6.67%
Target 5.4	2	6.67%
Target 5.5	5	16.67%
Target 5.6	1	3.33%
Target 6.1	4	13.33%
Target 6.2	5	16.67%
Target 6.3	9	30.00%
Target 6.4	9	30.00%
Target 6.5	2	6.67%

Target	# of SASB Issues Impacting the Target	TERI
Target 6.6	4	13.33%
Target 7.1	8	26.67%
Target 7.2	7	23.33%
Target 7.3	8	26.67%
Target 8.1	5	16.67%
Target 8.2	3	10.00%
Target 8.3	4	13.33%
Target 8.4	7	23.33%
Target 8.5	8	26.67%
Target 8.6	1	3.33%
Target 8.7	4	13.33%
Target 8.8	8	26.67%
Target 8.9	8	26.67%
Target 8.10	0	0.00%
Target 9.1	4	13.33%
Target 9.2	5	16.67%
Target 9.3	1	3.33%
Target 9.4	6	20.00%
Target 9.5	2	6.67%
Target 10.1	5	16.67%
Target 10.2	7	23.33%
Target 10.3	4	13.33%
Target 10.4	3	10.00%
Target 10.5	3	10.00%
Target 10.6	0	0.00%
Target 10.7	0	0.00%
Target 11.1	3	10.00%
Target 11.2	1	3.33%
Target 11.3	2	6.67%
Target 11.4	2	6.67%
Target 11.5	6	20.00%
Target 11.6	5	16.67%
Target 11.7	0	0.00%
Target 12.1	0	0.00%
Target 12.2	9	30.00%
Target 12.3	5	16.67%
Target 12.4	10	33.33%
Target 12.5	7	23.33%
Target 12.6	0	0.00%
Target 12.7	0	0.00%

Target	# of SASB Issues Impacting the Target	TERI
Target 12.8	0	0.00%
Target 13.1	7	23.33%
Target 13.2	2	6.67%
Target 13.3	0	0.00%
Target 14.1	7	23.33%
Target 14.2	3	10.00%
Target 14.3	6	20.00%
Target 14.4	1	3.33%
Target 14.5	1	3.33%
Target 14.6	1	3.33%
Target 14.7	1	3.33%
Target 15.1	8	26.67%
Target 15.2	8	26.67%
Target 15.3	10	33.33%
Target 15.4	5	16.67%
Target 15.5	7	23.33%
Target 15.6	0	0.00%
Target 15.7	3	10.00%
Target 15.8	0	0.00%
Target 15.9	0	0.00%
Target 16.1	1	3.33%
Target 16.2	3	10.00%
Target 16.3	1	3.33%
Target 16.4	6	20.00%
Target 16.5	7	23.33%
Target 16.6	2	6.67%
Target 16.7	2	6.67%
Target 16.8	0	0.00%
Target 16.9	0	0.00%
Target 16.10	1	3.33%

Towards better measures of well-being: Conditions for intelligibility/ Haley Allison Beer and Kelig Aujogue[iii]

Abstract

This paper adopts recent advancements in measurement theory to conceptually analyze and extend common practices in the measurement of well-being, and its impacts on organizational performance. Particularly, we focus not on the technical validity of such measures, but how they are likely, or not, to stimulate intended experiences and improvements of well-being for targeted subjects. To elucidate the theoretical model and its lessons for measuring well-being, we conceptually analyze the following: The United Kingdom's national indicators for well-being, and indicators from a comprehensive workplace preventative healthcare program at GSK. We demonstrate that the most appropriate, and positively impactful, measures for well-being will be those that purposefully and carefully discriminate between levels of implementation and use. Most specifically, those measures that either: 1) at the individual level enable subjects to reflect upon and nurture their own sensations of well-being; 2) at the organizational level monitor and enable the adoption and orientation of effective well-being programs; or 3) that help a nation understand the levels, dispersion, and causes or blockages of well-being in its institutions and environment. These objectives can easily become confounded when seeking to optimistically adopt and monitor well-being, but the awareness and careful implementation of appropriate measures in the right forms for the right individuals and/or institutions, are most likely to generate the improved sensations of well-being being sought globally. A host of actionable insights and directions for research are presented.

[iii] Dr. Haley Allison Beer, Assistant Professor of Performance and Responsibility, University of Warwick, Dr. Kelig Aujogue, Biostatistician, BAST, Inc

Introduction

The capacity to measure well-being is considered a gateway to new paradigms for managing organizations and recognizing economic progress 'beyond GDP'[1]. Emerging evidence points towards positive influences on well-being as key to mitigating the various decrements in physical and mental health related to modern working life, burnout, and stagnant productivity thresholds[2]. The global prioritization of well-being, defined as "feeling good and/or experiencing fulfillment and purpose"[3], has been acknowledged through its inclusion on the new round of United Nations Sustainable Development Goals (Goal 3). In accord with this movement, enormous efforts have been funneled into the development and implementation of measures for well-being interventions that help governments, scholars and practitioners better determine what difference the various interventions are having.

While measures such as well-being deemed core to society and the economy is aggregated into statistical understandings of population and institutional growth, health, and productivity, and relied upon for enabling macro-level policy decisions, these efforts often depend upon individuals on the ground who collect the relevant performance information for each measure. Unfortunately, measures intended to monitor and communicate social and humanistic goals such as well-being, are continuously found to be detrimental to the achievement of outcomes[4]. Universities, banks, hospitals, and fire departments are included in a list of core societal organizations that have been found to game measures (the expending of energy on receiving higher measurement scores, at the detriment of actual performance) considered standard in the respective industry, sometimes at the expense of human life[5].

It can therefore not be assumed that solely because technically valid and robust measures have been developed for well-being, that well-being will actually improve inside organizations and for society. Instead, the repetitive unexpected effects of measurement would suggest that measurement processes hold unquestioned assumptions that could be impeding progress. As an illustrative example, fill in the blank of this quote:

"[ ] involves purposive accessing and deliberative processing of information for selecting, constructing, regulating, and evaluating courses of action[6]".

Having conducted this very exercise in several practitioner and scholarly environments, it can be revealed that the most common automatic answer to this question is 'measurement'. The answer, however, is 'consciousness'. Performance measurement theory offers a proposed reasoning for the disparity in response as the 'behavioral assumption' in measurement processes – the unquestioned assumption that measurement directly elicits individuals to process information created by measurement processes and act positively on behalf of organizations[7].

In part, this assumption stems from present definitions of measurement, including those found within the measurement sciences, such as "measurement is a tool for obtaining and expressing objective and intersubjective information on empirical objects"[8], which do not leave much space for describing the (changing) condition of the person undertaking the action of measurement, i.e., the consciousness and agency of the individual who is measuring, being measured, or using the measurement information. For well-being measurement processes this omission is critical, as the measured object typically concerns the subjective physical, mental, emotional, and/or spiritual conditions of people[9].

In an attempt to unpack the behavioural assumption within performance measurement theory, recent qualitative studies have been conducted by the authors with social enterprises around the world (Canada, Chile, India, and United Kingdom) investigating how individuals experience the measurement process[10]. The qualitative inductive approach lends itself to a more nuanced understanding of the ways in which individuals interact with and give meaning to measurement processes. Within the studies, performance measurement was defined as 'a formal and *subjective* process, aimed at obtaining and expressing descriptive information about the property of organizational phenomena (e.g., objects, activities, people, and processes)'. This definition enabled the challenging of the behavioural assumption, by considering not only the effects of measurement practices on organizational performance, but also the experience of individuals engaging with those practices.

The studies have revealingly uncovered an expanded characterization of the measurement process, which denotes individual level interpretation, affects, and then response to/enactment of measures as determinants of the effects of measures[11]. This work confronts convention that technically valid and reliably designed measures are sufficient to ensure that measurement initiatives will help produce intended information, and understand and create desired performance. Instead, the way in which measures are introduced and implemented with those responsible for collecting information and/or applying that information to decision making becomes equally an important of consideration.

The aim of this paper is to scaffold the empirical findings and theoretical contributions of the expanded performance measurement process[12] onto common indicators for well-being, and to therefore draw out important lessons for how to design, select and embed an appropriate array of well-being indicators for greater positive effects. Significant work has been done to understand relevant and robust measures for well-being. This paper aims not at diminishing these efforts in any way, but rather to complement them with advances in the theory of measurement about how the robustness of the technical aspects of measures are enhanced by deeper considerations about the use of such measures. Ultimately showing how the processes of information collection and use elicited by particular measures at macro, meso (organizational), and individual levels stimulate different cognitive and affective reactions, and therefore have differing impacts on business performance and actual well-being.

Theoretical Basis 1: Contemporary measurement theory

Performance measurement is presently understood as the process of obtaining and expressing descriptive information about the property of an organizational object (e.g., process, activity or people)[13]. The desire to attain and express information about organizational objects has existed since the earliest organizations and management philosophers, largely in attempts to understand, and render manageable, the antecedents and drivers of organizational and institutional performance (e.g., Taylorism). Overall, organizational measurement is considered integral to the development, management, and strengthening of our global economies and society as it provides information for understanding contexts, using resources advantageously, making knowledgeable decisions, and guiding behaviours[14]. Over time debates have evolved from the worthiness of measures beyond financial indicators[15], towards broader discussions on the design of measurement systems and how measures may be used and applied[16], and eventually onto how they affect people in different ways[17]. More recently, the discussion has turned towards dismantling the epistemological assumptions of organizational measurement as a purely objective process, and likewise individuals' comfortableness with 'truth claims' stemming from the typical positivistic approaches to measurement. An important shift is happening from investigating measurement as an organizational process towards exploring how it affects and is shaped by people[18]. The underlying aim of this shift is to explain

'the behavioural assumption' in measurement theory, which presupposes that measures directly influence people's behaviours. It is conjectured that this assumption has led to particular gaps existing in our understandings of why and how individuals' subjective responses to measurement vary greatly[19].

As such, the theory and practice of measurement has evolved from concerns with validity and accuracy of measures, towards exploring the behavioural effects of various measurement practices[20]. This has led to some important discoveries concerning the design and implementation of measures in organizations, especially for those that have the intent of capturing social impacts – descriptions of subjective changes-in condition (physical, emotional, mental, or spiritual) in subjects receiving or involved in organizational interventions. Particularly uncovering how measures influence the experience individuals, teams, and organizations have while pursuing goals. As each measure has not only objective features which determine what is being measured and how valid the information derived from it will be, but social features – cultural, symbolic, and behavioural interpretations that engender both positive (enabling) and negative (controlling) uses of measures[21]. In positive scenarios, individuals feel empowered by the process and utilize the information derived from the measure to make informed decisions and take actions towards intended goals. For these individuals, the measurement process enables them to focus on relevant tasks and activities and interaction from an informed position with their environment. On the other hand, in negative scenarios, the measurement process is experienced as a distraction from, or irrelevant to, goals and therefore the individual is not activated in a meaningful way to change or otherwise improve upon their interactions within the given environment[22]. These negative experiences of measurement often imbue frustration or complete disengagement[23]. Measures focussing on subjective phenomenon such as well-being are extra susceptible to negative responses, as it is more difficult for the objectified measure to capture the meanings and values held towards such goals (i.e., emotional healing, happiness, vulnerability, dignity, etc.)[24].

To create better measures for well-being then, scholars and policy makers need not only focus on the robustness of the measure itself, but the myriad ways in which the growing array of available information derived from such measures being collected across national and organizational levels can provide opportunities for guided reflections, exchanges, interpretations, and discussions about well-being for individuals and societal groups[25]. When it comes to well-being, the behavioural aspects of measurement processes can play a large role in ensuring that the positive benefits of elaborate measurement systems reach all the way to the citizens they are intended to learn about, to elicit purposeful considerations of well-being at the same time. The scientific community's current understandings of the antecedents and drivers of well-being elucidate the importance of not just understanding the levels of well-being existing in a society or in an organization from a representational measurement perspective, but finding intricate ways to engage those people into the processes of understanding well-being.

Theoretical Basis 2: Antecedents and drivers of well-being in organizations

Researchers have studied a host of impacts resulting from behavioural well-being interventions, including meditation, gratitude lists, and mindfulness techniques[26]. Strong links have been established at the individual level between well-being interventions and: reduced stress, improved physical health, focused attention, enhanced job satisfaction, increased prosocial behaviours, and creativity[27]. An emerging set of studies has also connected well-being interventions to enhanced organizational level performance, in the form of reduced absenteeism and greater output efficiency[28]. These characteristics are likely to also reduce employee turnover and aid in the turn towards more responsible operating models in organizations.

Yet, there remains much work left to do to ascertain well-being antecedents, influences, and components in organizations[29]. Emerging critiques view current interventions as limited due to them being presently structured as singular activities, leaving employees little flexibility for learning and adopting well-being activities that suit their lifestyle, and overall leading to small numbers continuing to practice the techniques after a staged intervention concludes[30]. Others point towards the need to illuminate the experiential facets of well-being interventions, alongside the longstanding inquiries into the observable effects[31]. Indeed, while management scholars have intensively studied interventions for enhancing elements associated with well-being - engagement, productivity, and satisfaction- to a large extent this has been viewed from the perspective of the organization, rather than as an aim and experience for individuals[32].

For example, while individuals might have good intentions for adopting and practicing well-being techniques, old habits are hard to uproot, and studies show people tend to fall back into unhealthy patterns related to eating, sleeping, and exercising[33]. Further, while practices such as transformational leadership, collective rewards systems, and volunteer opportunities may improve prosocial motivation (desire to positively influence others' well-being), these behaviours can actually lead to, rather than prevent, burn-out[34]. Other work has illustrated that it is levels of receptivity in workers (their readiness and willingness to engage) that needs to be taken into account for well-being programs to be effective[35]. Yet, general understandings of how to improve and leverage emotional health and intelligence in the workplace at the individual-level remains largely underexplored.

So, while we may be becoming more adept at understanding various impacts of well-being programs, there are gaps in understandings surrounding how best to engage people into long-term and sustainable awareness of and care for their own well-being. The biggest challenge in supporting and enhancing levels of well-being in society is therefore not just the appropriate measurement of the phenomenon, but finding ways to understand and act upon these intricacies – how do we help people become more aware of and attuned to their own well-being? Subsuming the role of measurement to that of only a policy level instrument overlooks its potential to help individuals across society evaluate, and therefore adjust, their own levels and expression of well-being. Measurement is ultimately the practice of rendering things 'intelligible' – understandable and able to be acted upon[36]. Policy makers should not be concerned only with the intelligibility of well-being for themselves, but for how they can also stimulate this understandability for citizens.

Method: A conceptual analysis of different available frameworks

Based on the above discussion concerning how measures influence behaviours, and the importance of well-being initiatives to help individuals better understand their own levels of well-being, this section will analyze two different approaches to measuring well-being at the individual level. Building on expanded characterizations of the measurement process and the specific challenges of enhancing well-being outlined in the literature, such an approach allows us to offer a unique elaboration of the strengths and shortcomings of these common approaches to measuring well-being. We are expressly not evaluating the technical validity of the measures (i.e., the order of questions, the wording used in questions, scales applied, etc.), this type of work can be found for instance in the OECD's Guidelines for Measuring Subjective Well-Being. The following analysis is intended to be a complement to work on technical aspects of well-being measures, with an emphasis on additional parts of the measurement process. Namely the use of the information derived by the measure.

Analysis 1: United Kingdom's National Indicators of Well-Being

The Office for National Statistics in United Kingdom uses a four-point scale to measure personal well-being across the nation: 1) feelings of life satisfaction, 2) feelings of doing something worthwhile, 3) levels of happiness, and 4) levels of anxiety. This information has been collected since 2014 within the longstanding national census survey questions. The results are shared on the ONS website and show increases in well-being during the time period. While this survey is undoubtedly contributing to conversations about well-being in the nation for data scientists at the ONS and the policy makers they report to, it is highly unlikely that the measures are directly influencing or altering well-being at the citizen level. This is because the self-reported nature of the measure gives a purview into the national sentiment across demographics, but does not really illuminate why or how the witnessed trends arise. Further, they do not stimulate the individual respondents to consider more broadly how well-being is, or is not, being created or harmed by personal habits. The questions focus attention on a particular moment in time for the individuals, and do not engender any further reflection upon why those particular scores might be arrived at. While the information is arguably being used to inform certain expenditures and programs related to well-being, by for instance enabling targeted spending at regions or demographics, it is likely to be doing so without a more comprehensive understanding of how to engage those individuals in those locations into well-being programs to the extent that it shifts habits and behaviors. The national level statistics should therefore not really be seen as a legitimate way of influencing personal well-being.

Analysis 2: GSK Preventative Healthcare Program indicators

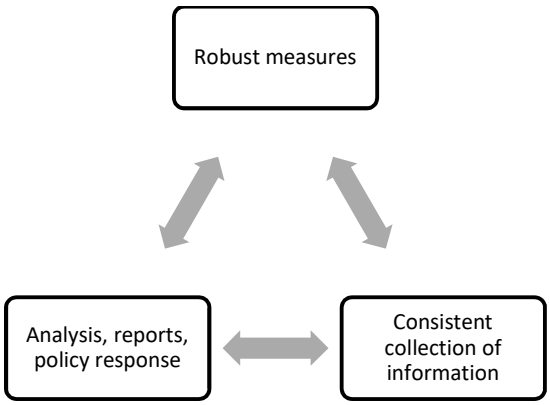
Taking an altogether different set of measures for monitoring and reporting on well-being, we will next look at well-being indicators included on GSK's preventative healthcare program: Partnership 4 Prevention (P4P). Launched in 2012, P4P brought a package of more than 40 preventative healthcare activities to GSK's employees and their families with the intent of raising overall health and well-being. The program is perceived as successful by the company and its employees due to many emerging organizational and individual level benefits. To name a few of the monitored results, the program has improved accessibility to regular medical care, prevented the onset of diabetes, and engaged hundreds of employees into mindfulness techniques which improve emotional and mental regulation. The program has measured success primarily with the following indicators: service utilisation, removal of access barriers, awards, and positive feedback.

The major difference here, in comparison to the ONS National Well-Being Scale, is that individuals are invited to interact with the well-being program to determine what activities and services are most appropriate to them, and the results of these interactions are what is tracked by the company. Well-being is improving through the enabling of individuals to understand different facets of it for themselves (i.e., physical, emotional and/or mental aspects and associated remedial activities). The indicators show what was selected and how to better tailor future services to incorporate highly demanded services. Further, when employees are invited to participate in providing feedback about their experiences of the P4P, they are elicited to reflect upon how their well-being, and the habits which contribute or not to its improvement has changed, and why. The measurement process itself imbues a better understanding of well-being across multiple levels. Productivity, employee satisfaction, retaining of talent, and overall cost savings continue to be witnessed on the back of this program, ultimately signalling a highly successful approach to influencing and measuring well-being.

Discussion: Selecting the best indicators of well-being

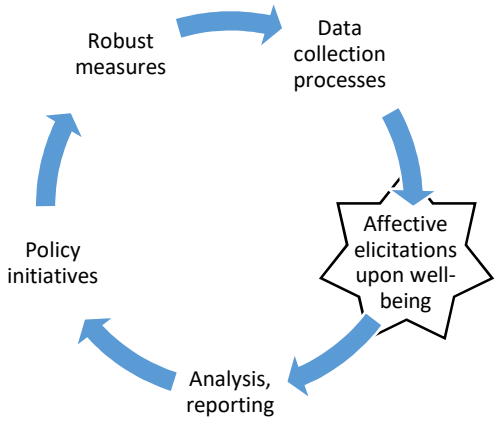
To understand whether measures have any impact on well-being, it is important to first discriminate between which level the measure is implemented at, and further what level it is used at. By level we mean national (macro), organizational (meso), or individual (micro). Most measures of well-being on their own do not influence well-being directly, but offer the opportunity to if geared more towards creating conditions in which individuals can find, express, and nurture their sensations of well-being.

Figure 1. Traditional considerations when designing measurement processes



In the context of improving business performance with measures for well-being, results will depend upon who is involved and how – not just on the existence of measures for well-being. The greatest downfall is that existing measures for well-being rely upon cognitive understandings of affective states of well-being, without in turn generally trying to elicit those affective faculties in a purposeful manner. To move towards more effective measures of well-being, institutions and organizations need to consider how the collection of measures in place across the various levels involved in well-being initiatives engender, or not, the consideration of well-being for the targeted individuals – not just how well their measures represent well-being in a given region.

Figure 2. Expanding considerations of measurement processes to increase intelligibility of well-being



Actionable Insights

- Effective measures are not about 'controlling' well-being, but about empowering it
- Inevitably this will look different, for diverse regions, communities, locales, and individuals – our measures need to be respective of this if we are to achieve the intention of improving well-being; otherwise we risk repeating past mistakes (i.e., tracking of poverty has major discrepancies around the world leading to misunderstandings of appropriate interventions to alleviate it).
- Measurement efforts need not only consider the technical 'validity' of well-being measures (which is really just epistemically aligned with researchers'/policy makers' needs), but the use of, and even further understanding of, the measures and peoples' roles in creating, collecting, analyzing, and applying the information derived from them.
- Policy makers, census takers, and data analysts should develop more engaged partnerships with corporates engaged in highly effective well-being programs such as GSK, to better understand the interlinkages between particular activities and increases in well-being within their stakeholder groups.
- Coupling insights from well-being measures collected across multiple levels of society is much more likely to render well-being intelligible to a greater number of individuals, and therefore to have a much greater impact.
- Countries should organize conferences or forums that gather together academics, organizations with leading well-being programs, data scientists, and citizens together to discuss various initiatives occurring and the lessons emerging around well-being on a regular basis.
- More research is required to illuminate the institutional conditions which recognize and foster people's needs for self-development and self-esteem in relation to changing institutional measures of well-being.

Conclusion

When it comes to well-being and other important societal goals, humanity has historically sought for homogenous answers when what is required is a mosaic of experiences and opportunities that take into account the varied epistemic, physical, spiritual, and educational disparities amongst the people on this planet. As policy makers, academics, and citizens with an avid interest in well-being we should be putting some of this motivation for measurement, for the understanding of well-being, into the creation and experience of well-being and more nuanced understandings of the organizational environments which foster and enable individuals to gain sensations of well-being. This will require the adoption and dispersion of qualitative techniques and collaborative activities across levels of society. We do not only need better measures for well-being, but novel ways of raising the conscious approach to this aspect of our lives.

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[1] See e.g., European Commission initiative '*Beyond GDP – Measuring Progress, true wealth, and well-being'* http://ec.europa.eu/environment/beyond_gdp/background_en.html

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Using wellbeing statistics to improve how government and business interact/ Tony Burton, Suzy Morrissey, and Tim Ng[iv]

Abstract

This paper outlines how wellbeing statistics can be used to improve how government and business interact. It identifies two traditional roles of government, as ensuring an economic environment that supports businesses to plan and invest, and providing a parallel system of regulatory and other interventions. It then identifies a third, and new, focus for government interaction with businesses – one which a framework developed by the New Zealand Treasury can help create.

By collating the impact of the activities of all agents in society, not just individual firms or only economic activities, the New Zealand Treasury's Living Standards Framework (LSF) provides useful information that businesses can use to understand the implications of their actions and those of others. The LSF outlines the health of the four capital stocks, enabling businesses to see opportunities and risks, and adjust their activities accordingly.

The paper outlines the LSF, describes its three elements of current wellbeing, future wellbeing and risk and resilience, and explains the rationale adopted in selecting wellbeing indicators to measure wellbeing. The paper also examines what a wellbeing approach means in practise, explains why a wellbeing approach was deemed necessary, and discusses examples of application in other countries.

This paper shows how the application of the LSF by the New Zealand government is a world-leading approach to bring a wellbeing perspective to policy, including providing a measurement framework, and could improve the way in which government and business interact.

[iv] Tony Burton, Suzy Morrissey, Tim Ng (Chief Economist), Office of Chief Economic Adviser, New Zealand Treasury

Introduction

This paper argues that a wellbeing approach can improve how government delivers the right environment for business to operate. It outlines a new approach, devised by the New Zealand Treasury and called the Living Standards Framework (LSF), to consider the collective impact of policies on intergenerational wellbeing. As the New Zealand government implements the LSF approach we are finding limitations in the conceptual and statistical work on wellbeing that will need to be overcome to make the most of this opportunity.

Traditionally government interaction with business has two distinct focuses. First to ensure an economic environment that supports businesses to plan and invest. This includes macroeconomic stabilisation through monetary policy, the development of economic stabilisers in fiscal policy and constructive engagement with the world trade system. This is supplemented by supply side policy to increase investment and regulatory frameworks that support business productivity.

Second is a parallel system of regulatory and other interventions designed to protect workers, consumers and others who may suffer negative consequences from market competition; or where there are market failures like externalities or incomplete markets.

The LSF offers a third, and new, focus for government interaction with businesses. By collating the impact of the activities of all agents in society, not just individual firms or only economic activities, the LSF provides useful information that businesses can use to understand the implications of their actions and those of others. The LSF outlines the health of the capital stocks, enabling businesses to see opportunities and risks, and adjust their activities accordingly.

The LSF is designed specifically for New Zealand but draws heavily on previous OECD work. It is an unapologetically pragmatic approach to wellbeing that incrementally builds on national income accounts with indicators of comprehensive wellbeing.

Consistent with this incremental approach, we believe the two traditional roles of government with business continue unchanged in a wellbeing approach, but are joined by the third role identified above. Additionally, the effectiveness of government in delivering all its roles can be transformed. In particular, the LSF provides:

- A robust, long term perspective on national success that provides a clearer sense of government intentions;
- A stable framework for understanding government decisions and intentions that helps business to plan and invest.
- A clearer sense of where business is expected to engage and contribute to wider social and environmental outcomes.
- A framework for understanding the impact business (and others) are having on the natural, human, and social capital stocks
- A way to understand the external risks and opportunities faced by business
- A potential means to consistently understand the costs to business of government interventions.

Applying the LSF to the practical demands of government has identified a number of issues with national statistics that will need to be addressed for the wellbeing approach to fully deliver for business.

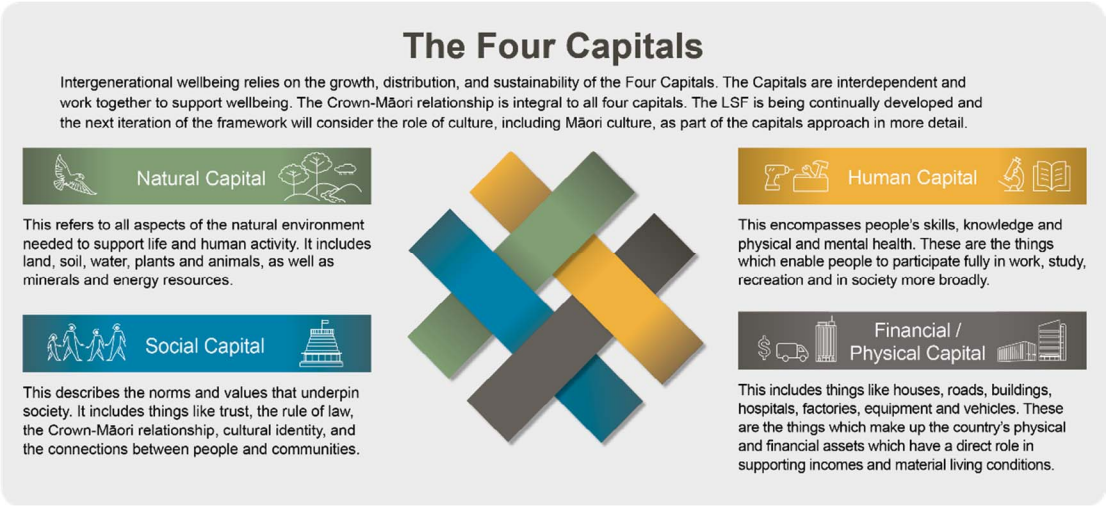
The structure of this paper is as follows. Following this introduction, Section 2 outlines the Living Standards Framework. It describes its three elements and the rationale adopted in selecting wellbeing indicators. Section 3 outlines what a wellbeing approach means in practise. It explains why a wellbeing approach was deemed necessary and includes discussion of examples of restricted application in other countries. Section 4 outlines the application of the LSF to business. Section 5 sketches some of the statistical thinking that will need to change

The New Zealand Treasury Living Standards Framework

The New Zealand Treasury Living Standards Framework (LSF) formalises what we have long recognised about the diversity of outcomes of government interventions.[1] The LSF has three elements: current wellbeing; future wellbeing; and risk and resilience. Consideration of all three elements enables us to provide advice designed to improve intergenerational wellbeing.

In practice, the many possible ways to measure intergenerational wellbeing usually start with some variant of **current** wellbeing, similar to the OECD's "How's Life" analysis.[2] The LSF organises indicators of long term or **intergenerational** wellbeing under four capitals. The working definitions in Figure 1 below are designed to be relevant for New Zealand, but are based on the OECD's definitions, and are likely to change as our work develops[3].

Figure 1: The Living Standards Framework



We are focusing our efforts where value can be added and avoiding innovation for its own sake. Thus, in choosing a variant for the LSF, we have been guided by how GDP is currently used by government and others as a proxy for wellbeing because this is the need wellbeing indicators fill. The LSF can be progressively built up from indicators used by the OECD - such as those for health, connectedness, security, rights and capabilities, inequality and sustainability- so they improve on the scope of income measures of national wellbeing, and emulating the qualities of those measures where they are useful (see e.g. Coyle and Mitra-Kahn, 2017; Corrado *et al.*, 2017).

Current wellbeing

There in an emergent consensus on the best way of measuring current wellbeing that means the available approaches are very similar to each other.[4] To make the LSF useful we have striven to retain the properties of income indicators of wellbeing that make them useful:

- international comparability,
- inter-temporal comparability,
- use available data,
- relevant to a developed country,
- measure what is uniquely important to New Zealanders; and
- politically durable and technically credible.

However, the LSF improves on traditional indicators of economic wellbeing, by providing:

- A dashboard approach that is fundamentally multidimensional.[5]
- Coverage of all generally recognised aspects of wellbeing.

The four capitals

As with indicators of current wellbeing, we are aligning our approach to the LSF capitals with the approach taken in the national accounts, in order to manage conceptual and practical measurement issues. In particular, the definitions in national accounts continually evolve. What matters is that all that is important is included, not where it is included. On this view the capitals are definitional identities that are not, and are not intended to be, "real" entities. Rather they are accounting identities whose definition will change as our knowledge of what needs to be included improves.[6]

This approach is sometimes confusing because it may appear to exclude aspects of future wellbeing. For instance, additional capitals have been proposed, including "cultural capital", "knowledge" and "intangible assets".[7] These are not excluded by the four capitals approach. They can be incorporated analogously to the way charities' activities are, for national accounts, treated in the same way as for-profit organisations. This sparse approach is another example of Treasury's focus on where it adds value. In particular, it aligns with the work of a wide variety of experts; it separates the practical measurement issues from conceptual discussions about the entities themselves; and creates a common language for discussing real wellbeing issues for New Zealanders.

Risk and resilience

The final element of the LSF is risk and resilience. Although it is not possible to know exactly what the future may hold, consideration of emerging issues is desirable, and it can focus attention on what may be needed to improve resilience to change. Such change can include external shocks such as a global financial crisis or climate change. However, it can also include opportunities presented by advances in technology, or changing consumer demand.

Next steps

To draw all this work together, the New Zealand Treasury is designing a Wellbeing Dashboard to provide indicators of current wellbeing and its sustainability. While drawing on the work of the OECD, it will provide detail relevant to New Zealand, especially with respect to culture and the bicultural dimensions flowing from New Zealand's foundational document, the Treaty of Waitangi.

What does a wellbeing approach mean in practice?

In this section we consider the practical improvements that a wellbeing approach, such as the LSF, can deliver. Such improvements are to the quality of policy advice, which will leave Ministers better informed to make decisions that will improve wellbeing. This section also provides a framing of the multiple uses of wellbeing approaches.

In our work developing the LSF we found considerable confusion in the literature about what a "wellbeing approach" means. The most commonly stated motivation for expanding beyond measuring GDP is summarised in Stiglitz et al (2008):

> "What we measure affects what we do; and if our measurements are flawed, decisions may be distorted. … [W]e often draw inferences about what are good policies by looking at what policies have promoted economic growth; but if our metrics of performance are flawed, so too may be the inferences that we draw." [8]

As an example, they argue that the GFC may have been mitigated, or even avoided, if such wider measures were available, and they hope environmental problems in particular may be mitigated by better measurement.[9] A panel of indicators has since been developed by the OECD based on their report.[10] Note that both the quote and the subsequent OECD indicators provide an overarching, macro perspective on wellbeing. The New Zealand Treasury is largely following this approach.

An eclectic approach is more common and a recent example is provided by the Global Happiness Council's *Global Happiness Policy Report 2018*. The first chapter is addressed to "public officials around the world grappling with the practical challenges of governance in the 21st Century" and discusses unambiguously macro issues like "War and Peace" and "The Global Environmental Crisis".[11] The overview in Chapter 2 provides aspirations for the work and, by far the most useful chapter for officials, is the OECD's summary in Chapter 8 of different country's attempts to implement a wellbeing approach.

However, the subjects of the remaining chapters are scattered across policies, including cost benefit studies of mental health interventions (Chapter 3), "positive education" to use the psychology of happiness to improve teacher training (Chapter 4), and a discussion of how measurement can improve cities (Chapter 7). While the proposals in the chapters are consistent with the high level aims of the first chapter, they do not otherwise cohere as a set of proposals.

It is worth noting that, to our knowledge, no government actually measures the success of health or education policy, never mind child protection or old age pension policy, by their impact on national GDP. Of course, some policies are based on evidence of the psychological benefits of paid work, and debate on the funding of these policies includes the economic impact of taxation and debate on income distribution.

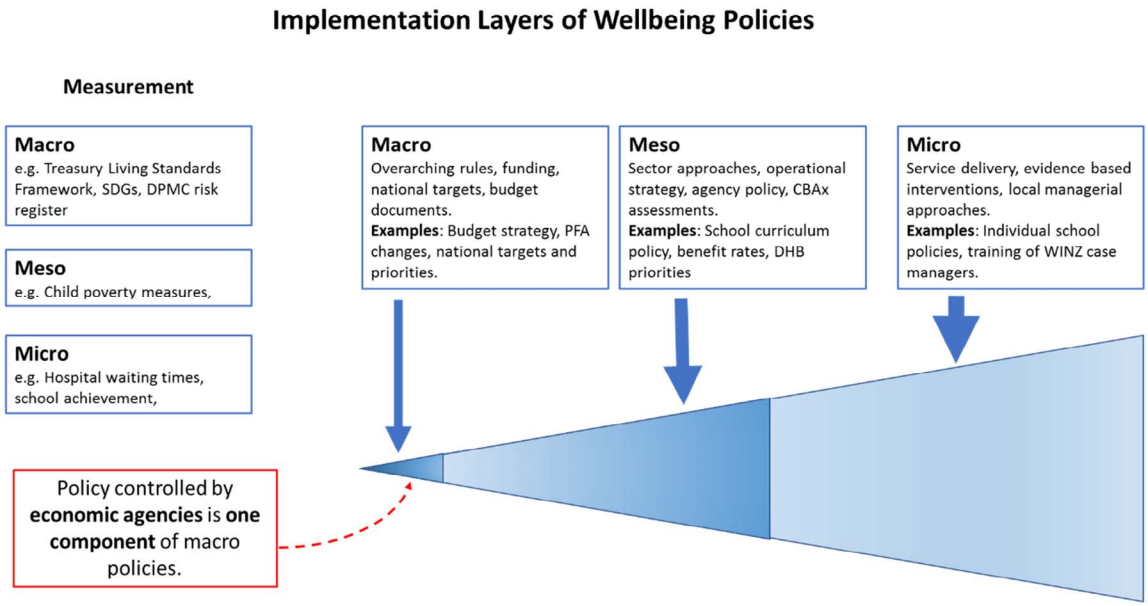
But there is a weak link between this and "drawing inferences about what are good policies" (Stiglitz et al, 2008:7) using GDP.

