

The Micro Foundations of Policy Diffusion Toward Complex Global Governance: An Analysis of the Transnational Carbon Emission Trading Network

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Abstract

Greenhouse gas emissions trading (ET) systems have become the centerpiece of climate change policy at multiple scales, unexpectedly largely outside of the UN climate governance process. The diffusion of ET is best described as a case of polycentric diffusion, where ET systems diffused to multiple loci of governance, but where they all serve similar goals under a broad policy framework guided loosely by the UN-based climate regime. Using network analysis combined with qualitative data, we explain how this polycentric pattern of policy development emerged, who carried and spread it and how, and how the idea has spread into a polycentric governance system. We contribute to the policy diffusion literature in a novel way to explain diffusion toward polycentric governance, show the limits of the existing literature to explain the diffusion of ET, and show the utility of network analysis in understanding the process and mechanism of polycentric diffusion.

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Introduction

Greenhouse gas emissions trading (ET) systems have become the centerpiece of climate change policy at multiple scales. Examples include a supranational system in Europe, sub- and transregional systems in North America, emerging national systems in a variety of states including South Korea, Australia, and China, and intra- and interfirm systems in the private sector. This proliferation shows little sign of abatement despite the stillbirth of an international ET system under the 1997 Kyoto Protocol to the UN Framework Convention on Climate Change (UNFCCC) and setbacks such as the failure to launch a national system in the United States. Indeed, while negotiations under the UNFCCC—an international treaty with near universal membership that provides the overarching framework for international climate governance—remain slow and conflictual on many fronts, parties continue to collectively favor carbon markets generally and approved a “new market mechanism” in 2011.

The basic idea of emission trading—or “cap and trade”—is to set an upper limit on greenhouse gas emissions for some target population, distribute emissions permits among participants, and then allow participants to trade permits among themselves to meet their respective commitments. ET sits alongside similar mechanisms that produce carbon credits—or “offsets”—that can be counted toward an emissions budget or target of an investing country, firm, or even individual. The best known such mechanism is the Clean Development Mechanism (CDM) of the Kyoto Protocol, which allows industrialized countries to invest in and receive credit for emissions reductions projects in developing countries. In ET and offset systems, the mechanism is most commonly justified as a way to achieve emissions reductions cost-effectively.

The ascendance of ET as a key tool for addressing climate change has been rapid since its inclusion in the 1997 Kyoto Protocol, however today ET remains largely outside of the multilateral treaty regime, with a few exceptions of linkages to Kyoto mechanisms by some national or regional systems. Parties agreed to include ET in the Protocol at the insistence of the United States and despite objections from the EU, many developing countries, and environmentalists (Andresen & Agrawala, 2002; Engels, 2006; Yamin, 1998). Yet, the envisioned global system embedded in the Kyoto Protocol never materialized, in part because the withdrawal of the United States from the Protocol in 2001 led to significant uncertainty about the future of the treaty

Table 1. The Cap and Trade Policy Domain (1996-2012)—Venues Where ET Has Been Proposed and/or Implemented.

Subnational		National	International	Private
Australian States and Territories	New Mexico New South Wales	Australia Brazil	EU ETS Kyoto Protocol	British Petroleum Chicago Climate Exchange
Beijing	Greenhouse Gas Reduction Scheme	Canada	NAFTA	
California		Chile	Commission for Environmental Cooperation	PEMEX Shell
Chongqing (China)	Ontario–Quebec	China		
Florida	Oregon	Denmark		
Guongdong (China)	Regional Greenhouse Gas Initiative (transnational)	Japan Kazakhstan		
Hubei (China)		Mexico		
Illinois	Rio de Janeiro	South Korea		
Massachusetts	Sao Paulo	New Zealand		
Midwestern Governors Association (transnational)	Shanghai Shenzen Tianjin	Norway Switzerland Turkey		
New England Governors/ Eastern Canadian Premiers (transnational)	Western Climate Initiative (transnational)	Tokyo United Kingdom United States		
New Hampshire				
New Jersey				

Source: Betsill and Hoffmann (2011); the International Carbon Action Partnership interactive world map of ET systems, http://icapcarbonaction.com/index.php?option=com_wrapper&view=wrapper&Itemid=147 (accessed December 18, 2012).

Note. ET = emissions trading; ETS = Emissions Trading Scheme; NAFTA = North American Free Trade Agreement; PEMEX = Petróleos Mexicanos

and the creation of a “global” market. At this same time, the broader institutional context of climate governance became unstable and fragmented (Abbott, 2012; Biermann, Pattberg, & Zelli, 2010; Keohane & Victor, 2011), multiple actors (e.g., firms, states, regions, subnational political units) came to see responding to climate change as within their authority, and adopted ET as a policy tool to achieve their own objectives (Table 1). Betsill and Hoffmann (2011) analyzed policy debates and market development in 33 policy venues between 1996 and 2008. While they found widespread acceptance of ET as an appropriate climate policy response, their analysis also reveals considerable diversity in how ET systems are organized and justified in different policy venues. Fragmentation in the ET policy domain has continued apace since 2008 with national systems now under consideration or scheduled for implementation in China, Brazil, Chile, Kazakhstan, Mexico, Turkey, Ukraine, and a number of cities and regions in China. An ET system is now operational in Australia after an early attempt failed.

In sum, ET systems reflect an emerging pattern in the governance of complex global problems. Global governance in issue areas ranging from finance and trade to food security and climate change, increasingly can be characterized as fragmented, where multiple loci of authority, sometimes linked, and often at multiple scales, comprise a governance system. Such governance arrangements go by various names in the scholarly literature, including polycentric (Ostrom, 2010a, 2010b), complex sovereignty (Grande & Pauly, 2005), and regime (and transnational regime) complexes (Abbott, 2012; Keohane & Victor, 2011; Raustiala & Victor, 2004). In this article, we use the term *polycentric* to describe the governance system in the ET policy domain to highlight that it involves multiple and relatively independent sites of decision making operating at different scales serving similar goals under a broad global policy framework guided loosely by the goals and norms of the UNFCCC.

Our objective is to explain how this polycentric pattern of ET policy development emerged over the last 20 years. We begin by arguing that existing models of international policy diffusion fail to capture the process of proliferation of ET policies regarding climate change, because they have focused almost exclusively on adoption and/or adaptation of policies in pre-existing, and usually similar, political units (e.g., states or substate units in a federal system). Instead, polycentric diffusion requires a focus on the meso level, between specific venues (micro level) where a policy is adopted and the broad structural or normative logics (macro level) that bookend the range of explanations of many international diffusion studies. In the case of ET, the meso-level analysis requires an examination of the network of individuals and organizations that carried and promoted ideas about the appropriateness of ET as a climate policy response. We use social network analysis supplemented with interview and archival data to identify how policy ideas traveled between ET venues.

