Private Transnational Governance as Ensemble Regulation: A Social Network Analysis

Oren Perez, Reuven Cohen & Nir Schreiber[1]

Bar Ilan Law Faculty and Math Dep. (respectively).

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I. Introduction

Over the past fifteen years, the structure of the global environmental governance system has undergone significant changes. From a system governed primarily by treaty-based instruments and their associated international organizations (**IGOs**) (UNEP, treaty secretariats), the system has evolved into a hybrid field that includes a plethora of private mechanisms (private transnational instruments, **PTIs**) that interact in various ways with the classic treaty based instruments. These private mechanisms[2] include voluntary corporate codes,[3] environmental management systems,[4]

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[2] Some of the foregoing instruments, such as the GRI, also cover non-environmental issues. There are similar instruments covering other aspects of corporate responsibility, such as the SA8000 standard, dealing with human rights of workers (http://www.sa-intl.org/).

[3] E.g., OECD Guidelines of Multinational Enterprises, the International Chamber of Commerce Business Charter for Sustainable Development.

[4] E.g., ISO 14001, the EU EMAS scheme and the Responsible Care program.

"green label" schemes,[5] environmental reporting standards,[6] economic instruments[7] green financial schemes, and green indexes.[8]

Developing a better understanding the dynamics of this evolving hybrid system constitutes a major theoretical and empirical challenge. Theoretically, analyzing this hybrid system requires us to rethink our conception of transnational law and transnational governance; empirically it requires us to develop methods that can capture the interactive dynamics of multiple instruments (extending the analysis beyond single regimes or sectors). But these theoretical and empirical challenges also hold significant policy weight. Our global challenges keep mounting: from global environmental programs (e.g., climate change) to protection of human rights, migration and poverty. The 2030 Agenda for Sustainable Development provides an up-to-date depiction of these challenges.[9] The global treaty system with its associated IGOs does not offer a satisfactory response to these challenges. Its dependence on inter-state cooperation and its excessively bureaucratic structure undermine its flexibility and its capacity to respond quickly to changed circumstances. Private regimes, because of their stronger affiliation with civic society and business organizations seem to offer a more flexible and innovative regulatory mechanism. However, the regulatory value of PTIs is still a matter of controversy. Two key questions concern the efficacy of particular private regimes (e.g., against greenwash charges) and their actual (rather than theoretical) synergy with the IGO system

The paper seeks to advance our understanding of the new hybrid system, by exposing the network structure of the private 'side' of this hybrid system. We focus, in particular, on the field of corporate social responsibility codes (**CSR-Codes**). The field of CSR-Codes is particularly relevant to the study of the new hybrid global governance complex because it covers many of the issues that are governed by conventional public international law regimes – from climate change to labor rights and bio-diversity. We argue that developing a better understanding of the structure and dynamics of the CSR-Codes network is a crucial step in improving our understanding of the

[5] E.g., the Forest Stewardship Council certification scheme and the US Energy Star program.
[6] E.g., the Global Reporting Initiative Sustainability Reporting Guidelines ("GRI") and the AA1000 Assurance Standard.
[7] A good example is private carbon offsetting standards, see, e.g., the Verified Carbon Standard (VCS) http://www.v-c-s.org/ and the Gold Standard (GS) http://www.goldstandard.org/.
[8] Green financial schemes include codes regulating lending practices and "ethical" investment standards. Green indexes include, e.g., the Dow Jones Sustainability Indexes and FTSE4Good series.
[9] See, https://sustainabledevelopment.un.org/post2015/transformingourworld.

transnational system as a whole. We develop a new theoretical framework that draws on two ideas - ensemble regulation and distributed authority. We support this framework by a holistic empirical strategy that utilizes the technique of social network analysis (**SNA**) drawing on a novel database which we have developed. Taking a network perspective provides we argue not only a better grasp of the normative influence of CSR codes but also provides new insights into the dynamics that govern the decision of firms to join CSR codes in the first place (a networked signaling game). The paper also have a broader objective: to introduce to the legal community the method of SNA and the unique methodological advantages that it offer for legal research. Despite the recent advances in the use of empirical methods in the analysis of law (Ho & Kramer, 2013; Suchman & Mertz, 2010) legal research is still lagging behind the social sciences in the use of network analysis.

There has been recently increasing interest in the role of private instruments in the transnational regulatory field. This research programme draws on several theoretical themes: global legal pluralism, polycentric governance theory, transnational networks, experimental governance and regime complexes (Gehring & Faude, 2013; A. Newman & Zaring, 2013; Orsini, Morin, & Young, 2013; Raustiala & Victor, 2004; Slaughter & Zaring, 2006) (Overdevest & Zeitlin, 2012; Charles F. Sabel & Jonathan Zeitlin, 2011; Zeitlin, 2011) (Eberlein, Abbott, Black, Meidinger, & Wood, 2013). One of the drawbacks of this literature has been the disregard of the interaction and potential synergy between private and public instruments in the regulation of global problems (Perez, 2012). The literature remained largely divided between those working on private transnational regulation and those working on public instruments.

The division between these two strands of literature has become less salient in the past five years with the publication of several studies that take a more holistic view of the global regulatory map. The evolution of the research on regime complexes provides good illustration of this change. This research programme started with the insight that the regulation of global problems does not take place solely within single treaty regimes, but in many cases involves arrangements of loosely coupled regimes that share common regulatory objectives and exhibit some level of coordination (Gehring & Faude, 2013; Keohane & Victor, 2011). The notion of regime complex is theoretically broad enough to cover the potential interaction between private and public instruments. However, the first phase of this literature focused on the interactions between distinct treaty regimes, disregarding the potential contribution of private regimes. So, for example, when Keohane and Victor described the regime complex for climate change they completely ignored the potential

contribution of private instruments to climate change governance (Gehring & Faude, 2013; Keohane & Victor, 2011). This approach is not however tenable. Consider just two example. Global guidelines on non-financial reporting such as the Global Reporting Initiative Sustainability Reporting Guidelines (G4) and the more specific guidelines of the Carbon Disclosure Project provide guidance to firms and other organizations on how to report their GHG emissions.[10] As such they contribute to the implementation of the UNFCC and Paris Agreement by facilitating monitoring of firms' behaviour. Another example are private standards that govern the measurement and management of greenhouse gases (GHG) such as the Verified Carbon Standard (VCS) and the Gold Standard (GS).[11] These standards complement the compliance regime of the UNFCC and Paris Agreement. The more recent literature in this field recognizes this shortcoming and explicitly incorporates private forms of authority in the study of regime complexes (Abbott, 2012; Abbott, Green, & Keohane, 2015; Green, 2013; Hale & Roger, 2014).