This difference between claim and reality is highly damaging to the usefulness of the wellbeing approach. In our experience officials infer that a wellbeing approach is evidence that *what they are currently doing* has greater impact than measured by economists. That is, they do not see a wellbeing approach as creating a case for change because, they correctly point out, their own indicators of success would not be expected to show up in the GDP indicators used by economic ministries.

It is more accurate to claim *economic* policy is dominated by GDP objectives. But outside of estimates of the tax take, and thus the available budget, the use of GDP is confined to the macroeconomic advice of Treasuries, regulatory advice from "ministries for business" and the tax collection agency. It is absent from advice on the policy covered in the *Global Happiness Policy Report,* but could make a helpful addition, given the economic consequences of health and education policy.

Considerably more thought is needed on what government actually does, in order to understand how a wellbeing approach might be implemented. A starting point that we found helpful is to think about how the activities of government agencies fit together to clarify *who* needs to change what they do and the *policy instruments* that could be used. Our initial representation is in figure 2 below:

Figure 2: Implementation Layers of Wellbeing Policies (government)



The diagram is intended to convey the levels of abstraction from "on the ground" interventions. Different agencies, or different groups within agencies, deal with work at different levels. The skills and interests are also widely different. The most abstract of all is the use of macro numerical measures by agencies like the New Zealand Treasury. It is at this level that government targets and budgets are set, often by people whose expertise is in those macro activities, rather than the specifics of implementing the policies that are being funded.

Most of the chapters in *Global Happiness Policy Report* are of policies intended to operate at a meso or micro level. That is, they were, respectively, sector policies (e.g. teacher training) or about local implementation of policies (e.g. improving city design).

Understanding this has large practical consequences if the intent is to influence "public officials around the world grappling with the practical challenges of governance". Most of what is done at a meso and micro level is not managed using GDP indicators or their proxies. Of course high level funding decisions will have an influence, but the agencies advising on high level funding will have a marginal, in the sense of small, impact on specific interventions. It makes sense that the ministry of health has more influence on health policy than the ministry of finance!

There is more potential impact in the setting of national targets because they will often be at a meso level. However, literature surveys and case studies are just one input into a process that needs to incorporate a wide range of objectives, capacity, and capability constraints, and stakeholder needs when making decisions about government services.

The approach described in Section 2 is one attempt at implementing *macro* level indicators. Implementing the Living Standards Framework is useful, but is most certainly not equivalent to changing the way government organisations work. To do that is far more wide-ranging, requiring the macro perspective be linked to meso and micro indicators, and linking those measures to practice that delivered the improved outcomes as captured by these indicators. Most of the *Global Happiness Policy Report* is best thought of as providing indicative examples of policies that might be developed over many decades.

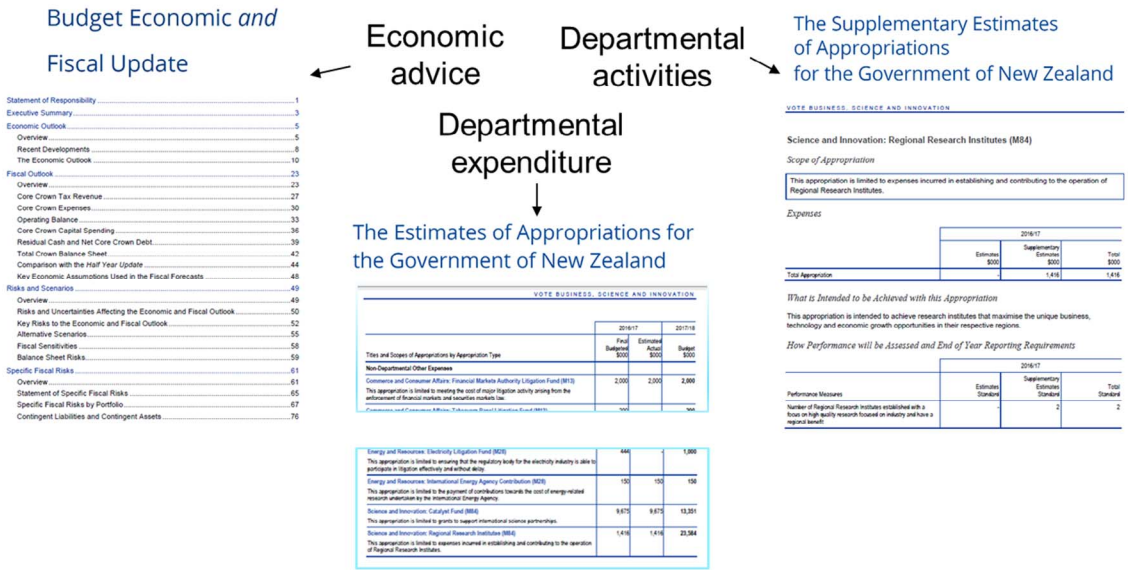
Using macro level indicators to align policies

More positively, the LSF can improve alignment between agencies. For the New Zealand Treasury this means a focus on macro levels of policy and how the Living Standards Framework can help implement the Stiglitz *et al.* programme.

One improvement whose impact should not be underestimated is linking policy.[12] The New Zealand Treasury has estimated that, even under highly restrictive assumptions about the intergenerational impact, aligning policy could be fiscally equivalent over forty years to raising the age of eligibility for the state pension by two years.[13]

In particular, a wellbeing approach helps align economic policy with fiscal decisions. Like other government organisations, the New Zealand Treasury tends to silo its policy advice. As Figure 3 below shows, The Treasury analysis of economic policy focuses on increased incomes, and is separated from departmental expectations and expenditures that have wider wellbeing objectives. Across all this advice there is little or no reference to long term fiscal issues.

Figure 3: The streams of The Treasury's advice



Source: The Treasury http://www.treasury.govt.nz/budget/2017

The LSF can draw together the measurement of the variety of outcomes from government expenditure so they are consistent across the whole range of economic, social, and environmental policy, and consistent with the intentions of the expenditure. Further, including the four capitals means that indicators of the sustainability of wellbeing are among the core system indicators.

What does this mean for business?

In a business context, the natural framework for thinking about wellbeing is the International Integrated Reporting Council (IIRC) framework for integrated reporting. In this section we briefly summarise the integrated reporting framework and then apply the discussion in Section 3 to show two key benefits of the LSF to businesses. First an improvement in the way government interacts with business, and secondly, a way for government to provide business with information regarding its impact on wellbeing and sustainability.

Consistent with the wider approach, we believe the LSF does not change the two traditional roles of government in the economy, but it does improve how those roles are implemented and introduces a third new role. The role economists tend to discuss is ensuring an economic environment that supports businesses to plan and invest. This includes macroeconomic stabilisation through monetary policy, the development of economic stabilisers in fiscal policy and constructive engagement with the world trade system. This is supplemented by supply side policy to increase investment and regulatory frameworks that support business productivity.

Second is the currently parallel system of regulatory and other interventions designed to protect workers, consumers and others who may suffer negative consequences from market competition; or where there are market failures like externalities or incomplete markets.

In this section we describe what this means in more detail and in Section 5 discuss the challenges this poses for work on wellbeing measurement.

Integrated reporting

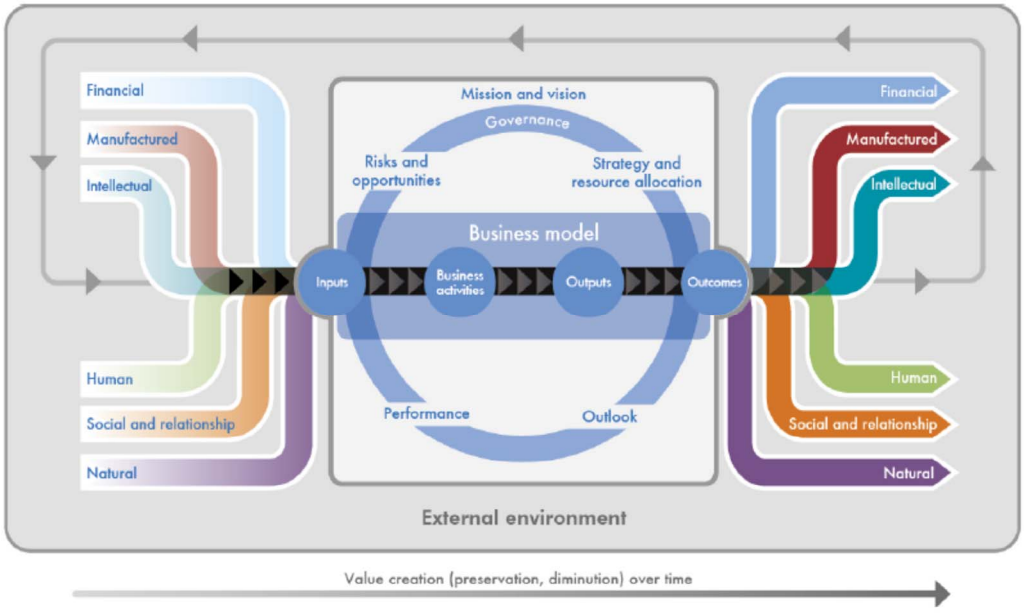
The New Zealand Treasury has borrowed heavily from integrated reporting in its approach to the LSF. What is particularly impressive about the IIRC is the extensive consultation and testing with businesses and investors from countries around the world, as a wider value creation model, for practical entities like businesses that agree with

> "The IIRC's vision is to align capital allocation and corporate behaviour to wider goals of financial stability and sustainable development through the cycle of integrated reporting and thinking."[14]

The integrated reporting framework is based on a model of value creation in which a business recognises inputs from six capitals that are used to generate both current value and to sustainably input into future capital values.[15] This model is crucial for understanding how the LSF can apply to both government and business.

Most importantly this is a model of production. In the LSF it is wellbeing that is produced while integrated reporting discusses value for the firm. Measurement makes the framework meaningful by supporting efficient production. For a business it makes it possible to be both profitable, and recognise the wider value created by the firm, by making sure one does not replace the other.

Figure 4: IIRC model of value creation



Source: IIRC (2013)

Further, there is a clear place for institutions in this model, which makes explicit the importance of governance, the recognition of risks and opportunities, and performance management. It is recognition of this institutional role that allows us to think about how a framework for the *institution of government* can link to businesses and their internal organisation.

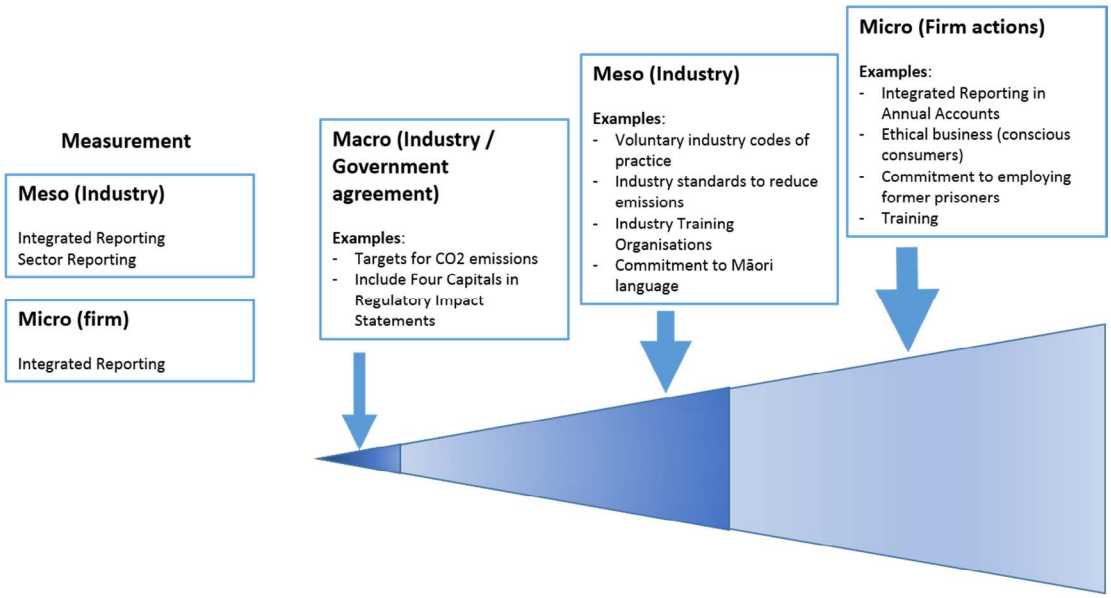
While these similarities are important, the differences should also be recognised. Most obviously, but least importantly, is that integrated reporting uses a six capital model. At a first approximation, the financial, manufactured and intellectual capitals of integrated reporting are merely aspects of financial / physical capital in the LSF. The greater detail on the "economic" capitals in integrated reporting reflects the importance of recognising these inputs on firm balance sheets of for-profit organisations.[16]

Conversely government's role in managing the macro aspects of wellbeing is different from a business which is operating at a meso, or more likely, micro level. It is in dealing with traditional macroeconomic policy, like monetary policy, setting regulations to create "fair" competition between firms, and dealing with externalities, that government is uniquely placed to add value, or improve wellbeing in the language of the LSF.

How does the LSF support integrated reporting?

In essence businesses can become the major driver for reducing the need for remediating action by government. The LSF role for businesses using integrated reporting is the same as it would be for government entities implementing meso or micro wellbeing approaches. It provides the macro content for integrated reporting so businesses can link their non-financial objectives to economy wide improvements in value. What is better about this approach is that government meso and micro activity is potentially needed less because those interventions are no longer needed. The LSF does this in four ways as outlined in Figure 5. Figure 5 provides a depiction of how business delivers wellbeing, and is complementary to Figure 2, which describes how government delivers wellbeing.

Figure 5: Implementation Layers of Wellbeing Policies (business)



First, the work by the OECD provides a robust, long term perspective on indicators of national success. The emphasis and priority will change with the results of the democratic process but not the measures themselves. The government equivalent (in Figure 2) would be the state supplied education and health systems. The change in government priorities does not mean teachers in the state education system stop teaching children. What changes are system priorities and hence, at a system level, what activities are prioritised. Individual schools and teachers make judgements about the impact of this on their work, but large parts of what they do remain unchanged.

The business equivalent is that their role in delivering value is unchanged unless the business wishes to change it. The framework provides continuity so the intended impact of changes in priority are put in the context of previous priorities. The idea is to be considerably clearer about the long term value the business is contributing, and to have agreed indicators of that value that are widely shared, and able to be used for long term planning. Monitoring and reporting of these indicators also provides clarification of any long term damage, enabling consideration of any emerging risks, and the ability of the firm (and society) to deal with them. This identifies their resilience.

Second, and following from this, it provides a stable framework for understanding government decisions and intentions. Thus the uncertainty for business created by government institutions, and the loss of value this generates, can be reduced.

Third, a clearer sense of where business is expected to engage and contribute to wider social and environmental outcomes. The current regulatory environment is based on rules and centrally set standards on how firms should act that are intended to increase overall wellbeing. The LSF specifies indicators of the wellbeing outcomes, which allows businesses to decide how they can best operate to improve wellbeing, make the most of opportunity and to understand their sustainability. Regulations are still going to be a necessary component of government intervention, but the LSF is a potential complement that can, through integrated reporting, offer a considerably more tailored and efficient approach.

Fourth, it provides a way to consistently understand the costs to business of government interventions and hence to find more cost effective ways of improving wellbeing. The LSF is not just designed to provide indicators of current and future wellbeing, but also the trade-offs between the different components. Makhlouf (2018)

Challenges for work on well-being measurement

Bring National Statistics into line with practical Wellbeing Measurement

The fact income measures are so widely used as a proxy for wellbeing, despite never being intended to measure wellbeing, gives important insight into what an alternative needs to achieve (Kuznets, 1934). We have identified eight criteria for understanding the extent to which currently available wellbeing indicators are delivering the insights needed by policy advisors. These criteria include international and intertemporal comparability, credibility, coverage and availability of the data. To provide a basis for policy advice, work has been undertaken to identify indicators of each of the Capitals in New Zealand (Frieling, King et al, Morrissey, van Zyl – all 2018). Further work is also underway to consider the specific New Zealand environment (Te Puni Kōkiri, Thomsen & Tavita, Yong – all forthcoming, 2018). However, additional

work on national measures is needed if we are serious about replacing GDP and income measures in national assessments of wellbeing.

Key measurement issues remain, including:

i) *The role of measurement*
Government is not interested in measurement for its own sake but in improving policy and outcomes. A focus on this objective supports decisions about what should be measured and to assess trade-offs between statistical quality and usefulness. This includes whether or not to attempt to measure levels, or whether to measure first and second order properties of measures; and where the greater feasibility of ordinal measures make them superior to more detailed cardinal measures. This mirrors how GDP is used in practice.

ii) *Indicators versus measures*
The causal interpretation of any statistics used to assess both current wellbeing and the capitals is often ambiguous, but highly consequential. This applies to direct measures of capital stocks in particular. For the practical policy purpose of assessing the effectiveness of government interventions and agencies, this distinction is crucial for understanding if a policy is addressing the issue in a causal sense or only the performance measure, which may be more distantly connected to ultimate government objectives in a causal sense.

iii) *How far can we hope to have a common currency for assessing relative value*
How useful is it to measure or value items in each domain in a common currency (such as inflation-adjusted New Zealand dollars)? There are both practical and normative grounds for scepticism with this approach, particularly where the (lack of) substitutability between wellbeing capitals is core to the debate we wish to inform with the data - for instance, this issue is germane to certain indicators of Natural Capital, such as the existence value of rare native species (see e.g. Lele *et al.*, 2013 for a discussion). Another example of particular relevance to New Zealand is values associated with national identity, which are defined by negotiation and agreement between settler and indigenous communities.

iv) *Availability and timeliness of official national statistics*
GDP measures are usually available on a quarterly or monthly basis, and this timeliness is crucial to its usefulness as a guide to public policy. It allows governments and government institutions to respond to sudden events, provides a robust basis for business to understand and anticipate changes in policy settings, and improves the credible use of evidence in policy.

v) *Role of administrative data*
Statistical agencies tend to have much greater experience dealing with survey data and face challenges in keeping ahead of opportunities created by technology change to use administrative data to guide government policy. Since administrative data include data on the actual implementation and incidence of policies and interventions, it has huge advantages over survey data for the identification of policy effects. Integrating it with the survey-based data currently used as proxies for wellbeing is necessary if government is to continue to improve its effectiveness.

Conclusion

This paper has outlined how wellbeing statistics can be used to improve how government and business interact. It has identified two traditional roles of government. The first role is to ensure an economic environment that supports businesses to plan and invest, such as through a stable macroeconomic environment, and supply side policies that increase investment and regulatory frameworks that support business productivity. The second role is to provide a parallel system of regulatory and other interventions designed to protect workers, consumers and others who may suffer negative consequences from market competition; or where there are market failures like externalities or incomplete markets.

The paper has also identified a third, and new, focus for government interaction with businesses – one which a framework developed by the New Zealand Treasury can help create. By collating the impact of the activities of all agents in society, not just individual firms or only economic activities, the New Zealand Treasury's Living Standards Framework (LSF) provides useful information that businesses can use to understand the implications of their actions and those of others. The LSF outlines the health of the capital stocks, enabling businesses to see opportunities and risks, and adjust their activities accordingly.

The paper outlined the LSF, describes its three elements of current wellbeing, future wellbeing and risk and resilience, and explains the rationale adopted in selecting wellbeing indicators to measure wellbeing. The paper has also examined what a wellbeing approach means in practice, explained why a wellbeing approach was deemed necessary, and discussed examples of restricted application in other countries.

This paper has shown that the application of the LSF by the New Zealand government will be a world-leading approach to bring a wellbeing perspective to policy, including providing a measurement framework, and could improve the way in which government and business interact.

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[1] E.g. "The basic aim of an equitable welfare state is to provide assistance to those in need …" The Treasury (1990). See also, for example, Jacobsen *et al* (2002); Gleisner *et al* (2011).
[2] See King *et al* (2018), CIPFA (2016) six capitals framework and the UN (2015) "sustainable development goals".
[3] OECD (2015)
[4] See King et al (2018) p6/7
[5] Nussbaum (2004)
[6] See Statistic New Zealand (2017) for latest data revisions
[7] cf Frieling (2018), Dalziel and Saunders (2014), and IIRC (2013).
[8] *Stiglitz et al* (2009), p7
[9] *Ibid*, P9
[10] E.g. OECD 2017
[11] Global Happiness Council (2018)
[12] Cf Global Happiness Council (2018), p14
[13] Burton *et al* (2016), Piii
[14] See IIRC (2018)
[15] IIRC (2013) p13 and *passim*
[16] Cf IIRC(2013), p11-12

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The State of Corporate Disclosure on Well-being: A Review of Corporate Reporting Practices in the Food and Agriculture Sector in 2018/ Diane Strauss and Alli Chlapaty[v]

Abstract

Our paper offers a review of the level of standardization, the quality, and gaps of the information on well-being provided in the sustainability disclosure of leading companies from the food and agriculture sector. We mapped the information and metrics provided by forty-eight companies against each Sustainable Development Goal (SDG) and stakeholder group impacted (consumers, employees, local communities, global communities, suppliers, shareholders).

First, our analysis confirms the lack of standardization of the data, as only five topics meet our standards for consensual metrics. Greater harmonization, however, seems within reach, in particular regarding the working conditions of employees. We also observe that companies provide mostly *effort-driven* narratives and metrics, which inform about actions and strategies, while they do not measure their *impact on stakeholders' well-being* through a rigorous set of indicators. Finally, we observe that the current reporting framework lacks rigor and leaves many well-being issues uncovered. We argue that corporate reporting would benefit from a more rigorous reporting framework assessing the various dimensions of well-being.

We identified critical disclosure gaps for all stakeholder groups. Disclosure on corporate impact on the well-being of local communities, in particular, suffers from two major gaps. First, the disclosure on corporate influence over national communities, through lobbying and tax payment (SDG16, Peace, Justice and Strong Institutions) is weak in coverage and in depth. Second, corporate measures of local communities' environmental protection (and therefore health) just emerged. Disclosure on employees' well-being, on the other hand, could be disclosed more easily, as most of the information lay in the human resources department. Few best-practices are presented in this paper, along with discussions on emerging metrics.

[v] Diane Strauss is Research Director of the Yale Initiative on Sustainable Finance, Alli Chlapaty is Research Assistant at the Yale Initiative on Sustainable Finance

Introduction

Our paper proposes a mapping exercise to assess the level of standardization of the data, gaps, and quality of information on well-being provided in the disclosures of leading companies from the food and agriculture sector.

A substantial body of work exists concerning the definition of well-being indicators from a national point of view in an attempt to complement the use of gross domestic product. The report, led by Stiglitz, Sen, and Fitoussi (2009), identified seven dimensions to the 'quality of life': material living standards (income, consumption, and wealth); health; education; personal activities, including work, political voice and governance; social connections and relationships; environment (present and future conditions); and insecurity (of an economic, as well as physical, nature). The Organisation for Economic Co-operation and Development (OECD) complemented this work with the development of a comprehensive framework that separates quality of life, material conditions, and resources for future well-being. The OECD now publishes an annual evaluation of well-being in OECD countries (OECD, 2017).

In parallel, companies have developed sustainability disclosure practices. The Global Reporting Initiative (GRI) provides a critical framework for companies to identify which metrics and topics they should report upon. The GRI combines a general set of metrics to be applied to all sectors (GRI 102, 2016) and thematic reporting frameworks. According to a report written by the World Business Council on Sustainable Development (WBCSD), Yale Initiative on Sustainable Finance and the GRI, about 46% of the food and agriculture companies reviewed mentioned using the GRI framework for key guidance in their reporting. (WBCSD, 2018) The GRI, however, has been criticized for its lack of required verification, and the overly large scope of indicators that leaves space for cherry-picking (Moneva, 2006; Roca & Searcy, 2012). The Global Impact Investing Network (GIIN), with its database, IRIS, is another key provider of impact metrics for businesses[1]. More recently, the Sustainable Accounting Standards Board (SASB) has provided reporting standards per sector, with a focus on material issues for investors[2].

Because of the multiplicity of reporting standards, there has been an attempt to identify the most common indicators in corporate reporting in general (Fifka, 2013; Habek & Wolniak, 2015), and in more specific areas of corporate reporting, such as – to name but a few – supply chains (Ahi & Searcy, 2013), corruption (Barkmeyer, 2015), poverty (GRI, 2018), and occupational health and safety (OHS) (Koskela, 2014). We have not found any research explicitly analyzing corporate sustainability disclosures from the overarching perspective of stakeholder well-being, however. The emergence of the Sustainable Development Goal (SDG) framework for corporate reporting may contribute to the development of an indirect focus on well-being in company disclosure filings. In its annual report on the state of corporate reporting, KPMG (2017) observed that SDGs emerge as a clear trend in corporate reporting, with more than 39% of companies organizing their reporting around these goals.

To get an initial overview of the practice today, we decided to go back to the fundamentals of the information provided by companies in their sustainability filings. Consequently, this article provides a review of the state of play of corporate sustainability disclosures on well-being in the food and agriculture sector. Because food and agriculture affect all parts of society, from consumers to suppliers and communities, this sector provides a strong representation of the challenges faced by companies in reporting well-being impact indicators. We listed, scored, and analyzed the information reported by: a) 48 companies in the food and agriculture sector; and b) three Environmental, Social and Governance (ESG) data- and

index-providers. All of the information disclosed was classified according to the SDG framework, and according to the stakeholders impacted (consumers, employees, local communities, global communities, suppliers, shareholders). The results were analyzed against the seven dimensions of the quality of life of Stiglitz et al. (2009).

The question of the quality and materiality of the information disclosed was critical to our gap analysis. We did not want to only focus on the most common metrics (GHG emissions, injury rates, etc.) to ensure that we did not miss a large portion of corporate reporting. Best practices recommended by disclosure standards include the development of metrics (SASB and GRI) and measurable targets (The Sustainable Stock Exchange Model guidance on reporting information to investors[3]). To be useful to stakeholders, we have considered that the information should to be comparable, reliable (Esty & Cort, 2017) and, most importantly, 'material' (WBCSD, 2018). We built our scoring methodology to reflect these latest trends.

Our analysis revealed some stunning results, which may, unfortunately, not be surprising. In line with the literature mentioned, only five issues seem to benefit from consensual metrics: GHG emissions, water consumption, waste production, social audits and monitoring and gender equality. For the rest, even if companies generally cover a similar set of issues, their practices vary too widely to allow the identification of common metrics. In particular, company sustainability filings still mention an impressive number of policies, but with no mention of quantitative metrics or targets.

A better harmonization of the metrics is not out of reach, however; a few indicators that are informative about employee well-being, in particular, are within reach.

The current reporting framework lacks rigor and leaves many well-being issues uncovered. We identified some boggling gaps. In particular, disclosure on business impacts on the local community (national or local) is scattered and weak. We observed a striking lack of disclosure of companies in addressing impact on national communities via impact on governments. Two companies out of forty-eight provided an indirect reference to total lobbying spending (in the USA, as required by US law). Only one company out of forty-eight pledged to pay taxes where it operates. Herein, we argue that tax payment, lobbying practices and the fight against corruption are critical elements of a conversation on stakeholder well-being, as reflected in SGD 16, Peace, Justice, and Strong Institutions. These aspects tend to be overlooked in the traditional ESG analysis where G only stands for the internal governance of companies.

We also observed that metrics on local community environmental protection and health were weak, in coverage and depth. Companies disclose output metrics (e.g., chemical input, wastewater treatment, water consumption) or philanthropic actions to communicate about their efforts towards local communities. But only few impact metrics allow to measure the *impact* experienced by the communities. As a result, researchers are currently working to develop new local or "context-based impact metrics" (e.g., biodiversity loss, nitrogen pollution, biophysical accounting, see section 2.c). In the future, these metrics may provide a more accurate vision of companies' impact on the ground.

As for consumers, agriculture companies largely focus on consumers' health. If companies tackle quite systematically the need for healthy nutritional inputs in their products, they often overlook other health concerns such as product toxicity. We advocate for the development of a more rigorous approach to analyzing companies' impact on consumer health.

To conclude, many of the metrics provided by the companies, which follow the GRI and GIIN frameworks, are actually *effort-driven*: 'We reduced our GHG emissions', 'We perform social and environmental auditing', 'We reduce the amounts of chemicals we use', for example. A perfect set of metrics for business *impacts* on well-being may still need to be developed, or to be used. Metrics providing scientific proof of a business's impact on health, wealth, and security, through independent datasets, offered by satellites, sensors, economic data, justice data, social media, or polls, will be an interesting avenue to explore. We hope that the OECD initiative on measurements for business impacts on well-being can contribute to this positive development.

Methodology

In this paper, we have not developed a set of common indicators for well-being, but we have proposed a mapping of what and how companies disclose via the prism of stakeholder well-being. We analyzed the coverage and depth of the data, identifying what we consider to be gaps, based on cross-referencing between the SDGs and the well-being indicators defined in the Stiglitz et al. (2009) report. Ultimately, we provide a snapshot of the correlation between the indicators disclosed in company reports and by major data-providers.

Company database

To understand the landscape of well-being indicators disclosed by companies, we created a database of all items disclosed by companies in their sustainability programs.

We selected 90 companies from various food and agriculture sectors. The ninety companies are leaders in their sector and were crossed checked with companies of interest to the Moore Foundation, GRI, and WBCSD members. Out of these 90 companies, we were left with 48 companies that published sustainability information (which not all did) in a language that the researchers could easily read, i.e., in English or Spanish, and we received the support of a Chinese-speaking researcher for two companies from this sample. The 48 companies selected for the review are listed in Annex 1, and broad details are provided in Table 01.

Table 01: Sample of companies reviewed by region and sub-industry

Continent	Total Companies	Average Score
Asia	12	1.7
Europe	16	2.1
North America	15	1.9
South America	5	1.5

Sub-Industry	Total Companies	Average Score
Agro-chemical	4	1.5
Animal Nutrition	1	2.8
Beer & Wine	4	1.9
CPG	10	2.3
Dairy	1	1.5
Food additives	1	1.3
General trading	2	1.6
Grain	9	1.6
Meat	4	1.8
Restaurant	2	1.7
Retail	9	1.8
Seafood	1	2.9

A team of five researchers reviewed the 48 reports and websites, listing all information disclosed in the sustainability reports in one database. We considered, then rejected, the possibility of selecting some information as relevant to well-being, and leaving some aside, but this process was too complex and subjective. Eventually, all information disclosed by the companies, directly or indirectly, related to the well-being of stakeholders. For example, the fight for climate change, or efforts towards a circular economy, translate into attempts to mitigate threats to future global communities, regarding their environmental protection, health, and security (dimensions presented in Stiglitz et al., 2009).

Each piece of information disclosed in a sustainability report was designated as an item. Each item got a score based on the depth of the reported information. We, therefore, defined a rating system that could capture the variable quality of the information reported, such as communication statements, philanthropic efforts, policies, quantitative metrics, collaborations, narratives, or core business strategies. The rating system is defined in Table 02.

Table 02: Description of the scoring system

Score	**Definition(s)**
0	Mention of the issue with communication language.
1	The company mentions the existence of a policy or of internal efforts without quantitative metrics. The company mentions a collaboration with external organization (mainly NGOs) with no explanation of their objective.
2	Backward looking quantitative metrics.
3	Quantitative metrics with forward-looking target and progress. Audited/certified backward looking metrics. Collaboration with external organization which explains the objective and assesses the results.
4	Backward quantitative metrics + forward looking target + strategies on how the business is going to adapt its *core strategy* to tackle the issue.

Our research team faced a challenge concerning score category 2; should all quantitative metrics be rated the same, regardless of their materiality? In other words, should we give a metric that is mostly irrelevant to an issue (number of electric cars in an agriculture company) a score of 2, as well as one that is material and substantially informative (GHG emissions)? We decided that it was too subjective to gauge the materiality of quantitative metrics, and we did not find a good protocol to do so. Therefore, we gave a score of 2 to all metrics that stood alone, with no target or clear strategy. We observed, however, that the process of auditing, target-setting (score of 3), and strategic adaptation (score of 4) tended to outweigh immaterial quantitative metrics. The reader can, therefore, be confident that items scored 3 and 4 are mostly material to the company.

To illustrate this rating, below is a typical example of the various reporting depths on gender equality:

0. Boilerplate: "We ensure that women work in an environment free of discrimination".
1. Policy without metrics: "Our internal equal rights policy provides strict guidelines to avoid unequal treatment between genders."
2. Statistics on the gender breakdown by management levels, illustrating the glass ceiling and the pay gap.
3. Statistics on the gender breakdown by management levels, illustrating the glass ceiling and the pay gap, independently audited, or with a target for the future.
4. Statistics and strategic adaptation: "We have acknowledged that women in our company face pay discrepancies and we are tackling this challenge in several ways: we are running a survey among women staff to identify what may be considered key limiting factors to the promotion of women at executive levels; we plan to run 'unconscious bias training' programs for (x percent) of the top executives by (date); we started a women's leadership forum; we adapted our benefits to provide paternity leave as long as maternity leave; and we implemented a parity policy for top management positions. We will evaluate the results of these efforts by (date), and aim at a full gender equal company by (date)".

Each item was connected to one SDG and one sub-topic. In the case of food and agriculture companies, we could place many of the topics under SDG 2, 'Zero Hunger and Sustainable Agriculture'. But we realized that this would hide the different focuses on health, income, sourcing, etc. We, therefore, broke down SDG 2 into different SDGs. In SDG 2, we only included items directly related to the purpose of ending hunger.

The list of sub-topics (from here on called topics) was created in an incremental manner to ensure that no issue would be forgotten. To this end, the research team was asked to list all items identified in the report, and either allocate them to an existing topic from a list of issues used in the article by the WBCSD, Yale Initiative on Sustainable Finance and GRI (WBCSD, 2018), or to the category 'other'. The list of 'other' topics was analyzed, and new topics were created. Items were then reviewed, one by one, to ensure streamlining across topics and stakeholders.

The various stakeholder groups identified were consumers, employees, the global community, the local community, shareholders, and suppliers. Items were generally applied to only one stakeholder group; for example, paid volunteering was allocated to 'employees', and not to 'employees' and 'local communities'. Only a few items were duplicated through being allocated to two stakeholder groups; for example, 'we perform audits on our subsidiaries and suppliers', leads to duplicating the item and allocating it to both 'employees' and 'suppliers'. The stakeholder 'shareholder' was selected for items that related to corporate governance or reporting practices. 'Shareholders' was also selected when the target population was not

clearly defined; for example, codes of conduct rarely mention whether they apply to employees or suppliers, or both.

Each of these assignments for the complete list of items was reviewed for consistency and accuracy by multiple researchers. Due to the large number of items present in each disclosure filing, we could not ensure that every single mention of an issue (score 0) was reflected in the database. For items scoring between 1 and 4, we are confident that most items have been incorporated.

The database resulting from this process contains 1,758 item lines.

Index and data-providers database

In order to understand what investors expect from companies when analyzing well-being indicators, we also created a database of the indicators of three of the most popular ESG metrics providers, Bloomberg, Thompson Reuters DataStream, as well as the Dow Jones Sustainability Index. Bloomberg and Thompson Reuters each provide their terminal-users with spreadsheets containing their metrics. Dow Jones provides two sample surveys publicly. For this study, the Diversified Consumer Services survey was used, as it was the broadest publicly-available survey.