Our diffusion story is about how polycentric governance can be created by diffusion of transnational policy ideas that do not find immediate homes in already existing polities like nation-states. Contrary to standard ET diffusion stories of U.S. coercion (e.g., Damro & Luaces Méndez, 2003; Ovodenko & Keohane, 2012), which underestimate pre-Kyoto European interests and development of policy ideas around ET, our analysis reveals that this policy idea developed almost simultaneously in the United States and Europe, with very tenuous links between them and prior to actors in either jurisdiction adopting ET as an actual policy tool. The existence of these two distinct networks has shaped subsequent diffusion patterns in these regions. Second, we find that the network of ET proponents was almost entirely transnational as opposed to transgovernmental. This characterization held even as intergovernmental organizations (Organisation for Economic Co-operation and Development

[OECD], United Nations Conference on Trade and Development [UNCTAD], Intergovernmental Panel on Climate Change [IPCC]) facilitated communication and became meeting grounds for transnational networks.

We conclude with a discussion of the implications of our findings for ET and polycentric diffusion more broadly. We note that the network analysis alone cannot explain variation in ET design in different venues. A complete analysis of polycentric diffusion also must focus on what happens in particular jurisdictions once the idea is diffused, where local political and economic forces interact with the parts of the transnational network active in that particular jurisdiction to shape the form of the market.

Polycentric Policy Diffusion

The international policy diffusion literature aims to explain how and why policies in one or a few political jurisdictions get emulated or reproduced in other similar units, or how an idea promoted internationally—say through a treaty or an international institution—becomes state policy (Cao, 2009, 2010; Finnemore, 1996; Finnemore & Sikkink, 1998; Füglistner, 2011). It also focuses almost exclusively on government actors as sources and targets. It even treats “go-between” actors as important almost exclusively in the context of their relationships with government. With these preexisting political jurisdictions in mind, it then seeks to explain how or why they select similar policy instruments or institutional forms in different jurisdictions (e.g., Busch & Jörgens, 2005; Graham, Shipan, & Volden, 2012; Holzinger, Knill, & Sommerer, 2008; Meseguer & Gilardi, 2009; Ovodenko & Keohane, 2012; Simmons, Dobbins, & Garrett, 2008). Explanations generally fall into four categories: coercion (by powerful states), competition (e.g., for investment or other economic advantage), learning and emulation (e.g., based on policy effectiveness), and harmonization (e.g., with international law).¹ The dominant logic is thus functional (e.g., success/effectiveness breeds diffusion), or a logic of consequences, that is, a rational response to powerful countries or institutions to adopt similar policies in response to competitive or other demands of a policy environment.

The story in polycentric diffusion must start earlier—prior to its adoption by any political or private authority—and move forward to a more complex understanding of governance where the policy becomes manifest in a polycentric way. It also must pay more attention to transnational actors—those who may interact with governments, but who are not necessarily government actors themselves. While transnational networks such as epistemic communities of experts (Haas, 1992) are not completely ignored in diffusion studies, the more common focus is on transgovernmental networks (Slaughter, 2004). We argue that it is important to start from the network rather than the polities

under such circumstances, because it is an empirical—not a theoretical—question where to look for the network in polycentric systems.

While some of the mechanisms identified in the traditional state-centric diffusion literature may also be at work in the ET diffusion story, we argue that an examination of the meso-level network of individuals and organizations who promoted and carried the policy idea better identifies the mechanisms through which policy ideas travel, become implemented in, and actually contribute to the creation of polycentric governance systems. In effect, our diffusion story is about how polycentric governance can be created by diffusion of transnational policy ideas that do not find immediate homes in already existing polities like nation-states.

The conventional starting points in the diffusion literature can lead to erroneous inferences on how ET systems actually spread. First, the state-centric focus misses the pattern in ET diffusion where existing authorities were often slow to take up the idea or actively resisted it, while at the same time new configurations of political authority adopted it. Examples include regional-level systems, whether through preexisting political structures (the EU) or by creating new ones (e.g., Regional Greenhouse Gas Initiative (RGGI) in the northeastern United States) and private authorities. The story is thus not simply emulation, but simultaneous and differentiated policy adoption. This kind of pattern may be particularly likely under globalization and when addressing complex global problems, where policy ideas more easily travel quickly and experimentation occurs (e.g., Graham et al., 2012).

Second, the dominant story driven by the assumptions in the diffusion literature—about U.S. coercion or neoliberal hegemony—is incomplete. Contrary to the argument of Ovodenko and Keohane (2012), emission trading as a model of climate change governance did not diffuse from the U.S. domestic experience with the sulfur dioxide trading system to the European Emissions Trading Scheme (ETS). Rather, the policy idea developed almost simultaneously in both jurisdictions, with only very tenuous links between them, prior to actors in either jurisdiction adopting ET as an actual policy tool. While the architects of the EU ETS learned from existing trading systems, not only in the United States but elsewhere, the idea did not specifically come from the United States nor did the United States actively promote domestic emission trading as a policy instrument, at least not until *after* Kyoto had already been agreed. This pattern is not consistent with a typical horizontal or vertical diffusion story. Whereas clearly U.S. power—not least the threat of nonparticipation—influenced the adoption of Article 17 of the Kyoto Protocol that enabled international ET, coercion cannot account for the adoption of the EU ETS outside of Article 17. Thus, while evidence supports that view that the intergovernmental negotiating processes and U.S. insistence

on the inclusion of flexible mechanisms—including ET—within the Protocol prevailed over initial resistance by many European countries, that should not be conflated with an explanation for why the EU adopted an emission trading system internally. Indeed, U.S. withdrawal from Kyoto prior to the development of the ETS meant it lost interest in other jurisdictions adopting such a mechanism, and the United States had no model of carbon emission trading to offer because no U.S. jurisdiction had adopted such a system. Thus, intergovernmental coercion arguments fail to account for why Europe adopted an ETS or the model they developed. Rather the enabling environment of the Kyoto Protocol, a ready set of policy ideas in Europe, the failure of European carbon tax, and a political environment of support for national and regional action on climate change, among other possible factors internal to the EU, combined account for the adoption of the EU ETS (Skjærseth & Wettestad, 2008; Wettestad, 2005).

Third, the functional story about learning and emulation does not fit because most early adopters took on the policy as an experimental exercise rather than based on success in other jurisdictions (Betsill & Hoffmann, 2011). In some places, this happened because authorities wanted to gain experience for the global system (i.e., the United Kingdom, Norway, EU, etc.), while in other places because authorities anticipated that an integrated global or even national system would not be forthcoming (the RGGI of a number of U.S. Northeastern states, the Western Climate Initiative [WCI] that includes some U.S. states and Canadian provinces, the private Chicago Climate Exchange, EU of late). In both cases, implementing ET in multiple places has been a key mechanism in the development of the polycentric system.

Fourth, as discussed below, the network of ET proponents, especially at the early stages, was almost entirely transnational as opposed to transgovernmental. This characterization held even as intergovernmental organizations (OECD, UNCTAD, IPCC) facilitated communication and became meeting grounds for transnational networks. Even in the U.S. case where the network was closely linked to government officials from the beginning, their focus was almost exclusively domestic until much later, once the Kyoto negotiations were well underway. Moreover, as we show later empirically, most of the U.S.-based actors in the transnational network were not those involved in either the U.S. domestic process or the high-level diplomatic process in the run-up to Kyoto.

