CONSTRUCTING AN INTERNATIONAL MARKET FOR CARBON TRADING: AN INSTITUTIONAL PERSPECTIVE

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Abstract

Mitigating climate change requires the collaborative and international management of a range of socio-economic processes that produce greenhouse gas emissions. Governments in a number of regions are developing carbon markets to mitigate climate change by limiting the production of greenhouse gases. This thesis examines the construction of carbon markets in the United States and Europe to understand what role these markets play in mitigating climate change. Using a relational economic geography framework and institutional theory, I frame the markets into two components: 1) the regulatory structures which give the markets existence and bound their rules of operation, and 2) the financial and service components which operationalized the markets. Within these components, I investigate four specific facets of market development: complementarity, spacetime, design vs. path dependence and institutional development. The study is conducted through close dialogue and case studies of organization in London, New York and Chicago as well as interviews with policymakers in Washington D.C. Sacramento, and San Francisco.

I find that the regulatory components of the market are built both by regulatory agencies and private organizations such as legal firms. Political path dependence constrains the development of the regulatory framework of the carbon markets. The financial service components are constructed in existing financial service centers such as London and New York by directly adopting expertise, products, services and infrastructure from other markets. With respect to the spacetime construction of markets, I find that carbon markets are being adapted to management in existing time zones, with a seamless transaction of activity between North America, Europe and Asia. However, the nature of spacetime within the markets is changing; the markets now manage non-spacetime. In sum, the carbon markets are constructed as a social institution which mitigates greenhouse gas production by communicating and widely disseminating the value of the absence of emissions.

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Chapter 1 | Introduction

1.1 Introduction

Carbon markets have begun to develop in Europe and the United States as a governance mechanism to reduce greenhouse gas emissions. In Europe the European Union Emissions Trading Scheme is a direct result of the Kyoto protocol. In this market, compliance parties must demonstrate emissions reductions or trade either European Union Allowances (EUAs) or Certified Emissions Reductions (CERs) to meet compliance targets (Watanabe & Robinson, 2005). In the United States a number of both regulatory and voluntary market initiatives have developed on the regional and national level. The Northeastern States are developing the Regional Greenhouse Gas Initiative; California has established a trading initiative under AB 32: Global Warming Solutions Act and several bills including the Lieberman-Warner bill have been introduced to the House and Senate to create a nation-wide cap and trade system. Carbon markets differ from other markets in terms of the scope of government involvement—the commodity of exchange is a regulatory creation and emissions reductions are registered and verified by government (Bumpus & Liverman, 2008). Carbon markets are additionally financial markets built around products without a tangible underlying. Nevertheless, carbon emissions trade like other commodities (Carr & Rosembuj, 2007; Hasselknippe, 2003).[1]

Arguing that modern economic systems lie at the root of modern environmental problems, many environmentalists are displeased with the growing emphasis on market-based mechanisms as a means of addressing environmental issues, particularly pollution

[1] It should be noted that the market for trading emissions is also growing in other areas such as Japan and Australia, and that UNFCCC CERs are produced through the Clean Development Mechanism (CDM) around the globe (Carr & Rosembuj, 2007). However, for reasons of scope, the focus of this article is the trade and financialization of carbon emissions reduction credits in the United States and Europe.

associated with climate change (Davis, 2006; Okereke, 2006; Smith, 1995). However, this may stem from a misunderstanding of what a market is and how it operates (Cantor et al., 1992). Although markets are often criticized in comparison with other control mechanisms such as taxes, they may be the best option for addressing climate change, especially given the issue's global scale (Christiansen et al., 2005). Humanity has never before attempted to coordinate action on the scale or scope necessary to address climate change. The pollutants implicated in climate change models are produced by every country and virtually every sector of modern economies (Driesen, 2006). Since markets are fundamentally a collaborative enterprise, coordinating the activity of numerous actors and institutions (from traders, to consumers, to investment banks) to maintain their infrastructure and operation, they may be fundamentally well suited to coordinate the collaborative regulatory response required to combat climate change (Clark & Thrift, 2005; Knorr-Cetina, 2005). Unfortunately, the existing literature on the use of market mechanisms as a regulatory instrument neglects this sociological aspect of markets, instead focusing on functional aspects of markets associated with price and quantity control (Weitzman, 2000; Hoel, 1998; Howe, 1994).