However, despite the increasing interest in PTIs and the role they play in global regulatory processes, the current literature still suffers from several shortcomings. The first shortcoming concerns the (relative) disregard of the literature on SNA (K. W. Abbott & D. Snidal, 2010; Faure, De Smedt, & Stas, 2015; Slaughter & Zaring, 2006). This is true even for scholars who strongly emphasize the notion of network in their analysis of global process of governance such as Ken Abbot, Duncan Snidal and Marie Anne Slaughter. This omission is troubling because SNA provides a wealth of theoretical and methodological insights that are directly relevant to the study of transnational regulation (Stephen P Borgatti, Jones, & Everett, 1998; Stephen P. Borgatti, Mehra, Brass, & Labianca, 2009; Easley & Kleinberg, 2010b). Focusing on the network structure of the CSR-Codes domain has implications for the way in which we examine the efficacy and legitimacy of private regimes as well as ontological questions concerning the very nature of this 'domain' (e.g., its capacity to exert normative power). Further the network perspective is also relevant to the evaluation of the adaptive capacities of private regimes, because in evaluating learning and feedback processes we need to take into account that these processes take place within

[10] G4 Sustainability Reporting Guidelines, Implementation Manual p. 107-117 and CDP Guidance for companies reporting on climate change on behalf of investors & supply chain members 2016, available at https://www.globalreporting.org/resourcelibrary/GRIG4-Part2-Implementation-Manual.pdf and https://www.cdp.net/Documents/Guidance/2016/CDP-2016-Climate-Change-Reporting-Guidance.pdf.

[11] For a complete mapping of this field see (Green, 2013).

a network structure and not just within the confines of a particular regime.[12] Over the past five years there has been increasing interest in the potential contribution of SNA to the study of international and transnational legal structures and reflected in the publication of several works that apply the insights of SNA (Albareda & Waddock, 2016; Green, 2013; Jason Beckfield, 2010; Kim, 2013-14; Thistlethwaite & Paterson, 2015). Our work contributes to this emerging line of literature.

Another problem with the contemporary research on PTIs concerns its limited empirical outlook. The research on PTIs – CSR Codes constitute a prominent example – tends to be highly fragmentary. The study of transnational CSR-codes is dominated by a piecemeal study of single codes or sectors (Berliner & Prakash, 2014; Dashwood, 2014; Fransen & Burgoon, 2014) (studying the the Global Mining Sector, the apparel sector, and the United Nations Global Compact respectively). Because of the fragmentary nature of these studies, they have been unable to expose the structure and dynamics of the PTI field as a whole. The methodology of SNA is particularly suitable for exposing the network structure of this domain. This critique is relevant also to recent work in this field which uses the methodology of SNA, which tended to focus on specific sectors such as private standards that govern the measurement and management of GHGs (Green, 2013), accounting and auditing standards (Richardson, 2009), sustainability accounting (Thistlethwaite & Paterson, 2015) or nanotechnology (Snir & Ravid, 2015).

II. The Theoretical and Empirical Framework

The paper seeks to respond to the foregoing critique by developing a new theoretical framework based on two ideas: ensemble regulation and distributed authority (Perez, 2011). In developing this framework we draw on SNA as well as on the literature on social capital (Burt, 2001; Ostrom & Ahn, 2008) and Abbott and Snidal's recent work on orchestration (K. Abbott & D. Snidal, 2010). As will be elaborated below we support our theoretical argument with a broad empirical analysis. The notion of social capital provides a theoretical umbrella for thinking about the potential

[12] Sabel and Zeitlin do emphasize the importance of networks in the development of experimentalist regimes, especially at the transnational level, and in a paper from 2011 they even sketch out seven pathways for the emergence and diffusion of transnational experimentalist regimes (Charles F Sabel & Jonathan Zeitlin, 2011: 2). However, they do not try to define formally what they mean by such networks or indeed to analyze them using the methods of SNA.

contribution of networks to global governance dilemmas. Elinor Ostrom highlighted the role of social capital in solving collective action dilemmas. She focuses on three types of social capital that are particularly important in the study of collective action: (1) trustworthiness, (2) networks and (3) formal and informal rules or institutions (Ostrom & Ahn, 2008: 20). In a joint paper with T.K. Ahn they define social capital as a "synthesizing approach to how cultural, social and institutional aspects of communities of various sizes jointly affect their capacity of dealing with collective-action problems" (Ostrom & Ahn, 2008: 22). Borgatti, Jones and Everett distinguish between two fundamentally different usages of the term social capital (Stephen P Borgatti et al., 1998; Easley & Kleinberg, 2010a: 61). One usage conceives of social capital as a quality of groups. It includes such things as rule of law, social integration, and trust. Another usage– conceives of social capital as the value of an individual's social relationships. It focuses on one's relationships with others are a source of material, information and emotional aid.

The concepts of ensemble regulation and distributed authority seeks to unfold the meaning of these dual understandings of social capital in the context of the global network of CSR-Codes. Ensemble regulation refers to a network of autonomous regulatory schemes, sharing a common core of basic principles, and exhibiting positive enforcement and normative externalities. These positive externalities enhance the regulatory power and legitimacy of the network as a whole. They reflect both the way in which firms are increasingly being subjected to multiple regimes with partially congruent norms and a shared vision (sustainability) and the fact the codes themselves monitor each other through their network of repeated interactions and permanent institutional links. The idea of ensemble regulation thus refers to social capital as a quality of the network as a whole. The idea of distributed authority brings the two understandings of social capital together. It argues that the different elements (Codes) of the network may play different roles and have different capacities. Thus some Codes may play a more central (orchestrating) role in the network, creating key norms and disseminating them (but at a general level with relatively lenient compliance regime) while others may play a more dominant role in the regulation of specific sector, both in terms of developing concrete norms and in terms of the stringency of their compliance regime). By highlighting the different capacities and roles of different codes we seek to capture the individual facet of social capital. But our argument goes further than that. We argue that this division of labor has evolved spontaneously without any hierarchical intervention and further that it evolved in a synergetic fashion that enhances the regulatory capacities of the CSR-

Codes system as a whole. Overall our thesis is that only by considering the network of CSR-Codes as a whole once can fully appreciate the regulatory capabilities of the system. Given the strong links between the Codes (which will be exposed below) it makes no sense, we argue, to consider these codes in isolation (e.g., evaluating their softness/hardness).[13]

We intend to examine this theoretical framework through an analysis of the global CSR-Codes network drawing on a novel database that consists of information on 61 CSR-codes (Annex A below).[14] The database includes information on the governance structure of the CSR-codes and their members (or certificate-holders as applicable). With respect to 49 codes out of these 61 Codes we also collected data of their member (or certified) firms.[15] Altogether our database includes 32220 firms. We analyze this database drawing on a multifaceted empirical strategy that combines SNA with institutional analysis. We first analyze the topological structure of the system drawing on institutional analysis that considers the relationship between the codes' governing bodies. We then focus on the subset of 49 Codes and analyze it as a bi-partite (affiliation) network involving firms and codes.[16] Together these two empirical strategies produce a rich, holistic map of the structure and dynamics of the global CSR-Codes network in a way that is missing from the current literature. It allow us to bring together the micro and meso levels of analysis (Wood, Abbott, Black, Eberlein, & Meidinger, 2015). We intend to study, first, the topological structure of the CSR-Codes, examining, for example, the dominance of particular codes or firms, the number of firms with multiple subscriptions, and other topological measures. In order to evaluate our hypothesis regarding distributive authority we will also classify the CSR-codes in our enlarged 61 codes network according to a taxonomy we have developed. This would allow us to consider the institutional features of the dominant codes. Finally, we also intend to examine the functional value of the network by looking into the CSR value of multiple subscriptions. In particular we will examine to what extent the number of subscriptions is indicative of firms' CSR performance (this part of the analysis has not been completed yet but it should be completed in the next 2-3 months).

[13] I draw here on ideas developed in two recent papers of mine (Perez, 2011, 2015).