Our analysis is more consistent with constructivist accounts of policy diffusion which focus on changing ideas about the appropriateness of public policies often facilitated by elite expert networks (Simmons et al., 2008). The idea of ET for greenhouse gases was germinated among relatively small groups of economists, environmentalists, and policy makers in the late 1980s

and early 1990s and eventually grew to not only dominate the governance of climate change but also to proliferate in diverse ways over time, space, and political jurisdiction. The core ideas through which the “common sense” understandings of such market mechanisms as a means of responding to climate change—through notions of efficiency, flexibility, negotiability, and the possibility of north–south bargains in particular—were disseminated through this network. The embedding of this “common sense” can also be understood in relation to broader norms of “liberal environmentalism” (Bernstein, 2001), where market mechanisms became understood as consistent with broader political-economic norms from the 1980s onward, as well as connected to the way that financial actors saw direct economic benefits in ET (Newell & Paterson, 2010).

We remain open minded as to whether traditional diffusion mechanisms are now kicking in, in the wake of experiments in North America and Europe, as more and more national jurisdictions are experimenting with ET, or pledging to do so. However, until now, our analysis paints a much more organic picture where policy ideas percolated in different settings and then gained strength over time as they interacted with political environments in different jurisdictions or policy settings.

Method

In contrast to many diffusion studies that infer the existence of a network, we empirically identify the nature and structure of the transnational ET network through social network analysis complemented by extensive interview and archival data on the evolution of the climate regime and carbon markets from the early 1990s to the present. We present a network mapping of the individuals and organizations involved in the various policy venues in which ET has been discussed or implemented in relation to climate change and produce a narrative that details crucial dynamics in the emergence and evolution of ET systems. Our meso-level analysis, which focuses on the interstices between specific ET venues and broader liberal or market discourses, can better identify mechanisms of learning than quantitative approaches that infer learning or socialization (e.g., Cao, 2009). While we do not dispute that interaction in international forums—in this case the UNFCCC or OECD—may facilitate such processes, our network analysis can capture channels of policy diffusion and also reduces the risk of overstating the role of international organizations and governmental actors if one were to look only at participation or membership in international organizations. The meso-level approach is especially useful for avoiding this risk in examining the early stages of the diffusion of a policy idea. Quantitative studies of this type, while very useful for examining large-scale diffusion to like units after the fact, are less well equipped to

identify mechanisms and processes of initial transfer of policy ideas or who carries them.

Social network analysis arose in Sociology (e.g., Boissevain & Mitchell, 1973; Coleman, 1958; Scott, 1991; Wasserman & Faust, 1997; Wellman, 1983) but has recently emerged as a crucial methodology in political science as well (e.g., Bach & Newman, 2010; Cao, 2009, 2010; Hafner-Burton, Kahler, & Montgomery, 2009; Hafner-Burton & Montgomery, 2006; Ward, Stovel, & Sacks, 2011). Put simply, a network is made up of nodes and edges. Nodes are the agents of interest (in our case we define the nodes as individuals or organizations working on carbon markets). The edges are the links or relations between the nodes (in our case, common participation in ET venues). The foundational assumption of this kind of relational analysis is that the “regular network patterns beneath the often complex surface of social systems” (Wellman, 1983, p. 157) are important for understanding and explaining social and political dynamics. Network analysis seeks to “describe these patterns and use their descriptions to learn how network structures constrain social behavior and social change” (Wellman, 1983, p. 157).

In contrast to network analyses that seek to explain the structure of networks themselves—examining why linkages among nodes develop in the ways that they do—our study uses network structure and characteristics to illuminate social and political outcomes. We present a descriptive mapping to identify the ET network structure and patterns from the last 25 years.² We are interested in the relationships between individuals and organizations that participate in the discussions, design, and operationalization of ET in different policy venues so that we can understand how the general ideal of ET along with specific ideas about how to carry it out have spread over time and space. In addition, we employ some of the quantitative tools of networks analysis, namely, the centrality measure betweenness³ to identify a set of particular actors that have been important links between clusters within the ET network.

For this analysis our goals are thus to observe the structure of the network underlying the development of ET systems, relate the observed network characteristics to the political dynamics of carbon markets observable in our qualitative data, and to identify key actors who have participated in the development of carbon markets *across venues*. The descriptive network analysis presented below can tell us a great deal about how ET networks have emerged and changed over time and provides a foundation for further quantitative networks analysis that would statistically analyze how “the pattern of ties in a network provides significant opportunities and constraints” (Wellman, 1983, p. 157) for the politics of carbon markets.

In this article, we use individual- and organizational-level data from eight policy venues that have been involved in the development of ET. The definition of a venue varies somewhat over the time period covered in the database. We start with a “germination” period in the early days of climate governance where the idea of ET emerged. For this period, we identify three venues: Project 88 in the United States (a bipartisan sponsored expert-based initiative focused initially on developing the policy case for market mechanisms for U.S. domestic clean air policy), OECD/UNCTAD (both of which sponsored reports on emission trading), and the Annex I Expert Working Group (AIXG), the principal forum for discussing ET in the UNFCCC negotiations before Kyoto in 1997. The other venues are more straightforward—specific instances where ET is considered and designed. These include Kyoto/Marrakesh (UNFCCC negotiations in Marrakesh produced the 2001 Marrakesh Accords, in which parties finalized the rules of implementation for the 1997 Kyoto Protocol) and four venues that are or were operational—the United Kingdom, EU, RGGI, and WCI.⁴ Data collection consisted of examining reports of meetings and negotiations for ET venues to ascertain who participated in their design and operationalization. We recorded individual names and organizational affiliations (Non-governmental Organization [NGO], corporate, Intergovernmental Organization [IGO], various levels of government), noting the date(s) and nature of participation (e.g., as observer, stakeholder comment, negotiator, etc.) in ET discussions.⁵ We identified 1,889 individuals and 744 unique organizations who participated in one or more of the policy venues.⁶ For the network with individuals as nodes, only the 115 people who participated in more than one venue were included.⁷

The network images presented below resulted from a series of methodological choices that need some mention. First, we defined the network by treating individuals or organizations as nodes and common participation in a venue as the link (edge) between nodes.⁸ If John Smith and Mary Jones participated jointly in RGGI discussions, they are linked by a tie. The edges are presented as value-free (i.e., no difference between a link that represents common participation in a single venue and a link representing 10 venues participated in common). In some cases, we censored or truncated links by degree (i.e., only links representing a specified number of venues in common are displayed). Finally, in a number of the graphs below, node size is a function of the betweenness score—a measure of centrality that captures how important a node (individual or organization) is to the connectivity of the network.⁹ We conducted interviews with some of the key individuals who appeared in the network images to validate our findings and gain further understanding of the meaning of network connections.

Discerning Diffusion via Transnational Networks

As we argue above, dominant approaches to diffusion, have difficulties in explaining instances of polycentric diffusion. They do not specify the mechanism of diffusion in a satisfactory way and thus are subject to misspecification of the diffusion process *and* the resulting impact of the policy tool or idea that is being diffused. Understanding *how* diffusion has proceeded is necessary for grasping important aspects of adoption/adaptation of ET in particular places as well as the general politics and place of ET in climate governance. Our network maps of the participants in the development of ET systems uncover ways in which the actors that drive and organize these schemes interact in an emergent polycentric governance system. When combined with qualitative data, they demonstrate that ET ideas spread in a way not anticipated by traditional diffusion studies.