For each provider, the items were assigned an SDG and topic, and an idea of whether the indicator was based on a policy or a quantitative metric.

Results

Section 1. Overall findings on the quality of reporting: material topics identified are similar, but the comparability of metrics is low.

With an average reporting score of 1.7 across all topics, the overarching results show that companies mention internal strategies that they do not back with quantitative metrics. Table 03 lists the five topics that meet our comparability conditions: 50% of companies reporting on the topic, and an average rating score above 2. Annex 1 lists all of the topics referenced, organized by their occurrence, and provides a snapshot of the level of comparability across topics.

Table 03: The four topics met our two criteria for data comparability

Topic	Reporting rate	Average Score	Most common metrics
GHG emissions	90%	2.2	Scope 1 and scope 2
Energy management	77%	2.1	Energy mix
Waste	57%	2.1	Waste reduction and/or waste to landfill
Social audits and monitoring	54%	2.1	Number of suppliers audited
Gender equality	50%	2.2	Workforce breakdown by gender

Section 2. Environmental protection, common metrics, and gaps

The disclosure of impacts on the environment is the most advanced of the three categories, with a broad coverage of 690 items for the 48 companies, and an average score of 1.9. We identified, however, that while companies are doing well while reporting on their efforts to reach a greater resource efficiency, they are not doing so well when assessing the local impacts of their practices. Table 04 offers an initial overview of the coverage and depth of reporting by SDG and stakeholder. The full mapping of SDG 6 (Clean Water and Sanitation) by topic is available as an illustration in Annex 2.

Table 04: Disclosure scores and coverage mapped by SDGs labeled in the Environmental ('E') category and by stakeholder group

Environmental SDGs	SDG 6	SDG 7	SDG 9	SDG 12	SDC 13	SDG 14	SDG 15	
SDG/ Stakeholder group	Clean Water and Sanitation	Affordable and Clean Energy	Industry Innovation and Infrastructure	Responsible Consumption and Production	Climate Action	Life Below Water	Life on Land	% of E Metrics
Consumers			0.75	1.00			1.25	1%
Employees	4.00	0.00		1.50	1.00			2%
Global Community	2.36	2.00	1.38	2.04	2.26	0.83	1.58	34%
Local Community	2.12		1.20	2.05		1.50	1.53	17%
Shareholders		2.14	1.00	1.42	1.86	1.00		19%
Suppliers	2.00		1.73	1.88		1.73	1.58	27%
All stakeholders	2.62	1.38	1.21	1.65	1.71	1.27	1.49	
Percentage of companies reporting	83%	77%	48%	100%	94%	19%	50%	

a. Environmental protection of global goods, towards target-setting

Common metrics to reduce resource use. Companies rigorously address the questions of climate change, water consumption, and waste reduction, with 83% of the companies reporting on their *GHG emissions*, 77% reporting on their *energy management*, 73% reporting on *water resource management*, and 48% on *waste management*. Up to 42% of the companies mentioned having a consistent *environmental management plan*. Most of these companies reported with auditable key performance indicators, with an average score of above 2.0. Companies also reported on other resource efficiency issues in their production processes, such as *product packaging* (35% of companies, average score 2.0), and *transportation* (29% of companies, average score 1.9).

Sustainable sourcing, broad coverage, uneven disclosure. Sustainable sourcing indirectly relates to major questions on environmental protection (biodiversity, deforestation, climate) and security (labor rights). Companies largely address sustainable sourcing in their disclosures (80% of companies) with an average score of 1.9 (median score of 2). Most companies with a score of 2 mentioned the percentage of sustainable sourcing as a key metric, but generally for one or two commodities, mainly palm oil. Eight companies mention supply chain transparency and traceability as an objective, but the average score stalls at 1.5 as few of them provide metrics to back this effort. The best practices regarding supply chain transparency include the percentage of known suppliers and a downloadable list. Supplier audits are another best-practice, with full disclosure of the results and percentage of suppliers audited. In addition, companies have put in place grievance mechanisms, zero deforestation pledges, and collaboration with non-governmental organizations (NGOs). Generally, the information does not provide much knowledge about the real impact of sourcing, but displays efforts and attempts to mitigate negative impacts. Nine companies mentioned

geospatial monitoring as a way of monitoring their supplier activities, with a very low average score of 1.2. This information may represent an interesting source for information in the future.

Company innovations towards sustainable agricultural practices. Half of the companies communicated about the implementation of some sort of innovative sustainable practice, be it farmer training, sustainability management, income generation schemes, or the uptake of innovative technologies to reduce the consumption of resources used. While this trend is encouraging, a narrative around the scope of these initiatives (e.g., percentage of farmers trained), and the scalability of the innovation (feasibility and timeline), is often missing (score of 1.4), leaving the reader with a sense of 'greenwashing'. The percentage of annual spending on research and innovation may offer a better proxy, although this information was not communicated.

b. Environmental pollution, the missing piece for local communities

As described in Stiglitz et al. (2009), environmental protection is one of the key components to quality of life, or well-being. A well-kept environment for local communities reduces health problems, and can create a feeling of happiness (Kellert, 1993). In this review of environmental disclosure practices, only a handful of items actually assessed the environmental *impact* that industrial and agricultural processes may have on local communities, including water pollution and scarcity, air pollution, chemical pollution, and biodiversity loss. Because resource availability is heterogeneous across regions, environmental impact is dependent on the location of resource use. More thoughts are provided in the discussion section about possible evolution.

Missing assessment of local chemical pollution in water, air and the land. As a starting point, companies addressed local pollution from a compliance point of view. Fifteen companies reported instances of environmental compliance breaches. Some of them described the nature of the breach and the associated penalties. Only a few companies, however, reported on local pollution mitigation strategies associated with their production and sourcing processes. Water treatment was the most advanced topic, with 16 companies disclosing information on their management of water quality (score of 1.9), although this topic is far less consensual than water resource management (consumption and reuse, 53 items, average score 2.2). Six companies mentioned their water discharge, and the quality of its treatment. Chemical input for agricultural processes (fertilizers, herbicides, pesticides) is also key for local environmental conditions, as it affects health, water quality, and the nitrogen cycle. Twelve companies mentioned chemicals or fertilizers as an issue in their report, with a median score of 1.0 (average of 1.7). Best practices on chemicals include a quantitative analysis of fertilizer inputs, and a target on fertilizers and nitrogen efficiency use. Only four companies addressed the question of air pollution, communicating information on SO_x and NO_x input, with an average score of 2.0.

A nascent practice for assessing local water scarcity risk. As mentioned in Section 2a, 22% of companies mentioned the risk of water scarcity at the local level (water basins), and addressed the need for local communities to access clean water. All of these companies used the World Resources Institute Aqueduct Water Risk Map as a tool to assess production sites at risk of water scarcity. Only a few of them complemented this analysis with a convincing narrative on how they handled the possibility of a water shortage.

No clear metric for biodiversity loss. 41% of companies disclosed efforts to enhance biodiversity on land and in the sea, with an average score of 1.5 for terrestrial environments and 1.0 for aquatic life. These efforts

were mostly focused on ways to enhance biodiversity, rather than on the mitigation of biodiversity threats. Half of the efforts of these companies addressed biodiversity on a global scale (e.g., weed resistance to herbicides, species protections, and pollinator conservation), and half were focused on local problems (e.g., mangrove protection areas, river conservation in Arkansas). Of the 29 items, eight were addressed in measurable terms (e.g., land conservation targets).

c. Discussion on environmental conditions reporting

Concluding our analysis on the measurement of business impact on environmental conditions, results show that companies are often able to measure their effort to curb the environmental externalities that threaten global communities (e.g., GHG emissions, global water consumption, resource depletion). On the other hand, they tend to fail to provide information on the impact of their processes and sourcing on local communities.

We identify the need for more rigorous reporting of local pollutant outputs, in particular chemical outputs but also better information on wastewater treatment and local and hazardous waste treatment.

We also argue that new metrics must be developed to provide a more a granular analysis of companies local impact on the environment, and therefore on local community. To date, very few metrics are designed to measure companies' local environmental impact, be it local pollution or resource extraction. As a matter of fact the local context is key to assess this impact. Agriculture impact on water pollution, water withdrawal, deforestation, nitrogen production and biodiversity loss is mostly dependent on the local ecosystems, resource availability and resilience (Dailin & Rodriguez-Iturbe, 2016). For example, due to varied water availability at the local scale, sourcing sugar cane in India may have more impact than sourcing sugarcane in Brazil. A new generation of metrics, called "environmental context-based metrics" is emerging as world datasets can now identify the areas that are most vulnerable to environmental impacts.

The WRI Aqueduct Water Risk Map has paved the way for this new approach on local environmental impact metrics. The tool is simple: providing a map which represents areas at risk of water scarcity. Companies can then overlay their production sites with this map and identify where their operations may *contribute* to local negative impact. The purpose here is not to exactly *quantify* nor *attribute* the impact of any one company on water scarcity. By acknowledging where operations or sourcing may be a risk for the environment, the company is better equipped to cope with the environmental risk, mitigate it, and develop collaborative approaches in the area. More "context-based tools and metrics" could emerge from this 'contribution' approach as global datasets better inform companies and governments about national and local environmental conditions. Researchers in Harvard are currently trying to develop context-based metrics on the local quality of the water and air (Vörösmarty, 2018).

Sensors and satellites may soon provide more information on the local environmental conditions (Hansen et al., 2013). The organization Global Forest Watch[4] uses satellite imaging to compile a world map of forest loss, from which one can monitor local deforestation. As satellite imagery becomes more precise (the company Planet Lab is able to monitor forest loss in real time), and as supply chains become more transparent, we think that companies will be able to increase monitoring of their suppliers, and prove no contributions to deforestation via satellite data.

Biophysical accounting represents another promising area for the development of local impact metrics related to food production and local environmental protection. A growing literature is assessing resource

use and pollution embedded in trade (MacDonald et al., 2015; Kastner et al., 2014). More precisely, researchers are modeling local impacts resulting from foreign consumption. For example, while palm oil is mostly produced in Malaysia and Indonesia, the major consumption of palm oil occurs in developed countries. As such, researchers can now model what is the Indonesian biodiversity loss triggered by the consumption of developed countries. Such models have been developed for water consumption (Dailin & Rodriguez-Iturbe, 2016), nitrogen input (Zhang et al., 2010; Zhang & Davidson, 2015; Oita et al. 2016) and biodiversity loss (Chaudhary & Kastner, 2016) induced by States imports. These biophysical accounting methods typically use a commodity specific coefficient (e.g., liters of water used per ton of wheat) and associate that with trade data. For example, Chaudhary & Kastner (2016, Chaudhary et al., 2015) developed a metric, *biodiversity loss per ton of crop in 184 countries,* to model the embodied biodiversity footprint of commodity importing States. The Yale Initiative on Sustainable Finance is currently looking into the possibility to use biophysical accounting methods to assess the local impact of commodities purchased by companies. In the near future, companies may be able to obtain a proxy for water scarcity, soil degradation or biodiversity loss associated with a ton of crop purchased and depending on its origin. All these metrics could hopefully strengthen the measure of business impact on local environmental, and indirectly their impact on local community health and well-being

Section 3. Better reporting on working conditions is within reach

Reporting on decent working conditions for suppliers and employees represented 222 disclosure items, with an average score of 1.6. Better reporting is within reach. Employee training, labor protections and human rights, equal opportunities and gender equality are the topics addressed by the largest number of companies. On the other hand, employee satisfaction and retention rates, which translate to a subjective feeling of well-being, are rarely communicated (less than 15 companies). Table 05 below provides an overview of the mapping by SDG and stakeholders on social issues. A more detailed table is provided in Annex 2 by Topic for the SDGs "Decent Work and Reduced Inequalities".

Table 05: Disclosure scores and coverage mapped by SDGs labeled in the Social ('S') category and by stakeholder groups

Social SDGs	SDG 2	SDG 3	SDG 4	SDG 5	SDG 8	SDG 10	
SDG/ Stakeholder groups	Zero Hunger	Good Health and Well-being	Quality Education	Gender Equality	Decent Work and Economic Growth	Reduced Inequalities	% of S Metrics
Consumers	2.67	1.66					19%
Employees		1.74	1.75	2.08	1.75	1.73	49%
Global Community	1.71	1.83					6%
Local Community	1.07	1.43	1.29	3.00		1.00	11%
Shareholders		0.00				1.75	1%
Suppliers	1.00	2.07		3.33	1.34	2.00	17%
All stakeholders	1.61	1.46	1.52	2.80	1.54	1.62	
Percentage of companies reporting	31%	90%	17%	58%	92%	79%	

a. Missing pieces of income and economic security

Labor rights and physical security, an emphasis on audits for employees and suppliers. Labor rights are a critical issue in the food and agriculture sector, as instances of forced labor, child labor, and intensive

labor have been reported in the production of many commodities, such as palm oil, cocoa, coffee, and seafood. About half of the companies reported having implemented social audits or monitoring mechanisms (such as grievance mechanisms), either with their employees or their suppliers, but the majority of these companies did not disclose the results of these audits. Only 6% of companies in our sample transparently reported both the *percentage* (vs the number) of structures audited during the year, and the results of the audit (e.g., number of breaches, and remediation). Most companies that have audit systems in place for their suppliers also developed stricter screening criteria and/or certification schemes for selecting their suppliers.

Missing pieces on economic security for employees. Most of the 93 items in *labor protection and human rights* mention the existence of soft policies that promote the respect of basic rights, but with no metrics. Best practices include the number of employees enrolled in trade unions (three companies reporting), information about the minimum notice period (two companies reporting), the breakdown of different contracts (full-time, seasonal, and temporary – one company reporting). The average score for this category is 1.3, and the median is 1.0. We saw one mention of the number of contracts terminated, although the number of jobs created and terminated may be a better proxy for economic impact.

Lack of information regarding income. Income is another key component of well-being. It is a key component of employee living standards, and a proxy for reduced inequality (SDG 10). Only 35% of companies reported on the income of their employees, with an average score of 1.3. Best practice includes the disclosure of entry-level salaries, which allows an interested reader to assess the living standard of employees, and compare it to national standards. Another best practice identified was a thorough assessment of national living conditions in all countries in which the company has operations, and the design of wages that correspond to a decent living standard (in partnership with the Fair Wage Network[5]). Entry-level wages were not disclosed. The companies did audit their subsidiaries to ensure living wage standards across countries. A low number of companies (three) reported on their supplier wages, but offered convincing metrics, with a score of 2.33. 10% of companies mentioned executive compensation, and one company reported the exact compensation of the top management team. Finally, 25% of companies reported on benefits offered to employees, which ranged from health care coverage to longer maternity leave, flexible working conditions, and commuter assistance.

Emerging metrics for equal opportunities. Approximately half of the companies reported some level of information on their efforts to reduce biased behaviors towards *gender equality* or *equal opportunities*. Most companies did so by disclosing a breakdown of the employee workforce by type (e.g., gender, age, disabilities, and/or minorities). More advanced companies provided a breakdown of their workforce both by gender (or minorities) and by management level, which offered an interesting snapshot of an existing glass ceiling, and the resulting pay gap. 10% of companies (5 companies) addressed the question of gender equality in their human resources strategies, which included paternity leave or gender parity in management. 6% of companies addressed the question of gender equality among their suppliers, particularly for farmers. These companies designed training schemes and employment targets for women, resulting in scores ranging from 2.0 to 4.0. One company (2%) designed training and audits for employers regarding maternity leave and women ability to return to a comparable positions. This company disclosed the number of breaches identified during the audits by continent.

Turnover and satisfaction as the best proxies for the well-being of employees? While assessing well-being indicators for employees and suppliers, the turnover rate, complemented with a satisfaction survey, appeared to be good proxies. We counted 20% of companies (10 companies) that reported on turnover rates,

and 31% (15 companies) that communicated about employee satisfaction (self-assessment). None of them provided a narrative about their turnover rate or satisfaction rate, and only one provided a comparison with the peer group.

b. Discussion, better indication of employees well-being are within reach

Companies already provide interesting metrics on employee well-being, but not on a systematic basis. We encountered eight metrics that provided the first assessment of employee well-being at work, all of which were directly extractable from human resources databases (see Table 06). This information can be made available by country or region. All of these metrics could ideally be available for suppliers as well.

Table 06:.Metrics available on employee well-being in company reports

SDG	Stiglitz/Fitoussi well-being categories	Metrics available	Additional narrative	Level of uptake
Gender equality	Economic security	Workforce breakdown by gender and management level + pay gap	The company accompanies the metric with a description of the causes and strategies implemented to tackle the issue + a timeline for evaluation	+++
Equal opportunities	Economic security	Workforce breakdown by minorities and management level + pay gap		+++
		% disabled		
Decent work	Subjective well-being	Turnover rate		++
	Economic security	Breakdown of workforce by type of contract		+
	Income	Hourly entry salary		+
Health	Health	Injury rate or number of days lost		++
Education	Education and skills	Hours of training		++
Peace, justice and strong institutions	Civic engagement and governance	Employee representation in unions		+

Reporting quantitative metrics: + less than 10 companies, ++ between 11 and 24, +++more than 24 companies

Polling technologies now offer opportunities to dig deeper into company impacts on employee well-being. As mentioned in section 3a, employee satisfaction rate, provided that the polling is transparent and conducted by a third party, is an interesting complement to turnover rates. New polling technologies, in particular, those that are associated with natural language processing[6] could test a number of other open questions on recurring managerial problems. The Yale Initiative on Sustainable Finance is currently looking into the ability of natural language processing polls to provide improved information on employee and supplier well-being.

Social media and internet technologies may also contribute to bringing more transparency to employee satisfaction. In the USA, for example, the online platform Glassdoor, a feedback aggregator that discloses anonymous employee feedback and salary estimates, is regularly used by large media groups (e.g., the New York Times, 2015; Forbes, 2015) to address working conditions.

Section 4. An inconsistent approach to health

Companies can have a direct and indirect impact on the health of many stakeholders. The upcoming section addresses disclosures on health for employees, suppliers, and consumers. Companies can also have a direct impact on global and local community health through environmental protection or pollution. This aspect is covered in Section 2b.

a. Occupational health and safety metrics for employees

A consensus is needed on OHS metrics. *OHS* is covered by 69% of the companies, with more than 80 items listed. A low average score of 1.75 translates as a low willingness for transparency. Most quantitative metrics are lagging indicators, such as the number of injuries, casualties, fatalities, and accidents. Metrics tracking injuries differ widely in form, from 'injury rates' (the most common) to 'number of injuries', 'number of hours lost', 'accident reduction', etc. This finding pleads for greater harmonization of lagging indicators. Only five companies mentioned tracking health and safety concerns of their suppliers through risk evaluation processes or safety compliance.

Is occupational health part of well-being? Fewer than 10% of companies (5 companies) provided information on occupational health and disease, in the form of 'sickness leave' or 'absenteeism'. To assess the relevance of this issue, we performed a literature review, looking for occupational health reporting guidelines, and found only some assessment of corporate reporting on OHS, with mixed results on corporate coverage and quality (Montero et al., 2009; Zanko & Dawson, 2012; Koskela, 2014). The GRI disclosure guideline 403-2 lists the items on OHS, which include occupational disease rate and absenteeism rate. GRI disclosure 403-3 requests disclosure of the number of workers facing high incidence or high risks related to their occupation. The World Health Organization also provides sector guidance on occupational health and disease protection[7]. We, therefore, conclude that occupational health should be considered an issue of well-being, and it might be useful to understand how companies impact on the health of their employees, prevent and mitigate chronic and acute health risks.

b. Health for consumers: Efforts to reduce malnutrition, an unclear signal on toxicity

Companies focus on nutritional balance and transparency. Half of the companies mentioned some responsibility for offering healthy products, and described their efforts to adapt products to nutritional challenges, mostly regarding sugar, sodium, and fat. Approximately 41% of companies are working on increased transparency for the consumer, including front-of-the-pack labeling with nutritional information, but also information about certification, genetically-modified organism tracking, and organic practices.

Companies recognize a responsibility for their marketing messages. Companies consider that one of their impacts on consumer health is conveyed through marketing. 25% of companies (15 companies) reported some type of effort to develop sustainable marketing towards consumers, such as promoting healthy cooking. Most of the information provided takes the form of a boilerplate or soft policy, but some companies have metrics to support their efforts. The reader would need some sense of scale for these efforts

on *sustainable marketing*, for example by providing the percentage of sustainable marketing on the total of the yearly marketing budget.

***What responsibility to disclose and mitigate product toxicity*?** Scientific studies have now demonstrated the toxicity of the repeated consumption of pesticides (WHO, 1990; Mascarelli, 2013; WHO factsheet on pesticide residues, 2018[8]), and of mercury in fish (Oken & Bellinger, 2008; FDA recommendations[9]), on human health and fetal development. Twelve percent of companies addressed efforts to develop organic product alternatives, and 25% mentioned their efforts to reduce chemical inputs, with an average score of 1.6 (see Section 2b). In addition, a portion of the seventeen companies providing sustainability trainings for farmers may be dedicated to the reduction of harmful inputs in food production. One company (2%) addressed the legal risks faced due to a running lawsuit on the toxicity of its herbicide. None of the seafood companies had addressed the question of heavy metals. Unlike for nutrition, we conclude that toxicity has not emerged as a comprehensive issue in agriculture and food production reporting.

c. Discussion on health metrics, the need for rigor

We found that health and safety disclosures lacked a solid reporting framework, and would benefit from a more rigorous assessment. Health reporting for employees is scattered among various metrics, mostly lagging ones. To date, companies do not assess occupational disease in their staff, nor do they explicitly address supplier health concerns.

Regarding consumer health, food and agriculture companies are mostly concerned with the question of the nutritional benefits and transparency of their products. This issue is high on their agenda. An assumption, which needs to be verified, is that this health issue emerged through the involvement of stakeholders in the materiality assessment (see Section 6a on internal governance). Generally, those companies did not assess the *impact* of their products on consumer health, but rather addressed their *efforts* to offering healthy products and mitigating negative effects.

We noticed that only a few companies connected the question of healthy and organic food with a narrative on affordability. Because the price is considered the largest barrier to organic purchasing by consumers (Tranter, 2009), the growth of these markets, as alternatives to potentially harmful consumption patterns, raises the ethical question of unequal access to health for low-income populations.

The issue of consumer exposure to harmful products applies to many other sectors than only the food and agriculture sector (endocrine disruptors, for example, are present in many manufactured goods). Arguably, companies should comply with national, regional, or global health standards, but the debate is complex, as a company's capacity to influence regulatory agendas may reduce compliance thresholds. In 2017, the Monsanto papers exposed the limited ability of the European Food and Safety Agency (EFSA) to deal with corporate influence. The press revealed that the EFSA, which is responsible for assessing the toxicity of food products, had copied and pasted about 100 pages provided by the company Monsanto into the evaluation of the toxicity of the herbicide glyphosate[10,11]. Herein, we argue that corporate influence on democratic structures is one of the most important measures relating to the impact on well-being, as it can negatively affect the setting of standards (see Section 6 on governance, below).

Section 5. The philanthropic role of companies in local and global communities

Philanthropy is still a common channel of communication on company social impacts, with a total of 137 items for our 48 companies.

Philanthropy is still a substantial part of companies' social reporting. All companies report some sort of philanthropic actions. Philanthropy has various purposes: food and fighting hunger (20 companies); education of employees or local communities (10 companies); health protection (10); or community development (24). Up to 29% of companies (14) offered paid volunteering time to their employees, which arguably benefits employee self-fulfillment and well-being.

The shift towards income generation and impact investing. We reported 15 items related to improved livelihood and income generation for employees, suppliers, and communities, particularly focused on farmers. These schemes consist of developing small business opportunities for farmers and communities to raise their standards of living. For example, one company developed a mushroom production scheme in schools to meet the nutritional needs of pupils, with the excess being sold at market. The companies assessed the number of undernourished children over the years, and demonstrated good outcomes, with a sharp decrease in undernourishment. The best practice identified in the field was the systematic assessment of baseline standards of living and the needs of farmers in order to properly evaluate the results of such schemes.

Section 6. Governance disclosure, or the lack of basic information on well-being

The review of governance disclosure revealed two major themes, organized around two SDGs. The first covers all information related to the internal management of the company, its ability to evolve, analyze opportunities, and manage risks (organized under SDG 12, Responsible Consumption and Production). The second category includes all reporting information related to the company acting as a good citizen, touching upon company influence on political institutions, and relationships with national authorities (organized under SDG 16, Peace, Justice and Strong Institutions). A detailed extract of our mapping on SDG 16 is available in Annex 2.

a. Companies and good corporate governance

Table 07: Disclosure scores and coverage mapped by SDGs labeled in the Corporate Governance ('CG') category and in the Good Citizens ('GC') category and by stakeholder groups

Corporate Governance SDG	SDG 12	
SDG/ Stakeholder groups	Responsible Consumption and Production	% of CG Metrics
Consumers	1.33	8%
Employees	1.00	1%
Global Community		0%
Local Community	1.33	2%
Shareholders	1.32	87%
Suppliers	1.67	2%
All stakeholders	1.33	
Percentage of companies reporting	85%	

Good Citizen SDG	SDG 16	
SDG/ Stakeholder groups	Peace, Justice, and Strong Institutions	% of GC Metrics
Consumers		0%
Employees	3.00	1%
Global Community	1.67	30%
Local Community	1.44	62%
Shareholders	1.50	6%
Suppliers		0%
All stakeholders	1.90	
Percentage of companies reporting	71%	

Stakeholder engagement is common in the assessment of materiality. The majority of items reported on good internal governance were allocated to the shareholder community, as they can affect the value of the company, now or in the future. Thirty-four companies (70%) engaged various stakeholders in the design of their sustainability reports, and 25 performed a materiality assessment, as preconized by the GRI. However, in views of the many disclosure gaps observed in this paper, we argue that a more robust materiality assessment is needed.

A variety of disclosure items on the integration of sustainability governance. We identified no clear trend on governance indicators. About 30% of companies (15 companies) mentioned their board composition, with no clear metrics, and an average score of 0.8. Twenty percent attempted to integrate sustainability concerns in their governance by creating sustainability committees, or organizing round tables with the executive management, while 4% companies tied executive compensation to sustainability outcomes. Thirty percent of companies described a management system for assessing, and providing oversight for, sustainability risks. Eight percent of companies identified data privacy and security as one of the risks facing the company. Thirty-nine percent of companies mentioned the existence of a code of conduct, and 6% had developed codes of conduct for their suppliers.

b. Companies as good 'citizens'

Information relating to possible conflicts of interest, bribery, corruption, political advocacy, antitrust policies, and taxes are key to the well-being of global and local communities. These items were associated with SDG 16, Peace, Justice and Strong Institutions, and can be correlated with the well-being dimension 'Political voice and governance'. They are critical indicators of companies acting as good 'citizens' towards countries, and create large-scale impacts, both in terms of wealth redistribution, health, and security. We argue that the limited coverage and depth of disclosure of these issues does not match their level of importance.

More transparency is needed on tax payments. Thirty-five percent of companies (17 companies) reported on tax payments, with an average score of 1.82. A score of 2.0 was granted to companies that disclosed the amount of tax paid during the year. Only one company out of the 48 reviewed provided a clear statement on its tax policies. It disclosed the amount of tax paid by country, committed not to use opaque structures or tax havens, and pledged to pay taxes in all of the countries where it operates.

Cherry-picking on lobbying efforts. About 43% of companies (21 companies) mentioned political advocacy or political donations. Most of the items cover advocacy efforts related to positive sustainability issues, such as malnutrition, conflict minerals, and water governance. None of the companies, however, provided an overview of the full lobbying spending across countries and regulations. Two American companies, which are legally mandated to disclose their lobbying budgets and the American officials targeted, indirectly referenced their American lobbying declarations in their sustainability reports. They did not provide additional information on their lobbying activities outside of the USA. Finally, only four companies mentioned their policies on conflicts of interest, such as the financing of business and academic think tanks.

Soft policies on bribery and corruption. Thirty-three percent of companies (16 companies) reported having put in place policies to fight bribery and corruption, with an average score of 1.43, and a median score of 1.0. Companies scoring 2.0 mentioned the number of bribery training events for their staff and suppliers.

Best practices include the development of hotlines for bribery cases, and disclosure of the number of cases reported through such hotlines.

c. Discussion on governance, political voice and security reporting

We identified a large gap in company disclosures quality and depth concerning their influence over the countries in which they operated, which we consider to be the primary channel of impact over local community. We argue that tax payment, lobbying about national and regional regulations and standards, as well as the fight against corruption, can directly affect all dimensions of well-being, such as environmental protections, health, physical security, and economic security.

While many countries are experiencing historic levels of debt, increasing the tax burden on the lower and middle classes, cutting access to public services, and facing lower investment capacities, it is becoming critical for companies to make commitments about the way they pay their taxes. Too few companies addressed the question of taxes in their sustainability reports. It is true that tax information is somewhat already communicated in the audited financial data in the annual report. Nonetheless, because taxes are a key instrument to wealth redistribution and well-being, the sustainability report is a place to go beyond compliance and commit to diligent tax payment. While discussing the impact of companies on well-being, tax payment should be one of the first items on the list, and this conversation is missing.

Another missing disclosure piece is about company influence over regulation. Due to their impact over national employment, but also thanks to substantial spending, companies can easily benefit from the attention of countries representatives. Nonetheless, the societal changes for which they advocate are not publicly disclosed. A few countries, such as the USA, legally request companies to disclose quarterly the amount of spending on lobbying and the regulations targeted. The exact content of the request remains unknown. Best practices for lobbying consist of full disclosure of the lobbying spending by country, a list of regulations targeted, and transparency on the changes requested (e.g., amendments tabled, policy papers). It also consists in full disclosure of their support to think tanks, NGOs, and academic research, which can produce lobbying material, as exemplified by the case of Exxon in financing climate-denial studies (Farrel, 2016). Once again, no serious discussion on well-being indicators can take place if the question of company influence on a country is not addressed.

Finally, more information could be disclosed on company efforts to curb bribery and corruption but no clear indicator exist. According to the literature, the more a company is exposed to corruption, the less likely it is to openly communicate its anticorruption engagement (Barkmeyer, 2015; Healy & Serafeim, 2016) Few self-assessment exist, including a tool from Transparency International.

Section 7. Overlap with data-provider metrics

We reviewed the indicators of three mainstream data- and index-providers: Bloomberg[12], DataStream[13], and the Dow Jones Sustainability Index. This analysis has limitations, both in the selection of institutions reviewed and in the depth of the analysis. We decided, however, to provide a few preliminary results that complement the findings of this paper. More benchmarking is needed to assess the comparability and quality of the information channeled by data-providers to investors.

The three institutions have different focuses. Bloomberg's strength is on environmental indicators, DataStream has an even representation across the three fields, while Dow Jones leans towards social information. Dow Jones is the only institution gathering information on the activities of companies as good

citizens. Table 08 offers a snapshot of the kind of information requested (quantitative metrics vs. policies) classified under environmental, social and governance data. The most covered environmental issues are those relating to climate change, with a total of 27 items across the three sources of information relating to GHG emissions and climate, and 23 on energy management. Eleven items were reported for water management, seven for waste, and three for chemicals.

Table 08: Coverage of environmental, social and governance issues by Bloomberg ESG, DataStream and DowJones Sustainability Index.

	Environmental	Social	Internal governance	Good citizens'	TOTAL
Bloomberg total	33	14	38	0	85
Bloomberg Quantitative Metrics	*30*	*8*	*32*	*0*	
Bloomberg Policies	*3*	*6*	*6*	*0*	
Bloomberg %	*39%*	*16%*	*45%*	*0%*	
Datastream total	46	39	33	0	118
Datastream Quantitative Metrics	*43*	*30*	*27*	*0*	
Datastream Policies	*3*	*9*	*6*	*0*	
Datastream %	*39%*	*33%*	*28%*	*0%*	
DJSI total	11	33	29	16	89
DJSI Quantitative Metrics	*6*	*19*	*15*	*9*	
DJSI Policies	*5*	*14*	*14*	*7*	
DJSI %	*12%*	*37%*	*33%*	*18%*	
TOTAL COUNT	**90**	**86**	**100**	**16**	**292**
TOTAL %	***31%***	***29%***	***34%***	***5%***	

In Table 09, we organized topics based on their occurrence among the three data-providers. We observed a coverage quite similar to company coverage (e.g., GHG emissions, energy management, waste, equal opportunity, retention). Taxes, political advocacy, and employee satisfaction are less consensual issues among data-providers.

To conclude this short analysis of common indicators among data-providers, we identified similar consensuses and gaps in the topics covered by companies.

Table 09: Occurrence of topics across Bloomberg, Datastream and DowJones Sustainability Index

3 institutions	2 institutions	1 institution
Energy Management	Environmental monitoring mechanisms	Chemicals
Waste	Transportation	Water quality management
GHG emissions	Benefits	Green building
Health and safety	Employee training	Reporting practices
Compensations	Social audits and monitoring	Spills
Labor protection and human rights	Philanthropy	Biodiversity
Retention	Customer satisfaction and engagement	Employee satisfaction
Equal opportunities	Stakeholder engagement and rights	Employee engagement in governance
Gender equality	Bribery and corruption	Code of conduct
Board composition and independence		Privacy and security
Risk and crisis management		Antitrust
Executive compensation		Political advocacy
Environment management plan and systems		Taxes

Conclusions

Companies provide a substantial amount of information on their pursuits to become more sustainable. The majority of this information directly or indirectly relates to the well-being of their stakeholders, such as efforts to protect the environment, now and in the future, stakeholder working conditions, health, and security. By shifting our analytical framework from the traditional ESG classification to mapping between stakeholders and development goals, we identified several consensuses and gaps in the corporate reports we analyzed.

The most common indicators reported by companies related to climate change, the energy transition, waste, social audit and monitoring and gender equality. These indicators are channeled to investors via data-providers, such as Bloomberg, DataStream, and Dow Jones. For most of the other indicators, the information can be either insufficiently reported by the companies, or insufficiently channeled by the data-providers.

A number of other gaps have been identified. Companies could strengthen the monitoring of their local environmental impacts, such as water pollution, air pollution, biodiversity loss, and impact on the nitrogen cycle. To do so, new approaches have been created. A few tools propose moving away from the quantitative *attribution of impacts* to *contribution to impact*. Through sensors and satellite data, maps can locate high-risk areas where a company's operations might contribute to an identified environmental risk. The question is no longer how much of an impact can be attributed to a company, but rather how can the company mitigate, individually and collectively, a given risk in the targeted area. Such tools already exist for water stress and deforestation. We hope to see the development of more of these for air pollution, biodiversity loss, and nutrient cycles. In parallel, biophysical accounting tools, associated with trade data, may be able to provide more information on the environmental impacts of one crop ton, based on its origin. Better measurement of environmental impacts may improve local environmental protection and therefore local communities' well-being.

Company reporting on employee and supplier well-being is weak overall, but best practices exist, and are well documented. Key performance indicators are easily extractable from human resources data. Rigorous screening and auditing of subsidiaries and suppliers is critical to ensuring the enforcement of corporate policies. Full disclosure of the audit results also provides a strong basis for discussion.

More information could be required, relating to the economic security of employees, including data on entry-level income, contract type, and number of people recruited and dismissed. Information on employee satisfaction can be extracted from employee surveys, and, as natural language-processing becomes mainstream, companies will be able to get better information about the key concerns of their employees, including possible data on occupation illnesses or stress related to work, personal life balance, and relationships with management.

Finally, as research demonstrates an increasing concern with chemical inputs on consumer, farmer, animal, and plant health, we expect more effort to be made on health impacts related to chemical inputs, as well as mitigation efforts. This is true for the food and agriculture sector, but reporting on environmental health concerns applies to numerous other sectors.