[14] Annex A also includes UNEP, which is not strictly a CSR organization despite its involvement in various CSR initiatives. ISO is also not a CSR organization but is included in the database because of its association with ISO14001 and ISO 26000.

[15] For 27 codes out of this list we also have a dynamic (historical) data of their membership.

[16] In this paper we focus on static analysis. We intend to complement this analysis with a dynamical analysis based on historical data regarding firms' certification patterns. The historical analysis will focus on the network formation dynamics and changes in inter-connectivity within the network.

We intend to do that by using global CSR rankings (as proxies for CSR performance). We have obtained data from Dow Jones Sustainability Indexes, Vigeo and FTSE4Good that should allow us to conduct this analysis.

III. SNA and Law: A Literature Review

In pursuing this study, we also have a broader objective, which is to introduce to the legal community the method of SNA and the unique methodological advantages that it offers for legal research. Despite the recent advances in the use of empirical methods in the analysis of law (Ho & Kramer, 2013; Suchman & Mertz, 2010) legal research is still lagging behind the social sciences in the use of network analysis. This is despite the fact that the concept of 'network' has been used extensively in the legal literature, in diverse contexts ranging from the Internet, to telecommunication, anti-trust and global legal pluralism (Claes & De Visser, 2012; Fox, 2009; Ladeur, 2012; M. A. Lemley & McGowan, 1998; M. Lemley, Levine, & Post, 2011; Lessig, 2001). SNA can contribute to legal research in two primary ways: first, it can be used to study inter-connections between legal texts (rulings, treaties, patents etc.); second, it can be used to analyse organizational links between different entities. In both respects SNA can unfold structural patterns and dynamics and test structural claims that cannot be captured without it.

There are two areas of legal research in which SNA was used quite intensively. First scholars used SNA methods to study the dynamics of precedents citation by courts, focusing especially on the way in which the authority of precedents depreciates in time and on the characteristics of key precedents (Black & Spriggs, 2013; Epstein, Landes, & Liptak, 2015; Hansford, Spriggs, & Stenger, 2013; Hitt, 2016) (Fowler & Jeon, 2008; Lupu & Fowler, 2013). Second SNA was used to study of interlocking directorate networks. This research programme focused on the phenomenon of individuals that sit on the board of directors of multiple companies, creating “interlocking directorates” between companies. This network can facilitate the flow of information and norms between companies and allow firms to coordinate their actions. It has been studied persistently from the 1970s, primarily by scholars outside law (Buch-Hansen, 2014; Dooley, 1969; Veen & Heemskerk, 2014) (David & Westerhuis, 2014; Heemskerk, Fennema, & Carroll, 2016). However, the legal literature has in general shown little interest in the burgeoning

research in this field (apart maybe of few studies in the field of antitrust).[17] Indeed as Barzuza and Curtis note "Despite the prevalence of interlocks and growing evidence of their importance, legal scholars have not paid much attention to interlocks as a component of corporate governance" (Barzuza & Curtis, 2014: 671). Further, most of the work that was done in this area by legal scholars tended to focus on the normative implications of corporate interlock, without engaging directly in empirical work.

We argue that SNA holds the potential to contribute to legal research beyond these two topics. While over the past ten years there has been increasing interest in the use of SNA in the study pf legal questions beyond the issues of precedents and interlocking directorates (see the general review below), legal research continues to lag behind the social sciences. Further, we think that not only SNA can contribute to the analysis of legal questions, legal scholars have an important role to play in structuring and undertaking these studies, joining forces, as we do here, with scholars from other disciplines such as mathematics and computer science.

There has been more interest in the use of SNA in the legal literature over the past ten years although it still remains sporadic and peripheral. Daniel Katz has published (with several co-authors) several articles using network analysis.[18] The first article (Katz & Stafford, 2008) studied the social and professional linkages between Federal judges, drawing on a network analysis of the flow of law clerks among judges. In another article Katz and his co-authors (Katz, Gubler, Zelner, & Bommarito, 2011) studied the structure of American legal academy. The authors collected information on the tenured or tenure-track faculty of all American law schools. They then transformed the dataset into a set of directed dyadic relations between the institution where a given individual received their initial socialization and the institution where that individual now acts to socialize the next generation. This analysis revealed the dominance of elite players, such as Harvard, Yale, Columbia and Chicago that have made the largest number of placements. It can be argued that these institutions have more influence on the flow of ideas (pp. 83-85). Edelman and George studied collaboration networks in law, drawing on the famous example of Paul Erdos collaboration network, taking Cass Sunstein as the legal equivalent of Erdos (Edelman & George,

[17] See, (Baccini & Marroni, 2015; Gerber, 2007; Huberfeld, 2006; Jacobs, 2013; Petersen, 2016).

[18] See also http://computationallegalstudies.com and Network Analysis and Law Tutorial http://computationallegalstudies.com/network-analysis-and-law-tutorial/.

2007). Michelle M. Miller used SNA to study the role of social networks in a household's bankruptcy decision study (Miller, 2015). Two other examples are a network study of patent citations (Strandburg, Csardi, Tobochnik, & Erdi, 2008; Strandburg, Csardi, Tobochnik, Erdi, & Zalanyi, 2007) and a study of the regulation of the telecommunications industry (Spulber & Yoo, 2005).

The field where most of the law-related work has been done over the past few years is, however, international and transnational law and international relations.[19] While these works have strong legal orientation, most of this work was undertaken by scholars from sociology, geography or political science. We will focus in this brief review primarily on works that examine the relationships between international organizations. There is another strand of literature which is less connected to our study that looks at the dynamics of precedents in international law.[20] The existing literature uses two primary techniques in order to analyze relationships between international organizations. The first focuses on legal instruments – treaties, standards or codes – as units of analysis and studies their inter-connections drawing on the method of citation analysis. The second technique focuses on organizations and examines, through various techniques, their inter-connectedness. A notable example of the first technique is Rakhyun E. Kim's study of international environmental treaty law (Kim, 2013-14). Like out study, Kim's study is motivated by an attempt to develop a macroscopic view of the field of international environmental law (**IEL**). The study of IEL he argues is dominated by "'fragmentation' rhetoric based on anecdotal evidence" and there is therefore a need for macroscopic studies that could unravel the structure and dynamics of this system. He argues that a network-based approach, which uncovers the underlying system architecture by reducing the system to an abstract structure capturing only the basic connection patterns between its components, could provide this macroscopic viewpoint. In order to perform the analysis Kim compiled a data set of 747 multilateral environmental agreements (MEAs) (1857 to 2012). He has chosen cross-references (citations) as proxies for the evolving structure this network. Examination of the texts of 747 MEAs identified 1001 cross-references. Drawing on a definition of fragmentation as the fraction of the largest component he finds that the system's level of fragmentation has been increasing since 1857 to 1975 as more and

[19] See, for an overview (Hafner-Burton & Kahler, 2009).
[20] See, in particular the works of (Cohen, 2013, 2015 ; Lupu & Voeten, 2012; Voeten, 2010) (Guillaume, 2011; PELC, 2014). There also some studies that use SNA to study IR scholarship (through citation analysis) (Maliniak & Powers, 2015; Maliniak, Powers, & Walter, 2013).

more nodes with no links were inserted into the network (the fraction reached the minimum of 5.6 percent in 1975). Since 1976, however, the fraction of the largest component has increased until today, and it stabilized around 56 percent. In another recent work that uses a similar methodology Jessica Green examined the inter-relationship between privately created standards to measure and manage greenhouse gas (GHG) emissions. The nodes represent each of the standards, while the are operationalized as recognition of others' rules (Green, 2013: 7, 13). She finds that 79 percent of standards created by private actors recognize rules created under the Kyoto Protocol; this findings suggests, she argues, an unintended consequence of private authority: it can serve as a venue for the embedding of public rules (Green, 2013: 2).