Three aspects of this diffusion are particularly salient. First, a pseudoepistemic community dedicated to ET for climate change emerged in the late 1980s and early 1990s that provided intellectual foundations for a global ET system. However, from the beginning diffusion of these ideas took two paths—one North American and one European—thus defying conventional wisdom about the externalization of U.S. experience with ET for sulfur dioxide. In addition, the network that developed supporting ET was substantially transnational, not transgovernmental.

Second, the diffusion of ET both (re)constituted and flowed through an emerging polycentric governance structure. ET was never designed holistically for climate change. On the contrary, some venues picked up and began to work with ET in anticipation of a larger system, gaining experience and shaping what ET applied to climate change would look like. These actions contributed to the fragmenting of climate governance, increasing the number of authoritative actors that saw themselves as governing climate change (Hoffmann, 2011). After 2001 when it became clear that a global ET system would not materialize, the fragmentation of ET and climate governance accelerated as different venues engaged with ET for a variety of reasons. The fragmentation and clustering of the ET network discussed below demonstrates this very dynamic.

Finally, the growing diffusion of ET in this post 2001 period was again largely a transnational phenomenon, shaped by the two paths that developed in the early days of ET discussions. While the network diagrams show a dearth of connections between the early epistemic community and the later operational venues, the distinct European and North American pathways are still evident.

Discerning these diffusion dynamics is consequential not just for accuracy's sake but also for understanding the politics and impact of the polycentric

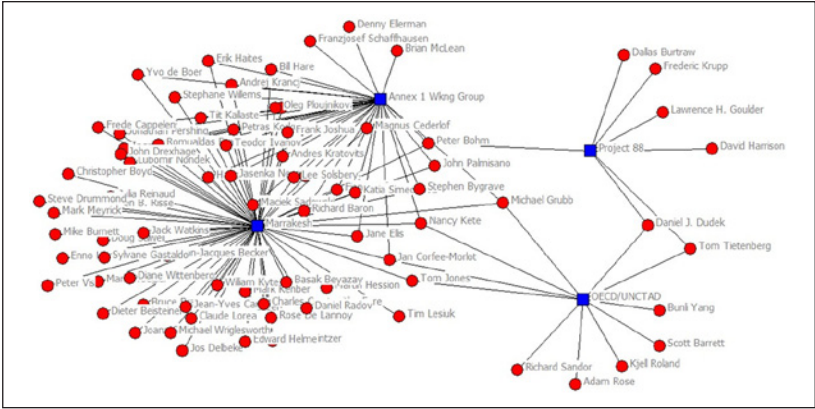


Figure 1. Early venues and the Kyoto-Marrakesh process.
 The U.S. cluster: Project 88 and beyond.

diffusion of ET. Two implications that deserve further study flow from our analysis of polycentric diffusion mechanisms. First, local, venue-level politics are key to understanding variation in ET systems precisely because of how ET diffused. If ET diffused through emulation of a single idea or through the coercive power of the United States, venue-level politics would not have the pride of place that they do. They would also not reflect the European/North American split evident in venue design. Second, that specific venues developed as distinct centers of authority matters for how political actors pursue the goal of a global carbon market and if/how it can be achieved. The polycentric diffusion that occurred sets the conditions for linkage and scaling up in ways that need to be better understood.

Two Roads to ET

To examine the emergence of ET in the climate change arena, we first created a network map of the two expert venues (Project 88 and OECD/UNCTAD) along with the venues that considered the place of ET in the UN negotiations (AIXG and Marrakesh). What is immediately apparent is that the early pseudoepistemic community is bifurcated into two distinct clusters with relatively loose connections. One cluster emerged in the United States organized around the Project 88 initiative and another in Europe, organized in particular by UNCTAD and the OECD (Figure 1). In Figure 1 the square nodes represent these early venues, the circles are individuals who participated in these discussions (only those individuals who also participated in another venue are

included). This illustrates the separation between the two sites in which ET discourse emerged in climate change debates. Only two individuals (Tom Tietenberg, an academic economist, and Dan Dudek, the senior person at U.S.-based Environmental Defense Fund, which strongly promoted ET in this period) participated commonly in Project 88 and in the OECD/UNCTAD reports. Notably, both are nonstate actors. Furthermore, Project 88 has fewer connections to the UN venues (AIXG and Marrakesh) than does the European-oriented OECD/UNCTAD. Given that these two network clusters are the principal sites for early discussions of ET for climate change, we unpack the character of the discourse at each site and how it emerged as this is an important context for understanding the observed variation in ET systems.

The network cluster that emerged in the United States was organized around "Project 88," a network of economists (e.g., Tom Tietenberg, Robert Hahn, and Robert Stavins, who was the project director) and policy makers (particularly Senators Timothy Wirth (D) and John Heinz (R)) advancing arguments for market-based mechanisms in environmental policy. Project 88's work led directly to an ET system created by the revisions to the Clean Air Act of 1990 to address sulfur dioxide emissions. Project 88 (1988) was also the first to suggest the possible use of ET to address climate change. In a second report, *Project 88—Round II* (1991), international ET to combat climate change plays an even more central role.¹⁰ By this time, as shown below, the ET network had grown significantly.

Project 88 was particularly important in creating a strong preference within U.S. policy-making circles for ET domestically and internationally. Its members also had some influence abroad. Stavins, for example, notes being at a number of meetings in the early 1990s where his views on emission trading were solicited, including briefing the Canadian federal cabinet, at the OECD and in briefings in the lead-up to the 1990 Houston G-7 conference.¹¹ Stavins also connected with the networks in OECD, principally by sending them files, reports, and data.¹²

An emerging European cluster: The OECD and UNCTAD. While this fairly tightly knit U.S. cluster was the first to mention the possible use of ET in relation to climate change, the idea started to gain broader international currency during 1989 as a number of others, mostly from other English-speaking industrialized countries, took the idea and ran with it. As Figure 1 shows, they were at best only loosely connected to Project 88 participants. Between 1989 and 1992, a distinct European network cluster can be identified.

A key report published in December 1989 by Michael Grubb of the Royal Institute of International Affairs in London, titled "The Greenhouse Effect: Negotiating Targets," proposed an international system of "tradable permits"

and gained wide circulation (Grubb, 1989). Like the Project 88 proposal for international ET, it outlined in considerable detail why, in Grubb's view, it would be preferable to pursue an international agreement based on ET than on other designs being put forward. However, direct connections to Project 88 are tenuous at best: Project 88 documents do not figure in the citations and the acknowledgments are mostly to U.K.-based policy makers, economists, and scientists. Grubb does acknowledge the "Harvard Negotiation Roundtable," which may have included Stavins who was then at Harvard, but this is not clear.¹³ He does cite another existing report by U.S. authors who seem unconnected to Project 88 (Swisher & Masters, 1989) as well as a background paper for the first IPCC report that discussed, but did not advocate, ET (Bertram, Stephens, & Wallace, 1989; Tilley & Gilbert, 1990).