Based on these results, it appears that the current reporting framework leaves aside many important issues related to well-being. We encourage future research to design a more rigorous reporting framework, perhaps based on an improved materiality assessment.

It also appears that companies provide *effort-driven* metrics, as opposed to *impact metrics* that would measure the effects of their actions on stakeholders. From this first glance, only a few metrics reported by companies are able to convey information about their effects. We have identified, in particular, the Aqueduct water risk scarcity assessment, which is likely to be more of an operational risk assessment than a local community impact assessment, and employee satisfaction polls.

To conclude, well-being is an interesting lens to flag existing disclosure gaps. However, shall we expect from companies to communicate on their impacts, even though such impacts can be diluted, and difficult to monitor? Or is sustainability reporting rather designed to communicate company efforts and policies, addressed in a measurable way? As the research continues to question what the right metrics are for measuring business impacts on well-being, the question of company's role in producing such data is critical. Most probably, independent data, produced by new technologies, such as satellites, social media, employment data, justice data, and environmental sensors, will provide a new generation of impact measurements. It is unclear, however, whether we should expect companies to be leaders in the design of such metrics.

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[6] Natural-language processing (NLP) is an area of computer science and artificial intelligence which processes a large amount of natural language data to evaluate trends, preferences, positive or negative feeling associated with concepts.
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[11] *The Guardian*, EU report on weedkiller safety copied text from Monsanto study. Arthur Neslen, 14 September 2017.
[12] For this paper, we reviewed the metrics selected by Bloomberg in its ESG snapshot (Excel sheet). Bloomberg also provides, in another document, corporate disclosure against the SASB information and rating from various rating agencies.
[13] Datastream is one of the ESG product developed by Thomson Reuters. It is not the only one.

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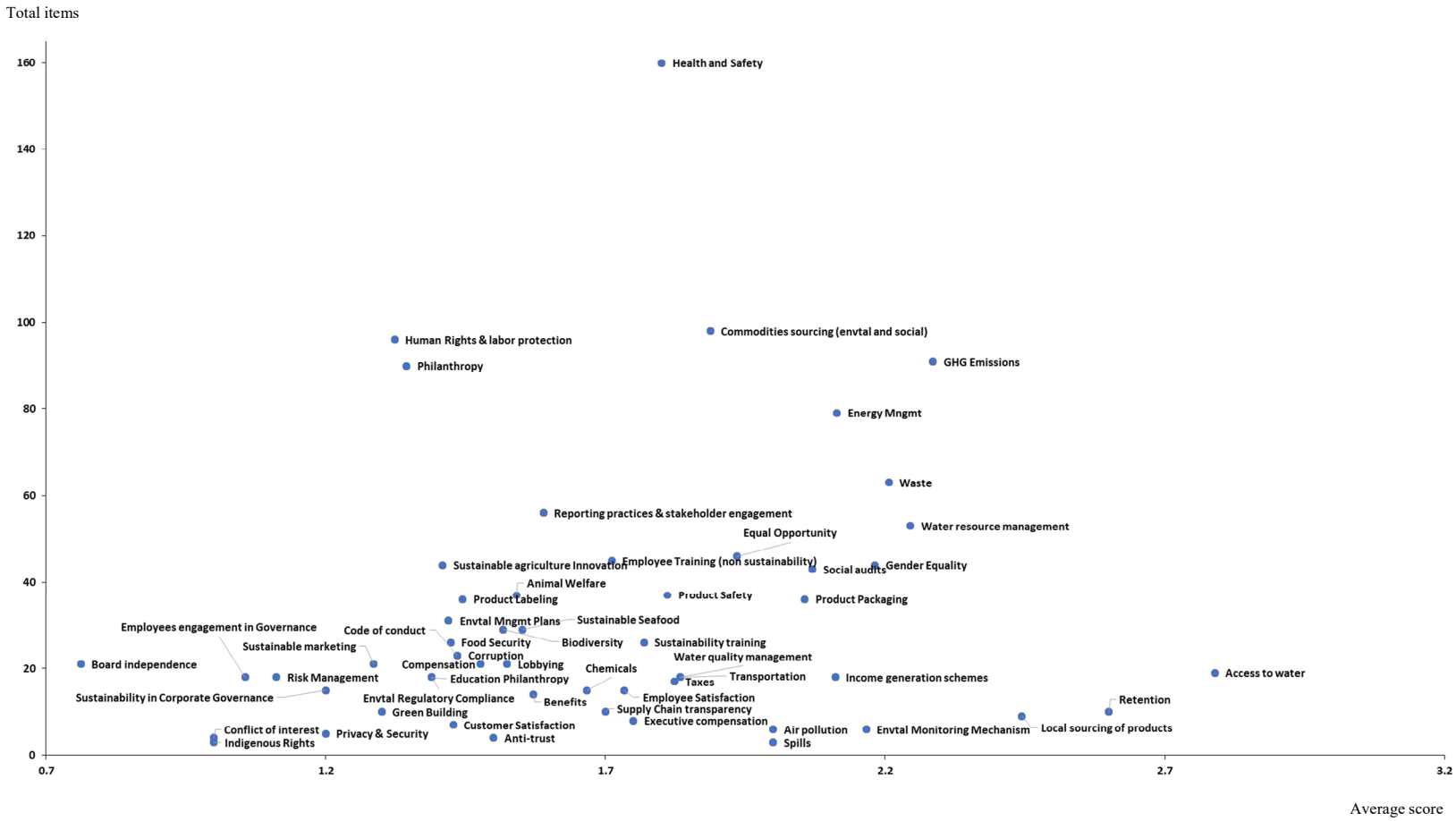
Annex 1a. Average and median scores by disclosed topics.

Issue in materiality spreadsheet	Total items	Average Score	Median Score
Access to clean and/or sufficient water	19	2.8	3.0
Air pollution	6	2.0	2.0
Animal welfare	37	1.5	1.0
Anti-trust	4	1.5	1.0
Benefits	14	1.6	1.0
Biodiversity	29	1.5	1.0
Board composition/independence	21	0.8	1.0
Bribery & corruption	23	1.4	1.0
Chemicals	15	1.7	1.0
Code of conduct	23	1.4	1.0
Compensation	21	1.5	1.0
Conflict of interest	4	1.0	1.0
Crisis & risk management	18	1.1	1.0
Customer satisfaction & engagement	7	1.4	1.0
Education philanthropy	18	1.4	1.0
Employee satisfaction	15	1.7	2.0
Employee training (non-sustainability)	45	1.7	2.0
Employee engagement in governance	18	1.1	1.0
Energy management	79	2.1	2.0
Environmental management plans and systems	31	1.4	1.0
Environmental monitoring mechanism	6	2.2	2.0
Environmental regulatory compliance	18	1.4	1.5
Equal opportunity	46	1.9	2.0
Executive compensation	8	1.8	1.0
Food security	26	1.4	1.0
Gender equality	44	2.2	2.0
GHG emissions/Climate change	91	2.3	2.0
Green building	10	1.3	1.0
Health and safety	160	1.8	2.0
Indigenous rights	3	1.0	1.0
Labor protection/Human rights	96	1.3	1.0
Livelihood and income generation	18	2.1	2.0
Local sourcing of products	9	2.4	2.0
Philanthropy	90	1.3	1.0
Political advocacy and lobbying	21	1.5	1.0
Privacy & security	5	1.2	1.0
Product labeling	36	1.4	1.0
Product packaging	36	2.1	2.0
Product safety	37	1.8	2.0
Reporting practices & stakeholder engagement	56	1.6	2.0
Retention	10	2.6	2.0
Social audits and monitoring	43	2.1	2.0
Spills	3	2.0	2.0
Supply chain transparency	10	1.7	2.0
Sustainability in corporate governance	15	1.2	1.0
Sustainability training	26	1.8	2.0
Sustainable agriculture innovation	44	1.4	1.0
Sustainable marketing	21	1.3	1.0
Sustainable seafood	29	1.6	1.0
Sustainable sourcing of commodities (environmental and social)	98	1.9	2.0
Taxes	17	1.8	2.0
Transportation	18	1.8	2.0
Waste	63	2.2	2.0
Water quality management	18	1.8	2.0
Water resource management	53	2.2	2.0

Annex 1b. Total items and average scores by disclosed topics



Annex 2. Extracts of our mapping by stakeholder group and SDG for a selection of SDGs

SDG	Topic	Stakeholder	Total Items	Number of Companies	Average Score
6. Clean Water and Sanitation	Access to clean and/or sufficient water	Consumers	0	0	
		Employees	2	2	4.0
		Global community	0	0	
		Local community	15	11	2.7
		Shareholders	0	0	
		Suppliers	2	2	2.0
	Water quality management	Consumers	0	0	
		Employees	0	0	
		Global community	0	0	
		Local community	18	15	1.8
		Shareholders	0	0	
		Suppliers	0	0	
	Water resource management	Consumers	0	0	
		Employees	0	0	
		Global community	45	34	2.4
		Local community	9	8	1.7
		Shareholders	0	0	
		Suppliers	0	0	

SDG	Topic	Stakeholder	Total Items	Number of Companies	Average Score
16. Peace, Justice, and Strong Institutions	Anti-trust	Consumers	0	0	
		Employees	0	0	
		Global community	0	0	
		Local community	0	0	
		Shareholders	4	4	1.5
		Suppliers	0	0	
	Bribery & corruption	Consumers	0	0	
		Employees	0	0	
		Global community	0	0	
		Local community	23	22	1.4
		Shareholders	0	0	
		Suppliers	0	0	
	Conflict of interest	Consumers	0	0	
		Employees	0	0	
		Global community	4	4	1.0
		Local community	0	0	
		Shareholders	0	0	
		Suppliers	0	0	
	Political advocacy and lobbying	Consumers	0	0	
		Employees	1	1	3.0
		Global community	0	0	
		Local community	20	16	1.5
		Shareholders	0	0	
		Suppliers	0	0	
	Taxes	Consumers	0	0	
		Employees	0	0	
		Global community	17	17	1.8
		Local community	0	0	
		Shareholders	0	0	
		Suppliers	0	0	

SDG	Topic	Stakeholder	Total Items	Number of Companies	Average Score
8. Decent Work and Economic Growth	Employee satisfaction	Consumers	0	0	
		Employees	15	15	1.7
		Global community	0	0	
		Local community	0	0	
		Shareholders	0	0	
		Suppliers	0	0	
	Employee training (non-sustainability)	Consumers	0	0	
		Employees	45	33	1.7
		Global community	0	0	
		Local community	0	0	
		Shareholders	0	0	
		Suppliers	1	1	1.0
	Employee engagement in governance	Consumers	0	0	
		Employees	18	12	1.1
		Global community	0	0	
		Local community	0	0	
		Shareholders	0	0	
		Suppliers	0	0	
	Labor protection / Human rights	Consumers	0	0	
		Employees	52	26	1.6
		Global community	0	0	
		Local community	0	0	
		Shareholders	0	0	
		Suppliers	52	26	1.0
	Retention	Consumers	0	0	
		Employees	10	10	2.6
		Global community	0	0	
		Local community	0	0	
		Shareholders	0	0	
		Suppliers	0	0	
	Social audits and monitoring	Consumers	0	0	
		Employees	15	12	2.6
		Global community	0	0	
		Local community	0	0	
		Shareholders	0	0	
		Suppliers	32	23	1.9
10. Reduced Inequalities	Benefits	Consumers	0	0	
		Employees	14	12	1.6
		Global community	0	0	
		Local community	0	0	
		Shareholders	0	0	
		Suppliers	0	0	
	Compensation	Consumers	0	0	
		Employees	18	17	1.3
		Global community	0	0	
		Local community	0	0	
		Shareholders	0	0	
		Suppliers	3	3	2.3
	Equal opportunity	Consumers	0	0	
		Employees	45	28	1.9
		Global community	0	0	
		Local community	0	0	
		Shareholders	0	0	
		Suppliers	2	2	1.5
	Executive compensation	Consumers	0	0	
		Employees	0	0	
		Global community	0	0	
		Local community	0	0	
		Shareholders	8	6	1.8
		Suppliers	0	0	
	Indigenous rights	Consumers	0	0	
		Employees	0	0	
		Global community	0	0	
		Local community	3	3	1.0
		Shareholders	0	0	
		Suppliers	0	0	

Annex 3. List of companies reviewed

Company

AB inBev

Ahold

Albertsons

Algar

Amaggi

Archer Daniels Midland

Bunge

Casino Group

Charoen Pokphand Foods

Chinatex

Coca-Cola Company

Cofco

Costco

Crh Beer

Danone

Delhaize

Diageo

Dunkin Brands

Dupont

FrieslandCampina

Group Calvo

Heineken

Itochu Corp

Kellogg Company

Kroger

Marfrig Global Foods

Marks & Spencer

Marubeni

McDonald's

Metro

Minerva Foods

Mitsubishi

Molinos

Monsanto

Nestle

Nidera

Noble Group

Nutreco

Olam

PepsiCo

Smithfield

Syngenta

Thai Union Group

Tyson Foods

Uni-President Enterprises

Unilever

Wal-Mart

Wilmar International

Linking SDGs, Wellbeing and KPIs in the Construction Industry/ Anat Itay Sarig[vi]

Abstract

This paper maps the use of the Sustainable Development Goals (SDGs) within the construction industry, by examining the links between SDGs and corporate Key Performance Indicators (KPIs). We offer a comparison between different measuring frameworks used by corporations, investigating the possibility that KPIs and SDGs are becoming increasingly attached due to reporting requirements made by financing institutions. We identify how reporting on environmental impact is performed by corporations in alignment with their KPIs while reporting on social impact remains qualitative and thus not adopted into main frameworks. We argue that the use of quantitative subjective indicators to report social impact can be enhanced using requirements from financing institutions, and that the well-being framework proposed by the OECD can be a mediating tool for such a task.

The study reviews the main frameworks available to corporations for measuring the impact on society and the environment, such as SDGs, KPIs, Global Reporting Initiative (GRI), International Finance Corporation (IFC) and Well-being, exploring their main traits. We then examine the KPIs of the most successful companies in the infrastructure industry (particularly the sub-industry of construction), revealing a trend of using solely objective indicators. Delving deeper, a case-study of a project in Kenya of a global construction company (SBI International Holdings AG) allows for an analysis of the specific reporting requirements made by the IFC, in regard to the KPIs of the company, compared to SDGs and well-being domains. We affirm a solid connection between the reporting requirements and the measurements used by the company as its KPIs - though it is limited to quantitative measures. We identify how measures of impact on society, though reported to the financing institute, are not adopted as KPIs, probably due to their qualitative nature. This highlights the need for structured quantitative subjective measures that can be used as KPIs and serve the company in its decision making, as well as in its monitoring of social impact. The methodology used in this study is both qualitative and quantitative in its analysis of the materials and indicators reviewed.

We conclude with three main findings: (1) SDG indicators required by financial bodies are strongly related to what the corporation decides to measure as KPIs; (2) Lack of quantitative subjective indicators is evident on all frameworks reviewed; (3) The well-being framework is a useful, unutilized framework from the public realm, that can bridge both the gap between objective and subjective indicators and the gap between KPIs and SDGs. Thus, well-being measurement should be highly encouraged.

[vi] Dr Anat Itay Sarig, Chief Scientist and co-founder of BBetter. anat@bbetter.biz

Introduction

This paper reviews different measuring frameworks, exploring how SDGs and KPIs become connected on a case study of a large construction company. We examine the different frameworks for measuring corporate impact on the environment and society, focusing on SDGs as the desired goal according to the UN, and the KPIs which are the desired goal for the corporations. Results show how closely-related these seemingly remote ends are, through mediating frameworks such as GRI and IFC requirements for funding, thus reinforcing the importance of applying financial regulations to encourage corporations to include sustainability measurements in their KPIs. In addition, the results demonstrate how quantitative subjective measurements are not included in current requirements yet can be easily introduced through the well-being connection well recognized in the public sector. Therefore, we argue that it is recommended to apply financial regulations to societal, quantitative subjective indicators reflecting corporate influence on peoples' well-being.

We begin the introduction by a short preview to the main topics of this paper: SDGs, the Construction Industry, and the milestones of the well-being approach. We conclude the introduction by explaining the flow and rational of the paper – from frameworks, to the industry review, to a specific case study and finally – to conclusions.

SDGs are landmarks all UN member countries have agreed to attain by 2030. They refer to different aspects of life, vital to the future of the world, that all stakeholders should be invested in, in order to achieve the established goals (UN, n.d.)[1]. In support of countries engagement and commitment to SDGs, there are various initiatives and resources such as extensive research (OECD, 2017a), ranking (Willige, 2017), and so on. However, while the decisions and regulations of the public sector have a well-recognized, extensive impact on achieving SDGs, the corporate world plays a truly profound role, though somewhat less recognised. It is the corporate world that actually supplies most of our infrastructure, food, utilities and much more. If the corporate world does not commit to achieving the SDGs, it is as if the world is pursuing its goals on one hand and hindering them on the other. But how can the corporate world be encouraged to participate in attaining the SDGs without harming their efforts to be successful, as viewed by the capital markets? Different tools are available and are constantly being developed to assist in this task through aligning corporate efforts, reporting with the SDGs, developing accounting standards and more. Examples vary from initiatives such as the SDG compass (SDG Compass, n.d.), Reporting Initiatives (Martinez, Keresztesi, Indrane, & Das Gupta, n.d.; Business Call to Action; GRI, 2016; The HOW Report, n.d.), Sustainability accounting (Sustainability Accounting Standards Board, n.d.), and start-ups such as ECO-OS (ECO-OS, 2016). However, measuring the business impact on SDGs is still a complex challenge, with different degrees of success attained by different industries (UNSDSN, 2015).

Measuring corporations' impact on the environment and society is especially important in the infrastructure, real estate and construction industries, as their impact on the environment and people's well-being is immediate and considerable. The construction industry has a very powerful impact on peoples' well-being and on the environment, for example through building roads and infrastructure (e.g. electricity) in places that had no prior access to it. This is in many respects' life changing, bringing services to rural areas, creating access to basic facilities, as well as access to education and employment. Nevertheless, these projects are often also harmful, both to the environment, causing problems ranging from excessive consumption of natural resources to pollution (Ding, 2008), and to the local people – their traditions and

communities. It is evident further on in this paper how the effects on the environment are being measured, while effects on people's lives, i.e. well-being measures, still pose a challenge.

The concept of well-being, its science and proposed measuring methods are becoming increasingly more noticeable in sectors responsible for the creation of public policy (Global Happiness Council, 2018). Well-being is a concept drawing from various fields of research, such as the field of quality of life (Michalos, Encyclopedia of Quality of Life and Well-Being Research, 2014), political science (Salvadori, 2006) development theories (Robeyns, 2016), behavioural economics (Tversky & Kahneman, 1992) and psychology (Diener, n.d.). The concept was introduced to the conventional international measuring systems due to concerns regarding the insufficiency of economic measurements to provide an accurate and comprehensive understanding of living conditions (OECD, n.d.). Over the past decade, the combination of countries searching for the appropriate measures to monitor and plan their progress (Trewin & Hall, n.d.; Canadian Index of Wellbeing, n.d.), the Stiglitz-Sen-Fittoussi committee in 2009 (Stiglitz, Sen, & Fitoussi, 2009) and the work carried out by the OECD, resulted in well-being becoming a recognized topic for the public sector, organizations and to some extent, the corporate world. Well-being is defined slightly differently by various measuring institutions, but it is always described to include living conditions and the ability to attain fulfilling and flourishing lives. Well-being is generally understood as describing multiple facets of life such as safety, health, wealth, infrastructure, community, etc. (Istat, n.d.) and their impact on societies, measured both objectively and subjectively. Many countries and international institutions have adopted independent measures of well-being, some applying all the elements, and others choosing those that work within their specific context (Burchi & De Muro, 2016) (OECD , 2011).

One of the most important contributions of the well-being framework is the understanding that subjective indicators are necessary to supplement objective indicators, and that without them one's life experiences cannot be fully understood. While subjective indicators are dependent upon perceptions, objective indicators describe what can be counted (Michalos, Objective and Subjective Quality of Life, 2014). Subjective indicators provide an account of how people perceive their lives, be it their satisfaction with their commute times, or their general health. Since people sense changes in their surroundings faster than immense systems (such as governments or corporations), these subjective indicators offer early warning signs for decision makers (OECD, 2013). Subjective information can be gathered either in a qualitative or quantitative manner. Qualitative subjective information includes reports elaborating on people's opinions, and it is rarely statistically representative. Quantitative subjective data, such as survey results, often does not capture the entire realm of human emotions or experiences, but it typically supplies a representing sample, indicating how specific issues are perceived by many people. Surveys and other subjective measuring tools exist within GRI, SDGs and other frameworks reviewed here, while other frameworks such as the IFC use more qualitative methods. However, they are not generally applied to measuring impact on affected populations. As subjective measures are becoming more and more commonly accepted for policy making and strategy development, tools are becoming increasingly available. Recent studies demonstrate how countries use well-being metrics (some including subjective well-being measures while others do not) for their policy creation (Durand, 2018), as well as validate the importance of such measures to the work environment (de Neve, 2018; Institute for Health and Productivity Studies Johns Hopkins Bloomberg School of Public Health, 2015).

However, SDGs and well-being have yet to become inherent aspects of corporate conduct. During its ordinary course of business, the corporate world measures many aspects of its activities. It uses different methodologies to help improve its performance and attain its goal – continuing production while increasing

profit. Financial aspects are critical, and other Key Performance Indicators (KPIs) are regularly measured to monitor the company's conduct and determine best practices. Part of the measuring performed by the private sector is a result of external demand: measuring that is required by the client and by the financing body for the client. Here we focus on the demands made by the World Bank's member organization, the International Finance Corporation (IFC). By financing many operations that take place in developing countries, IFC and other World Bank frameworks determine for companies what they should be measuring in order to be eligible for a tender (Equator Principles, 2018).

Thus, we begin in section 1 by comparing these measurement frameworks - SDGs, Well-being, IFC, KPIs - their purpose, main qualities and possible interconnections. The frameworks more common to the public sector are SDGs and well-being, while IFC and KPIs are more commonly used within the corporate world.

Section 2 explores KPIs, identifying major trends of the infrastructure industry and its sub-categories in its KPI reporting. We concentrate on leading construction companies within the industry, identifying gaps in the measurements of the environment and social aspects within the KPIs. We identify how only the most successful corporations are required to measure environmental and social impact, and that these corporations use solely objective measures, thus ignoring the subjective impact on people's well-being.

Section 3 explores a concrete example of a project SBI Holdings has operated in Kenya since 2016. The project is described, with emphasis on the requirements from the company, particularly on sustainability issues. We then examine which indicators the company reports, drawing the actual links between its relevant SDGs and KPIs. This is accomplished by comparing between KPIs and the IFC requirement measurements, and the relevant SDGs as represented by commonly used GRI measurement. The connection to well-being domains is also considered to complement this analysis.

The paper discusses three main conclusions in the concluding section: 1) what are the financial requirements or incentives necessary to measure impact on SDGs? This touches upon the issue of cost-benefit analysis each corporation conducts when making decisions; 2) what is the role that well-being indicators play in corporate thinking? Is it possible to detect well-being measurements in the corporate analysis of impact? And finally, 3) what is the potential role of subjective measurements for this industry? We conclude by suggesting how to meet the challenges hindering the use of SDGs as part of the core measurements of the business, as well as what research is further required to achieve these goals.

Section 1: Measurement Frameworks

This section reviews different sustainability measuring frameworks relevant for corporations, and the interactions between them. Measuring performance is key to both the public and private sectors. Corporations are required to produce financial reports relating directly to their KPIs. However, reporting has expanded far beyond that. Sustainability reports are becoming an informal requirement for any business interested in enhancing its reputation. This extends outwards, enabling the corporation to differentiate itself from the competitors within the field it operates in. As PwC observes, "by valuing social, environmental, tax and economic impacts, business is now able to compare the total impacts of their strategies and investment choices and manage the trade-offs" (PwC, n.d.). It also applies internally - measuring the well-being of a company's employees, including satisfaction, trust in the company vision and engagement are known to influence employee turnover and general revenue[2] (Deloitte, 2016). Thus, companies are measuring and communicating distinct types of data, including well-being, asserting that the practice has positive impacts both internally and externally (Deloitte, 2016). In other words, it is no longer a question

of whether to measure, but a question of what to measure and when to publish it. All frameworks presented in this section are highly relevant to the corporations and have interesting inter-connections. We begin with the frameworks most related to the business core: the KPIs, and then IFC representing frameworks relevant for their funding, as well as GRI relevant for their reporting. We continue with the well-being framework used by the public sector and internally within some leading corporations and conclude with the SDGs. We then present the connections between these frameworks.

Key Performance Indicators (KPI)

Corporations develop their KPIs internally, to review and monitor the corporate conduct and achievements. KPIs serve as a tool for accountability towards the corporate shareholders, thus influenced by them and the fiduciary responsibility as well. KPIs are a type of performance measurement, used by organizations to focus on the most critical aspects of organizational activity, to maximize current and future success (Parmenter, 2015). They can be both quantitative and qualitative, according to the organization's goals, and focus on a range of aspects, whether it is financial, operational, sales-related, etc. Infrastructure projects have an immense and diverse effect on the environment throughout their life-cycle (Jin, Fei, Li, & Skitmore, 2013). Sustainability indicators can provide information on any aspect of the interplay between the environment and socio-economic activities. Thus, sustainable development indicators are associated with a wide range of categories. These include economic performance, waste generation and management, material use, recycling, air quality, water quality, land use, soil, biodiversity, working conditions, services and public facilities, environmental management and policy, etc. (Tasaki & Kameyama, 2015). Apart from the objective indicators which cover timeliness, budget management, safety, health and environmental impact, subjective measures cover aspects such as satisfaction with safety and work conditions. Subjective measures include issues of quality, functionality (fulfilling the intended purpose of the project) and satisfaction (Chan & Chan, 2004). Customarily, subjective measures are reported in qualitative rather than quantitative manner (Ortar, 2018). In a nutshell, KPIs are the engines driving business strategy, influencing bonuses for management, are reported to external stakeholders, and are important for the value and reputation of the company.

International Finance Corporation (IFC) Performance Standard

Corporations wishing to win tenders dependent upon financing of the World Bank and similar organisations, mostly in projects in the developing world, need to meet standards such as the IFC regulations. The "IFC Performance Standard" is the International Finance Corporation (IFC) sustainable measurement framework. The IFC is a sister organization of the World Bank and member of the World Bank Group. It is the largest global development institution focusing exclusively on the private sector in developing countries (IFC, 2018). The IFC measurement framework aims to create a sustainable reporting system for financial institutions to assess environmental and social risk management in projects. For instance, "The Equator Principles" (EPs, based on IFC regulations) serve as guiding tools for multilateral development banks, including the European Bank for Reconstruction & Development, and export credit agencies (through the OECD Common Approaches), that are increasingly drawing on the same standards (Equator Principles, 2018). Due to these similarities, financial institutions may use an independent set of measurements, but without major differences in the actual measurement methodology, process and indicators. The IFC developed the Performance Standards (IFC-PS), a sustainability framework to articulate its strategic commitment to sustainable development and is an integral part of the IFC's approach to risk

management. The IFC-PS are designed to help avoid, mitigate and manage risks and negative impact as a way of doing business in a sustainable way. This includes stakeholder engagement and disclosing obligations in relation to project-level activities.

In the case of its direct investments (including project and corporate financing provided through financial intermediaries), IFC requires its clients to apply the IFC-PS to manage environmental and social risks and impacts so that development opportunities are enhanced.
The eight established Performance Standards that the client (the party responsible for implementing and operating the project) must meet throughout the life of an investment by IFC are:

1. Assessment and Management of Environmental and Social Risks and Impacts
2. Labour and Working Conditions
3. Resource Efficiency and Pollution Prevention
4. Community Health, Safety and Security
5. Land Acquisition and Involuntary Resettlement
6. Biodiversity Conservation and Sustainable Management of Living Natural Resources
7. Indigenous People
8. Cultural Heritage

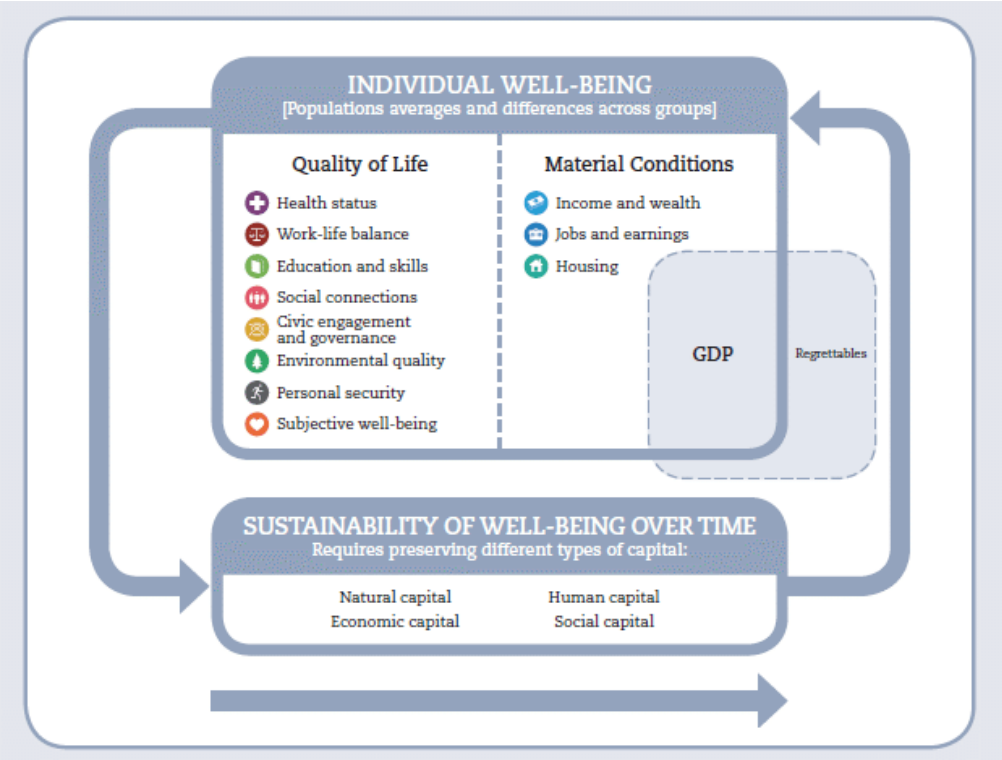
Performance Standard 1 establishes the importance of environmental and social assessment in projects and calls for effective community engagement. Performance Standards 2-8 describe the requirements from the IFC client regarding risks and impact on people throughout the project. Nonetheless, they focus on qualitative reports regarding local committees, while there are no mandatory quantitative subjective indicators in the IFC-PS, to monitor or describe how people perceive the changes their surroundings undergo.

Global Reporting Initiative (GRI)

Corporations publish an annual sustainability report. Several methodologies exist, such as frameworks by SASB, GRI, Carbon-Trust and many more. In our research we focus on the Global Reporting Initiative (GRI) framework for sustainability reporting, because 93% of the world's 250 largest corporations report their sustainability performance using the GRI Standards (KPMG, 2017). The framework sets out the principles and indicators organizations can use to measure and report their economic, environmental and social performance. The GRI mission is to make sustainability reporting standard practice by providing guidance and support to organizations. There are three universal standards used by every organization that make up a GRI sustainability report, and three series of topic-specific standards which cover economic, environmental and social impacts. The "GRI 101 – Foundation" explains the framework and reporting principles, and introduces the materiality principle, which identifies the organization's material topics, that have the most significant impact and influence on stakeholders. The materiality principle allows the organization to focus on the subjects most relevant to it. Based on the material topic, each subject-specific standard is chosen. The second universal standard is the "GRI 102 – General Disclosures," which is for reporting contextual information, and "GRI 103 – Management Approach" reports how the organization manages each material topic. Each GRI standard differentiates between reporting requirements, recommendations and guidance. None of the GRI standards address the issue of subjective quantitative measuring. We review examples of the GRI system and indicators towards the end of this section and in section 3.

The OECD Well-being Measurement Framework

The OECD has operationalised the concept of well-being by generating a measurement framework for well-being and its progress at the national level. Well-being, with its inherent consideration of various aspects of life such as safety, health, wealth and the environment, became central due to the inherent problems with modern methods to measure societal progress (OECD, n.d.). The use of macro-economic statistics, such as GDP, "did not portray the right image of what ordinary people perceived about the state of their own lives". Other than observing the scope of material living conditions, the scope of the framework is based on measuring quality of life as an element which "shapes their opportunities and life chances" (OECD , 2011). The framework is built around three categories: material condition, quality of life and sustainability, each consisting of their own domains.



The framework, aligning with the recommendations of the Commission on the Measurement of Economic Performance and Social Progress, also known as the Stiglitz-Sen-Fitoussi Commission, focuses on measuring individuals and households, not society as a whole. It measures outcomes rather than inputs and outputs, statistically examining averages and inequalities, incorporating subjective and objective indicators and is intended for NGOs, policy makers and the public sector in general. This framework is a cohesive and holistic approach to measuring well-being.

Sustainable Development Goals (SDG)

One of the most significant frameworks affirming the importance of sustainability as a global and cross-sector aspiration is, of course, the UN Sustainable Development Goals (SDGs). Adopted by countries in

2015, as the evolution of the Millennium Development Goals (MDGs) from 2000[3], SDGs are applied equally in developed and developing countries. The SDGs are a list of 17 broad goals, 169 targets and 232 indicators for 2030 and are typically referred to as "Agenda 2030". According to research by PwC, 70% of businesses plan to embed the SDGs within 5 years, and 90% of citizens think it is important that businesses implement SDGs. That said, only 13% have identified the tools they need to carry out the assessment, and 29% are setting goals (PwC, 2018).
Most of the goals refer to people, their standard of living and the opportunities available to them. Yet, the majority of indicators is objective, refraining from asking people how they perceive these circumstances and experience their opportunities.

Connections between the Frameworks

The different measurement frameworks have many similarities, and many overlapping qualities. Given that the organizations share likeminded goals, many partnerships were formed to promote these common objectives.

SDGs and GRI

A prominent example is the work of UN Global Compact, the World Business Council for Sustainable Development and GRI to create the *SDG Compass*, a tool that links between the SDGs to the relevant GRI Standards and Sector Disclosures. The table below is a partial example of SDG 3 and the relevant GRI indicators. The tables produced are set according to the SDGs, and the GRI indicators are aligned accordingly (SDG Compass, n.d.).