The second technique focuses on institutional links between international or transnational organizations. Most of the studies have either studied directly this question directly drawing on various measures of institutional links or have studied these ties indirectly through by constructing affiliation networks. A good example of a study that focus on affiliation networks as a way of assessing institutional ties is Jason Beckfield study of the 'The Social Structure of the World Polity' (Jason Beckfield, 2010). Beckfield studied the social structure of the world polity, using network analysis of the complete population of intergovernmental organizations (IGOs) as it has evolved since 1820. He studies this networks as a bipartite or affiliation network in which the nodes are partitioned into a set of IGOs and a set of states. He finds that the world polity's structure reveals growing fragmentation, driven by exclusive rather than universalist intergovernmental organizations. The world polity has thus grown less cohesive, more fragmented, more heterogeneous, and less "small worldly" in its structure. This structure reflects a recent rise in the regionalization of the world polity. Beckfield study focuses on the conventional field of public international law. Other scholars have studied the transnational legal domain, looking into private institutions. These studies also take a more direct approach to assess the existence of cross-institutional ties.[21] Examples include Bartley and Smith study of ten certification organizations (Bartley & Smith, 2010) and Alan Richardson study of regulatory networks for accounting and auditing standards (Richardson, 2009). Thistlethwaite and Paterson study of the network of

[21] Morin et al (Morin, Louafi, Orsini, & Oubenal, 2011) take a different approach by studying the connections between the individuals involved in a certain international body. They conduct a network analysis of the individual members of the International Platform on Biodiversity and Ecosystem Services (IPBES) Panel and Bureau.
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sustainability accounting organizations consider the links between the organizations by constructing affiliation network based on connections between individuals serving as board members in these bodies (Thistlethwaite & Paterson, 2015: 5).

Our work complements these studies in several respects. First, the work of Kim and Beckfield focuses on the conventional entities of public international law; our work extends the analysis to the domain of transnational law, looking at network of CSR codes. Second, we used two techniques to measure inter-institutional ties – looking both at direct institutional connections and assessing ties indirectly by constructing an affiliation network that builds on firms' membership. This should provide more robust understanding of the topological structure of the network. Third, we complement the topological analysis with an analysis of the functional value of cross-membership by testing its association with CSR performance through analysis of global CSR rankings. Kim's study, for example, remains silent about the functional value of cross-treaty links, which may be functionally cooperative or disruptive. Our study differs in several key points from Kim's work.

IV. Analysis: Preliminary Results

In this section, we provide preliminary results of the network analysis. We will have more complete results for the conference. As noted above our network analysis had two aspects. First, we examined the relationship between the Codes' governing bodies drawing on an analysis of institutional data extracted from the Codes' websites. Second, we analyzed the CSR-codes system as an affiliation network involving firms and codes. The two analyses complement each other because they expose different aspects of the institutional links between the Codes. We expected the two forms of analysis to yield similar results with respect, for example, to the topological structure of the networks especially in terms of the centrality of dominant codes.

A. Institutional Analysis of the CSR-Codes Network (CN)

We describe first the results of the analysis of the institutional links between the Codes' organizations (**CN network**). We have taken an inclusive approach to the question of the definition of 'institutional linkage' and included in it various forms of organizational associations. This

reflects the intuition that for assessing the capacity of the network to self-coordinate the general topological structure of the network is more important than the exact institutional realization of a link between two Codes.[22] In a universe lacking central hierarchical authority, a more extensively linked network has a better capacity for self-coordination, first because information can flow more easily between nodes and because such structure gives more room for mutual influence (e.g., mutual monitoring). In order to examine the level of institutional inter-linkages we distinguished between five types of institutional connections:

- **Governance** - covers participation in other codes' governance bodies as well founders of other codes and other historical connections. For example, Fair Trade (FI) is a co-founder of ISEAL and is represented in ISEAL's board of directors.
- **Partnership** - covers partners, collaborators, cooperators and allies. For example, Global Reporting Initiative (GRI) is an ally of Carbon Disclosure Project (CDP).
- **Compliance cooperation** - covers codes which provide traceability or compliance services to other codes. The only example of such connection that we found is UTZ Code of Conduct for the Tea, Coffee and Cocoa Sectors, which provides traceability services to Roundtable on Sustainable Palm Oil (RSPO).
- **Membership** - covers codes which are members[23] of other codes. For example Textile Exchange (TE) is a member of Better Cotton Initiative (BCI).
- **Support** - covers codes, which support other codes. The term "support" designates a lower level of institutional linkage than partnership or membership – a signal of ideological affinity. For example, Round Table Responsible Soy (RSPO) supports United Nations Global Compact (UNGC)[24].

[22] This analysis does not expose of course all the interactions between codes. One can go deeper by analyzing major global conferences in which representatives from these organizations meet, personal relations between agents and more.

[23] UNGC use the term "participants" instead of "members". Many codes distinguish between membership and certification. Membership reflects participation in the governance of the code as an organization; certification is provided to organizations that meet the requirements of the standard promulgated by the relevant CSR-Code. In some cases, the two categories overlap. In this analysis, we focused on membership while in the analysis of the affiliation network we focused on certification (or membership that is equivalent in substance to membership).

[24] The codes, which support UNGC, are those who have the "We Support the Global Compact" logo on their websites. This logo is used by codes, which are participants of UNGC, and demonstrates those codes' commitment to UNGC and its principles.
https://www.unglobalcompact.org/participation/getting-started/brand-guidelines

In assessing the existence of any of the above links we relied exclusively on the characterization of the link in the codes' websites and have not examined it independently. We thus do not have data about the intensity of any connection. For example, we do not have data regarding the nature of partnership relations between Codes or how involved are Codes in the governance of other Codes.

We analyzed each of the Codes (see **Appendix A** for the exact list) by closely examining its website to see if it is connected to any of the other codes via one of the above organizational paths. Other than partnership (which is reciprocal) all the paths listed above are directed and not symmetrical. The analysis took place in August-September 2015. The analysis included a search for information about the members, partners, supporters, governance and history of each code. The results of the analysis were inserted into a matrix that included all the Codes which we than analyzed using the tools of SNA. For instance, if code A was in the governance bodies of code B, an edge pointing to B was drawn. The analysis produced directed unconnected graph with $|V| = 61$ nodes and $|E| = 116$ edges. The degree of node *i* (or node centrality) $C_D(i)$, is the number of edges connected to that node. The average incoming and outgoing degrees are $\langle C_D^{in} = 1.11 \rangle$ and $\langle D_C^{out} \rangle = 0.79$, respectively.[25] The maximal incoming degree is 16, associated with ISEAL. The maximal outgoing degree is 7, corresponding to *GRI*. Another quantity of interest is Dangalchev centrality (Dangalchev, 2006), given by:

$$C(i) = \sum_{i \neq j} 2^{-d(i,j)}, \quad (1)$$

Where $d(i; j)$ is the number of edges in a shortest path, between nodes *i* and *j*. The three largest values are 12.50, 11.44 and 11.16, associated with *ISEAL*, *GRI* and *UNGC*, respectively.[26]

The Centralization of a network measures its resembles to a star graph in which one central node has ties to every other node (Crowston & Howison, : 76).