This analysis of the texts at the time as well as interview data supports our finding in the network analysis that the emerging European network cluster was relatively detached from the existing U.S. network cluster. Importantly, the discourse adopted by each differed significantly. For Grubb and the people he worked with, the classical efficiency and pro-markets argument that dominated U.S. debates were less important than the more practical question of how best to get an international agreement given the various huge structural problems (the inertia of energy systems, global inequalities, uncertainties about emissions trends in particular countries).¹⁴

This European network developed over the next 2 years to a considerable extent because of the policy entrepreneur work of Frank Joshua at UNCTAD. Joshua brought together the group of people who had started publishing on ET in relation to climate change (notably Grubb and Tietenberg but also Scott Barrett, Kjell Roland, and Richard Sandor from the Chicago Board of Trade). Also important in developing this network was interest by the OECD, which organized a workshop on "Tradeable Permits to Reduce greenhouse gas emissions" in June 1991.¹⁵ For UNCTAD and the OECD, the 1992 United National Conference on Environment and Development (or "Earth Summit") was a clear impetus; their publications were timed to come out shortly before that conference and contribute to its deliberations. For the OECD in particular, this work clearly also fit within its general interest in the use of economic instruments in environmental policy, encapsulated by Bernstein (2001) as the shift to liberal environmentalism.

Emergent Fragmentation

In the period following the adoption (1992) and entry into force (1994) of the UNFCCC, the European network cluster became organized more explicitly through the OECD, and became the core of the expert network leading up to

the 1997 Kyoto Protocol. In the context of international negotiations, ideas about ET were discussed during the mid-1990s primarily through the AIXG, a group coordinated by the OECD and formed during 1994-1995 as a forum for industrialized countries and countries with economies in transition (Annex I Parties under the UNFCCC) to discuss informally design issues regarding revisions or protocols to the UNFCCC. The OECD aimed explicitly to have a depoliticized debate around the various technical issues involved in the negotiations—measurement and monitoring of emissions, national communications, and design of a protocol or other instrument.¹⁶

During the run-up to Kyoto, the AIXG became the key site where a technical consensus for ET emerged. Doug Russell, lead negotiator for the Canadian government, chaired the AIXG for most of that period. Despite this diplomatic context, which makes it appear as a conduit for U.S.-led pressure within the negotiations, at the level of the expert network, the most significant direct continuities to the earlier policy discussions are to the European network cluster rather than the American one. Russell, for example, plays no role in other venues (although he did in Canadian domestic discussions which do not figure in our analysis here).¹⁷ Figure 1 shows this pattern clearly—with four links (Grubb, Kete, Corfee-Morlot, Jones) from the OECD/UNCTAD cluster and only Bohm from Project 88. Bohm was an economist from Stockholm University, not apparently a central actor in Project 88 according to our interviews. None of the key U.S. economists promoting ET in Project 88 or the U.S. acid rain program appear to have participated in the AIXG or Marrakesh. Their influence flowed solely through the U.S. administration and its diplomatic pressure rather than via the transnational expert network.

As is well known, in the diplomatic negotiations, the United States was the principal actor pushing the idea to link binding targets to market mechanisms. This position started to unfold in 1996, as indicated by Tim Wirth's (U.S. Under-Secretary of State for Global Affairs) speech to the second Conference of the Parties in July 1996, where he proposed the adoption of "activities implemented jointly and trading mechanisms" (Wirth, 1996) as elements in what would become the Kyoto Protocol.¹⁸ But this proposal ultimately bore fruit because of the foundational work that had been conducted by the early network clusters, particularly the OECD/UNCTAD cluster whose members were directly participating in the AIXG. These individuals and organizations were already receptive to the idea of using ET in the global response to climate change and were able to capitalize on the political opening provided by the United States to move forward. Other published interview data and accounts from EU Commission officials at the time generally confirm our network analysis findings. For example, Peter Zapfel, who shows up in our network analysis post 1998 after joining the Directorate General Environment

within the European Commission, writes that U.S. officials did almost nothing to promote ET among its strategic partners prior to 1997 outside of the international negotiations. Following Kyoto, after Europe had already agreed to the idea,

The US was eager to make up for the strategic mistake [of failing to promote ET] . . . This was a critical oversight which nearly resulted in a failure of the 3rd Conference of the Parties. Immediately after the Kyoto conference US actors with an interest, but also real-life experience, in emissions trading (EPA staff, the environmental pressure group Environmental Defense, the think tank Center for Clean Air Policy, researchers at the Massachusetts Institute of Technology and other academics etc.) invested a lot of time and resources in participating in the European debate. (Zapfel & Vainio, 2002, p. 7)

While the Environmental Protection Agency (EPA) became involved, according to Zapfel and Vainio (2002), mainly transnational actors—academics, NGOs, think tanks—provided the link with the already existing network within Europe and the OECD. Interestingly, Wettestad (2005) identifies Zapfel himself, who joined the commission in January 1998 and who had studied ET in the United States, as a key proponent, but one of many within the Commission who had responded to legal advisors and working groups who pushed the idea within the Commission as the best way to exert control over climate policy.

In this regard, it is notable that European resistance to the inclusion of ET in the Kyoto Protocol stemmed not from opposition to the idea of ET itself, which had strong support from industry who had opposed an EU carbon tax prior to 1997. Rather, European governments worried international ET within Kyoto specifically would favor the United States if it tried to achieve quantified targets by relying heavily on purchasing international credits rather than through domestic action. Thus, whatever coercion occurred intergovernmentally applied to the dead-letter international ET system under Kyoto, not the adoption of regional or national ET systems that arose in the wake of failure of an international system. If anything, U.S. withdrawal from Kyoto and indifference provided a political impetus for the European ETS because it mitigated competitive concerns and provided an opening for European leadership (Wettestad, 2005).

A brief period of heavy U.S.–European interaction 1998–2000 did follow Kyoto’s signing, again mostly through transnational pathways including Environmental Defense’s intense and successful effort to promote an ET pilot for British Petroleum (BP) launched in 1998, but the policy quickly became heavily Europeanized as it became clear the U.S. administration would not

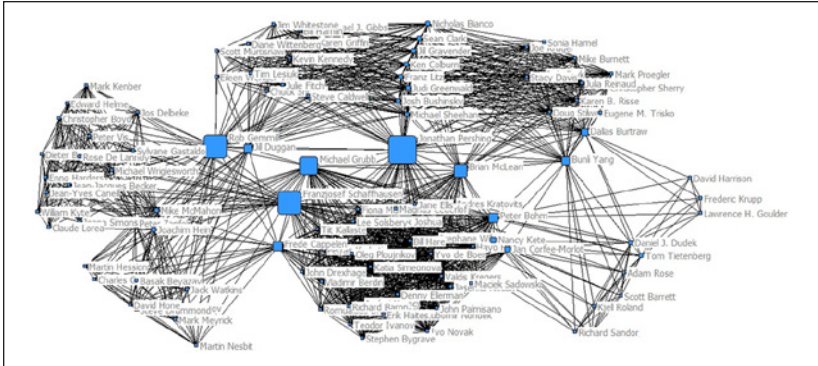


Figure 2. Early and operational venues—Degree I network.

launch a national ET system and the “different institutional, cultural, legal, and administrative nature of EU Member States diminished the value of the contributions by US experts” (Zapfel & Vainio, 2002, p. 9). Instead, the BP pilot and national experiments in Europe provided more important demonstration effects for stakeholders and lessons learned that influenced the development of the EU ETS (Zapfel & Vainio, 2002).