SDG	Business Theme	Relevant GRI Standard or Sector Disclosure	Disclosure/ Indicator Nr.	Disclosure/Indicator Title
3. Ensure healthy lives and promote well-being for all at all ages 	Access to medicines	GRI 203: Indirect Economic Impacts	203-2	Significant indirect economic impacts
	Air quality	GRI 305: Emissions	305-1	Direct (Scope 1) GHG emissions
			305-2	Energy indirect (Scope 2) GHG emissions
			305-3	Other indirect (Scope 3) GHG emissions
			305-6	Emissions of ozone-depleting substances (ODS)
			305-7	Nitrogen oxides (NO_X), sulfur oxides (SO_X), and other significant air emissions
		G4 Sector Disclosures: Airport Operators, Oil and Gas	AO5	Ambient air quality levels according to pollutant concentrations in microgram per cubic meter ($\mu g/m^3$) or parts per million (ppm) by regulatory regime
			OG6	Volume of flared and vented hydrocarbon
			OG8	Benzene, lead and sulfur content in fuels
	Disaster/emergency planning and response	G4 Sector Disclosures: Oil and Gas	OG13	Number of process safety events, by business activity
	Healthy and affordable food	G4 Sector Disclosures: Food Processing	former FP4	Nature, scope and effectiveness of any programs and practices (in-kind contributions, volunteer initiatives, knowledge transfer, partnerships and product development) that promote access to healthy lifestyles; the prevention of chronic disease; access to healthy, nutritious and affordable food; and improved welfare for communities in need
	Land remediation	G4 Sector Disclosures: Construction and Real Estate, Mining and Metals	CRE5	Land remediated and in need of remediation for the existing or intended land use, according to applicable legal designations
			MM1	Amount of land (owned or leased, and managed for production activities or extractive use) disturbed or rehabilitated
	Occupational health and safety	GRI 403: Occupational Health and Safety	403-2	Types of injury and rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities
			403-3	Workers with high incidence or high risk of diseases related to their occupation

GRI and IFC-PS

Another example is the GRI partnering with the IFC sustainable reporting to assist in closing the gap of measuring sustainability in emerging markets. The lack of sustainability reports significantly constrains investors (including institutional investors) when attempting to make an informed decision. IFC has partnered with the GRI because the GRI has established the international standard for sustainability reporting by organizations worldwide. The joint project's outcome was a "Good Practice Note" for interested companies on how to improve their sustainability reporting using the GRI Guidelines in conjunction with IFC's Sustainability Framework (IFC & GRI, 2010). The publication aligns each IFC PS to the GRI indicators.

IFC requirements	GRI Performance Indicators
PS2: Labor and Working Conditions	Labor Practices
PS3: Pollution Prevention and Abatement	Environment
PS4: Community Health, Safety, and Security	Society
PS5: Land Acquisition and Involuntary Resettlement	Society (Indirectly covered)
PS6: Biodiversity Conservation and Sustainable Natural Resource Management	Environment
PS7: Indigenous Peoples	Human Rights
PS8: Cultural Heritage	Not covered

SDG and Well-being

The final example is between the OECD Well-being framework and the SDGs (OECD, 2017).

able 1. Comparison of the OECD well-being framework and the 2030 Agenda

OECD Well-being Framework			Sustainable Development Goals
Individual well-being	*Well-being dimensions*	Income & wealth	SDG 1 (poverty); SDG 2 (food)
		Jobs and earnings	SDG 8 (decent work & economy)
		Housing	SDG 11 (cities)
		Health status	SDG 3 (health)
		Work-life balance	SDG 8 (decent work & economy)
		Education & skills	SDG 4 (education)
		Civic engagement & governance	SDG 16 (institutions)
		Environmental quality	SDG 6 (water); SDG 11 (cities)
		Personal security	SDG 16 (institutions)
	Differences across groups		SDG 1 (poverty); SDG 5 (women); SDG 10 (inequality)

OECD Well-being Framework			Sustainable Development Goals
Sustainability of well-being over time		Natural capital	SDG 13 (climate); SDG 14 (oceans); SDG 15 (biodiversity); SDG 12 (sustainable production);
		Economic capital	SDG 7 (energy); SDG 8 (decent work & economy); SDG 9 (infrastructure); SDG 12 (sustainable production);
		Human capital	SDG 3 (health); SDG 4 (education)
		Social capital	SDG 16 (institutions)
OECD dimensions of individual well-being not covered by SDGs		Subjective well-being Social connections	
Elements of SDGs not covered by the OECD well-being framework			SDG 17 (implementation) "Global contributions, trans-boundary effects, international efforts"

The OECD framework, as presented in this table, explicitly states that subjective well-being (life satisfaction) and social connections (a crucial aspect of community life) are not covered by the SDGs while covered by the OECD framework. The SDGs are closely tied to the concept of well-being, but not necessarily to its actual measuring. This is evident in the table above, by the publications linking the two (Pandyaswargo, Abe, & Fransiscus, 2015), and by the SDGs' own reference to well-being. An interesting example is Goal 9, Target 9.1.1, stating that human well-being can be supported by the development of quality, reliable, sustainable and resilient infrastructure (UNSTAT, 2015). We see here that the connection between infrastructure and individual well-being is recognized but is yet to be measured.

To conclude this section: we have reviewed here frameworks from the public sector and from the private sector to measure impact on the environment and society. We have identified the scarcity of subjective quantitative measurements while establishing their relevance, especially to measuring people's well-being. We turn to a review of the infrastructure industry, to examine whether it is possible to apply public sector framework within the private sector, and particularly in the construction industry.

Section 2: Construction Industry Measurements Overview

In the previous section we explored the main frameworks for measuring impact on the environment and society, finding that some are easily connected, and others are close in spirit yet not in indicators used. In this section we explore the infrastructure industry, connecting the framework theories to what is actually measured by leading companies, through an analysis of the KPIs they currently measure. We zoom in to the sub category within infrastructure - the construction industry, to explore its unique measuring characteristics.

Companies belonging to the Infrastructure category include entities within the fields of: energy, industrials, utilities, real estate, materials and telecommunications. We review companies ranked among the 100 most sustainable in the world by the World Economic Forum (WEF) and World Bank (WB) certified measuring entities, such as Corporate Knights. Consolidating the frameworks used across the entire industry is challenging. However, if we use The Triple Bottom Line framework (of economic, environmental and social) and the defined framework of 14 Primary KPIs of the WEF, we can determine what indicators are used within the infrastructure industry to assess and monitor sustainability. Most indicators are supported by financial data, and therefore, financial strength scores and the measuring methodology used are inter-dependent. Most indicators are measured by objective data alone, with little or no access to subjective data measurements. This seems to be the result of companies being assessed in the sustainability measuring process based on financial criteria that are not intended to be inter-connected to sustainability directly. In other words, most of the industry still refers to economic prosperity as the leading element of sustainability, rather than social or environmental impact. This creates large gaps in the results between the three categories, leading the outcomes further away from well-being, and closer to financial reporting. We argue that supplying easy access to subjective data and integrating it into the measuring methodology will fill the current data gap and supply a more holistic measurement between the economic, social and environmental indicators.

Ranking of Most Sustainable Infrastructure Companies in 2017

When reviewing the list of the most sustainable infrastructure companies of 2017 according to the report presented in January 2018 at the World Economic Forum, focused on sustainability and responsible business monitoring (Corporate Knights, 2018), we see a ranking based on publicly disclosed data (e.g. financial filings and sustainability reports). All required data points are pre-populated, and submissions from companies are not required. However, data is verified with companies on the list prior to publication (Corporate Knights, 2018). The ranking methodology is based on 14 key performance indicators (KPIs) covering resource, employee, financial management and supplier performance. All indicators are objective measured, holding the same measuring weight, and there is no subjective data (qualitative or quantitative) included in the measurement process (Corporate Knights, 2018).

Ranking Criteria

A company qualifies for the ranking process if they meet the following criteria (Corporate Knights, 2018):

- Have excess capital of $US 2 billion
- Have published public data and sustainability reports relevant to the measurement process or were willing to publicize such information after being contacted by the measuring entity.
- Scored on the 'Priority KPIs' for their respective industry and published at least 75% of the results. A Priority KPI is any of the 14 KPIs (see table 1 below) that are disclosed by at least 10% of all companies in a given industry and the four universal KPIs (No. 6,8,11 and 12), as they are mandatory disclosure points for all companies.
- Each sector was assigned a fixed number of slots in the final Global 100 list, based on each sector's contribution to the total market capitalization of the Global 100's financial benchmark. The infrastructure industry holds almost 40 slots, meaning it holds approximately 40% of the global market.

- Scored above a 5 on the F-Score of financial strength. The F-Score is the sum of scores for each of the nine tests of the Piotroski F-score methodology. Each company receives one point if it passes one of the tests, and a zero if failed. Below is a list of the nine tests:
    1. Net profit is positive
    2. Operating cash flow is positive
    3. Net profit ÷ total assets at beginning of year, minus the same number for the previous year is positive
    4. Operating cash flow is greater than net profit
    5. Long term debt ÷ by average assets has not increased
    6. The current ratio has increased (the change is more than zero, so even a negligible increase passes the test)
    7. No raising of ordinary (common) equity over the previous year: this test is passed if the company did not issue any ordinary shares (excluding shares from dividend reinvestment plans and employee share plans)
    8. Gross margin has improved over the previous year
    9. Asset turnover has increased.

Companies were eliminated if they were penalized in 2015 or 2016 in accordance with CK Financial Sanctions, for any of the following violations: anti-trust and community-related violations, environmental accidents, generalized environmental pollution, infringement of labour standards, human rights-related abuses, child exploitation or violation of collective bargaining arrangements. Companies in the bottom quartile percent score were eliminated.

This testing method discloses a few challenges: The criteria to enter the ranking itself is based on financial stability, but not necessarily sustainability. Due to the criteria that must be met to be eligible for this ranking process, it is estimated that only a small portion of the mega-corporations, and hardly any of the small to medium sized corporations in the infrastructure industry, are considered and therefore monitored. In addition, even financial sanctions for violations such as anti-trust and community-related violations are based solely on objective measures. Violations need to be extremely severe to be registered, such as a wrongful death on the construction site. This takes place while subjective indicators could have revealed discontent, for example, with safety regulations or conduct prior to such tragedies.

Categories and Priorities for KPIs

The 14 Primary KPIs included in measuring industry sustainability are divided into four categories: Resource Management, Financial Management, Employee Management and Additional (miscellaneous). See table 1 below to view the division of the KPIs across the four categories.[4] All methodologies are qualitative, and indicators used are objective.

Table 1: Primary KPIs (Corporate Knights, 2018)

No.	Category	KPI	Methodology
1	Resource Management	Energy Intensity	Revenue (converted to USD using PPP exchange rate) / (Energy use – renewable energy use)
2		Carbon Intensity	Revenue (converted to USD using PPP exchange rate) / GHG emissions: scope 1 & 2
3		Water Intensity	Revenue (converted to USD using PPP exchange rate) / Water use
4		Waste Intensity	Revenue (converted to USD using PPP exchange rate) / Nonrecycled or reused waste generated
5	Financial Management	Innovation Capacity	R&D expenses / revenue: three-year trailing (2014 – 2016)
6		Percentage Tax Paid (Universal KPI)	Cash tax amount paid / EBITDA: five-year trailing 2012 - 2016
7		CEO-Average Employee Pay	CEO compensation / average employee compensation
8		Pension Fund Status (Universal KPI)	75% (total DB and DC employer contributions/ FTE employees percentile-ranked against peers) + ¼ (fair value of DB plan assets/FTE employees percentile-ranked - (1-(fair value of DB plan assets/liability percentile-ranked)
9	Employment Management	Safety Performance	Fatalities and lost time incidents
10		Employee Turnover	Number of departures / average total employees
11		Leadership Diversity (Universal KPI)	No longer compared against same industry peers only, but against all companies in the universe
12		Clean Capitalism Pay Link (Universal KPI)	Mechanisms that link senior executive pay to clean capitalism targets
13	Additional (Miscellaneous)	Supplier score	The company's largest supplier as determined by Bloomberg and CDP
14		Clean Air Productivity score	Revenue (converted to USD using PPP exchange rate) for: VOC emissions (25%) Nox emissions (25%) Sox emissions (25%) Particulate matter emissions (25%)

The companies were scored on "Priority KPIs" for their respective industry, in addition to the four *Universal KPIs* (numbers 6, 8, 11 and 12). Among the sub categories of the industry, the construction industries measure almost all KPIs (Corporate Knights, 2018), including employee safety and diversity. However, they are limited to objective measures alone.

Zoom-in on the Construction Industry

After reviewing which KPIs are used by leading companies in the infrastructure industry, we dive into the construction sub-category, to examine its unique measuring characteristics. The infrastructure industry, a compilation of construction, energy, water, communications and utilities represents the majority of global market activities. As key actors in the management of these activities, construction companies have major responsibilities. Thus, much progress has already been made in the application of sustainability indicators in the construction industry. It has also been successfully argued that compliance with and participation in sustainability initiatives is beneficial to the business' image and its relationship with stakeholders, while also enabling it to anticipate potential future legal obligations (Nidumolu, Prahalad, & Rangaswami, 2009). These processes, whether for external or internal use, are supported by a vast organizational measurement and reporting system. The quality of the reporting system helps inform the statement of organizational sustainable performance to external stakeholders, while providing managers with criteria for sound

decision-making (de Carvalho Ferreira, 2016). Therefore, there is a desire to enhance the measuring system to provide more accurate and holistic data for the analysis process, leading to better decision-making capabilities, based on more than the dominating financial stability indicators alone.

Some of the key indicators recommended for the construction industry for these purposes are:

- Cost of materials and services: as they make up a significant portion of all construction costs, the incorporation of sustainable procurement practices throughout the supply chain helps improve the overall organizational performance (de Carvalho Ferreira, 2016).
- Supply chain influence: while subcontracting is a way to lower prices, it may have negative consequences for workers and the environment (Thomas & Tang, 2010).
- Education and training: technology and innovation are among the most important sustainability-related processes at the company level. If construction companies are hiring workers with little education, it is their responsibility to train them (Haslam, et al., 2005).
- Health and safety in the workplace: seen to be highly related to education and training (Haslam, et al., 2005).
- Innovative constructive solutions: these are often the most sustainable (de Carvalho Ferreira, 2016).

All recommended indicators are of high importance, especially since most construction companies measure sustainability at the project and not company level. Many contributed to the definition of sustainability metrics at the project level (Fernández-Sánchez & Rodríguez-López, 2010; Shen, Hao, Tam, & Yao, 2007; Zhang, Wu, Shen, & Skitmore, 2014). Two interesting paths explore models addressing sustainability based on (1) initiatives (Zhao, Zhao, Davidson, & Zuo, 2012), and (2) the identification of companies' stake-holders, addressing sustainability from the perspective of social responsibility (Cui & Lu, 2011). Considering the existing literature, very few contributors specifically address large contractors and even fewer are actually applied to, or tested in case studies. However, a tailor-made Sustainability Indicator system was recently developed and proposed to companies (de Carvalho Ferreira, 2016), with the purpose of improving companies' performance evaluation processes. This included a thorough literature review and a benchmark identifying the current best practices. This provided the support for a proposal of several KPIs able to monitor and assess sustainability in the context of construction. However, because there is no universally accepted definition of sustainability, it is only possible to summarize the implicit elements common to most definitions. Thus, sustainability is an integrative and multidisciplinary field in which the causes, effects and interactions of human action in society, the environment and the economy are studied simultaneously. All these aspects are analysed considering a time frame of several decades, to guarantee a fair distribution of resources among generations. These sustainability efforts presume that actions taken go beyond what is stated in current laws and regulations (de Carvalho Ferreira, 2016; Moldan, Januskova, & Hak, 2012). With this in mind, the notion of sustainable corporations is adapted as a starting point, in which a corporation is required to be simultaneously:

- Economically sustainable: guarantees a cash-flow sufficient to provide liquidity at any point, while producing returns for its shareholders. Adds economic value with its activity;
- Socially sustainable: adds value to the communities by increasing the human capital of individual partners and manages social capital in a way that stakeholders understand its motivations;
- Ecologically sustainable: does not participate in intrinsically destructive activities and manages its inputs or outputs of natural capital respecting a recovery rate for the environment.

The indicators used for each category are portrayed in the following table.

Table 2: Indicators for Sustainable Construction Companies (de Carvalho Ferreira, 2016).

No.	Category	Sub-Category	Indicator
E1	Economic Indicators	Economic returns to stakeholders	Gross Value Added
E2		Financial condition: profitability	Return on equity
E3			Return on assets
E4			Return on sales
E5			EBITDA margin
E6		Financial condition: liquidity	Current ratio
E7			Quick ratio
E8			Financial autonomy
E9		Financial condition: leverage	Net financial costs
E10			Current assets percentage
E11			Receivables by total assets
E12		Financial condition: activity	Working capital turnover rate
E13			Assets turnover rate
E14			Long term assets turnover rate
E15		Strategy and risk exposure	International turnover
E16			Turnover by sector of activity
S1	Social Indicators	Labour force profile	Number of employees and annual change
S2			Employees' age (<30 ; [30-50] ; >50)
S3			Part-time and temporary employees percentage
S4			Blue-collar workers percentage
S5			Turnover rate
S6		Human resources investment	Personnel costs per employee
S7			Salary per employee
S8			Education and training per employee
S9			Training costs per employee
S10			Highest to average salary ratio
S11			Total Human rights and workplace complaints
S12			Women and migrants proportion in general
S13			Women and migrants proportion in management
S14		Health and safety	Lost time injury incidence rate (LTIIR)
S15			Lost time injury frequency rate (LTIFR)
S16			Number of serious accidents
S17			Health and Safety certification
S18		Product quality, safety and suitability	Theoretical to actual guarantee release ratio
S19			Construction defects to total value ratio
S20		Ethics and contractual compliance	Theoretical to real budget ratio
S21			Theoretical to real construction time ratio
S22			Number and amount payed (legal actions lost)
S23		Local communities	Main social activities (descriptive indicator)
S24			Social investment per net result
A1	Environmental Indicators	Pressure on natural resources	Materials consumption
A2			Energy consumption
A3			Water consumption
A4			Pressure on the land
A5		Emissions and effluents	CO2 emissions

A6			Waste production
A7			Effluents production
A8		Positive pressures	Percentage of recycled and reused materials
A9			Percentage of renewable energy
A10			Percentage of waste recovered
A11		Environmental Management	Percentage of operation under an EMS

Compared to other industries, construction is characterized by a range of complexities, dynamic operational activities and is exposed to unforeseeable external factors. The construction industry's method of operation is fragmented, with multiple procurement systems and specialties, carried out by several stakeholders with varying interests. This reality, of multiple and essentially different projects, emphasizes the need to have access to dynamic and flexible measuring tools to implement on an individual basis. Case studies show that most indicators are generally measured in each global construction company and is therefore a credible measuring scale. However, three types of constraints were found in the sustainability information disclosed:

- Lack of consolidation: the data presented does not always reflect elements relevant to the whole company, but rather to specific projects;
- Omission/non-monitoring: some non-financial data is not disclosed, even when a topic is mentioned as relevant to that company's sustainability;
- Inconsistency: indicators with the same designation but different methodologies are common.

In addition to the above-mentioned constraints, the lack of public opinion from affected societies is apparent in the data calculations. This is partly due to difficulty in reporting on qualitative subjective data (such as content of grievance committees), and a lack of access to quantitative subjective data gathering tools. Even with the available adaptions and social media analysis of subjective data, a gap between the availability and quality of financial and non-financial data is still evident. This gap has repercussions on the indicators and ultimately on the conclusions taken from them. Most of the constraints can be explained by the lack of regulation surrounding one data type or another. This urges the consideration of sustainability indicators and reports as valuable scientific and managing tools, and less as marketing instruments.

Analysis of the indicators shows that there is a great need for technical and organizational capabilities, especially given that: 1) causes and effects of managerial actions take time to become evident, 2) there is no subjective measurement to give early warning signs on company conduct. Therefore, the actual effect of the construction company on local communities is difficult to establish. In order to provide appropriate assessments for the sustainability of the construction industry, different practices were recommended and are under development (de Carvalho Ferreira, 2016). It seems that adjusting or supplementing some of the objective indicators with subjective quantitative indicators would be a sensible solution. Measuring subjective quantitative indicators both internally and externally would increase the probability for early warning signs and better understanding of company conduct and impact. For example, the company can measure employees' sense of safety (internally) and satisfaction from safety within the community (externally). A comprehensive methodology should be established encouraging companies to add to their objective indicators several quantitative subjective indicators, touching upon at least two life domains. This would allow the companies to enhance their data resolution and include an even balance of social and environmental indicators to their financial sets.

After reviewing the industry, with its main KPIs and practices, the next section delves into a specific case study, thus allowing us to examine whether and how these assertions may stand in practice.

Section 3: Case Study on the Kisumu Town project in Kenya, SBI International Holdings

The case study is an opportunity to examine in practice the main assertions made in previous sections, namely regarding the connections between the different frameworks (section 1), and whether the KPIs of the construction industry as seen in section 2 can indeed be tied to them. We examine the connections between the specific project KPIs, SDGs and their relation to the IFC regulations. In addition, we observe the nature of indicators chosen and contemplate their connection to the well-being framework.

About the Company

SBI International Holdings AG is a global infrastructure company operating in Central and South America, the USA, Europe and Africa[5]. SBI implements civil engineering, development and construction projects such as: public works, roads and highways, bridges, water and wastewater plants, telecommunications, hydroelectric power plants (HPP), quarries, asphalt and concrete processing plants. The company has between 7,000-12,000 employees (depending on the projects at hand), 90% of them locals.

The Kisumu Town Project

We begin by examining an infrastructure project carried out by SBI in Kenya: The Kisumu Boys Roundabout – Mamboleo Junction. The project covers the dualling (conversion of a road to a dual way) of an existing road in Kisumu Town, by approximately 4.6 km. The project serves local traffic and relieves traffic jams, as well as opens a path for international trade with Southern Sudan (Odhiambo, 2015). The client for this project is the Kenya National Highway Authority (KeNHA), while the financing of the project is jointly covered by the World Bank and the Government of Kenya. The project started in July 2016, with a planned completion date within 18 months. The project includes many complex stages, including the maintenance of thoroughfares of traffic throughout the work, drainage, utilities and electricity. By focusing on a project that creates tangible economic and social progress but is also prone to damaging the area, the case study highlights the nexus between the core principles of the firm's business activity, and the project's impact on the society and environment.

When securing the project (as with similar ones), SBI must abide by certain regulations. As part of the World Bank's sustainability policy, it offers funding for projects that comply with social and environmental demands. The "Social and Environmental Safeguards" are established according to the Environmental Management & Coordination Act of 1999. Road construction projects must be subjected to an environmental impact assessment (EIA). Reports and licenses must be submitted proving that all aspects of environmental and social impact mitigation are implemented and periodically reported, stating the contractor's key responsibilities: Land and water contamination, displacement of people and property, pollution and waste, HIV/AIDS related impact, occupational and general health impact, including considerations such as gender equality, etc. The measurements and indicators are reviewed according to the Performance Standards set by the World Bank's private sector arm, such as the IFC. This arm defines the clients' responsibilities for managing their environmental and social risks and applies to all investment and advisory clients whose projects have gone through IFC's initial credit review process after January 1, 2012. Periodically, the World Bank updates the indicators according to need.

With respect to the Kisumu Town project and similar cases, the IFC strategy focuses on developing assets that are essential for economic growth and sustainability, to improve the quality of life of the people living

with and across the communities they serve. The IFC has identified the depth of the need for infrastructure improvements in Africa, highlighting the "untold numbers of businesses suffering for lack of reliable power for industrial processes or because it costs far too much to get their goods to the market. At the most basic level, millions of lives are threatened every day for lack of clean water or safe sanitation." (IFC, 2018). For this purpose, and in order to address these challenges, the IFC founded an equity fund dedicated to infrastructure projects in the Africa region, including roads, wind power farms and other renewable energy projects, ports, water and sewerage utilities, and social infrastructure.

Considerations of Societal Well-being in the Project

One of the most challenging aspects of such projects is that sometimes it requires resettlement action plans. Several tools have been defined to meet these challenges. A central one is the Grievance Management System. This exists to provide community members and affected persons the ability to lodge or express their grievances with the project. A Grievance Officer (GO) facilitates these interactions according to a grievance management system which is in place for 12 months from the commencement of construction to provide the following levels of amicable review and settlement. It is a qualitative and subjective process, including:

1. At-Site Level: Involving the participation of local administrators and village elders on the project site.
2. Mediation Committee: In case the grievance cannot be resolved at the first level.
3. Court of Law: The final option, if there is no solution within the project's grievance mechanisms at level 1 and level 2.

Steps for grievance resolution usually consist of:

1. Receipt of grievance or complaint by the GO
2. Determination of corrective action
3. Fact-finding meeting with the complainant
4. Implementation of the corrective action
5. Verification of corrective action
6. Action by grievance committee
7. Action by National Land Commission
8. Judicial recourse as last resort.

In some cases, the grievance resolution is the responsibility of the client (i.e. KeNHA), and not the construction company carrying out the work. Either way, this is a qualitative process, demonstrating the importance of subjective perceptions, yet is limited to a small number of people. A quantitative and subjective data (such as surveying), would offer a more inclusive, comparable picture.

Comparing Measurement Frameworks for the Project

During the project's execution, the contractor (SBI) is required to report to KeNHA and to the World Bank, as the funders of the project. Each project's measurements are a result of discourse between the contractor and the World Bank, and are reported periodically to the World Bank. This is referred to as the "Social and Environmental Safeguard". The dialogue consists of requests from the IFC for certain measurements and modifications and verifications with the contractor, according to the project's characteristics (scope, duration, industry etc.).

The table below demonstrates the alignment of the IFC topics informed in the Project Status Report (the implementation status of the Social and Environmental Safeguards) with SBI company KPIs, the matching GRI indicators and well-being topics according to the OECD Better Life index.

Table 3: Comparing Measurements across Frameworks used in the Project

Project Status Report to the World Bank	**KPI**	**GRI**	**OECD Well-being Topic**
Baseline Socioeconomic Data (demographics)	✓	102-8	Irrelevant
Land take or Resettlement of PAP's and delivery of compensation		AO8*	Housing
Community/Stakeholder Engagement		102-21 413-2	Civic Engagement
Underserved People and Vulnerable Groups		405-1	Community
Benefits and Livelihood Restoration		FS14*	Education Jobs
Grievance Redress Mechanism		103-2	Life Satisfaction Civic Engagement Community
Institutional Capacity		102-21	Civic Engagement
Disclosure of Information within the Project		102-21	Civic Engagement
HIV and AIDS Mitigation Measures			Health
Employment of Local Community Members	✓	202-2 404-[2,3]	Jobs Income
Gender Equality and Sexual Harassment	✓	414-2	Safety
Crime Management	✓	410-1	Safety
Labour Rights	✓	102-41 401-[1-3] 412-2	Jobs
Excessive noise and vibrations		AO7*	Environment
Air Pollution	✓	305-7	Environment
Road Safety	✓	CRE6	Environment Safety
Occupational Health and Safety	✓	403-[1,2]	Jobs Health Safety
Solid Wastes	✓	307-1	Environment
Liquid Wastes and Sanitation	✓	306 [1-4]	Environment
Flora and Fauna		CRE5	Environment
Water Pollution	✓	303-1 303-3 306-1	Environment
Borrow Pits Management	✓	301-1	Environment
Quarry Management	✓	301-1	Environment
Training – First Aid	✓	410-1	Health
Training – Fire Safety	✓	410-1	Safety
Training – Road Safety	✓	410-1	Safety
Campsite Management – Sanitation			Health
Camp Site Management – Welfare			Health
Camp Site Management – Safety			Safety
Campsite Management – Waste Management			Environment
Not included in the Bank's requirements	✓	302-[1,4]: Energy	Environment
Not included in the Bank's requirements	✓	414-2	Jobs Income

*Sector-specific indicators: AO – Airport Operators ; FS – Financial Services, CRE – Construction and Real Estate

Initial Findings

First, there is an alignment between the KPIs used by SBI and the GRI indicators. This demonstrates that SBI chooses to apply the GRI measurements available as part of its company KPIs. Considering the close relations between the GRI indicators and the SDGs, this demonstrates how SDGs are becoming more accessible for companies and adopted to its core measurements. However, not all GRI indicators are measured by the company as KPIs, yet all of those measured as KPIs are relevant for the financing institute. On the other hand, not all Status Report elements to the financing institute are included in the KPIs, though most of them are. It is interesting to note that those who are not included as KPIs are the ones referring mostly to society and should be measured subjectively. This ultimately demonstrates two main points: (1) SDG measures align very well with the World Bank requirements (through GRI), and (2), the company incorporates the measures into their KPIs, except for what is considered to be more challenging aspects – such as impact on society.

Another interesting phenomenon is revealed when examining the well-being topics and their relation to the other frameworks used: all KPI measurements have one or more matching topics in the OECD Better Life Index, thus demonstrating a viable and relevant connection to well-being measurement frameworks as well. The most relevant domains to this project are environment, jobs, health and safety. The domains relating to the IFC requirements yet missing from the KPIs are community, civic engagement, housing, education and life satisfaction. These life domains are crucial during such construction works, as they are most vulnerable to be affected by the project. Such is the case with housing, community life, education and skills required to the new ways of living and so on.

In other words, this reveals the obstructions to measuring central aspects of well-being, namely those involving subjective perceptions of the local communities.

Using GRI and IFC measurement as KPIs – A Discussion

We have seen that some World Bank or IFC regulations turn in practice to the company KPIs. The motivation for measuring KPIs that are also relevant to IFC frameworks comes from the direct link to core activities in the company. The IFC is an integrated part of the funding process, and the company meets these standards in order to be eligible to carry out infrastructure projects in the developing world. This is common not only with the IFC projects, but also with projects funded by other international finance and investment entities. The connection to the GRI stems from GRI supplying a framework used in the annual sustainability reports. Therefore, the company departments are reporting them. These indicators apply to all the different aspects of business and are a measure of the SDGs. In other words, choosing such KPIs serves the company in that it measures what it is already monitoring, and what it needs to monitor for financial and business purposes. Nevertheless, a few challenges are still evident:

Evaluation Considerations:

Ultimately, although the consensus on the significance and relevance of environmental and social impact assessment has a solid foundation within the literature, the challenges of measuring it have yet to be solved in practice. Members of the senior management in businesses use the data to make decisions and lead their companies. They are also evaluated according to their success or failure to deliver on these measurements and take caution in adding elements that might portray the company in anything but flattering light. The

decision of which indicators to measure, either as a KPI or as part of a sustainability measurement framework, depends heavily on the expected outcome and the requirements they create from the system. Producing subjective quantitative measuring and reports is a process that includes developing measuring mechanisms, creating databases and compiling the report, thus demanding resources and time from various company functions. Even worse, if, at the end of the day, the measurements might reveal a non-flattering picture of the company, it might not be considered a worthwhile journey to take, unless compelled to, or otherwise motivated to. Measuring the company's effect on societies does not directly create revenue, unless structured strategically from the start, or is explicitly obligated to do so by the financing body. As we have seen, the case study demonstrates how certain requirements are adopted into the KPIs, while others are reported in a qualitative manner to the financing body and are excluded from company KPIs. It is encouraging to see that "it is becoming clear to everyone in the company that measuring SDGs are no longer a privilege, but a business must in our industry" (Tapiero, 2018). However, the elements not yet included in that account are the ones that influence societies the most.

Subjective indicators

Within corporate KPIs reviewed in this paper, no subjective indicators are found. This touches on the heart of the matter. Infrastructure work affects the environment and people. Objective indicators can be used to measure the environment, and are the best measurements for it, since the environment cannot express emotions. However, people expressing their emotions can cause damage to a company, whether their emotions are justified or not. For example, when the company is protecting the environment by leaving a swamp in place, it might not seem helpful to the people in its surroundings that were hoping for economic development in the area. This could adversely affect their impressions towards the work and reflect negatively on the company. In other words, subjective indicators are perceived as risky, potentially connoting a negative reputation, and believed to be easily manipulated (Veenhoven, 2001). Nonetheless, it is indisputable that the effect on the local population and its well-being is extensive. Evidently, many of SBI KPIs refer to the community. However, they are either objective measures (thus not taking perceptions into account), or qualitative (thus less comparable and less representing) measures. This is often the case in projects around the world, where the lack of quantitative subjective indicators to measure and ideally impact the SDGs is significant. A recent analysis of a case study in Indonesia reaches very similar conclusions (Skevington & Epton, 2018). The question is whether there are mechanisms available to both encourage that type of measuring and develop solutions to increase the benefits and diminish the costs? If, for instance, companies would be obligated to measure subjective indicators (such as general satisfaction) in relevant life domains such as housing, health and community, through at least one indicator per domain, a much clearer perspective may be gained that reflects the development alongside the difficulties of projects. Such subjective indicators could identify how effective the execution of society and community-related work plans are, providing a clearer understanding of how to improve their positive impact and minimize the negative impact. Clear and straightforward indicators can save a company from wasting valuable resources, focusing them where they are most needed before it becomes too costly (post accidents, for example).

Corporate Reputation

Sustainability measuring and reporting benefits companies beyond the direct incentive to gain financial resources and projects. Employees, consumers, investors and society overall are inclined to prefer working, purchasing and investing in companies that have proven social and environmental awareness records (Philippe & Durand, 2011). In the case of SBI, in which the core activities rely on natural resources, they are expected to be accountable for the social and environmental impact they have. Therefore, corporate

awareness of the importance of environmentally and socially responsible activity has significantly increased in tandem with social norms. This incentivizes sustainability reporting as a means of strengthening the company's reputation, as one that creates social and environmental value, beyond the financial bottom line. Subjective measuring of life satisfaction (on different life domains or in general) of the local communities can greatly assist in demonstrating such achievements once a project has ended.

Well-being and Corporations

Currently, when it comes to corporations, well-being is a term mostly relegated to internal use, as in HR surveys, employee health and satisfaction programs, etc. In the context of assessing the impact of construction projects on local communities, it is starting to appear on the documents of new projects (Eco & Partner Cosult, 2015), but still has no clear measurement qualities. What this case study demonstrates is how narrow the gap is between what is already being measured, to the wider concept of well-being. However, this encapsulates two challenges: one is the aforementioned issue of subjective measures. The second is that well-being takes an approach of measuring different domains at the same time. SBI and similar companies rarely see an incentive for measuring aspects of life they do not directly affect (thus hindering the option of measuring general satisfaction from life, for example). It is therefore interesting to contemplate what strategies could be planned if the information available to the company was more extensive. Would that change the company's conduct? It might allow for better planning, smarter use of resources and a more positive impact on all stakeholders involved.

Conclusions

This paper explored the connections between SDGs and the core measures of the business, as defined by the KPIs. It examined the challenges and opportunities found in the current measuring systems, to draw recommendations on how to bring the two closer together, through a review of the construction industry in general, as well as a specific case study within the industry. It displayed the positive connection between SDGs and KPIs through financing regulations and GRI tools yet revealed the gap regarding social aspects. This is crucial for societal well-being and better planning of it within corporate conduct - but not yet recognized on the frameworks utilized for corporate measuring.

Promoting business goals is sometimes perceived as clashing with promoting environmental and social goals. This view has shifted over the years, and the measuring methods are adapting accordingly. The incorporation of sustainability indicators in general and SDG indicators in particular can be seen as a result of a twofold process. On the one hand, there is more awareness worldwide to the issues of social and environmental impact, especially in companies from the infrastructure industry, due to their immediate effect on natural resources, communities and economies. Hence, companies wishing to promote and communicate their values, find themselves measuring and reporting SDGs. On the other hand, the global awareness of sustainability and the publication of SDGs created a demand from public sector clients that the private sector comply with these standards. This, in turn, became a requirement to obtain projects. As a result, SBI and similar companies in the industry have developed a sustainable business practice over the past few years. The practice touches upon the very core of business decisions and project procurement processes throughout the company. Yet, not all aspects are measured, and the gaps are extensive when it comes to objective and particularly subjective impact on society (as opposed to the environment). Qualitative measures, though important to in-depth understanding of the field of work, do not provide impact data in a comparable, aggregated manner that can guide strategy and action. Without measuring indicators reflecting the status and perceptions of the people affected, early warning signs cannot be detected, and harm might be caused where it could have been prevented.