[25] In evaluating average degree we assumed the degree of isolated nodes is zero.
[26] In evaluating Dangalchev centrality we assumed that the distance of isolated nodes is infinite; they thus do not contribute to the ultimate calculation.

(2) $$C_G = \frac{\sum_i [C_D^* - C_D(i)]}{(n-1)(n-2)},$$

where C_D^* is the maximum value of degree centrality in the network (measured in number of edges, both in an out) and (n - 1)(n - 2) in the denominator is the sum of the value in the numerator computed for a star graph with n nodes. The centralization ranges from 0 (perfectly decentralized) to 1 (perfectly centralized, a star graph). For the entire network we measured $C_G = 0.26$. Since the network is unconnected it was also plausible to consider the maximal strongly connected component (MSCC) with $|V_s| = 34$. For the latter, the centralization was 0.447. Taken as a whole this network is rather decentralized and composed from a few distinct clusters. We also found that the MSCC consists mostly of partnership type organizations (except RJC, GEO which are governance type, TE which is membership type, and RSB which is both membership and governance type).

Let σ_{st} be the number of shortest paths from nodes s and t. Let $\sigma_{st}(v)$ be the number of shortest paths from s to t that some node v lies on.[27] Then the Betweenness centrality is defined by

(3) $$C_B(v) = \sum_{s \neq v \neq t} \frac{\sigma_{st}(v)}{\sigma_{st}}.$$

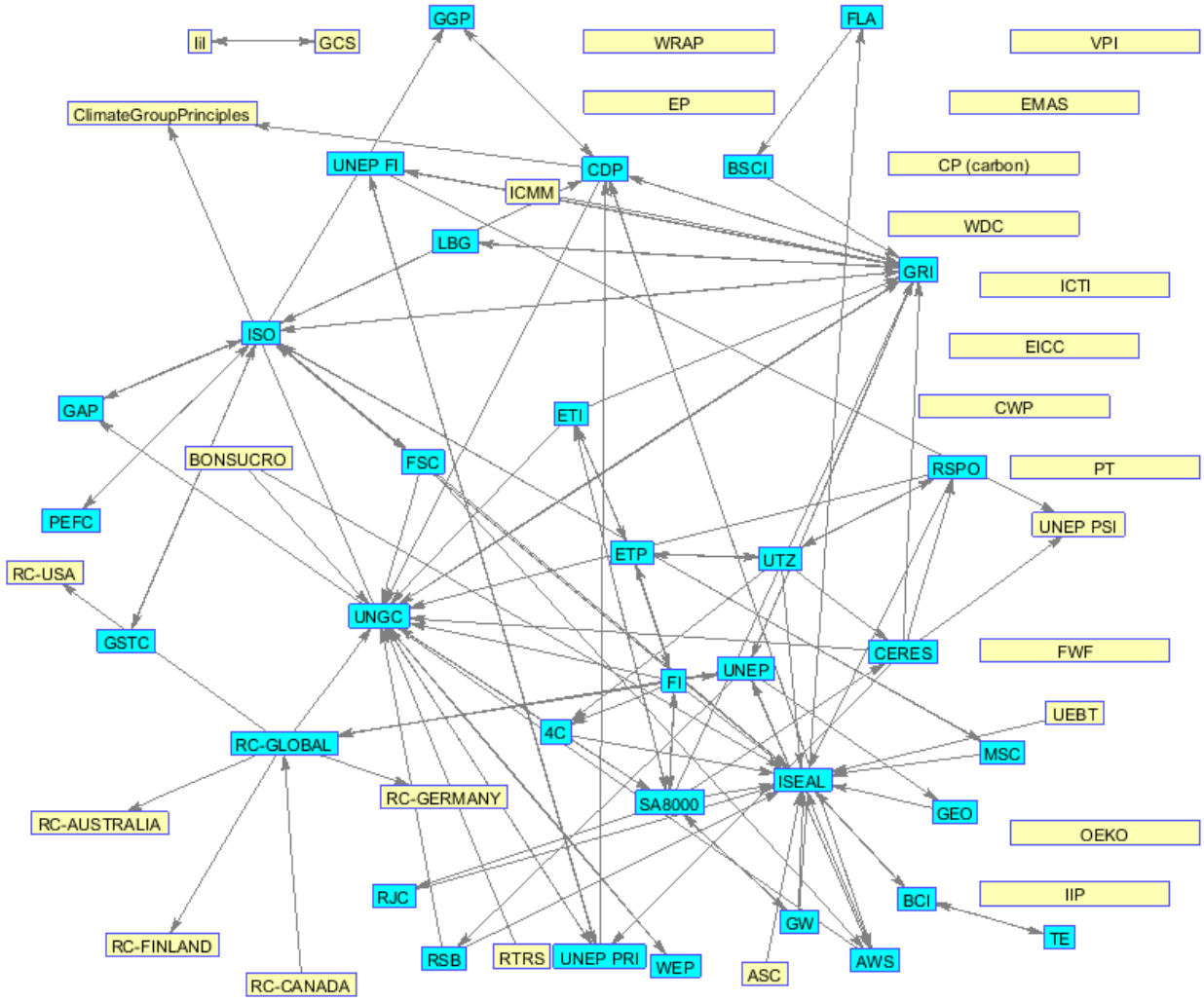
Betweenness centrality quantifies the influence of node v on the flow of information between nodes s and t. It can be normalized by $(n-1)(n-2)$ s.t $C_B(v) \in [0,1]\ \forall v$. For the CN, the maximal betweenness centrality $\max_v C_B(v) = 0.177$, was found to be associated with GRI. This means that GRI serves as a bridge to the largest number of shortest paths between any two randomly chosen codes in the connected subgraph. Other significant values are related to ISO (0.171), UNGC (0.164), SA8000 (0.121) and ISEAL (0.109). These organizations all lie in the maximal component.

The figure below provides a visual representation of CN. The maximal strongly connected component is marked with cyan. The CN network is not fully connected and some of the codes are

[27] The unconnected nodes are not part of the shortest paths and thus, in effect, are not included in this calculation.

completely isolated. Several organizations stand out as more highly connected to others: ISEAL, UNGC, GRI, ISO, UNEP[28] (with 17, 14, 11, 8, 10 edges respectively (in & out)) (see **Appendix B** for the complete distribution). This finding coheres with the perceived status of these bodies. It may suggest that these bodies play a more important role in coordinating (orchestrating) the network.

Figure 1: Institutional Links between CSR-Codes



[28] For UNEP we lumped together UNEP, UNEP FI, UNEP PSI and UNEP PRI.

Another element of the study, which is not yet completed, is a mapping of the Codes according to a taxonomy we have developed. Our classification scheme distinguishes between the Codes according to four criteria:

1) *General – versus specific*

   We interpret *generality* as a term that describes codes that apply to firms across several industrial sectors. GRI, UNGC, CDP, WEP, EMAS are general codes because their governing objectives (e.g., on sustainability reporting, gender equality, environmental management) are not sector-spec. While EMAS focuses on environmental management and is thus, arguably, less general than UNGC (that seeks to establish general sustainability principles that apply to any aspect of corporate life), we nonetheless consider it general because it applies to a whole range of industries.