The 2001 Marrakesh Accords represent a crucial juncture in the development of ET as a climate governance tool, precisely because it set out the mandate to develop a global ET system to help the international community reach its Kyoto targets. Marrakesh thus appears as a key bridge between the early germination period and the operationalization of ET in different policy venues. Of course, a global trading system did not come to fruition as originally envisioned, but the precedent set in 2001 opened political space for the development of ET in other, smaller jurisdictions (Betsill & Hoffmann, 2011). The Marrakesh catalyst motivated action in venues dedicated to Kyoto targets (EU ETS) and those designed independently of the Kyoto Process (RGGI, WCI). It is at this juncture that we begin to see how the development of ET contributed to and reflected the increasing fragmentation of global climate governance.

Figure 2, where links between nodes represent common participation in one or more venues, shows that the continued relative separation between the U.S. and European network clusters continued once ET moved to the operational phase. The early networks already discussed appear in the bottom right of the picture (Project 88 and UNCTAD/OECD) and in the dense cluster in the middle (AIXG).¹⁹ The two clusters in the top of the picture are RGGI and WCI. The clusters at the bottom left are the EU ETS and the U.K. pilot

scheme. The size of the node indicates an actor's betweenness score. Larger node size means that node is more central to the network in the sense that removal of the node would have a relatively large effect on breaking up the network. Among other things, this shows that four people are the key individual connections linking the European and UN venues to the U.S. venues, while the UN and European venues are more fully connected. Pershing and McLean are the only direct connections between U.S. venues and the AIXG, while Gemmill and Duggan connect the EU and the United Kingdom directly to the WCI. Centers of authority are emerging with relatively sparse individual connections between them and with relatively few direct individual connections to the intellectual foundations or global design of ET.

The transatlantic connections are thus very weak in terms of individuals directly working on multiple venues. To be clear, links could come in other forms (i.e., information can flow through other media than individuals), but this does demonstrate how relatively disconnected the operational discussions were from the early theoretical discussions measured in terms of the individuals who developed the early ideas of ET and the individuals who worked on designing operational systems. It also shows how the U.S. venues developed in a manner relatively disconnected from the European and UN venues. Again, the network diagram demonstrates how the development of ET reflected the fragmentation of climate governance in the early to mid-2000s. No overarching model diffused; on the contrary, ET developed in particular places in relative isolation. However, it is also clear that the development of individual ET systems with different goals, politics, and designs also contributed to the fragmentation of climate governance (Hoffmann, 2011).

Another way of viewing this pattern is that there are two distinct pathways from the AIXG to the venues where ET has (or will) become operational. Figure 2 can in effect be read temporally. There are almost no direct connections from the very early debates (Project 88 and UNCTAD/OECD) to the operational venues. Only Grubb connects those debates to the United Kingdom and EU, while Burtraw and Yang connect them to the U.S. venues. All other connections go through the AIXG, and by extension Marrakesh, which reinforces the American/European separation because there are separate connections from AIXG to each. AIXG connects to the U.S. venues via McLean and Pershing, while it connects to the United Kingdom via Grubb and the EU via Schaffhausen and Grubb among others.

We can note also another temporal dimension, in that the key connectors early in the process (from "germination" to the Kyoto-Marrakesh process) are different to those that are present later. There is no one who is present all the way through, from germination, through Marrakesh, to one of the U.S.

venues, and only Grubb connects the early debates, through Kyoto-Marrakesh, to any operational venues (the EU ETS and the United Kingdom). There are some individuals connecting through Marrakesh to the EU (Jones) and the United Kingdom (Grubb, Clark), and some who are present in the germination and in WCI/RGGI (Yang and Burtraw) but none of the direct U.S. connections to the early period pass directly through Marrakesh. As mentioned before, the key links across the transatlantic divide are also different in the two periods.²⁰

The analysis with individuals as nodes provides a new window on the development of ET markets. The venues are emergently apparent—in that we can recognize specific venues as clusters in the network pictures just by observing the links between individual participants. This tells us that the within-venue links are much denser than the between-venue links. There are thus a relatively small number of individuals who participate across venues—the network is clustered around venues with key nodes lying between them. This reflects the polycentric governance system in which ET developed as a tool of climate governance. Furthermore, the analysis to this point casts doubt on emulation as a mechanism of diffusion. The emergence of two paths to ET is evident in the network analysis and documentary and oral records. The fragmented nature of climate governance also shaped the further development of those networks (i.e., because the United States was outside the UN process post 2001, the ET network developed largely outside the context that the EU developed within).

Transnational Not Transgovernmental

Ideas about ET are not only embodied in and transmitted by individuals—individuals are part of larger organizational actors. It may be the case that the diffusion of ideas about ET flows not only through individuals but also through organizations that participate in multiple venues. This seems especially likely when we move beyond the early germination phase dominated by a relatively few experts to the design and operationalization of actual trading systems with many stakeholders. To examine this possibility, we ran network analyses with organizations (governmental, nongovernmental, corporate, academic) as nodes in the ET network.²¹ We considered that an organization participated in a venue when one or more individuals affiliated with that organization participated. With this operationalization another set of somewhat surprising characteristics emerge. Most notably, the key actors that work across venues are transnational (in the sense of being private sector or NGOs) rather than transgovernmental as expected in existing literature on similar diffusion processes (e.g., Slaughter, 2004).

In the germination period through Marrakesh (Figure 3), only 2 of the 18 organizations in this degree 2 network (organizations that participated in two or more