Our study affirms there is a connection between financial demands to the measurements chosen by the corporation as its KPIs. It also demonstrates how these incentives are not sufficient when it comes to reporting on social impact. We also see how public sector framework of well-being is compatible with corporate KPIs. Therefore, if IFC and similar funding bodies would incorporate quantitative subjective indicators as part of their standard regulations, efforts to develop best practices would follow. Using subjective indicators measured by surveying the local communities before, during and after the project, for example, would be beneficial both strategically at the company level and for monitoring SDGs globally. In practical terms, the technology, means and knowledge to collect subjective data are already established in the public sector, and those that are missing can be developed or adapted from other sectors (such as polling, data mining from social media, etc.). However, this relates heavily to the notion of well-being which the corporate world is not yet comfortable with. It is becoming more commonly mentioned in professional infrastructure documents but is yet to be established as a necessary reference for corporate conduct and applied towards the communities affected by the corporation's work. Moreover, best practices for incorporating well-being into the corporate world in general and the construction industry in particular are yet to be brought forward, and so it is a relatively new territory for most companies. Accomplishing this requires that supporting organizations such as the OECD and financing institutions further develop the ties between well-being and other frameworks, especially SDGs, in a practical, applied manner. As a way of encouraging this connection, financial institutions can incorporate a requirement to measure a few general life satisfaction questions on different life domains (such as safety and community) before, during and after the projects.

The framework of well-being takes all aspects of life into account. In that sense it is a truly reliable map of reality. It emphasizes the connections between different domains of life, asserting that actions taken in the education domain affect health, safety and so forth. A corporation's work does not impact a single domain of life. It affects all of them and what this study has shown is that very few aspects are actually being measured. This means that the framework of well-being has not been operationalized for the private sector yet, and we find that be a crucial step in the efforts to effectively engage corporations in measuring and positively impacting SDGs.

The strong ties observed in this study between the SDGs and KPIs through financing bodies and regulations support the argument that measuring is intrinsically linked to the inclusion of incentives into the ecosystem of the projects. The connections between well-being and SDGs are firm in and of themselves, so it is only necessary to recognize the missing link - the more extensive and influential the demand is on the core business (i.e. financing), the greater the chance for more extensive measuring. This can create two complementing goods: better KPIs and better success for companies (through understanding and communicating their social impact) and better impact for societies these corporations operate in.

Ultimately, quantitative subjective measurements can and should be incorporated into the standard requirements for corporations, for reasons of risk management, better planning, reputation and much more. The public sector's framework of well-being offers conceptual leads and concrete measuring tools to determine which domains should be addressed, and which subjective indicators should be measured within these domains. The well-being framework allows taking data and turning it into useful knowledge for the private sector, and in a world with plentiful data – this is an important quality. Incorporating well-being aspects into the financial regulations referring to the SDGs, is the next logical and practical step to generate massive impact on SDGs around the world.

[1] "For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and people like you."
[2] "Companies with high engagement levels see a 19% increase in operating income".
[3] MDGs are eight goals that all 191 UN member states have committed to try to achieve by the year 2015.
[4] The 2017 Global 100: Overview Methodology, p. 8. For detailed measuring methodology, see Ibid, p. 19-23.
[5] SBI has been formed in 2006, yet has operated as Solel Boneh since the 1980's.

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A new approach to the well-being of factory workers in global supply chains: Evidence from apparel factories in Mexico, Sri Lanka, China and Cambodia/ Dorota Weziak-Bialowolska, Tamar Koosed, Carlued Leon and Eileen McNeely[vii]

Abstract

Most factory studies focus only on minimal safety and health at work or on "compliance audits with minimal standards". Compliance audits typically aim for achieving minimum standards versus striving for excellence. The audit criteria are set to tackle violations only rather than to understand process of improvement, efficiencies, and the effectiveness of corrective actions.

While the relationship between health and work is not new, the measurement of health and well-being as basic goals of work, in line with business outcomes, is a new bar for social impact and global health. We posit that a transparent evaluation of workforce well-being and factory conditions, which draws directly from the experience of representative sample of all workers instead of an external auditor, has the potential to revolutionize the current compliance audit procedures that commonly lack objectivity, a more representative view of work on the factory floor, and an understanding of the linkages between drivers and outcomes of worker well-being in factory operations.

We designed a comprehensive worker survey to monitor well-being in supply factories. Survey results provide buyers, suppliers and workers with a snapshot of the average worker experience of well-being and factory conditions (compared to simple auditor reports). Applying definitions of well-being at work that draw from decades of research on occupational health and safety, work stress and job strain, well-being and socially supportive communities, we aimed to conduct a comprehensive assessment of worker needs. Further, worker health and well-being were considered in relation to various business outcomes, such as turnover and job satisfaction. From this perspective, we explored the potential dependencies between worker needs and business needs at the factory level.

Our study shows that by setting out a metric for continuous process improvement that includes workers' voice, buyers and suppliers all standing to gain – especially in the most vulnerable workforces and regions of the globe – business can choose to be a force for good by changing expectations on the factory floor.

[vii] Dorota Weziak-Bialowolska, Ph.D. Sustainability and Health Initiative (SHINE), Department of Environmental Health, Harvard T. H. Chan School of Public Health, doweziak@hsph.harvard.edu; Tamar Koosed, Manaus Consulting, tamar@manausconsulting.com; Carlued Leon, Manaus Consulting, cleon@manausconsulting.com; Eileen McNeely, Ph.D., Sustainability and Health Initiative (SHINE) , Department of Environmental Health, Harvard T. H. Chan School of Public Health, emcneely@hsph.harvard.edu

Background

Global trade has changed the way work gets done. In recent decades, the emergence of international supply chains has transformed the structure of production and employment, raising concerns about the social and environmental conditions in which goods and services are designed, produced and distributed (Barrientos, Gereffi, & Rossi, 2011; Barrientos, Mayer, Pickles, & Posthuma, 2011). Although the expansion of labor-intensive global production to developing and emerging economies has undeniably resulted in new job opportunities, especially for women and migrant workers, the terms and conditions of employment as well as labor regulations are insufficient to ensure workers' welfare in local factories (Egels-Zandén & Lindholm, 2015). Disasters that resulted in thousands of deaths, such as Rana Plaza and Tazreen Fashions factories in Bangladesh, have refocused attention toward making workers' lives safer and better.

Even before these disasters, and in consideration of weak local legal systems and regulatory oversight, many brands established audit programs to ensure safe conditions in factories. This approach targeted unmitigated and intolerable risk, a low expectation in comparison to improving the overall well-being of the workforce.

Harvard researchers at the T.H. Chan School of Public Health developed a new approach to raise the bar on factory conditions. We designed a workforce survey to register and monitor the impact of business on workers' lives. We also collected objective business metrics from factories to compare and complement subjective evaluations provided by workers. The process was intended to circumvent the known limitations of the subjective evaluations of auditors (Short, Toffel, & Huguill, 2014) by incorporating workers' perspectives (from the representative sample of all workers) directly and aiming for continuous improvement in worker well-being beyond only the simple assurance of basic compliant working conditions. Our goal was to, first, establish a common set of indicators to measure work and well-being in the factory. Second, we aimed to collect empirical evidence about the connections between drivers of well-being at work and business outcomes. Third, using this evidence, along with the tools to measure and monitor progress overtime, we sought to engage vendors in caring for their workforce.

The research team considered a holistic definition of working conditions and well-being that went beyond basic human rights and safety and included the vast literature on the potential of work to affect well-being, i.e. the fulfilment of human needs for autonomy, meaningful work and working relationships, opportunities for challenge and learning, safe physical conditions, flexible arrangements to accommodate demands outside of work, and the attainment of basic material security through ample wage compensation.

Levi Strauss & Company (LS&Co.), a US designer and distributor of apparel, became the "test bed" for this idea. The Harvard Study of Worker Well-being in Supply Chains involved LS&Co. supply factories (vendors who supply LS&Co. as well as other companies) in four countries to collect data on factory working conditions, worker well-being, and business outcomes. In this project, we piloted a fully integrated, factory-led monitoring system to demonstrate the mutual dependency between worker needs and business needs. Factories used a common platform for valuing, communicating and developing human assets (i.e. worker well-being) in line with financial goals.

Specific Aims

We designed a comprehensive worker survey to monitor well-being in supply factories. Survey results provide buyers, suppliers and workers with a snapshot of the average worker experience of well-being and factory conditions (compared to simple auditor reports). Applying definitions of well-being at work that draw from decades of research on occupational health and safety, work stress and job strain, well-being and

socially supportive communities, we aimed to conduct a comprehensive assessment of worker needs. Further, worker health and well-being were considered in relation to various business outcomes, such as turnover and job satisfaction. From this perspective, we explored the potential dependencies between worker needs and business needs at the factory level.

We focused on developing empirical evidence in three main areas:

1) The impact of physical conditions on worker physical health and business outcomes.
2) The impact of the psychosocial working environment on mental health and business outcomes.
3) The impact of overall quality of life on workers' flourishing.

To our knowledge, this is the most comprehensive view of worker well-being in the same supply chain and across four countries that sets the stage for a common approach and expectation for improving workers' lives. In this paper, we summarize the results of the study and the implications for rethinking and encouraging positive social impacts in the supply chain.

Literature review

The impact of physical working conditions on worker physical health and business outcomes

Numerous reports have chronicled the physical demands of work in the apparel factory[1] (ILO, 2016). The job usually involves handling material in sustained postures with rapid repetitive motions to achieve targets for piece rates, while working under varying conditions of temperature, restricted space, ventilation, and lighting.

Studies in occupational safety and health as well as in environmental health show that the improvement of working environment is conducive to safety and health (Marmot, Friel, Bell, Houweling, & Taylor, 2008). Physical hazards, such as lightning, temperature (i.e. heat and cold stress, humidity, air quality and air circulation) and noise, significantly affect people's health, productivity, performance and comfort (Akbari, Dehghan, Azmoon, & Forouharmajd, 2013; Kjellstrom, Holmer, & Lemke, 2009; Parsons, 2000; Xiang, Bi, Pisaniello, & Hansen, 2014). In particular, adverse physical working conditions can lead to physical health damage, such as musculoskeletal disease (Bambra, Lunau, Van der Wel, Eikemo, & Dragano, 2014; Kennedy et al., 2010), cardiac problems (Li & Angerer, 2014; Williams et al., 1962), fainting (Bodin Danielsson, Bodin, Wulff, & Theorell, 2015), dehydration (Kjellstrom et al., 2009; Parsons, 2000; Xiang et al., 2014), work injury (Engkvist, 2010; Xiang et al., 2014), fatigue (Cheuvront, Kenefick, Montain, & Sawka, 2010), lower job satisfaction (Leather, Beale, & Sullivan, 2003), increased risk of absenteeism (Widanarko et al., 2012) and increased turnover or intention of turnover (Applebaum, Fowler, Fiedler, Osinubi, & Robson, 2010).

Additionally, research on ergonomic hazards show that poor ergonomic design (as reflected by working in uncomfortable, painful and static postures) is also detrimental to physical health, causing pain and discomfort, and often results in work-related musculoskeletal disorders (Bambra et al., 2014). Ergonomic conditions, such as heavy physical work, monotonous movements and high physical demands, were also found to be associated with sickness absence, reduced work ability and turnover (Donoghue & Castle, 2007; Leijon et al., 2016; Lund, Labriola, Christensen, Bültmann, & Villadsen, 2006).

Previous studies have shown empirical and theoretical evidence supporting that physical working conditions can be conducive or detrimental to employees' physical health, job satisfaction and turnover. Based on that, we tested the following hypothesis:

Hypothesis 1: Adverse physical working conditions are detrimental to factory workers' physical health and business outcomes in global supply chains

The impact of the psychosocial working environment on mental health and business outcomes

Psychosocial work factors have been identified to be occupational risk factors for various physical and mental health outcomes (Bambra et al., 2014; Kennedy et al., 2010; Marmot et al., 2008), well-being (De Croon, Sluiter, Blonk, Broersen, & Frings-Dresen, 2004; Herr et al., 2015), job satisfaction (Price, 2001; Young & Corsun, 2010) and turnover (De Croon et al., 2004; Fuß, Nübling, Hasselhorn, Schwappach, & Rieger, 2008; Mossholder, Settoon, & Henagan, 2005; Skagert, Dellve, & Ahlborg, 2012), among others.

The research on psychosocial work exposures follows several main theoretical models. These models include: the job strain model/demand-control-support model (Karasek, 1979), which considers psychological demands, decision latitude (skills discretion and decision authority) and social support at work; the effort–reward imbalance model (Siegrist et al., 2004) which identifies the importance of effort at work and reward in terms of esteem, job promotion and job security; the job demands-resources model (Demerouti & Bakker, 2011; Demerouti, Bakker, Nachreiner, & Schaufeli, 2001), which integrates the stress and motivational research traditions in the evaluation of job demands and job resources, and; the organizational justice model (Kivimaki, Elovainio, Vahtera, & Ferrie, 2003; Ndjaboué, Brisson, & Vézina, 2012), which refers to the equity in the rules and social norms that govern companies, particularly justice with respect to distribution of resources, procedures and interpersonal relationships.

The organizational justice model considers the organizational level structures beyond any specific job. These factors – as also pointed out by other authors – may affect fairness (Maslach, Schaufeli, & Leiter, 2001), reward and recognition (Maslach et al., 2001), justice and dignity (Kolk, 2016), various forms of workplace violence, including physical violence (Loomis, Holf, Runyan, Marshall, & Butts, 2001; Rhoades & Eisenberger, 2002), verbal violence (Bambra et al., 2014; Niedhammer, Chastang, & David, 2008), sexual harassment (Diekmann, Walker, Galinsky, & Tenbrunsel, 2013; McLaughlin, Uggen, & Blackstone, 2012; Niedhammer, Sultan-Taïeb, Chastang, Vermeylen, & Parent-Thirion, 2012), and discrimination based on gender, age, ethnicity, disability or sexual orientation (Krieger et al., 2010; Thoresen, Kaplan, Barsky, Warren, & de Chermont, 2003), and job insecurity (Holtom, Mitchell, Lee, & Eberly, 2008; Marmot & Wilkinson, 2009; Thoresen et al., 2003).

This extensive literature offers strong evidence that employees exposed to adverse psychosocial factors (e.g. high work load, conflicting demands, unsupportive or hostile working environment, poor organizational climate, work pressure, job insecurity) and to low levels of control (lack of decision-making authority, inflexible time schedules, lack of skill development and skill use) are more likely to report poor mental health outcomes (e.g. psychiatric disorders, depression, anxiety) (Marmot et al., 2008; Maslach et al., 2001; Saijo et al., 2014), unfavourable business outcomes (e.g. lower job satisfaction and increased turnover) (Albrecht, Bakker, Gruman, Macey, & Saks, 2015; Avey, Luthans, & Jensen, 2009; Bambra et al., 2014; Rourke, 2014) and reduced well-being (Bakker & Demerouti, 2007; Demerouti & Bakker, 2011).

Learning from the theoretical models and empirical research, we posit that when employers offer favorable psychosocial working conditions, workers are less likely to suffer from poor mental health, are more satisfied and are less likely to leave, leading to better organizational performance. Therefore, we tested the following hypothesis:

Hypothesis 2: Adverse psychosocial working environment has a negative effect on workers' mental health and business outcomes in the global supply chain

The impact of overall quality of life on individual flourishing

The World Health Organization identifies inadequate access to health care, education, work, leisure, safe working conditions, good quality of housing and supportive communities as health damaging. It also identifies health inequality as a barrier to human flourish (CSDH, 2008; Marmot et al., 2008). International firms and agencies have been urged to center well-being (people, social justice and dignity) in their corporate social responsibility and sustainable development agendas (Kolk, 2016).

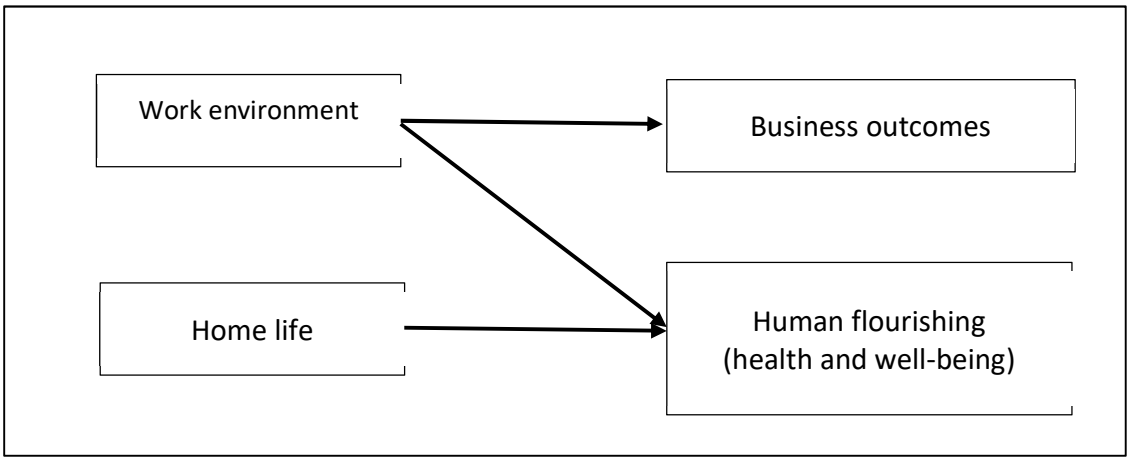
Empirical research show that access to good quality housing, clean water, and sanitation are human rights and basic needs for healthy living, which are believed to be a central component in tackling poverty and contributing to well-being (Krieger and Higgins 2002; Marmot et al. 2008; Shaw 2004). Studies also show that human flourishing can be improved through enhanced access to healthcare and education (Marmot et al., 2008), adequate nutrition (Pernia & Quibria, 1999), financial security (Davis, 2016; Marmot & Wilkinson, 2009), job security (Marmot & Wilkinson, 2009), save and supportive neighbourhood and communities (Krieger & Higgins, 2002), and proper work-family balance (Bambra et al., 2014; de Neve, Krekel, & Ward, 2018; Fuß et al., 2008).

Based on aforementioned theoretical and empirical evidence around the fulfilment of basic needs for crucial human flourishing, we tested the following hypothesis:

Hypothesis 3: Impoverishment, job insecurity, family and financial concerns, and work-home demand imbalances are impediments to human flourishing of workers in the global supply chain.

In sum, this study is a comprehensive examination of the circumstances affecting apparel factory workers' lives in four countries that includes both home and work factors yet with a strong emphasis on their work lives as this aspect may be strongly influenced and ultimately changed by buyers' and suppliers' expectations.

Figure 1. Context for worker well-being



Methods

Overview and sample

The Harvard Well-Being Survey was conducted in the LS&Co.'s supply chain (vendors who supply LS&Co. and also other companies) in Sri Lanka (July 2016 and August 2017), Mexico (February 2017 and March 2018), China (December 2017) and Cambodia (December 2017), totalling a sample of about 7,000 workers. Survey data were gathered on tablets offline or directly connected to the Harvard Survey platform while in the factories. During survey administration, groups of workers were released from their line positions (e.g. one production line at a time) to come to the survey stations. A communication campaign took place prior to survey activities to invite workers to participate in the survey. Workers' decision to participate in the survey was voluntary and was not disclosed to management. Confidentiality of survey responses was also ensured and individual survey responses were not shared with factory management. Aggregate survey results were fed back to both participants and management in separate occasions.

Each instance of survey administration was combined with qualitative data collection. First, workers were asked to provide any type of information they wanted to share with the study team via suggestion boxes placed at the exit of the survey stations.

Second, the impact of the survey process on the workers themselves was evaluated through structured interviews with a select pool of workers that supported the on-site administration of the survey. These interviews were conducted one, three and six months after the survey. As part of this exercise, we (1) evaluated whether workers felt safe and respected during and after their participation in the HWBS; and (2) collected information about the workers' understanding of the survey results once released.

After the data analysis was completed, the major findings from the survey were shared with both factory management and the workforce at large. In addition to sharing results, group discussions were arranged to collect feedback from workers. Together with the quantitative and qualitative results, the solutions proposed by workers were shared with management to address workers' wellbeing and system efficiencies.

The analyses presented in this paper uses data the 2017 survey period, totalling about 4,600 workers. (Table 1).

Table 1. Descriptive statistics

	Sri Lanka 2017	Mexico 2017	China 2017	Cambodia 2017
Number of workers surveyed and percent of the total workforce	1284 32.8	2288 58.3	419 46.0	587 19.8
Females (%)	57.7	45.4	71.2	86.5
Age - mean (SD)	30.6 (9.2)	32.5 (10.5)	34.6 (9.8)	24.6 (4.9)
Having children under 18 years old who currently live with the interviewed worker (%)	46.1	67.2	82.6	56.7
Taking care of an elderly (%)	50.5	46.2	76.4	78.3
Married (%)	57.9	44.2	81.1	60.5
Education (at least high school) (%)	59.4	33.2	20.3	18.9
Job tenure (%)				
Up to one year	36.6	39.4	53.8	34.2
More than one year and up to 5 years	23.6	34.2	31.9	53.5
More than 5 years	39.8	26.4	14.6	12.2

Instrumentation

Harvard Worker Well-Being Survey

The Harvard Worker Well-Being Survey (HWBS), a tool designed to track workers' well-being, was piloted in eight factories in the LS&Co.'s supply chain in Mexico, Sri Lanka, China, and Cambodia. This tool comprises metrics that comprehensively measure the state of health and human flourishing in the working population, specifically as influenced by physical working conditions, work rules, demands and resources, gender equity climate, learning and skill development, trusting and supportive relationships, worker input into decision-making, fairness, respect, recognition, access to healthy work environment and healthcare resources at work, and supportive social and physical resources in the community and the household. The HWBS also comprises self-reported business outcomes, such as self-reported work injury, job satisfaction and job engagement.

Business indicators

Along with survey data, we collected monthly aggregate business metrics that included regular and overtime hours, total production employees, pieces produced (targeted and actual), and quality data (numbers of pieces rejected and reworked). In addition, we obtained individual employee information related to absenteeism, voluntary turnover, and work injury. These employee data were merged with their survey data to model the impact of working conditions on the factories' most critical business outcome: turnover.

Variable definitions

Hypothesis 1

To measure physical working conditions (independent variables), we used questions about how often temperature, humidity, noise, lighting, air quality and air flow affected workers' job. To measure ergonomic conditions, we used questions about how often problems with machines or tools, uncomfortable position and prolonged position affected workers' job. Answers "frequently" or "all the time" were used to indicate whether a condition affected their job.

To gauge physical health outcomes, we used:

PHO1. Incidence of fainting in the last six months;
PHO2. At least 28 out of 30 days of not feeling pain at work;
PHO3. Reporting at least one musculoskeletal symptom limiting work activity at least occasionally in the last month;
PHO4. Feeling fatigue (limiting work activity) at work frequently or all the time in the last month;

To measure business outcomes, we used:

BO1. Self-reported work injury in the last 30 days
BO2. Job satisfaction (measured using a 10-point scale where 0=Not at all satisfied and 10=Extremely satisfied)
BO3. Turnover[2]

Hypothesis 2

To measure psychosocial working conditions (independent variables), we used questions about:

- Job demands: I have too much to do a good job; My job requires working very hard; My job requires efforts that are hard on my body.
- Meaning of job: I find my work meaningful.
- Decision authority: I get to decide how to do my job; I have a lot of say about what happens in the factory.
- Social support: My supervisor is helpful; My supervisor truly cares about me; I can depend on my co-workers for help.
- Reward and recognition: I feel recognized for my work.
- Trust, justice and fairness: My supervisor treats me fairly; Employees trust management; Being discriminated at work in the last 12 months due to gender (at least occasionally).
- Workplace verbal abuse: Experiencing threats or acts of verbal abuse at work in the last 12 months.
- Sexual harassment: Being sexually harassed at work in the last 12 months.

To gauge mental health outcomes, we used:

MHO1. At least 28 out of 30 days of not feeling depressed.
MHO2. Feeling stressed at work (to the extent that limits work activity) frequently or all the time in the last month.

To measure business outcomes, we used:

BO1. Self-reported work injury in the last 30 days
BO2. Job satisfaction (measured using a 10-point scale where 0=Not at all satisfied and 10=Extremely satisfied)
BO3. Turnover

Hypothesis 3

To test Hypothesis 3, we used statements measuring overall quality of life factors as independent variables:

- Job security: I worry about losing my job.
- Work-family conflict: Demands of my job interfere with my home life.
- Financial situation: Having savings (amount of one-month rent) to use in case of financial emergency.
- Living conditions: Having easy access to clean water, medical care and healthy food at home.
- Family concerns: Experiencing (1) verbal abuse, (2) threats of physical abuse or actual physical abuse, and (3) threats of sexual abuse or actual sexual abuse from people in worker's household.

As outcomes, a set of flourishing measures were used, including mental and physical health, happiness and life satisfaction, meaning and purpose, character and virtue, close social relationships, and financial and material stability (Węziak-Białowolska, McNeely, & VanderWeele, 2017; VanderWeele, 2017). Because these domains are assessed through two questions (each measured on a 10-point scale), they were averaged to create a composite measure of each domain. Each composite ranges from 0 to 10, with higher values indicating higher human flourishing (Table 2).

Table 2. Flourishing outcomes

Domain	Question/statement
F1. Happiness and Life Satisfaction	F1.1 Overall, how satisfied are you with life as a whole these days? *0=Not Satisfied at All, 10=Completely Satisfied*
	F1.2 In general, how happy or unhappy do you usually feel? *0=Extreme Unhappy, 10=Extremely Happy*
F2. Mental and Physical Health	F2.1 In general, how would you rate your physical health? *0=Poor, 10=Excellent*
	D2.2 How would you rate your overall mental health? *0=Poor, 10=Excellent*
F3. Meaning and Purpose	F3.1 Overall, to what extent do you feel the things you do in your life are worthwhile? *0=Not at All Worthwhile, 10=Completely Worthwhile*
	F3.2 I understand my purpose in life *0=Strongly Disagree, 10=Strongly Agree*
F4. Character and Virtue	F4.1 I always act to promote good in all circumstances, even in difficult and challenging situations *0=Not True of Me, 10=Completely True of Me*
	F4.2 I am always able to give up some happiness now for greater happiness later *0=Not True of Me, 10=Completely True of Me*
F5. Close Social Relationships	F5.1 I am content with my friendships and relationships *0=Strongly Disagree, 10=Strongly Agree*
	F5.2 My relationships are as satisfying as I would want them to be *0=Strongly Disagree, 10=Strongly Agree*
F6. Financial and Material Stability	F6.1 How often do you worry about being able to meet normal monthly living expenses? *0=Worry All the Time, 10=Do Not Ever Worry*
	F6.2 How often do you worry about safety, food, or housing? *0=Worry All the Time, 10=Do Not Ever Worry*

Statistical analysis

Descriptive statistics were first computed to present factors influencing workers' well-being. We focused on the variables identified to test our research hypotheses. Second, relationships between work-related factors, health, flourishing and business outcomes were modelled. For continuous outcomes, multiple regressions were used and standardized estimates (effect size) were reported. For dichotomous outcomes, logistic regression was applied and odds ratios were reported. To examine the association between work-related factors and the risk of leaving a factory (turnover), we used an event history analysis, i.e. the Cox proportional hazard regression model with continuous time intervals (Cox, 1972). This model allowed investigators to explore the effect of several variables simultaneously on turnover, as well as to control for this effect upon the time passed between the HWBS administration and the quitting decision. Risk ratios were reported.

Each regression controlled for (1) demographic variables: gender, age, marital status (married distinguished), education (at least high school distinguished), having children below 18 at home, taking care of an elderly, (2) general health, and (3) job characteristics: job tenure (up to one year, more than one year and up to three years, and more than three years), work shift (day shift distinguished) and factory.

Data were weighted to make results representative with respect to gender, age, job tenure and factory. Analyses were performed using Stata 14.

Results

Descriptive statistics – Health outcomes

We found that poor health outcomes varied across countries. In particular, fainting incidents at work in the six months preceding the survey were more frequent in Sri Lanka (7%), followed by Cambodia (4%) and China (2%). Also 20-40% of workers reported at least one musculoskeletal symptom limiting their activity "frequently", or "all the time", 7-19% of workers experienced pain at work three or more days in the last month and 9-22% felt fatigued at work. Additionally, 20-35% of workers reported being thirsty "frequently" or "all the time" at work, indicating possible problems with dehydration.

With respect to mental health, we observe that 12-35% of workers reported feeling depressed more than two days per month (this percentage is the highest in Sri Lanka and the lowest in Cambodia). Additionally, 4-20% of workers felt stressed at work.

Table 3. Health outcomes – percentages of positive answers

Health outcome	Sri Lanka 2017	Mexico 2017	China 2017	Cambodia 2017
Physical health				
Fainting at work in the last 6 months	6.8	na	1.8	3.9
At least 28/30 days of not feeling pain at work	83.0	93.5	92.8	81.3
At least one musculoskeletal symptom experienced at work at least occasionally in last month limits activity	45.6	29.4	31.6	21.6
Fatigue experienced at work - at least frequently or all the time in last month - limits activity	22.0	19.5	13.7	8.6
Mental health				
At least 28/30 days of not feeling depressed	65.3	80.4	87.4	88.2
Stress experienced at work yesterday - at least frequently or all the time in last month	10.9	19.5	10.2	4.2

na = "not asked"

Descriptive statistics – Business outcomes

Over 11% of workers in Sri Lanka, China and Cambodia self-reported a work injury in the last 30 days compared to 18% in Mexico. These numbers were considerably higher than the factory reported injury totals. The highest job satisfaction was observed in Cambodia (9.1 on the 0-10 rating scale), followed by China (8.6), Mexico (8.3) and Sri Lanka (7.1), where job satisfaction was 2 points lower than in Cambodia. Regarding turnover, we noticed that in Mexico on average 15% workers leave factories every month, while in Sri Lanka this number is three times lower.

Table 4. Business outcomes

Health outcome	Sri Lanka 2017	Mexico 2017	China 2017	Cambodia 2017
Work injury (self-reported) at work in last 30 days (%)	11.5	17.8	11.5	11.2
Job satisfaction – mean (SD)	7.11 (2.95)	8.35 (2.39)	8.58 (2.01)	9.07 (1.32)
Average monthly turnover rate (%)	4.8%	15.2%	nd	nd

na = "not asked"; nd = "no data"

Descriptive statistics – Flourishing outcomes

Workers in Sri Lanka scored the lowest in all dimensions of human flourishing but financial and material stability (Table 5). China and Mexico scored the highest in most flourishing factors, particularly on close social relationships and mental and physical health. In regard to financial and material stability, workers in Cambodia scored the lowest, with an average score of four points. Scores for financial and material stability also had the highest variation. This may imply considerable inequality in poverty and deprivation levels among workers in all analysed countries, especially if compared to other dimensions of human flourishing.

Table 5. Flourishing - means (SD)

Flourishing dimension	Sri Lanka 2017	Mexico 2017	China 2017	Cambodia 2017
F1. Happiness and Life Satisfaction (scale 0-10)	6.50 (3.10)	8.43 (2.16)	8.43 (1.80)	8.65 (1.57)
F2. Mental and Physical Health (scale 0-10)	7.64 (2.44)	9.10 (1.37)	8.85 (1.53)	8.43 (1.67)
F3. Meaning and Purpose (scale 0-10)	8.13 (2.42)	9.25 (1.58)	8.55 (1.63)	8.97 (1.36)
F4. Character and Virtue (scale 0-10)	8.13 (2.58)	8.89 (2.02)	8.44 (1.84)	8.94 (1.34)
F5. Close Social Relationships (scale 0-10)	7.62 (2.81)	8.90 (1.87)	9.06 (1.41)	9.05 (1.41)
F6. Financial and Material Stability (scale 0-10)	6.03 (3.23)	na	6.21 (3.42)	4.39 (3.36)

na = "not asked"

Descriptive statistics – Physical working conditions

Workers reported that factory conditions negatively impacted their work. Between 4-43% reported that physical working conditions, such as temperature, humidity, air flow, air quality, lighting and noise, affected them "frequently" or "all the time". 7-19% noted problems because of uncomfortable positions or prolonged positions (32 -38%). Additionally, 6-23% of workers reported that problems with tools and equipment affected their job performance.

Table 6. Physical and ergonomic working conditions

Condition affecting workers' job all the time or frequently (%)	Sri Lanka 2017	Mexico 2017	China 2017	Cambodia 2017
Temperature	28.0	14.7	6.0	19.1
Humidity	7.5	4.8	4.0	12.0
Noise	43.5	36.5	15.0	9.3
Lighting	12.8	9.7	6.4	40.5
Air quality	35.6	22.2	13.6	29.0
Air flow	15.5	19.6	11.2	30.2
Not working machine or tool	15.2	22.9	5.9	9.0
Uncomfortable position	na	19.2	7.1	19.2
Prolonged position	na	na	31.9	37.5

na = "not asked"

Descriptive statistics – Psychosocial work factors

More than 90% of workers in all four countries perceived their job as meaningful, even as many agreed that their jobs require hard work (China: 93%, Mexico: 80%, Sri Lanka: 75%) and is physically demanding

(Mexico: 77%, Sri Lanka: 65%, China: 47%). The workload was described as limiting their ability to do the job properly (Sri Lanka: 60%, Mexico: 66%, China: 58%). In Cambodia, workers reported lower levels of agreement with these perceptions (31% said their job was physically demanding; 34% thought it required hard work; and 38% reported high workload). Social support from both supervisors (supervisor is helpful and care about workers) and co-workers (I can depend on my co-workers for help) was the weakest in Mexico and Sri Lanka. Workers in Cambodia generally expressed the most positive opinions about the job while workers in Mexico and Sri Lanka had the most negative.

Workers generally believed the workplace was not fair, with 6-23% reporting that they were not treated fairly by supervisors and 6-29% saying they did not trust management. Workers thought they were not recognized for their work, a problem more noticeable in Mexico (43%) and Sri Lanka (26%). Between 25-35% of workers reported experiences of verbal abuse at work, up to 10% reported sexual harassment in the workplace, and 4-20% claimed discrimination due to gender.

Table 7. Psychosocial work factors

Psychosocial work factors (%)	**Sri Lanka 2017**	**Mexico 2017**	**China 2017**	**Cambodia 2017**
Job demand				
I have too much to do at work to do a good job	59.1	66.0	58.3	38.0
My job requires working very hard	74.4	79.8	93.3	33.8
My job requires efforts that are hard on my body	64.7	76.9	47.5	31.0
Meaning of work: **I find my work meaningful**	91.6	90.70	95.1	96.9
Decision authority				
I get to decide how to do my job	72.7	na	77.3	93.8
I have a lot of say about what happens in the factory	na	74.1	43.6	85.1
Social support				
My supervisor is helpful	83.2	77.0	88.2	93.6
My supervisor truly cares about me	79.2	69.4	89.0	93.2
I can depend on my coworkers for help	83.0	74.4	82.9	93.4
Reward and recognition: **I feel recognized for my work**	74.3	56.8	97.1	97.8
Trust, justice and fairness				
My supervisor treats me fairly	82.1	77.1	91.1	93.7
Employees trust management	83.7	71.5	94.0	96.5
Workplace verbal abuse: **Being threaten or experienced verbal abuse at work in the last 12 months**	35.4	34.9	25.5	25.3
Sexual harassment: **Being sexually harassed at work in the last 12 months**	5.3	9.7	4.2	0.1
Discrimination: **Being discriminated at work due to gender in the last 12 months (at least occasionally)**	19.6	14.4	3.6	3.9

na = "not asked"

Descriptive statistics – Factors related to overall quality of life

Our study shows that both job security and financial security are perceived as a considerable problem. Both are especially pronounced in Mexico and Cambodia, where more than four in five workers worry about becoming unemployed and only one out of 10 has money saved in case of emergency. We also found

evidence that work affected family life, more profoundly in Mexico and China where more than 40% of workers reported this issue.