   Specific codes are those that apply to specific sectors such as banking, fishery, forests etc. The different designation of responsible care vis-à-vis EMAS can be explained by the fact that the former applies only to the chemical industry.

   Examples of General Codes: GRI, UNGC, CDP, WEP, EMAS

   Examples of specific codes: WDC, UTZ, Responsible Care

   (Eberlein et al., 2013) (Auld, 2014: 132-3)

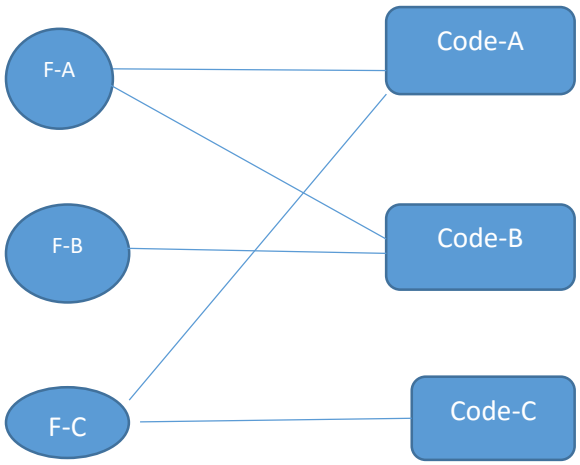
2) Stringency of the Compliance Regime: strict v. soft

   a. *Soft compliance*: UNGC, WEP (no compliance mechanisms, just self-reporting or declaration on commitment)
   b. *Intermediate:* GRI, Responsible Care (because this category offers firms various compliance options, including verification by third parties – but the final decision which to choose remains at the firm's discretion)
   c. ***Strict****:* SA8000, FSC (have compliance mechanisms with third party assurance, which are integral to the program and are non-negotiable) (so the key issue here is the existence of enforcement process that is *external* to the certified firm)

3) *Governance*: we adopted the scheme developed by *Abbott and Snidal*, which distinguishes between organizations governed by Civic-society, Industry, Public Organizations, creating 7 categories altogether (some of the schemes are governed by only one type of the governing bodies (states, firms or NGOs) and other schemes are governed by two (states-firms, NGOs-firms or states-NGOs) or three governing groups) (K. W. Abbott & D. Snidal, 2010).
4) *Commodities* - designate sector-specific codes that focus on the production of raw materials (mines, forestry, fisheries etc).

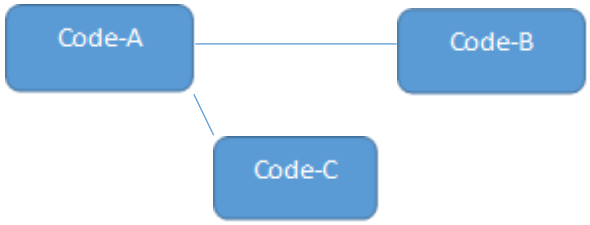
B. The Affiliation Network

The key part of the study is the analysis of the CSR-codes system as an affiliation network involving firms and codes. The CSR-codes network which consists of codes and firms is a bipartite or affiliation network (Stephen P. Borgatti & Everett, 1997; Easley & Kleinberg, 2010a:95; Feld, 1981; Latapy, Magnien, & Vecchio, 2008; Lattanzi & Sivakumar, 2009) (Jason Beckfield, 2010), having codes as one set of nodes and firms as another. A network is bipartite if its nodes can be divided into two sets in such a way that every edge connects a node in one set to a node in the other set (in other words, there are no edges joining a pair of nodes that belong to the same set; all edges go between the two sets) (Easley & Kleinberg, 2010a:95). In the following figure, firm A is a member of Codes A and B, firm B is a member of Code B and firm C is a member of Code C and A.

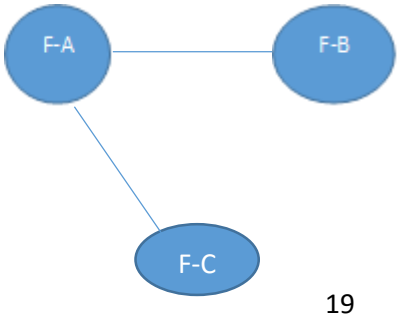


Formally, a bipartite graph is a triplet $G = (V_1,V_2,E)$ where V_1 is one set of nodes (say, the firms), V_2 is another set of nodes (say, the codes), and $E \subseteq V_1 \times V_2$ is the set of links (Latapy et al., 2008:31). Other examples include authoring networks, where the authors are linked to the paper they authored, company board networks, where the board members are linked to the companies in which they serve as directors and credit market (banks and lending firms) (Davis, Yoo, & Baker, 2003; Laniado & Tasso, 2011; Latapy et al., 2008) (Masi, Fujiwara, Gallegati, Greenwald, & Stiglitz, 2011) (Souma, Fujiwara, & Aoyama, 2003). In all of these cases, one can either study the topological and dynamical structure of the bipartite network, or the network induced (or projected) on one of the nodes' set (Latapy et al., 2008: 33-35; M. E. Newman, 2003: 24). For example, in the CSR-codes network one can study the bipartite network of codes and firms as a whole. Alternatively, one can consider the induced network of codes, where two codes are connected by an edge if at least one firm is subscribed to both. Another option is to treat the network of firms, where two firms are connected by an edge if they subscribe to the same code) (M. Newman, 2009: 124). The topological and dynamical structure of the network can be studied either in the bipartite or projected form. In our study we focus mainly on the induced networks of codes and firms. Using the above example, the induced networks will have the following form.

Induced Network of Codes:



Induced Network of Firms:



The network we analyzed is much more complex than the one described above. It includes 49 codes (in 27 out of which we also have historical data)[29] and 32200 firms. The following figure includes the induced graph of the CSR-Codes Network (derived from the affiliation network of Codes and Firms. An edge is drawn between two codes if there is a firm that is a member (or hold a certificate) in both codes. The edges are not weighted (for this graph we disregarded the number of firms two codes have in common although this is of course an important issue, which we will deal with in the next version of the paper). We can make some preliminary observations regarding the topological structure of the network. The following analysis refers to the induced network of Codes (AN).

First, the induced CSR-Codes network is much denser than the network derived through the institutional analysis: of the 49 CSR-codes only one code is not connected (PT) (in CN 15 Codes were not part of the main component including PT). Second, several organizations stand out as more highly connected: GRI, CDP and UNGC. GRI and UNGC also emerged as highly connected in CN. However, because of the complexity of the graph it is difficult to figure out the structure of the network solely through observation. The following measures provide further insight to the structure of this network.[30]

- Average degree $\langle D_G \rangle = 10.08$. This means that on average each Code is connected (via common firms) to 10.08 codes.
- Average weighted degree $\langle D_G^W \rangle = 25.54$. It follows that on average, each code is linked through 25.54 firms.
- Average connection length $\langle \ell \rangle = 2.38 \lesssim \langle D_G^W \rangle / \langle D_G \rangle$.
- Maximal degree $D_G^{\max} = 40$ is associated with GRI code. Other highly connected codes are UNGC (39), CDP (32), RPSO (28) and SA8000 (20). The complete distribution is provided in **Appendix C**. This finding implies that certain codes have a more central role to play in the coordination (orchestration to use Abbott & Snidal phrase) (Abbott, 2014; K.