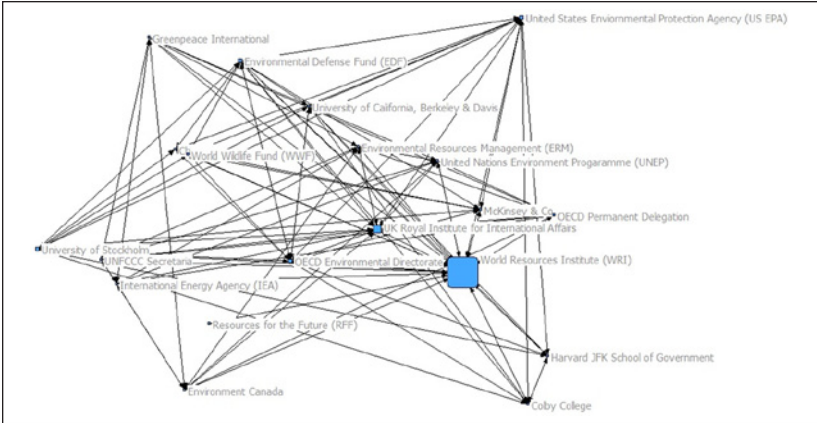


Figure 3. Early venues and Marrakesh—Degree 2 network.²²

of the three early venues and Marrakesh) are national government agencies (U.S. EPA and Environment Canada). NGOs, IGOs, and universities are much more prominent in the network. Note also, that unlike the individual-based network map, there are no discernible clusters in the organizational map. This indicates the formation of a more general substrata of organizations dedicated to ET with ties that were less venue specific. Moving forward from Marrakesh to the operational venues, a similar pattern emerges, but with different significant organizations. Figure 4 displays the degree 2 network for Marrakesh and the four operational venues. Here we see a significant increase in the number of organizational actors participating in multiple venues and nonstate actors are again dominant. The most central actors (measured by betweenness scores) are BP, the Center for Clean Air Policy, CO2e.com, the European Commission, World Resources Institute (WRI), ICF Consulting, the Climate Trust, and the Pew Center on Global Climate Change (now Center for Climate and Energy Solutions). Here again we see less clustering (i.e., venues are not readily identifiable as they are in the individual-based network map), but the Europe–North America divide does emerge. The clusters on the left-hand side of the picture are more involved in European venues, while those on the right are involved in North American venues. This again underscores that the European venues are heavily connected to Marrakesh and the multilateral process, while the North American venues are less so. In the degree three network in Figure 5 (where a link means that nodes participated in common in three or more venues), the dominance of nonstate actors is abundantly clear. While governmental actors are prominent in the venues in their own jurisdictions, these eight transnational actors

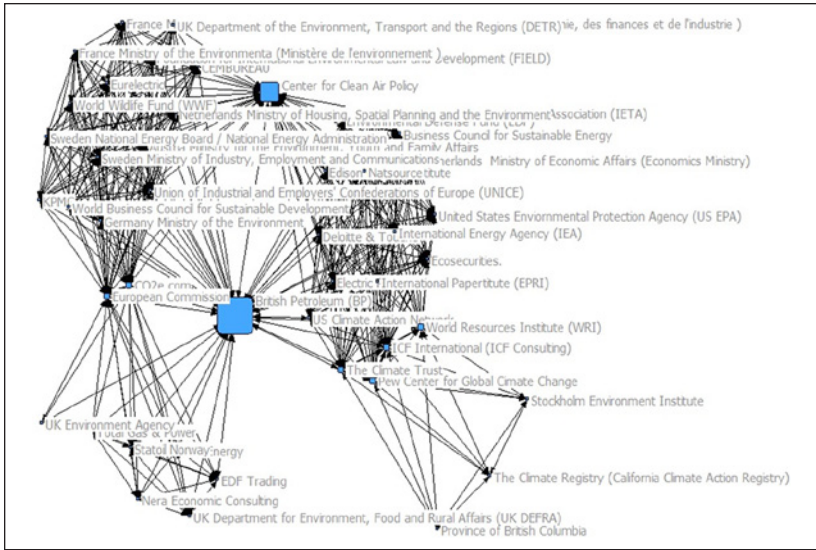


Figure 4. Marrakesh and operational venues—Degree 2 network.

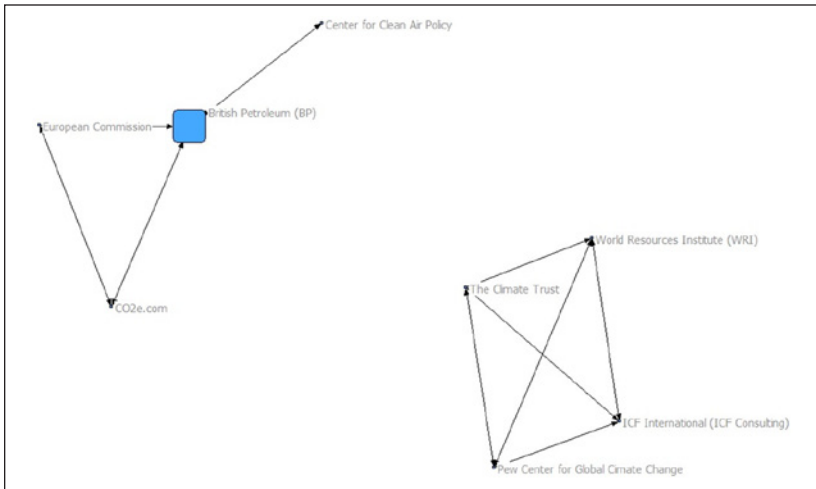


Figure 5. Marrakesh and operational venues—Degree 3 network.

are the only ones that participated this heavily across multiple ET venues (this figure also underscores the transatlantic divide).

Nation-state actors and transgovernmental agency relationships appear to play a relatively constrained role. One possible interpretation is that states and their agencies play a small role in the dissemination of knowledge of ET *across venues*, preferring to only participate when their own state is involved directly (i.e., EU).²³ Of course, industry actors show up at all the venues because they are directly implicated in ET rules. The network mapping indicates that a core set of actors took up the task of “proselytizing” ET (WRI, Pew, Center for Clean Air Policy, the Climate Trust) just prior and after Marrakesh across policy venues, consistent with Zapfel’s recollections cited earlier of the immediate post-Kyoto period—hence the lack of distinct clustering in the organization-based network map. They worked to operationalize the ideas that emerged in the germination period and achieved consensus among a small number of well-networked individuals. These eight organizations appear to be a core set of actors that are participating in all the operational venues and that are then linked to secondary and tertiary actors who participate in one or two venues. It is reasonable to suppose that they could be key gatekeepers or agents of information diffusion.

Conclusion

Our meso-level analysis highlights the ways in which polycentric diffusion of ET differs from conventional understandings on international policy diffusion. The ET story does not fit the diffusion-by-U.S. coercion narrative nor can it be explained in terms of rationalist learning and emulation facilitated by IGOs. On the contrary, distinct epistemic networks with relatively weak links between them emerged in the early phases of international consideration of ET and those early networks created different bases for moving forward. When venues began to take up ET, they reflected and contributed to the growing fragmentation of climate governance and thus we observe a polycentric ET structure. We find that there was not a single ET model being emulated; rather normative preferences for ET diffusion generally and combined with the two types of justificatory discourse outlined earlier. No coercive power forced a particular way to do ET. Instead, distinct authoritative centers developed that have been relatively unconnected to other governmental actors (at least in the network) that worked on ET in their own context.

In addition, the diffusion process appears to be driven by transnational actors rather than transgovernmental ones. Governments and government agencies (national and subnational) work directly on ET in their own venues but did not generally participate in the design discussions for significant number of other venues (at most one other venue). Instead, corporate and NGO actors appear to be the glue holding the global enterprise of ET together.