We also found that some workers do not feel safe in their own households; 9-19% report verbal abuse, 4-10% report threats and/or experiences of physical abuse and 2-6% report threats and/or experiences of sexual abuse at home. With respect to adequate living conditions, we found that some workers live in households without easy access to clean water (4-11%), medical care (6-21%) and healthy food (7-11%).

Table 8. Factors related to overall quality of life

Factors related to demands of living (%)	Sri Lanka 2017	Mexico 2017	China 2017	Cambodia 2017
***Job security:* I worry about losing my job**	34.1	85.7	41.1	82.2
***Financial situation:* Having savings to use in case of financial emergency (amount of one month rent)**	29.4	15.6	51.1	10.8
***Work-family conflict:* Demands of my job interfere with my home life**	27.1	42.8	40.6	31.5
Living conditions				
Easy access to clean water	91.0	88.6	94.1	96.3
Easy access to medical care	93.1	81.2	79.1	94.3
Easy access to healthy food	91.1	89.1	93.0	93.3
Family concerns				
Threats or experiences of verbal abuse from people in your household	18.5	9.4	9.0	12.2
Threats or experiences of physical abuse from people in your household	7.1	4.5	4.4	9.6
Threats or experiences of sexual abuse from people in your household	6.0	1.5	3.0	3.5

na = "not asked"

The impact of physical working conditions on worker physical health and business outcomes

Our analyses show that physical working conditions are associated with physical health status. In particular, temperature complaints were associated with the increased probability of feeling pain or fatigue at work. Humidity complaints were associated with increased probability of days with pain. Noise complaints were associated with feeling fatigued. Inadequate lightning was found to increase probability of fainting episodes.

Further, workers reported more fatigue when machines or tools were not operational. Poor ergonomic conditions, i.e. prolonged or sustained positions, increased the risk of experiencing at least one musculoskeletal disorder.

Table 9. Physical working conditions and physical health.

Condition affecting workers' job all the time or frequently	Fainting at work[b]	Musculoskeletal symptom[a]	Days without pain (at least 28/30)	Feeling fatigued
	Logistic regression - Odds ratio			
Temperature	1.063	1.207	0.627**	2.341***
Humidity	1.659	1.213	0.589*	0.771
Noise	1.271	1.834	0.838	2.724***

Lighting	3.984*	0.692	0.868	0.997
Air quality	0.689	0.565	1.210	0.832
Air flow	1.976	1.417	0.949	1.171
Not working machine or tool	1.398	0.589	0.817	1.561**
Uncomfortable position[a]	-	1.383	-	-
Prolonged position[a]	-	2.282**	-	-

****p<0.001, **p<0.01, *p<0.05*

Note: Each regression was controlled for (1) demographic variables: gender, age, marital status (married distinguished), education (at least high school distinguished), having children below 18 at home, taking care of an elderly, (2) general health and (3) job characteristics: job tenure (up to 1 year, more than 1 and up to 3 years, and more than 3 years), work shift (day shift distinguished) and factory. All independent variables are dichotomous with reference category "no";

[a]questions about uncomfortable position and prolonged positions were asked only in China and Cambodia; we did not use them in all regressions not to limit the sample size and not to limit generalizability of results; however, as these two ergonomic factors are indicated in the literature as the main causes of musculoskeletal disorders, we included them in the regression of musculoskeletal symptom;

[b]question about fainting incidence was not asked in Mexico, therefore this regression is based on data from China, Cambodia and Sri Lanka only;

Physical working conditions were also found to affect business outcomes. Inadequate temperature and air flow significantly increase the risk of work injury. Poor temperature, faulty tools and machines, and noise decreased job satisfaction. In contrast, air flow increased job satisfaction. None of these physical working conditions was related to turnover.

Table 10. Physical working conditions and business outcomes

Condition affecting workers' job all the time or frequently	**Injury at work**	**Job satisfaction**	**Turnover[c]**
	Logistic regression; Odds ratio	Linear regression; std. est.	Cox regression; risk ratio
Temperature	1.535**	-0.104***	0.705
Humidity	1.408	0.002	1.569
Noise	1.224	-0.087***	1.036
Lighting	0.809	-0.014	1.473
Air quality	0.880	0.020	0.956
Air flow	1.601**	0.049*	0.986
Not working machine or tool	1.244	-0.113***	0.921

****p<0.001, **p<0.01, *p<0.05*

Note: Each regression was controlled for (1) demographic variables: gender, age, marital status (married distinguished), education (at least high school distinguished), having children below 18 at home, taking care of an elderly, (2) general health and (3) job characteristics: job tenure (up to 1 year, more than 1 and up to 3 years, and more than 3 years), work shift (day shift distinguished) and factory. All independent variables are dichotomous with reference category "no";

[a]Questions about uncomfortable position and prolonged positions were asked only in China and Cambodia; we did not them in all regressions not to limit sample size and not to limit generalizability of results; however, as these two ergonomic factors are the main causes of musculoskeletal disorders we included them in the regression of musculoskeletal symptom;

[c]Turnover analysis is based on Mexican data only

The impact of the psychosocial working environment on mental health and business outcomes

The results showed that perceiving the job as meaningful is related to lower risk of depression and greater job satisfaction. Workload, reported as physical demands of the job, were associated greater risk of having work injuries and feeling stressed at work.

Social support, in terms of co-worker relations, was related to more positive mental health. In addition, the experience of caring supervisors and helpful co-workers increased job satisfaction. Co-worker support in particular was related to a decreased risk of turnover. Recognition at work significantly increased job satisfaction.

The analysis showed further impacts of relationships at work. Trust in management was related to decreased stress and increase job satisfaction. Gender-based discrimination increased the risk of depression and lowered job satisfaction. Workplace abuse, i.e. reporting threats and/or experiences of verbal abuse at work increased the probability of depression, stress and work injury, while it lowered job satisfaction. A similar finding is also observed for sexual harassment, i.e. increased risk of depression and work injury.

Table 11. Psychosocial working conditions, mental health and business outcomes

	Days without feeling depressed (at least 28/30)	**Feeling stressed yesterday at work**	**Injury at work**	**Job satisfaction**	**Turnover**
	Logistic regression; odds ratio		Linear regression; std. est.		Cox regression; risk ratio
Job demand					
I have too much to do at work to do a good job	0.873	1.239	1.167	-0.021	0.989
My job requires working very hard	0.830	0.900	0.792	0.031	1.192
My job requires efforts that are hard on my body	0.906	1.346*	1.720***	-0.006	0.877
***Meaning of work:* I find my work meaningful**	1.615**	0.927	0.846	0.124***	0.845
Social support					
My supervisor is helpful	1.091	0.800	0.974	0.034	1.022
My supervisor truly cares about me	1.197	0.857	0.744	0.075***	1.192
I can depend on my coworkers for help	1.130	0.742*	1.114	0.042*	0.627*
***Reward and recognition:* I feel recognized for my work**	1.218	0.797	1.089	0.148***	1.048
Trust, justice and fairness					
My supervisor treats me fairly	1.091	0.928	0.943	0.020	1.074
Employees trust management	1.088	0.620**	0.774	0.165***	1.080

Being discriminated at work due to gender in the last 12 months (at least some discrimination, at least occasionally)	0.712*	1.267	1.215	-0.038*	0.950
***Workplace verbal abuse:* Being threaten or experienced verbal abuse at work in the last 12 months**	0.409***	2.258***	1.556***	-0.095***	1.399
***Sexual harassment:* Being sexually harassed at work (last 12 months)**	0.637*	1.377	1.833**	0.008	0.806

****p<0.001, **p<0.01, *p<0.05*

Note: Each regression was controlled for (1) demographic variables: gender, age, marital status (married distinguished), education (at least high school distinguished), having children below 18 at home, taking care of an elderly, (2) general health and (3) job characteristics: job tenure (up to 1 year, more than 1 and up to 3 years, and more than 3 years), work shift (day shift distinguished) and factory.

[b]*Turnover analysis is based on Mexican data only*

The impact of demands of overall quality of life on individual flourishing

Our analysis revealed that the quality of life is significantly related to individual flourishing. Job insecurity and financial worry negatively impacts workers' financial well-being. Fulfilment of basic needs in terms of access to medical care and proper nutrition also affects workers' flourishing. In particular, insufficient access to medical care negatively impacts life satisfaction and happiness, as well as and character and virtue. Inadequate access to healthy nutrition has a negative influence on health, life satisfaction and happiness, social relationships, and material and financial stability. Violence in the household also showed to be an important factor affecting workers' flourishing. Our analysis shows that experiences of verbal abuse from people in the household adversely affects life satisfaction and happiness, character and virtue, social relationships, and material and financial stability.

Home life is also impacted by work life. Conflicts between work and family obligations negatively affects life satisfaction and happiness, health, social relationships, and financial and material stability.

Table 12. Demands of living and human flourishing

	Happiness and life satisfaction	**Mental and physical health**	**Meaning and purpose**	**Character and virtue**	**Close social relationships**	**Financial and material stability[c]**
	Linear regression - standardized estimates					
***Job security:* I worry about losing my job**	-0.005	0.009	0.029	0.037	0.015	-0.144***
***Financial situation:* Having savings to use in case of financial emergency (amount of one month rent)**	0.063***	0.019	0.023	0.040*	0.051**	0.188***

***Work-family conflict:* Demands of my job interfere with my home life**	-0.094***	-0.058**	-0.028	-0.030	-0.072***	-0.104***
Living conditions						
Easy access to clean water	-0.009	0.032	0.037	0.014	0.012	0.015
Easy access to medical care	0.074***	0.020	0.045	0.101***	0.026	0.023
Easy access to healthy food	0.086***	0.066**	0.019	0.039	0.094***	0.142***
Family concerns						
Experience of verbal abuse from people in your household	-0.070***	-0.038	-0.024	-0.080***	-0.087***	-0.062*
Experience of threats of physical abuse or physical abuse from people in your household	-0.017	-0.016	-0.022	-0.030	-0.029	-0.006
Experience of threats of sexual abuse or sexual abuse from people in your household	0.011	0.027	0.026	0.020	0.027	0.002

****p<0.001, **p<0.01, *p<0.05*

Note: Each regression was controlled for (1) demographic variables: gender, age, marital status (married distinguished), education (at least high school distinguished), having children below 18 at home, taking care of an elderly, (2) general health and (3) job characteristics: job tenure (up to 1 year, more than 1 and up to 3 years, and more than 3 years), work shift (day shift distinguished) and factory.

[c]This regression is run on data from China, Cambodia and Sri Lanka; In Mexico questions about financial and material stability were asked using different wording, which limits the comparability.

Qualitative findings

The qualitative comments collected from workers through suggestion boxes[3], from group discussions and interviews confirmed the survey findings. In comments related to the survey, workers were thankful that someone cared about them and allowed them to voice their concerns, worries and hopes for change. Some employees expressed distrust that anything would change or that the survey would be useful at all. A large number of comments showed negative opinions about management.

While people may be prone to take time to register complains rather than compliments in a suggestion box, the most recurrent comments about management practices or systems revolved around: (1) *Lack of trust and fairness related to insufficient or incorrect pay* (either missing hours, unpaid overtime, or miscellaneous charges or deductions) and (2) *Lack of respect from supervisors related to perceptions that workers were mistreated* (such as unpredictable schedules, excessive working hours and forced overtime, difficulty obtaining leave permissions, inequitable treatment and favoritism, and verbal abuse). Challenges related to the physical structure of the plant were also raised, including poor air quality, inadequate ventilation, excessive heat, lack of clean and cold drinking water, excessive noise, inadequate work stations or equipment, locked and dirty bathrooms without sufficient supplies (toilet paper), dirty canteen with limited space, lack of healthy food choices, and broken microwaves.

In addition, workers explained that they are stressed about meeting production goals in order to get bonuses, one of the underlying issues behind verbal abuse at the factory. Workers also mentioned workload and pressure to hit targets as factors affecting the capacity of co-workers to build good relationships, as there is

little free time to bond with peers. A recurrent recommendation from workers was to revise production targets, which were perceived as unrealistic or inadequately calculated, and to improve the quality of communications between workers and supervisors/management.

Although workers did not anticipate that management would make changes in response to survey results, in our three-month follow-ups, workers named some tangible adjustments. In Mexico, some workers reported more ventilation and breaks for exercising, free transportation to/from work, and more drinking water fountains in the factory. In Sri Lanka, half of the checkers reported health check-ups, health awareness campaigns, and health related trainings, including information sessions on personal hygiene, cleanliness and water, family planning, gender equality, and social behavior (aimed to address harassment issues).

Lessons learnt

The type and depth of management response to our findings varied importantly across countries, with some factories making traditional investments (ad-hoc programmatic approach) and others making investments geared toward creating system-wide, work climate changes. In Sri Lanka, factories tended to adopt ad hoc solutions, such as health campaigns/short trainings to address specific health issues. Nonetheless, the solutions adopted were designed in direct response to survey results and input from workers, leading to the implementation of strategies that were more conducive to address key well-being and business issues compared to programs previously carried out. These strategies included improving temperature and ventilation in workstations, as validated in interviews and group discussions with workers. Other strategies involved addressing verbal and sexual harassment at the factory and improving worker-supervisor and worker-worker communications.

In Mexico, investments ranged from quick ad-hoc changes to system-wide adjustments, both strategies responding to survey and worker comments results. To improve specific physical conditions at the factory, management adopted measures such as increasing the number of fans and drinking water fountains, as well as purchasing better chairs for workstations. It also provided free transportation and reduced the volume of music around workstations. A large investment was a new face recognition payment system to address workers' concerns about missing worked hours in their pay and miscalculated overtime hours. Another ongoing strategy is the development of a new formula to calculate productivity and establish more adequate production targets. Finally, the factory has added new shifts to certain production areas to significantly curb overtime.

Discussion and conclusions

While the relationship between health and work is not new, the measurement of health and well-being as basic goals of work, in line with business outcomes, is a new bar for social impact and global health. We believe that a transparent evaluation of workforce well-being and factory conditions, which draws directly from the experience of a representative sample of workers, has the potential to revolutionize the current compliance audit procedures that commonly lack objectivity, a more representative view of work on the factory floor, and an understanding of the linkages between drivers and outcomes of worker well-being in factory operations. We argue that our approach will allow for a comprehensive look into the existing relationship between factories and their labor force – allowing workers to be part of the process, and suppliers and buyers to appreciate the business case for action given this ecosystem view. The system enhancement will add the feature of optimizing work systems over merely flagging minimal operating conditions. Our study provides evidence to this reasoning.

Specifically, our study shows that improved physical and ergonomic working conditions, which seem to be a standard in developed countries, are still lacking in middle- and low-income countries, exposing workers to serious health hazards and limiting their job satisfaction. Our findings thus confirm our first research hypothesis. We join with Marmot at al. (2008) in claiming that work, which is perceived as a mode to leave poverty and improve quality of life, does not necessarily function this way in developing countries. We also present evidence that adverse psychosocial conditions do have a detrimental effect on workers' mental conditions, affect their occupational safety by increasing risks of work injuries, and lead to decreased job satisfaction and higher turnover. This implies that our second research hypothesis is confirmed. In particular, we learnt that through trusting, caring and supportive climate, which ensures recognition of efforts and provides meaning to tasks conducted, the mental conditions of workers can be improved, work hazards alleviated and job satisfaction increased. Turnover may also be decreased through the supportive attitude of co-workers. We also found confirmative evidence that alleviating demands of living in terms of fulfillment of basic needs for safety, nutrition, health care and financial security, as well as ensuring balance between work and family life, contribute to workers' flourishing. This confirms our third research hypothesis.

Our conclusions are in line with suggestions of International Labour Organization (ILO, 2016), Kolk (2016), Locke et al (2009), Lund-Thomasen and Lindgreen (2014), Marmot et al. (2008) and WHO (CSDH, 2008), among others, that international businesses should go beyond implementing minimum standards of safe labor and instead develop policies that reduce workers' exposure to health-damaging physical and psychosocial work factors and policies to better balance work and family life. International businesses should also work with vendors and suppliers to ensure workers' decent living conditions and financial well-being by securing a living wage and reducing job insecurity.

We posit that going beyond compliance to focus on workers – their needs, their dignity and their social justice – can create tangible benefits for both workers and businesses. In contrast to the traditional compliance model, our approach makes evident the connection between workers' well-being and business outcomes. Through it, manufacturers can better appreciate how worker well-being can be a key input into their production processes and make their business model stronger. Our study shows, however, that to this end, engagement of and training for local factory managers – both essential to let them understand importance of worker's value as a resource and not only perceive him/her through cost lenses, as also advocated by Lund-Thomsen and Lindgreen (2014) – are needed.

For example, in Sri Lanka, one of the two countries for which we have results from two data collection points, our efforts were directed to make manufacturers understand that setting up better systems to improve workers' well-being and track business metrics on a monthly basis enables assessing trends in the data and exploring causal factors. Although we must admit that well-being conditions have not changed much yet, we observed a substantial drop in the turnover rate (from 8.4% in 2016 to 4.8% in 2017 – until September 2017).

To conclude, most factory studies focus only on minimal safety and health at work or on "compliance audits with minimal standards". Compliance audits typically aim for achieving minimum standards versus striving for excellence. The audit criteria are set to tackle violations only – still not always successfully or in a limited way due to the subjectivity of an auditor – rather than to understand process of improvement, efficiencies, and the effectiveness of corrective actions. Our study shows that by setting out a metric for continuous process improvement that includes workers' voice, buyers and suppliers all standing to gain – especially in the most vulnerable workforces and regions of the globe – business can choose to be a force

for good by changing expectations on the factory floor. In other words, raising the bar to workers' well-being, raises the curtain to a new stage of opportunity for enhancing workers' lives and efficiency in the business.

Despite certain contributions of our study, we note that factors found as significant may be interpreted as likely drivers only – a result of using cross-sectional data. As such we advocate for an approach whereby once the correlates are detected, in-depth analyses based on longitudinal panel data are necessary to confirm their casual influence. Such analyses are to be conducted in the near future as we are in the phase of collecting longitudinal data. Other limitations of our study relate to the fact that this study was conducted in one buyer supply chain and in only four countries, yet, providing data from more than 7,000 workers. It is worth noting that additional two buyers are about to join the study.

[1] (http://www.ilo.org/dhaka/Areasofwork/working-conditions/lang--en/index.htm).

[2] Association between work-related factors and the risk of transitioning from employment in a factory to leaving a factory was conducted only on the Mexican subsample. It was not feasible to conduct this analysis using Chinese and Cambodian HWBS as the survey was conducted there in December 2017 implying that the time past between HWBS administration and potential leaving was insufficient. Turnover metrics provided by factories in Sri Lanka appeared to be of poor quality limiting considerably reliability of turnover analysis. Turnover data was collected by the factories (based on personnel files) and shared with the study team. This data served to compute two variables. One indicates whether an employee quit or not the factory in the four-month period after the administration of the HWBS (dichotomous indicator). The second one reflects the time between taking the HWBS and quitting (continuous indicator ranging from one to 142 days). These variables were merged with the WBS data.

[3] Conclusions presented below are based on 1672 comments collected in Mexico and 540 comments collected in Sri Lanka in 2017.

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Measuring the Impact of Businesses on Workers' Job Satisfaction: Evidence from a Canadian Longitudinal Workplace and Employee Survey/ Danny Leung and Huju Liu[viii]

Abstract

Job satisfaction contributes to an individual's overall sense of well-being. This paper provides Canadian evidence on the relationship between workplace policies / practices and employee job satisfaction using a unique longitudinal matched database, the Workplace and Employee Survey (WES). Methodologically, this paper adopts a first-difference panel data method for estimating ordered logit models to control for unobserved time-invariant fixed effects. In addition, this paper takes into account selection, the possibility that there are unobserved characteristics that affect both workers' job satisfaction and their decision to remain with their employer. To control for selection, this paper constructs industry– and region-specific job creation and destruction rates for use in the Heckman selection model. The estimation results show positive selection. That is, workers who are more likely to stay with the same employer are more likely to experience an increase in job satisfaction.

After controls for fixed effects and selection are applied, the results show that having an employee participation program (or high-involvement work design) or a personal and family support program is important for job satisfaction. The impact of introducing these programs could be as large as the impact on job satisfaction of increasing the change in hourly wages from 3% (the median) to 84% (the 99th percentile). A detailed examination of which types of programs are more effective reveals that having a communication mechanism between employees and management (such as employee surveys, employee suggestion programs, and frequent notifications about overall workplace performance or changes) or having elder care and employee assistance programs in the workplace is important for job satisfaction.

[viii] Danny Leung, Director, Economic Analysis Division, Statistics Canada, danny.leung@canada.ca; Huju Liu, Senior Economist, Economic Analysis Division, Statistics Canada, huju.liu@canada.ca, 100 Tunney's Pasture Driveway Ottawa, ON K1A 0T6, Canada,

Introduction

There is a growing consensus that measures of material well-being, such as gross domestic product (GDP), income and wealth, fall short of explaining what really matters to an individual's overall well-being or happiness (Stiglitz et al. 2009). Consequently, there has been a call for the measurement and analysis of people's subjective well-being in many countries (Stiglitz et al. 2009; Organisation for Economic Co-operation and Development (OECD) 2013).

Job satisfaction forms an integral part a person's subjective well-being, as most people spend many hours in a day and many days of their lives at work. Job satisfaction can be viewed as a single metric of utility / welfare that workers derive from their jobs out of the entire profile of job and workplace characteristics (Hamermesh 2001), which includes but is not limited to, compensation, non-wage benefits, working hour arrangements and job flexibility, job security, employee participation in decision making, training opportunities, and employee and family support programs. Job satisfaction has been extensively studied in the economics literature and other branches of social research. In general, higher job satisfaction is related to higher life satisfaction (Helliwell and Huang 2010), lower quits and absenteeism (Akerlof et al. 1988; Clark et al. 1998; Freeman 1978), higher job performance and productivity (Iaffaldano and Muchinsky 1985; Böckerman and Ilmakunnas 2012), and higher organizational performance (Ostroff 1992). Hence, it is important for businesses, in their own interest, to improve the job satisfaction of their workers.

This paper aims to assess the impact of various business practices or policies on workers' job satisfaction using a unique Canadian longitudinal employer–employee linked survey, the Workplace and Employee Survey (WES). Matched microdata are particularly useful in examining the relationship between workers' job satisfaction and business practices / strategies.[1] However, studies on this subject using linked data have been limited in Canada.[2] The WES is particularly useful in studying the link between job satisfaction and business policy because its longitudinal structure makes it possible to control for unobserved heterogeneity. Furthermore, its information on both employees and workplaces allows the use of an extensive list of individual and workplace characteristics as controls.

In this paper, two methodological issues are addressed during the estimation of the relationship between job satisfaction and business policies. First, it has been noted that unobserved heterogeneity is important in accounting for the variation in job satisfaction (Ferrer-i-Carbonell and Frijters 2004; Haile 2015). A number of estimation strategies that use panel data for estimating ordered logit models with individual specific unobserved heterogeneity have been developed in the literature. For example, Ferrer-i-Carbonell and Frijters (2004) developed a fixed-effect ordered logit estimator where an optimal cut-off was defined for each individual. Baetschmann et al. (2015) proposed an alternative estimator (the Blow-up and Cluster estimator, BUC) that is easy to implement and nearly as efficient as other estimators. To address this issue, this paper adopts a first-difference panel data method for estimating ordered logit models to control for unobserved time-invariant individual fixed effects.

Second, a selection issue is also addressed in the estimation. The WES contains 3 short 2-year panels for workers: 1999-to-2000 panel, 2001-to-2002 panel, and 2003-to-2004 panel. Detailed job satisfaction was asked only of those employees who had stayed with the same employer over the two years. Therefore, the identification of individual unobserved heterogeneity in the WES relies on the sample of workers who do not change workplace. This leads to a selection problem because job satisfaction has been shown to affect worker turnover (Akerlof et al. 1988; Clark et al. 1998). This paper uses the Heckman (1979) model to control for selection. The selection into continuing with a workplace is modeled, and the inverse Mills ratio

is added to the first-difference ordered logit regression as an additional control. Neither the estimation method proposed by Ferrer-i-Carbonell and Frijters (2004) nor Baetschmann et al. (2015) takes into account the selection issue.

Using the proposed methodology, this paper examines the relationship between employee job satisfaction and particular business policies / practices. Specifically, the impact of practices that encourage employee participation, training, personal and family support programs, and non-wage benefits is examined. Satisfaction can come from learning, problem-solving, and inter-group cooperation. Many studies have argued that job characteristics like participation, learning, and autonomy can motivate workers and increase their work potential (Hackman and Oldham 1976). The preliminary results of this study show that on-the-job training (literacy, numeracy and IT-related), high-participation work design (employees frequently being informed about workplace performance), personal and family support (employee assistance and elder care help), and non-wage benefits (supplements to employment insurance benefits for maternity / parental leave or lay-offs) are positively associated with increases in job satisfaction. Quantitatively, the impact of these policies / programs on job satisfaction is similar to the impact of increasing changes in the hourly wage from the median to the 99th percentile.

The rest of the paper is organized as follows. Section 2 describes the design of the WES and its information on job satisfaction and business policies / practices. The econometric framework is discussed in Section 3. Section 4 examines estimation results from pooled cross-sectional regressions and the first-difference ordered logit regression with selection. Section 5 concludes the paper.

Data

The empirical analysis is carried out using the Statistics Canada's Workplace and Employee Survey (WES). The WES was designed to be representative of all business locations operating in Canada with paid employees in March. Employers in the Yukon, Nunavut and the Northwest Territories are excluded, as are employers operating in certain industries, such as crop production and animal production, fishing, hunting and trapping, private households, religious organizations, and public administration. The target population for the employee component is the employees of the selected workplaces who are working or are on paid leave in March.

The WES is a survey with a longitudinal design. In 1999, a sample of about 9,000 business locations was drawn from Statistics Canada's Business Register. This sample was based on 252 strata defined by industry, region and workplace size. These workplaces were followed over time until 2006. The initial sample was supplemented at two-year intervals with new locations, in order to keep the sample cross-sectionally representative, in 2001, 2003 and 2005. A random sample of up to 24 employees was drawn for each selected workplace in the odd survey years (1999, 2001, 2003, and 2005). The employees were followed for up to two years. Over the period from 1999 to 2006, the survey response rate ranged from 74% to 95%. This resulted in a sample size of 5,818 to 6,693 workplaces and 16,804 to 24,197 employees.[3]

The WES has a few advantages over other matched data that have been used to study job satisfaction, such as the British Workplace Employment Relations Survey (WERS) and the European Community Household Panel (ECHP)—Finnish Longitudinal Employer-Employee Data (FLEED). First, whereas the WES took place each year from 1999 to 2006, the WERS took place only every few years. Second, the WES is a panel for both workers (although only two years) and workplaces, while the WERS is only a panel of workplaces with large gap.[4] Third, the WES covers a variety of business policies / practices / strategies. The ECHP—FLEED does not have as much coverage and detail.[5]

In the WES, two questions about satisfaction were asked, one about satisfaction with the compensation package in view of the job responsibilities and the other about job satisfaction. For both, employees could respond in any of five ways: "very satisfied" (1), "satisfied" (2), "dissatisfied" (3), "very dissatisfied" (4), and "no opinion" (5).[6] All employees sampled in 1999, 2001, 2003, and 2005 were asked these questions. However, only those employees who stayed with their employers were asked these questions in 2000, 2002, and 2004.

The WES covers a wide range of workplace policies, not only the availability of specific policies, but also employees' use of policies. The workplace policies considered in this paper include policies related to the following: high involvement or employee participation; job-related training; employee and family support programs; and non-wage benefits.

High-involvement or employee participation policy asks how frequently employees participate in each of the following activities: team or circle concerned with quality; employee feedback or suggestion programs; job rotation or cross-training programs; task teams or labor-management committees; self-directed workgroups; and notifications through a workplace performance newsletter. Employees respond for each question with "never," "occasionally," "frequently," or "always."

In regard to training and development, employees were asked whether they had received any job-related classroom training paid or provided by employer, and whether they had received on-the-job training sponsored by employer. For both classroom training and on-the-job training, the main focus of the training was also sought. The analysis groups the responses into four types: training related to team building or problem solving; literacy, numeracy or IT training; managerial / supervisory training, professional or apprenticeship training, and sales and marketing training; and other training.

In regard to employee and family support programs, employees were asked whether personal support or family services were provided by their employer. Possible programs include child care, employee assistance, elder care, and fitness and recreation services. For each type, employees were also asked whether they used those programs.

Employees were also asked whether any non-wage benefits were provided by their employer. Non-wage benefits include pension plans, life insurance, and dental plans. Workers were also asked whether they participated in each of those non-wage benefit plans.

In addition to these workplace policies, WES also contains information on a range of individual and workplace characteristics. Individual characteristics include age, gender, immigrant status, age on arrival in Canada, marital status, number of children, education level, and occupation group. Job-specific characteristics are also covered: tenure; the time since the last promotion; whether the individual is overqualified for the current job; whether the working arrangement is flexible; whether the job is full-time or part-time; whether the job involves overtime; whether the job is indeterminate or a term position; the hourly wage; and whether bonuses and tips are received. Workplace characteristics include industry, region, employment size, hiring rate, and job separation rates.

Econometric framework

Job satisfaction in the WES is measured on a scale of 1 to 4, where 1 stands for "very satisfied," 2 stands for "satisfied," 3 stands for "dissatisfied," and 4 stands "very dissatisfied." In general, one can estimate job satisfaction by means of an ordered probit or logit; whether this is done depends on the probability

distribution of the error term. Taking an example of ordered logit, one can estimate job satisfaction according to the following equation:

$$\Pr(JS_{it} = k) = \Pr\left(\mu_k < X_{it}\beta + \varepsilon_{it} \le \mu_{k+1}\right) = \frac{1}{1+\exp\left(X_{it}\beta - \mu_{k+1}\right)} - \frac{1}{1+\exp\left(X_{it}\beta - \mu_k\right)} \quad (1),$$

where i is an index for individual and t is an index for time; k is the value for job satisfaction score, k=1 to 4, in the WES; X_{it} is a covariate vector of interest for each individual at time t ; μ_k and μ_{k+1} are the cut-offs when $JS_{it} = k$ is observed; and ε_{it} is assume to be Intergenerational Income Database standard logistic.

It has become increasingly important to acknowledge the significance of unobserved heterogeneity in accounting for the variation of job satisfaction (Ferrer-i-Carbonell and Frijters 2004, Haile 2015). With unobserved heterogeneity, equation (1) becomes

$$\Pr(JS_{it} = k) = \Pr\left(\mu_k < X_{it}\beta + \alpha_i + \varepsilon_{it} \le \mu_{k+1}\right) \quad (2),$$

where α_i denotes the time-invariant individual effect that could correlate with X_{it}. Without properly treating α_i, estimates of β could be biased. A number of estimation strategies developed in the literature have used the panel data method for estimating ordered logit models with individual-specific correlated unobserved heterogeneity. For example, Ferrer-i-Carbonell and Frijters (2004) developed a fixed-effect ordered logit estimator where an optimal cutoff is defined for each individual and the optimal cutoff is the one that minimizes the individual Hessian matrix. Baetschmann et al. (2015) proposed an alternative estimator (the Blow-up and Cluster estimator, or BUC) that is easy to implement and nearly as efficient as other estimators. Essentially, the BUC estimator transforms all ordered multiple response into dichotomous choices for each individual and applies a conditional fixed-effect logistic regression.

The WES contains 3 short 2-year panels for workers: 1999-to-2000, 2001-to-2002, and 2003-to-2004. A random sample of employees was also available in 2005, but they were not followed into 2006. Moreover, detailed job satisfaction was asked only of those employees who stayed with the same employers. For those who changed employers, a question was asked only in order to compare job satisfaction at the new job with job satisfaction at the old job without corresponding information on the new employer. Therefore, the identification of individual unobserved heterogeneity in the WES relies on the sample of workers who do not change workplaces. However, this may lead to a selection problem as job satisfaction has been shown to affect worker turnover (Akerlof et al. 1988; Clark et al. 1998).

To take into account both unobserved individual heterogeneity and the selection issue, this paper adopts a first-difference panel model, which cancels out the time-invariant individual fixed effect, augmented with Heckman selection (1979). Specifically, the study estimates the change in job satisfaction on changes in covariates of interest. That is,

$$\Delta JS_{i,j} = \Delta X_{i,j}\delta + \varphi_{i,j} + u_{i,j} \quad (3),$$

where $\Delta JS_{i,j}$ denotes the change in job satisfaction over the two consecutive years for individual i in panel j; $\Delta X_{i,j}$ denotes the changes in individuals' covariates; and $\varphi_{i,j}$ denotes the inverse mills ratio, the selection

term for each individual.[7] Note that, since the job satisfaction score in the WES takes on four values, the change in job satisfaction score takes on seven values.

To construct the inverse mills ratio, the probability of an employee staying with the same employer is first estimated using a probit model. That is,

$$Y_{it} = Z_{it-1}\gamma + \epsilon_{it}, \quad (4)$$

where $Y_{it} = 1$ if an individual worker still worked for the same employer in the second year of each panel as in the first year, 0 if the worker did not; Z_{it-1} is a set of covariates that would have impact on job change. Therefore, the inverse mills ratio is calculated as

$$\varphi_{i,j} = \frac{\phi(Z_{it-1}\hat{\gamma})}{\Phi(Z_{it-1}\hat{\gamma})},$$

where ϕ and Φ are probability density function (pdf) and cumulative density function(cdf) of standard normal distribution, respectively, and $\hat{\gamma}$ is the coefficient estimate from equation (4).

An important identification requirement for the Heckman selection method is an exclusion criterion. That is, *Z* must contain at least one variable not in *X* in equation (2). The aggregate job reallocation rate (job creation and job destruction rate) at the region and industry levels is chosen as the exclusion criterion. The intuition is that workers' mobility is certainly related to the aggregate job reallocation at the industry and region levels at which they belong. Workers in a fast-growing industry likely have more outside opportunities. Similarly, workers in a declining industry likely experience more job mobility, either voluntarily or involuntarily. However, it is unlikely that the aggregate job reallocation rate is closely related to workers' job satisfaction.[8]

The National Accounts Longitudinal Microdata File (NALMF), developed at Statistics Canada, is used to construct the aggregate job creation and job destruction rates. The NALMF is an administrative databank created by joining several administrative tax data in Canada. The target population of the NALMF consists of all corporations (either with or without employees) and unincorporated businesses with employees. Detailed firm-level information on employment, payroll, income statement, and balance sheet are included in the NALMF.

More specifically, for every employer firm in the NALMF from 2000 to 2006, the study calculates job creation and job destruction rates following Davis and Haltiwanger (1999). The job creation rate is the positive employment changes between two adjacent years divided by the average employment over the same two adjacent years. The job destruction rate is calculated as the absolute value of negative employment change divided by the average employment over the same two adjacent years. The aggregate rates by region (Census Metropolitan Area, or CMA) and industry (three-digit level of the North American Industry Classification System, or NAICS) are simply the weighted average of firm-level rates using firm employment as the weight. Finally, the aggregate job creation and job destruction rates are linked to the WES for the same CMA and three-digit industry combination.

Results

1. Description of sample used in the estimation

As discussed in Section 2, the worker portion of WES comprises three panels, each being two years in length. Workers in the first year are followed into the second year as long as their workplaces are still in scope. Workers whose firms exited in the second year are not surveyed. The sample used for the estimation is constructed by taking all of the workers from WES, excluding all years of data for those that are not surveyed in the second year. The result is a balanced panel, including individuals surveyed in the second year, but who may have exited the labour force, become self-employed or changed workplaces in the second year.

Additionally, those that had no opinion about their job satisfaction in either of the two years in which they were surveyed are also dropped from the estimating sample. This removes approximately 0.5% of the observations in each panel.