[29] All the 49 Codes are included in the 61 members CN (listed in Appendix A). But for the other 12 codes we could not find data on firms' membership or this data was not relevant (e.g., in the case of UNEP).
[30] We used the same assumptions as before with regard to unconnected node.

W. Abbott & D. Snidal, 2010). At the other side stand Codes that are only loosely connected to the network (that is, their forms' membership body includes only few cases of multiple subscriptions, prominent among these are GW and ETP with one edge to other codes.[31]

- Maximal betweeness centrality is $\max_{v} C_B(v) = 0.478$ corresponding to EMAS. Next largest values correspond to UNGC (0.128), 4C (0.119), GRI (0.116) and SA8000 (0.114).
- The graph centralization is $C_G = 0.65$.

Another important feature of the graph concerns the distribution of firms with multiple subscriptions which has the following structure (overall there are 2707 companies with joint memberships).

Table 1: Distribution of Multiple Subscriptions

Type of connection	**Number of subscriptions**
2	2050
3	442
4	122
5	53
6	25
7	12
8	2
9	1

Another interesting question we analyzed concerns the characteristics of firms with multiple subscriptions. Our working hypothesis is that such firms would display, comparatively to their peers, a stronger CSR performance. We have several potential explanations for this hypothesis referring both to the accumulative regulatory influence of the subscription to several legal regimes

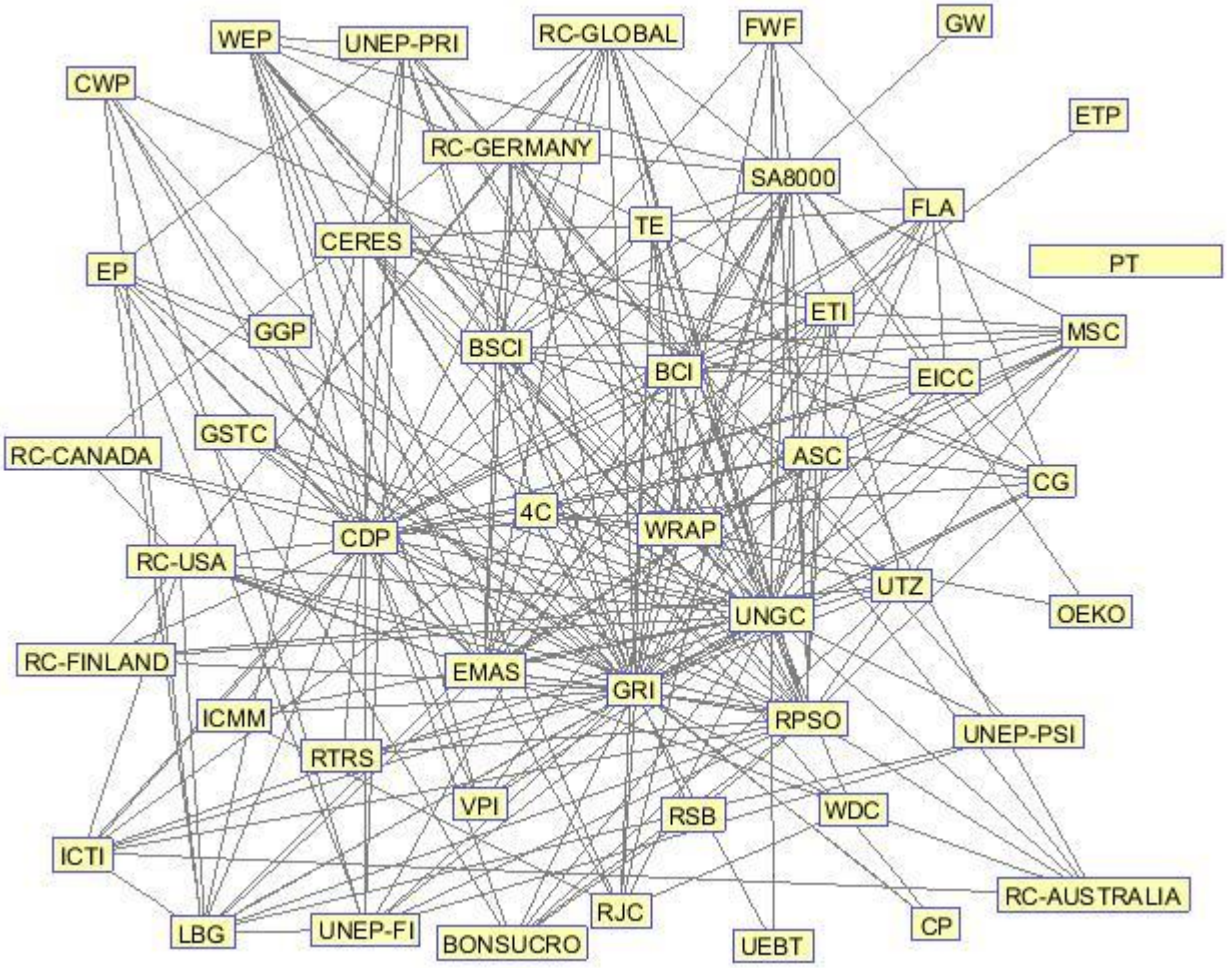
[31] eigenvalue centrality, PT (0.0078) ETP (0.0135).

and to the desire of firms to signal their commitment to sustainability values. To give a sense of the identity of these firms we compiled a list of the firms with 7-9 subscriptions (Table 2 below).

Table 2: firms with 7-9 subscriptions

Firm name	**Number of occurrences**
3M	7
Anglo American	
Arkema†	
Basf Se	
Bnp Paribas	
Credit Suisse	
Evonik Industries	
Kao	
Nestle	
Royal Bank Of Scotland†	
Rsa Insurance	
Swiss Re	
Aviva	8
Nike	
Bank Of America	9

Figure 2: The Affiliation Network of CSR-Codes and Firms - the Induced CSR-Codes Network



As noted above we hypothesized that the number of subscriptions should be indicative of firms' CSR performance. To test this hypothesis we intend to compare our data on cross-subscriptions with data on global CSR rankings, which we take as credible proxies for CSR performance. We have obtained data from Dow Jones Sustainability Indexes, VIgeo and FTSE4Good that should allow us to conduct this analysis. In order to test the relation between membership in codes and sustainability performance, we intend to use the following methodology:

1. Multilinear regression of the selection to the sustainability indices (binary variables Y_i) for DJSI or FTSE4good vs memberships in each of the codes (binary matrix X_{ij} where i goes over companies and j over codes). The universe for each of those indices includes all companies that applied for that index.
2. Correlation between the degree of each company in the company-codes graph and the selection to each index.
3. Correlation between each company's centrality in the company-codes graph, based on betweenness/eigenvector/other methods and its inclusion in each index.
4. Correlation between selection to an index and membership in several codes (degree), where the universe is only companies selected for the index compared to all companies in the database.

We hope to have complete results for this section in June for the conference.

V. Conclusion

Our empirical analysis demonstrates that the field of CSR-Codes constitutes indeed a quite dense network. Shifting the research gaze form the particular code-regime to the network of codes/firms and their interactions provides new insights about this system, such as the central role of some codes, the potential synergy between the codes (manifested in multiple subscriptions) and more.