When viewed in terms of either individuals or organizations that participate across venues, it is the nonstate actors who are not associated with particular venues that are the common denominators. These actors saw themselves as “honest brokers” spreading the idea of ET but not a particular model of ET.²⁴

Our analysis thus suggests three revisions to conventional diffusion stories. First, early stages of diffusion are distinct and have a good deal in common with learning and elite network dynamics, whether or not they are formal epistemic communities. Second diffusion in polycentric systems may be far removed from emulation or mimetic isomorphism, but instead the process of diffusion contributed to the creation of authoritative centers and made local politics paramount. Finally, our analysis suggests that a focus on mechanisms and pathways is key. Examining the causal mechanisms for how ideas get transferred, rather than focusing on the causal effects (the conventional epistemological choice) allows us to capture the actual process through which policy diffuses and provide a better foundation for understanding the politics of adoption/adaptation of policies. Our empirical analysis confirms our suspicion that the meso level between the ideological context and the politics of individual venues is a key area for inquiry should we hope to fully understand the ongoing development of ET. In particular, the transnational network provides the basis for ET in different settings and locales. Network analysis is a useful means of revealing such connections and how polycentric diffusion plays out and influences the shape and politics of ET. We would expect these conclusions to be of interest not only to the study of climate change governance but a range of other processes with polycentric governance features.

Finally, this analysis sets the stage for a continuing research agenda to more fully understand how this diffusion mechanism works in polycentric governance systems. Our current analysis demonstrates that distinct networks formed in North America and Europe but does not reveal how the general idea of ET gets translated into specific policies and practices in different venues. This opens up opportunities for future research. First, ideas about how to enact ET can diffuse through different media than the ones we have captured in our network analysis (individuals and organizations that participate in meetings). Examining different possible network configurations is crucial for further exploring the conclusions we reach here.

Second, once we grasp the dynamics of polycentric diffusion, a next necessary step is to turn to examination of the variation in ET across venues—the shape of what gets adopted. Our conjecture is that the fragmented path of polycentric diffusion makes venue-level politics a key factor in how ET develops in particular places, contributing to the variation we now see across the ET venues system. However, adoption/adaptation does not take place on a blank slate; rather it is shaped by the means of diffusion that precede it. For

example, the lack of connections of the EU and North American networks, arguably, contributed to incompatibilities in reporting requirements and basic units of emission measurements, and developed under different political rationales described above. Adding venue-level case studies to the analysis that examine the political dynamics within venues in future work will allow us to link the polycentric diffusion with the resulting venue politics in a rigorous way.

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Authors' Note

The authors' names appear here in reverse alphabetical order. All four authors contributed equally to the research and writing of this article.

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Notes

1. Simmons, Dobbins, and Garrett's (2008) and Graham, Shipan, and Volden's (2012, p. 18) review of the literature boils down 104 terms of diffusion mechanisms to a very similar list: "learning, competition, coercion and socialization."
2. A different way of using network analysis is to calculate node-level statistics and then use that data in econometric analysis—that is, a centrality measure would be calculated for each node in a network and then that measure becomes an independent variable in a regression explaining actors' behaviors and interactions.
3. Betweenness "corresponds to the number of shortest paths in the network that pass through a particular node, and therefore it measures the dependence of a

- network on a particular node for maintaining connectedness” (Hafner-Burton, Kahler, & Montgomery, 2009, p. 564).
4. The United Kingdom ran a pilot emissions trading (ET) system between 2003 and 2005. For the Western Climate Initiative (WCI), the precise start date for the Emissions Trading Scheme (ETS) is not yet completely decided, but at the time of writing, California will begin trading in 2013 with British Columbia, Québec, and perhaps Ontario to follow at an as yet undisclosed date.
 5. While we have recorded dates of participation where available, there are significant data availability limits on this aspect. We do make some comments on the temporal aspects of the networks below, but these are not based on data about dates, but rather our knowledge about when discussions in each venue was active.
 6. We are aware of a number of issues to do with the construction of this database. First, the availability of data for each venue varies considerably, quantitatively and qualitatively. For some, complete lists of participants in consultative meetings, members of relevant committees, and so on, are available; for other venues, access to such data is considerably more difficult. We have worked to make the data as comparable and comprehensive as possible, and, based on triangulating the results with our direct observations of these processes and extensive interviews, we do not believe that the results are invalid as a consequence of these limits.
 7. We chose to limit the data set for theoretical and practical reasons. Practically, having such a large population in the network would make the network mapping less interpretable. Theoretically, we are interested in linkage between venues, thus including individuals who only participated in one venue would not add to the analysis.
 8. Focusing on individuals or organizations as nodes downplays other ways that information can flow, for example, through citations. In addition, while we concentrate on individuals or organizations that participated in the venues, this does not mean that other kinds of links between individuals are not also important.
 9. There are multiple measures of centrality for nodes. Betweenness measures the importance of nodes for network connectedness and nodes with high betweenness scores can play roles as brokers (because removal of high betweenness nodes leaves the network fragmented). One could use other measures like degree centrality (the number of links a node has to other nodes) or closeness centrality (the length of the path from one node to all other nodes). However, betweenness has more relevance for our project because of its association with a brokering role.
 10. This section draws heavily on Bernstein (2001) and Bernstein’s research for that project.
 11. Interviewed by Bernstein, August 2, 1996 (Center for Science and International Affairs, Harvard University, Cambridge, MA).
 12. Interviewed by Bernstein, August 2, 1996 (Center for Science and International Affairs, Harvard University, Cambridge, MA). Note that he does not appear as a link to the OECD workshop in our network analysis, as this is a record of attendance at the workshop and participation in the report only.
 13. In an interview much later (2007), Grubb mentions Richard Stewart as the person working on it in the United States. Stewart also worked on Project 88.

14. Interviewed by Paterson, December 17, 2007 (Cambridge, UK). See also in particular Grubb (1989), where he explicitly develops these arguments.
15. The proceedings are published as Corfee-Morlot (1992). For other publications on this in this period, see, for example, Hoel (1991) or Markandya (1991).
16. Paterson interview with Corfee-Morlot, November 11, 2007, Paris.
17. This was confirmed in interview with Russell, August 13, 2012, Ottawa.
18. Interviewed by Bernstein, March 13, 1997 (telephone to Washington, D.C.)
19. The picture looks largely similar if we add in the Marrakesh network. It is very close to the Annex I Expert Working Group (AIXG) network and we leave it out for clarity.
20. One element that emerged from the network analysis that we cannot fully examine is that the connections between European and U.S. venues are exclusively Anglo-American. This is not an enormous surprise given knowledge about general patterns in comparative political economy and transnational politics (Hall & Soskice, 2001; van der Pijl, 1998).
21. Similar to the individual-based network analysis, organizations were only included in the analysis if they participated in two or more venues. They methodological choices mentioned above about the network parameters were the same for the organizational networks as they were for the individuals.
22. Note that this is a dichotomized network—an organization can either participate or not. We do not take into account the number of individuals from an organization that took part in venue activities.
23. With the EU, this finding is interesting, given that we know that the EU has attempted directly to influence subnational actors in the United States (especially in California), as well as in Australia (Paterson, interview with Vicky Pollard, November 19, 2007, Brussels). The people involved in this diplomatic activity appear to have been separated from the policy process by which ET systems have been developed in those sites.
24. Hoffmann interviews with staff of Pew and World Resources Institute (WRI), 2009.

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