2. Ordered logit – Job satisfaction

For comparison purposes, Table 1 first presents the estimates from the ordered logit described in equation (1) that was run on a sample of workers who stayed in the same workplace over the two-year panel. In this first set for regressions, the wide range of workplace practices that could be analyzed in the WES are collapsed into a smaller number of summary variables.[9]

The first set of results in Table 1-Model 1, with inclusion of satisfaction with money, shows that workplace policies are associated with higher job satisfaction even after controlling for a range of individual, workplace and job characteristics. Workers who received, in the previous twelve months, job-related classroom training or on-the-job training had higher job satisfaction in the year in which they received that training.

Workers who report frequent participation in at least one of the workplace employee participation initiatives (including employee surveys, employee suggestion programs, job rotation or cross-training, being informed of workplace performance or changes, task teams or labour-management committees aimed at addressing a broad range of workplace issues, teams concerned with quality or work-flow issues, and self-directed work groups that have high-level responsibility for a project or service area), also tend to have higher job satisfaction in the year during which they participate.

The availability of various personal or family support programs (including child care, employee assistance, elder care, fitness and recreation programs, and other personal and family support programs) is also associated with higher job satisfaction. The positive association is even stronger for workers who report using at least one of these programs.

Surprisingly, the relationship between the availability of non-wage benefits at the workplace (including pension plans, life insurance, and dental plans) and job satisfaction, the relationship between the participation in these plans and job satisfaction, and the relationship between wages and job satisfaction are not statistically significant in Model 1. However, the association between wages and job satisfaction, and the association between participation in these non-wage benefit plans and job satisfaction, are positive and statistically significant in Model 2. The key difference between Model 1 and Model 2 is that Model 1 includes a set of dummies that control for whether workers were very satisfied, satisfied, dissatisfied or very dissatisfied with their pay and benefits in view of their duties and responsibilities. This set of dummies is statistically significant. This suggests that, once controls for whether individual workers are satisfied with

their total compensation package are in place, the amount of compensation, both monetary and non-monetary, is not related to job satisfaction. Being paid a bonus, however, was positively related to higher job satisfaction in both Model 1 and Model 2.

Another notable difference between the results in Model 1 and Model 2 is that the R^2 is much higher when satisfaction with the compensation package is included. The R^2 for Model 1 is 0.211, while it for Model 2 is 0.047.

Besides the differences in Model 1 and Model 2 mentioned above, the other coefficients are similar. In terms of individual characteristics, it is found that married workers, females and younger workers tend to have higher job satisfaction scores. Overall, immigrants have lower job satisfaction, but this negative effect is mitigated for workers who were younger at immigration. Workers who immigrated at age 9 or an earlier age have job satisfaction similar to that expressed by non-immigrants. Education appears to have a non-monotonic relationship with job satisfaction: workers with a level of education above or below a bachelor's degree were found to have higher job satisfaction than workers with a bachelor's degree. Extreme over-qualification, measured by whether an individual had a bachelor's degree or above and was working a job that required at a minimum less than high school or a high school diploma, had no impact on job satisfaction. It is also found that individuals working in managerial, professional, trades and clerical professions had higher job satisfaction than production workers or workers in sales or marketing. Only individuals in the managerial profession have higher job satisfaction in Model 2 when satisfaction with the compensation package is not included. Individuals who have been promoted recently, in the last two years, tend to have higher job satisfaction.

With respect to workplace characteristics, individuals at smaller workplaces with fewer employees tend to have higher job satisfaction. Individuals at workplaces with higher separations rates tend to have lower job satisfaction. Unionized workplaces also were related to lower job satisfaction.

In terms of job characteristics, individuals working in indeterminate positions, jobs with flexible hours, or jobs that require no overtime tend to have higher job satisfaction. Individuals with a shorter job tenure tend to have higher job satisfaction.

A pair of similar order logit models are also estimated where more detail on workplace policies are included.[10] For example, classroom training is broken into 4 types: type 1, decision making, team building, leadership and communications training; type 2, computer and literacy or numeracy training; type 3, managerial and professional, apprenticeship, sales and marketing training; and type 4, other training (including orientation, occupational health and safety, and environmental protection). It is found that among these types, only type 4 training is related to higher job satisfaction. On-the-job training is broken down into similar groups. Here, it is found that type 2 and type 3 are related to higher job satisfaction.

Among the different types of employee participation initiatives, it is found that frequent participation in employee surveys and employee suggestion programs, frequently being informed about overall workplace performance or changes, and frequent participation in task teams concerned with a broad range of workplace issues are associated with higher job satisfaction. The other types (frequent participation in job rotation programs, frequent participation in teams concerned with quality and work flow issues, and frequent participation in self-directed work groups with a high level of responsibility) are not consistently associated with higher satisfaction.

With respect to the availability of personal or family support programs, only the presence of a fitness and recreation program is related to higher job satisfaction when controls for satisfaction with the compensation package are included. Employment assistance, child care, and elder care programs are also related to higher job satisfaction when these controls are not included.

For non-wage benefit plans, only the presence of a group registered retirement savings plan and employer supplements to Employment Insurance is related to higher job satisfaction. Other plans (dental, employer-sponsored pension plans, life and disability insurance, supplemental medical insurance, and stock purchase) are not related to job satisfaction.

Overall, the results suggest that workplace policies are related to job satisfaction. The possibility of multicollinearity among the various non-wage benefit plans, personal and family support programs, and employee participation initiatives remains to be investigated. The issues of selection and unobserved heterogeneity are addressed in the following sections.

3. Selection

Table 2 presents the results of a Probit model that examines the probability of remaining with the same employer in the second year. These results are conditional on job satisfaction, workplace policies and other workplace characteristics, individual characteristics, and job characteristics in the first year. As mentioned in Section 2, the exclusion restriction, the variables assumed to affect the probability of continuing with the same employer but not individual job satisfaction are the job creation and destruction rates specific to each industry and census metropolitan area. Table 2 shows that higher job creation rates are associated with a lower probability of remaining with the same employer. The higher job creation rates likely reflect a better set of outside opportunities for workers.

The signs of the other variables are as expected. Higher job satisfaction, greater satisfaction with the compensation package in view of duties and responsibilities, higher wages, the presence of unionization, being a full-time worker, being an indeterminate employee, classroom and on-the-job training, personal and family support programs, and the presence of non-wage benefits are associated with a higher probability of continuing. The findings for age are non-monotonic. Younger workers are more likely to continue than workers aged 65 and older. However, the relative impact is higher for workers aged 35 to 54 than for workers aged 34 and younger. After workers aged 65 and older, workers younger than 24 are the next-least-likely to continue with the same employer. Job tenure is another statistically significant factor. Individuals with tenure of less than one year are less likely to be continuers than individuals with 2 to 5 years of tenure. Individuals with tenure of more than 2 to 5 years are more likely to be continuers.

4. Ordered logit – Change in job satisfaction

Tables 3-1 and 3-2 shows the results for various ordered logit regressions on the change in job satisfaction with and without the selection. Table 3-1 presents the ordered logit results when the summary measures workplace policies are used and when the change in satisfaction with the compensation package (in view of job duties and responsibilities) is included as a regressor. Model 1 shows the results when the selection (inverse Mills ratio from the Probit model estimated in Section 4.3) is excluded, and Model 2 shows the results with controlling for selection. The selection term is positive and significant, indicating that the unobservable factors that cause workers to stay with their employer is positively correlated with increases in job satisfaction.

The findings for the workplace policies are similar to those for the order logit on job satisfaction. Going from not receiving on-the-job training in the first year to receiving on-the-job training in the second year is associated with a higher probability of an increase in job satisfaction. The opposite, going from receiving on-the-job training to not receiving on the job training, does not impact job satisfaction. This may indicate that on-the-job training has longer-lasting impact on job satisfaction. Without the selection term, there is some evidence that going from no classroom training to receiving classroom training is associated with a higher probability of an increase in job satisfaction.

Going from non-frequent participation in employee participation initiatives to frequent participation is associated with a higher probability of an increase in job satisfaction, and going from frequent participation to non-frequent participation is associated with a lower probability of an increase in job satisfaction. Similar results are found when a workplace goes from not offering any personal and family support programs to offering at least one program, and from offering at least one program to not offering any programs. When selection is taken into account, there is also evidence that going from not using a support program to using at least one program is associated with a higher probability of an increase in job satisfaction.

As in the ordered logit on job satisfaction, the results for the presence and use of nonwage benefits are mixed. There is evidence that going from having non-wage benefits to not having non-wage benefits is associated with a lower probability of an increase in job satisfaction. However, when controls for selection are applied, the impact of going from no non-wage benefits to some non-wage benefits is also negative. At least, going from not using non-wage benefit programs to using non-wage benefit programs is positive.

Another result that carries over from the previous regressions is that unionization status appears to be negatively associated with job satisfaction. When the workplace goes from not being unionized to being unionized, the probability of an increase in job satisfaction becomes lower. When the workplace goes from unionized to non-unionized, the probability of an increase in job satisfaction becomes higher.

An increase in education, measured by obtaining a new postsecondary certificate, a new bachelor's degree or a new degree above a bachelor's degree, tends to decrease the probability of an increase in job satisfaction. This is plausible as the result is conditional on the wage not changing and the individuals staying with their current employer. If the education qualifications of a worker increased, but this worker's compensation did not change, it is likely job satisfaction would fall.

Unlike the outcomes from the previous ordered logit on job satisfaction, the study found that workers in smaller workplaces have a lower probability of an increase in job satisfaction than workers in workplaces with more than 500 employees. This may be the result of promotion opportunities being less numerous in small workplaces.

Volatility in the employment size of the workplace also leads to a lower probability of an increase in job satisfaction. A large increase in employment of more than 100 employees or a decrease in the number of employees of more than 100 is associated with a lower probability of an increase in job satisfaction.

Table 3-2 presents the results when the change in satisfaction with the compensation package is dropped from the regression. The results are similar to those in Table 3-1. One notable difference is that the coefficient on the change in wages becomes larger in Table 3-2. As in the case of the order logit on job satisfaction, the change in satisfaction with the compensation package accounts for a large fraction of the R^2. Without this variable, the R^2 falls from the 0.057 to 0.067 range to the 0.011 to 0.023 range.

When individual workplace policies are used as regressors, the study finds that employee participation (in the form of employee surveys and employee suggestion programs, being frequently informed about overall workplace performance or changes) and non-wage benefits (employer paid supplemental to employment insurance) are important for job satisfaction.[11] These were also found to be important in the order logit on the level of job satisfaction. However, elder care and employee assistance programs are found to be important for the change in job satisfaction, but not for the level of job satisfaction

Overall, it is found that, even after controlling for selection and unobserved heterogeneity in the level of job satisfaction, certain workplace policies and wages are found to be associated with job satisfaction. When it comes to the specific workplace policies, it is found that the policies that impact the level of satisfaction are generally not the same ones that impact the change in satisfaction. The differences could be explained by the fact that a two-year time span is too short to pick up the impact of a change in workplace policies, especially when those policies were in place for many years before the change. It could also be that the differences are due to different collinearity issues arising when one examines the levels and the changes.

5. The relative importance of workplace policies and wages on job satisfaction

To have a better sense of the impact of business policy as compared to the impact of wages on job satisfaction, Table 4 summarizes changes in the probability of an increase in job satisfaction associated with change of business policy and change in hourly wage from the first year to the second year of each worker panel. Table 4 is based on the results from ordered logit regression of change in job satisfaction with selection and without change in satisfaction with compensation included, as shown in Table 3-2, Model 2. This is to make sure that the impact of wages is only through itself, not through its correlation with the satisfaction with compensation term. Also, the selected policies are those whose coefficients are significantly different from zero.

The median year-to-year change in the hourly wage for the continuing employees over the period from 1999 to 2004 is about 2.9%. When the change in hourly wages is increased from the median to the 75 percentile (equivalent to an 11.5% increase in hourly wage), the probability of an increase in job satisfaction rises by 0.003 percentage points. Similarly, if the analysis were to increase the wage changes from the median to the 99th percentile (equivalent to an 84.1% increase in hourly wage), the probability of an increase in job satisfaction would rise by 0.023 percentage points.

With respect to the impact of policy changes, the change from not to having an employee participation program to having an employee participation program increases the probability of an increase in job satisfaction by 0.02 percentage points. This impact is larger than that of increasing wage changes from the median to the 95th percentile. The impact of not having a personal and family support program to having such a program is an increase in the probability of improving job satisfaction by 0.025 percentage points. Interestingly, the impact of having a personal and family support program (from no to yes) and the program being used by employee (from no-use to use) at the same time is much larger than that of only having the program available but no change in the employee's participation in the program, 0.061 vs. 0.023 percentage points. This impact is even beyond that of wage increase from the median to the 99th percentile.

The impact of having non-wage benefits is negative, resulting in the probability of improving job satisfaction decreasing by 0.024 percentage points. However, the impact of employee participation in non-wage benefits is positive, offsetting some of the negative impact of having non-wage benefit plans and resulting in a slightly negative combined effect, -0.004 percentage points. The negative impact of having

non-wage benefits may be due to the possibility for some firms that wages or salaries are likely to adjust downward as a result.

Conclusion and discussion

Job satisfaction forms an integral part of people's subjective well-being. Higher job satisfaction not only contributes positively to individual well-being, but also helps improve organizational performance. This paper provides Canadian evidence on the relationship between workplace policies / practices and employees' job satisfaction using a unique longitudinal matched database, the WES. Methodologically, this paper adopts a first-difference panel data method for estimating ordered logit models to control for unobserved time-invariant individual fixed effects. In addition, this paper also takes into account a selection issue arising from the design of WES. In the WES, questions on job satisfaction were asked only of employees who stay with the same employers. The estimation results show positive selection. That is, workers who are more likely to stay with the same employers are more likely to experience an increase in job satisfaction.

After controls for unobserved individual heterogeneity and selection are applied, the results show that introducing an employee participation (or high-involvement work design) program or personal and family support program is important for improving the job satisfaction of employees. The impact of introducing these programs could be as large as the impact of increasing the change in hourly wages from 3% (the median) to 84% (the 99th percentile). A more detailed examination shows that having a communication mechanism between employees and management (for example, employee surveys, employee suggestion programs, or being frequently informed about overall workplace performance or changes) and having elder care and employee assistance programs in the workplace is important for job satisfaction.

However, it is possible that the causality may go the other direction. Employees that have higher job satisfaction may be more likely to participate those programs. Earlier, this paper showed that an employee's actual use of a program has a larger impact on job satisfaction than the presence of a program. Mohr and Zoghi (2008) who also used the WES show that workers who are more satisfied with job in year 1 are more likely to participate in high-involvement work design. This causal link can be examined for future work, owing to a design of the WES. In the odd survey years of WES, workplaces were asked whether particular policies existed or adopted. This feature provides a good opportunity to investigate the causal link between the adoption of particular policies / practices by business and subsequent workplace-level job satisfaction.

Table 1. Ordered logit regression for policy bundle, pooled regression, 1999-2004.

Y= jobscore	*Model 1 (with satisfaction with money)*			*Model 2 (without satisfaction with money)*		
Independent variables	Coef.	s.e.	aster	Coef.	s.e.	aster
money_vs	5.489	0.120	***			
money_s	3.071	0.110	***			
money_ds	1.575	0.108	***			
Lnwage	0.0214	0.0618		0.646	0.0618	***
class_jrt_employee	0.132	0.0372	***	0.118	0.0361	***
ojt_employee	0.171	0.0352	***	0.157	0.0332	***
highpart_employee	0.342	0.0416	***	0.348	0.0406	***
support_employee	0.170	0.0510	***	0.274	0.0455	***
support_used	0.110	0.0651	*	0.182	0.0535	***
nw_benefits	-0.0575	0.0612		-0.0426	0.0618	
non_wage_used	0.0745	0.0497		0.153	0.0509	***
bonus	0.117	0.0418	***	0.117	0.0410	***
tips	-0.0176	0.0734		-0.0796	0.0696	
union	-0.234	0.0427	***	-0.174	0.0437	***
female	0.106	0.0449	**	0.122	0.0443	***
age24	-1.059	0.188	***	-1.115	0.199	***
age2534	-1.001	0.177	***	-1.159	0.192	***
age3544	-0.853	0.174	***	-0.972	0.189	***
age4554	-0.689	0.174	***	-0.874	0.187	***
age5564	-0.494	0.180	***	-0.622	0.191	***
immigrant	-0.375	0.0689	***	-0.427	0.0714	***
ageimm9	0.332	0.107	***	0.295	0.108	***
ageimm1018	0.201	0.121	*	0.0423	0.120	
ageimm1924	0.156	0.118		0.265	0.117	**
ageimm55	-0.372	0.793		-0.256	1.043	
nhs	0.297	0.0910	***	0.513	0.0904	***
hs	0.317	0.0875	***	0.479	0.0841	***
sps	0.201	0.0875	**	0.340	0.0900	***
psc	0.133	0.0753	*	0.224	0.0723	***
aba	0.212	0.0980	**	0.193	0.0905	**
occu_m	0.481	0.101	***	0.247	0.108	**
occu_p	0.369	0.101	***	0.00513	0.105	
occu_t	0.270	0.0815	***	0.0616	0.0849	
occu_s	0.0952	0.126		0.0206	0.133	
occu_a	0.271	0.0925	***	0.144	0.0988	
married	0.105	0.0419	**	0.125	0.0437	***
child	0.0623	0.0398		0.0320	0.0398	
micro	0.749	0.0969	***	0.943	0.0951	***
small	0.584	0.0734	***	0.647	0.0741	***
medium1	0.250	0.0663	***	0.174	0.0613	***
medium2	0.111	0.0629	*	0.0490	0.0587	
sep_rate	-0.183	0.0664	***	-0.212	0.0686	***
hiring_rate	0.0480	0.0521		-0.00265	0.0544	

flex_hour	0.157	0.0366	***	0.200	0.0344	***
full_time	-0.00821	0.0563		-0.0899	0.0566	
regular_emp	0.165	0.0639	***	0.113	0.0640	*
overtime	-0.0611	0.0339	*	-0.213	0.0333	***
prmtlast2y	0.271	0.0440	***	0.236	0.0450	***
prmtlast5y	0.120	0.0767		0.0950	0.0731	
prmtlast6y	0.145	0.0868	*	0.145	0.0962	
tenure_1	0.246	0.0664	***	0.280	0.0595	***
tenure_6	-0.120	0.0572	**	-0.0910	0.0521	*
tenure_11	-0.0767	0.0529		-0.131	0.0519	**
exover	-0.148	0.110		0.0666	0.0940	
industry dummy	yes			yes		
year dummy	yes			yes		
region dummy	yes			yes		
R^2	0.211			0.047		
Observations	95,090			95,090		

Source: The Workplace and Employee Survey, Statistics Canada, ***: significantly different from 0 at 1%, **: significantly different from 0 at 5%; *, significantly different from 0 at 10%.

Table 2: Probit regression for Heckman selection

Y=1 if stay with the same employer			
Independent variables	Coeff.	s.e.	Aster.
j4	1.115	0.104	***
j3	0.950	0.0998	***
j2	0.494	0.110	***
tjcrx	-0.167	0.0929	*
tjdrx	0.144	0.146	
class_jrt_employee	0.0764	0.0362	**
ojt_employee	0.0903	0.0393	**
highpart_employee	0.0422	0.0391	
support_employee	0.111	0.0419	***
nw_benefits	0.139	0.0486	***
union	0.193	0.0425	***
lnwage	0.0951	0.0491	*
money_vs	0.174	0.0887	*
money_s	0.139	0.0764	*
money_ds	0.0180	0.0815	
female	-0.0367	0.0391	
age24	0.196	0.149	
age2534	0.367	0.146	**
age3544	0.534	0.145	***
age4554	0.649	0.144	***
age5564	0.340	0.144	**
immigrant	0.0504	0.0727	
ageimm9	-0.227	0.117	*

ageimm1018	0.116	0.108	
ageimm1924	-0.0447	0.105	
ageimm55	0.949	0.570	*
nhs	0.0301	0.0906	
hs	-0.0214	0.0819	
sps	0.0700	0.0803	
psc	0.00751	0.0679	
aba	-0.0848	0.0750	
occu_m	-0.0937	0.0891	
occu_p	-0.0869	0.0839	
occu_t	0.0114	0.0675	
occu_s	0.200	0.102	*
occu_a	0.0592	0.0772	
married	-0.0408	0.0411	
child	0.00788	0.0413	
micro	0.112	0.0809	
small	0.0229	0.0687	
medium1	-0.00739	0.0543	
medium2	-0.0718	0.0532	
flex_hour	0.00345	0.0370	
full_time	0.155	0.0520	***
regular_emp	0.335	0.0507	***
overtime	-0.000807	0.0367	
prmtlast2y	0.0486	0.0459	
prmtlast5y	0.0538	0.0730	
prmtlast6y	0.0377	0.0875	
tenure_1	-0.429	0.0447	***
tenure_6	0.244	0.0593	***
tenure_11	0.202	0.0479	***
over	-0.0430	0.0578	
exover	-0.0660	0.0770	
under	-0.199	0.164	
Constant	-1.320	0.254	***
industry dummy	yes		
region dummy	yes		
year dummy	yes		
R^2	0.15		
Observations	53,521		

Source: The Workplace and Employee Survey, Statistics Canada, ***: significantly different from 0 at 1%, **: significantly different from 0 at 5%; *, significantly different from 0 at 10%.

Table 3-1: first-difference ordered logit regression, policy bundle, with satisfaction with money, 1999-2004

Y=change in job score	*Model 1 (without selection)*			*Model 2 (with selection)*		
Independent variables	Coef.	se	aster	Coef.	se	aster
imr				1.838	0.148	***
dsatismoni	0.939	0.0347	***	0.920	0.0352	***
dlnwage	0.254	0.106	**	0.190	0.106	*
class_y	0.120	0.0650	*	0.106	0.0647	
class_n	0.00786	0.0563		0.0464	0.0561	
ojt_y	0.129	0.0579	**	0.113	0.0577	*
ojt_n	-0.0683	0.0612		-0.0620	0.0623	
highpart_y	0.227	0.0711	***	0.166	0.0720	**
highpart_n	-0.215	0.0651	***	-0.225	0.0655	***
support_y	0.206	0.0747	***	0.195	0.0758	***
support_n	-0.203	0.0705	***	-0.165	0.0707	**
support_used_y	0.134	0.112		0.194	0.112	*
support_used_n	-0.00667	0.101		0.0591	0.0998	
nwbenefits_y	-0.130	0.0987		-0.238	0.0976	**
nwbenefits_n	-0.367	0.154	**	-0.388	0.163	**
non_wage_used_y	0.155	0.0931	*	0.159	0.0939	*
non_wage_used_n	-0.0810	0.110		-0.0561	0.110	
bonus_y	-0.0309	0.0641		-0.0285	0.0633	
bonus_n	-0.128	0.0824		-0.0975	0.0832	
tips_y	0.127	0.0896		0.119	0.0907	
tips_n	-0.130	0.0798		-0.126	0.0805	
union_y	-0.261	0.149	*	-0.336	0.146	**
union_n	0.209	0.138		0.291	0.141	**
occu_low	-0.164	0.349		-0.160	0.347	
occu_high	0.607	0.306	**	0.590	0.335	*
married_y	0.00802	0.109		-0.0486	0.106	
married_n	0.0362	0.113		0.0127	0.113	
child_y	-0.105	0.101		-0.0820	0.102	
child_n	0.0168	0.105		0.0829	0.108	
flex_hour_y	0.0354	0.0604		0.0185	0.0606	
flex_hour_n	-0.101	0.0684		-0.112	0.0685	
full_time_y	0.217	0.151		0.0978	0.153	
full_time_n	0.0221	0.131		-0.000963	0.133	
regular_emp_y	0.291	0.110	***	-0.0157	0.111	
regular_emp_n	-0.314	0.136	**	-0.424	0.144	***
overtime_y	-0.0111	0.0589		-0.0198	0.0582	
overtime_n	-0.0680	0.0613		-0.0517	0.0615	
new_psc	-0.148	0.132		-0.278	0.130	**

new_ba	-0.371	0.216	*	-0.573	0.214	***
new_aba	-0.400	0.252		-0.514	0.237	**
panel2	0.0163	0.0500		-0.0271	0.0504	
panel3	-0.0256	0.0495		-0.0617	0.0499	
micro	-0.0381	0.0780		-0.193	0.0795	**
small	-0.0471	0.0655		-0.195	0.0663	***
medium1	-0.129	0.0557	**	-0.252	0.0571	***
medium2	-0.123	0.0572	**	-0.196	0.0581	***
big_i	-1.155	0.247	***	-1.212	0.215	***
big_d	-1.270	0.260	***	-1.299	0.231	***
dhire_rate	0.0865	0.0643		0.122	0.0633	*
dsep_rate	0.0207	0.0803		0.0360	0.0800	
industry dummy	yes			yes		
region dummy	yes			yes		
R^2	0.057			0.067		
Observations	47,545			47,545		

Source: The Workplace and Employee Survey, Statistics Canada, ***: significantly different from 0 at 1%, **: significantly different from 0 at 5%; *, significantly different from 0 at 10%.

Table 3-2. First-difference ordered logit regression, policy bundle, without satisfaction with money, 1999-2004

Y=change in job score	*Model 1 (without selection)*			*Model 2 (with selection)*		
Independent variables	coef	se	aster	coef	se	aster
imr				2.020	0.146	***
dlnwage	0.413	0.107	***	0.336	0.109	***
class_y	0.104	0.0643		0.0893	0.0639	
class_n	-0.0287	0.0540		0.0128	0.0538	
ojt_y	0.107	0.0577	*	0.0926	0.0571	
ojt_n	-0.0427	0.0612		-0.0377	0.0624	
highpart_y	0.245	0.0742	***	0.176	0.0744	**
highpart_n	-0.247	0.0635	***	-0.258	0.0641	***
support_y	0.232	0.0816	***	0.217	0.0824	***
support_n	-0.229	0.0667	***	-0.187	0.0678	***
support_used_y	0.215	0.122	*	0.278	0.122	**
support_used_n	-0.0197	0.0984		0.0509	0.0977	
nwbenefits_y	-0.116	0.0964		-0.237	0.0954	**
nwbenefits_n	-0.396	0.155	**	-0.409	0.165	**
non_wage_used_y	0.216	0.0966	**	0.221	0.0973	**
non_wage_used_n	-0.115	0.113		-0.0885	0.113	

bonus_y	-0.0211	0.0631		-0.0188	0.0622	
bonus_n	-0.0949	0.0836		-0.0656	0.0841	
tips_y	0.107	0.0887		0.100	0.0912	
tips_n	-0.116	0.0792		-0.112	0.0798	
union_y	-0.252	0.171		-0.328	0.167	**
union_n	0.187	0.148		0.275	0.152	*
occu_low	-0.0847	0.319		-0.0686	0.319	
occu_high	0.467	0.309		0.468	0.333	
married_y	0.0634	0.112		-0.000855	0.110	
married_n	-0.0662	0.117		-0.0889	0.116	
child_y	-0.122	0.0994		-0.0991	0.101	
child_n	0.0183	0.111		0.0917	0.114	
flex_hour_y	0.0310	0.0633		0.0132	0.0639	
flex_hour_n	-0.117	0.0666	*	-0.126	0.0667	*
full_time_y	0.227	0.149		0.0964	0.151	
full_time_n	-0.0217	0.134		-0.0459	0.136	
regular_emp_y	0.274	0.113	**	-0.0661	0.115	
regular_emp_n	-0.283	0.126	**	-0.404	0.130	***
overtime_y	-0.0553	0.0555		-0.0649	0.0549	
overtime_n	-0.0234	0.0615		-0.00717	0.0621	
new_psc	-0.188	0.127		-0.329	0.127	***
new_ba	-0.274	0.178		-0.493	0.182	***
new_aba	-0.451	0.215	**	-0.570	0.214	***
panel2	-0.0105	0.0504		-0.0562	0.0508	
panel3	-0.0582	0.0489		-0.0966	0.0491	**
micro	-0.0234	0.0767		-0.195	0.0786	**
small	-0.0331	0.0665		-0.196	0.0679	***
medium1	-0.101	0.0542	*	-0.238	0.0562	***
medium2	-0.124	0.0546	**	-0.204	0.0558	***
big_i	-1.234	0.307	***	-1.301	0.272	***
big_d	-1.368	0.320	***	-1.402	0.287	***
dhire_rate	0.0957	0.0594		0.136	0.0587	**
dsep_rate	0.0479	0.0737		0.0651	0.0742	
industry dummy	yes			yes		
region dummy	yes			yes		
R^2	0.011			0.023		
Observations	47,545			47,545		

Source: The Workplace and Employee Survey, Statistics Canada, ***: significantly different from 0 at 1%, **: significantly different from 0 at 5%; *, significantly different from 0 at 10%.

Table 4. Impact of change in business policy on the change in job satisfaction

Policy change from No to Yes	*change in probability of increase in job satisfaction*
Employee participation	2.0%
support program	2.5%
support program but no use	2.3%
support program and use	6.1%
non-wage benefit	-2.4%
non-wage benefit but no use	-2.5%
non-wage benefits and use	-0.4%
union	-3.1%
ln wage increase (p50-p75)	0.3%
Ln wage increase (p50-p90)	0.7%
Ln wage increase (p50-p95)	1.1%
Ln wage increase (p50-p99)	2.3%

Source: The Workplace and Employee Survey, Statistics Canada.

[1] Examples using matched employer–employee data include Böckerman and Ilmakunnas (2012), Haile (2015), Böckerman et al. (2011), and Chowhan et al. (2012).
[2] Canadian studies using linked data include Chowhan et al. (2012) and Mohr and Zoghi (2008).
[3] Statistics Canada, http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=2615.
[4] http://www.wers2011.info/methodology/4587717348.
[5] See a description of ECHP-FLEED in Böckerman and Ilmakunnas (2012).
[6] In the subsequent analysis, the values of job satisfaction are recoded reversely, with 1 for "very dissatisfied" and 4 "very satisfied." Observations denoted as "no opinion" are dropped.
[7] The selection term would be cancelled out in other fixed-effect estimators such as BUC as it is time-invariant.
[8] Böckerman et al. (2011) showed that aggregate uncertainty has no impact on job satisfaction.
[9] The variable labels and a full description of the variables are provided in the Annex.
[10] Because space is limited, estimation results are not provided. However, they are available upon request.
[11] Again, the regression results are presented in the paper. However, they are available upon request.

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Annex – Variable Labels and Definitions

Variables	*Description*
	Pooled regression and selection regression (Tables 1 and 2)
jobscore	job satisfaction score: 4-very satisfied, 3-satisfied, 2-dissatisfied, 1-very dissatisfied.
money_vs	money satisfaction: very satisfied
money_s	money satisfaction: satisfied
money_ds	money satisfaction: dissatisfied
lnwage	ln of hourly wage
class_jrt_employee	received classroom training
ojt_employee	received on-the-job training
highpart_employee	frequent participation in at least one of employee feedback, suggestion, job rotation, workplace info, task teams, work group
support_employee	personal support or family service offered by employer
support_used	employee use of personal support of family service offered by employer
nw_benefits	non-wage benefits offered by employer
non_wage_used	employee participation of non-wage benefits offered by employer(pension, RRSP, stock purchase)
bonus	received bonus payment
tips	received tips, commission, or piecework payment
union	union member
female	gender: female
age24	age group: younger than 24
age2534	age group: 25-34
age3544	age group: 35-44
age4554	age group: 45-54
age5564	age group: 55-64
immigrant	immigrant
ageimm9	age at immigration: younger than 9
ageimm1018	age at immigration: 10-18
ageimm1924	age at immigration: 19-24
ageimm55	age at immigration: older than 55
nhs	education: less than high school
hs	education: high school
sps	education: some post-secondary
psc	education: post-secondary certificates
aba	education: above bachelor degree
occu_m	occupation: managers
occu_p	occupation: professional
occu_t	occupation: technical/ trades
occu_s	occupation: marketing/sales
occu_a	occupation: clerical/administrative
married	marital status: married or common-law
child	if having children
micro	firm size: 1-4 employees
small	firm size: 5-19 employees
medium1	firm size: 20-99 employees
medium2	firm size: 100-499 employees
sep_rate	separation rate: total separation/total employment
hiring_rate	hiring rate: total new hires/total employment
flex_hour	flexible working hour
full_time	full-time employment (working more than 35 hours per week)

regular_emp	regular or permanent employment
overtime	working over time
prmtlast2y	most recent promotion: less than 2 years ago
prmtlast5y	most recent promotion: 3-5 years ago
prmtlast6y	most recent promotion: more than 5 years ago
tenure_1	job tenure: less than 1 year
tenure_6	job tenure: 6-10 years
tenure_11	job tenure: more than 11 years
exover	extremely over-qualified for job: an individual with a bachelor's degree or above working at a job that required a minimum less than high school or a high school diploma
over	over-qualified for job: an individual with a post-secondary certificate or above working at a job that required a minimum less than high school or a high school
under	under-qualified for job: an individual with some post-secondary education or less working at a job that required a minimum bachelor degree
j4	if jobscore=4, very satisfied
j3	if jobscore=3, satisfied
j2	if jobscore=2, dissatisfied
tjcrx	total job creation rate at industry-census metropolitan area level
tjdrx	total job destruction rate at industry-census metropolitan area level

First-difference ordered logit with selection (Tables 3-1 and 3-2)

djobscore	change in job satisfaction score
imr	inverse mills ratio
dsatismoni	change in satisfaction with money
dlnwage	change in ln of hourly wage
class_y	received class-room training (from no to yes)
class_n	received class-room training (from yes to no)
ojt_y	received on-the-job training (from no to yes)
ojt_n	received on-the-job training (from yes to no)
highpart_y	frequent participation in at least one of employee participation program (from no to yes)
highpart_n	frequent participation in at least one of employee participation program (from yes to no)
support_y	personal support or family service offered by employer (from no to yes)
support_n	personal support or family service offered by employer (from yes to no)
support_used_y	employee use of personal support of family service offered (from no to yes)
support_used_n	employee use of personal support of family service offered (from yes to no)
nwbenefits_y	non-wage benefits offered by employer (from no to yes)
nwbenefits_n	non-wage benefits offered by employer (from yes to no)
non_wage_used_y	employee participation of non-wage benefits offered by employer(from no to yes)
non_wage_used_n	employee participation of non-wage benefits offered by employer(from yes to no)
bonus_y	received bonus payments (from no to yes)
bonus_n	received bonus payments (from yes to no)
tips_y	received tips, commission, or piecework payment (from no to yes)
tips_n	received tips, commission, or piecework payment (from yes to no)
union_y	union membership (from no to yes)
union_n	union membership (from yes to no)
occu_low	occupation downgrade (if moving from managers/professionals to others)
occu_high	occupation upgrade (if moving to managers/professionals from others)
married_y	married (from no to yes)
married_n	married (from yes to no)
child_y	having children (from no to yes)
child_n	having children (from yes to no)
flex_hour_y	flexible working hour (from no to yes)

flex_hour_n	flexible working hour (from yes to no)
full_time_y	full time status (from no to yes)
full_time_n	full time status (from yes to no)
regular_emp_y	regular employment (from no to yes)
regular_emp_n	regular employment (from yes to no)
overtime_y	working overtime (from no to yes)
overtime_n	working overtime (from yes to no)
new_psc	new education obtained: some post-secondary
new_ba	new education obtained: bachelor degree
new_aba	new education obtained: bachelor degree above
panel2	panel indicator: 2001-2002 panel
panel3	panel indicator: 2003-2004 panel
big_i	total employment change: more than 100
big_d	total employment change: less than 100
dhire_rate	change in workplace hiring rate
dsep_rate	change in workplace job separation rate