Appendix A – The List of Codes in our Database Annex A – The List of Codes in our Database

Code	Initials	Information About Firms' Membership (dynamic and/or static; *d,s* respectively)	Institutional Connections to other Codes ('None' represents cases in which our analysis did not find any institutional connections between that code and the other on the list)
1. Aquaculture Stewardship Council	ASC	V s	V
2. Better Cotton Initiative	BCI	V d	V
3. Better Sugar Cane Initiative	BONSUCRO	V s	V
4. Business Social Compliance Initiative	BSCI	V d	V
5. Carbon Disclosure Project	CDP	V d	V
6. Carbon Principles	CP (carbon)	V d	None
7. Climate Wise Principles	CWP	V s	None
8. Code of Conduct for the Tea, Coffee and Cocoa Sectors	UTZ	V s	V
9. Common Code for the Coffee Community	4C	V s	V
10. Council for Responsible Jewelry Practices Code of Conduct	RJC	V d	V
11. Eco-Management and Audit Scheme	EMAS	V d	None
12. Electronic Industry Code of Conduct	EICC	V s	None
13. Equator Principles	EP	V d	None
14. Ethical Tea Partnership	ETP	V s	V
15. Ethical Trading Initiative Base Code	ETI	V s	V
16. Fair Labor association workplace code of conduct	FLA	V d	V
17. Fair Wear Foundation	FWF	V s	None
18. Fairtrade International	FI		V
19. Forest Stewardship Council Principles and Criteria	FSC		V
20. Global Gap	GAP		V
21. Global Reporting Initiative	GRI	V d	V
22. GoodCorporation standard - with the Institute of Business Ethics	GCS		V
23. GoodWeave	GW	V s	V

24. Greenhouse Gas Product Certification Standard	GGP	V s	V
25. International Council of Chemical Associations - Responsible Care	RC-GLOBAL	V d	V
26. International Council of Toy Industries - ICTI CARE (Caring, Awareness, Responsible, Ethical) Process	ICTI	V d	None
27. International Council on Mining and Metals (ICMM) Sustainable Development Principles	ICMM	V d	V
28. International Organization for Standardization	ISO		V
29. Investing in Integrity	IiI		V
30. Investors in People Standard	IIP		None
31. London Benchmarking Group	LBG	V d	V
32. OEKO-TEX® Standard 100	OEKO	V s	None
33. ProTerra	PT	V s	
34. Responsible Care Australia	RC-AUSTRALIA	V s	V
35. Responsible Care Canada	RC-CANADA	V s	V
36. Responsible Care Finland	RC-FINLAND	V s	V
37. Responsible Care Germany	RC-GERMANY	V d	V
38. Responsible Care USA	RC-USA	V d	V
39. Round Table Responsible Soy	RTRS	V d	V
40. Roundtable on Sustainable Palm Oil	RSPO	V d	V
41. Social Accountability 8000	SA8000	V d	V
42. Textile Exchange	TE	V d	V
43. The Alliance for Water Stewardship	AWS		V
44. The Climate Principles	ClimateGroupPrinciples	V s	V
45. The Coalition for Environmentally Responsible Economies - CERES Principles - Ceres Company Network	CERES	V s	V
46. The Global Sustainable Tourism Council	GSTC	V s	V
47. The Golf Environment	GEO		V
48. The international Social and Environmental Accreditation and Labelling Alliance	ISEAL		V
49. The Marine Stewardship Council Principles and Criteria	MSC	V d	V
50. The Mission of the Roundtable on Sustainable Biomaterials	RSB	V s	V
51. The Program for the Endorsement of Forest Certification	PEFC		V
52. The Union for Ethical BioTrade	UEBT	V d	V
53. The Women's Empowerment Principles	WEP	V d	V
54. UN global compact	UNGC	V d	V
55. United Nations Environment Programme	UNEP		V
56. UN Principles for Responsible Investment	UNEP PRI	V d	V
57. UNEP FI Principles for Sustainable Insurance Initiative	UNEP PSI	V d	V
58. UNEP Statement by Financial Institutions on the Environment & Sustainable Development + Statement of Environmental Commitment by the Insurance Industry	UNEP FI	V d	V
59. Voluntary Principles on Security and Human Rights	VPI	V d	None

60. World Diamond Council Resolution on Conflict Diamonds	WDC	V s	None
61. Worldwide Responsible Apparel Production Principles	WRAP	V s	None

Appendix B: In and Out Links in the Network of Institutional Links between CSR-Codes[32]

code	in degree	out degree
1. 4C*	0	2
2. ASC	0	0
3. AWS*	0	3
4. BCI*	0	2
5. BONSUCRO	0	0
6. BSCI*	0	1
7. CDP*	1	4
8. CERES*	0	2
9. ClimateGroupPrinciples	1	1
10. CP (carbon)	0	0
11. CWP	0	0
12. EICC	0	0
13. EMAS	0	0
14. EP	0	0
15. ETI*	0	2
16. ETP*	1	2
17. FI*	1	1
18. FLA*	0	1
19. FSC*	0	1
20. FWF	0	0
21. GAP*	1	1
22. GCS	0	1

[32] * indicates membership in the maximally strongly connected component (MSCC).

23. GEO*	0	1
24. GGP*	1	1
25. GRI*	4	7
26. GSTC*	0	1
27. GW*	0	1
28. ICMM	0	0
29. ICTI	0	0
30. IiI	1	0
31. IIP	0	0
32. ISEAL*	16	1
33. ISO*	8	0
34. LBG*	1	0
35. MSC*	0	1
36. OEKO	0	0
37. PEFC*	0	1
38. PT	0	0
39. RC-AUSTRALIA	1	0
40. RC-CANADA	0	0
41. RC-FINLAND	1	0
42. RC-GERMANY	1	0
43. RC-GLOBAL*	0	2
44. RC-USA	1	0
45. RJC*	0	1
46. RSB*	0	1
47. RSPO*	2	0
48. RTRS	0	0

49. SA8000*	3	1
50. TE*	1	0
51. UEBT	0	0
52. UNEP*	3	0
53. UNEP FI*	1	1
54. UNEP PRI*	2	1
55. UNEP PSI	2	0
56. UNGC*	12	2
57. UTZ*	1	1
58. VPI	0	0
59. WDC	0	0
60. WEP*	1	0
61. WRAP	0	0

mean(deg_in) = 1.115

mean(deg_out) = 0.787

Appendix C: Distribution of Degrees in the Affiliation Network

Code name	Degree
1. 4C	10
2. ASC	9
3. BCI	13
4. BONSUCRO	7
5. BSCI	16
6. CDP	32
7. CERES	9
8. CG	9
9. CP	3
10. CWP	6
11. EICC	9
12. EMAS	19
13. EP	10
14. ETI	11
15. ETP	1
16. FLA	10
17. FWF	6
18. GGP	3
19. GRI	40
20. GSTC	4
21. GW	1
22. RC-GLOBAL	12
23. RC-CANADA	4
24. RC-USA	12
25. RC-GERMANY	9
26. RC-AUSTRALIA	6
27. RC-FINLAND	5
28. ICMM	4
29. ICTI	9
30. LBG	13
31. MSC	11
32. OEKO	2
33. PT	0
34. RJC	8
35. RSB	3
36. RPSO	28

37. RTRS	3
38. SA8000	20
39. TE	14
40. UEBT	2
41. UNEP-FI	10
42. UNEP-PRI	11
43. UNEP-PSI	4
44. UNGC	39
45. UTZ	7
46. VPI	5
47. WDC	3
48. WEP	12
49. WRAP	10

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