This thesis seeks to shed light on the collaborative aspects of carbon markets and to investigate whether these aspects enhance their ability to serve as regulatory devices on a global scale. It aims to explain the social factors that drive the market approach and how financial markets engage in delivering environmental objectives. The core hypothesis of the project is that the success of carbon markets in reducing carbon emissions fundamentally relies on the market's ability to engender organized and internationalized social interaction of actors and processes. In other words, the economic drive for market operation on ever greater scales has its roots in collaborative social

mechanisms and is crucial to coordinating an international regulatory framework. Once fully functional, carbon markets have the potential to serve as coordinators for collaboration between different regulatory regions.[2] While the primitive nature of the carbon markets makes conclusive testing of the hypothesis difficult, the nature of the development of carbon markets gives clues to the direction and method of their future growth and function. It is therefore important to investigate the relationships between the actors and institutions of the developing carbon markets, and the relationship between the market and external regulatory components. This thesis investigates questions including: What are the social and economic factors that drive market formation? Can markets be designed or are they purely subject to historical context? What is the interaction between markets and space and time? Are markets always competitive or can they be complementary or collaborative?

1.2 Overarching Theoretical Framework

This thesis analyzes the development of carbon markets using a relational economic geography framework (Bathelt & Glückler, 2003; Boggs, 2003). The approach proposes a novel view in the field for conceptualizing of space, objects of knowledge, action, and research goals. Space, rather than being treated as a container which confines and determines economic action, is treated as a separate entity which can be described and theorized independently from economic action. Economic action and interaction are the central objects of knowledge in the relational approach. Analysis in relational economic geography investigates processes such as institutional learning, creative interaction, economic innovation, and inter-organizational communication through a

[2] Indeed, coordinating diverse regulatory interests was the determining factor for the creation of a European Union Emissions Trading Scheme as opposed to a Europe-wide emissions tax (Watanabe and Robinson, 2005).

geographical lens. Relational economic geography enables a complex understanding of economic action and its localized consequences. It focuses on those people, firms, institutions and other organizations which are involved in economic decision-making, as well as on those people and environments that are subject to the consequences of economic action.

Relational economic geography is a particularly fruitful framework for studying the development of carbon markets because it can facilitate conceptualization of the carbon markets as the product of interaction between actors and institutions across broad geo-political spaces. The framework allows for the market to be conceptualized as an evolving socio-economic set of processes, rather than an actual economic product. Carbon markets are at an early stage of their evolution, and are developing in multiple centers across the globe due to the ambitions and activities of multiple actors. It is thus particularly important to be able to conceptualize markets as evolving relationships of these processes. In addition, since markets develop in particular spaces, a framework for understanding the spaces of relational economic geography is also very important.

Relational economic geography suggests that spaces of concentrated activity can be used as a lens to gain a perspective on broader market function. In particular, the framework suggests that market institutions are not only subject to spatial attributes, but also help to shape these attributes. In other words, the framework suggests that the main geographic centers which host carbon market institutions—London, New York and Chicago—will both shape and be shaped by the carbon market. These locations in effect serve as both mechanistic and theoretical foci, reflecting on the markets and providing researchers a point of entry into the market more broadly. Overall, the relational economic geography approach suggests that carbon markets are not simply the product of

neo-liberal policy hegemony or a straightforward attempt to commoditize the atmosphere. In the same way that a financial market establishes a system of interaction which organizes socio-economic productivity, carbon markets in effect establish a medium through which varied international interests can collaborate.

The relational economic geography framework is combined with institutional theory to understand the structure and function of carbon markets. I suggest that contrary to contemporary understanding of markets from neo-liberal economic theory, markets are social institutions, built and operated through a network of relationships. The markets do not exist a priori the actors and organizations that enact them. Likewise the market is not a thing absent of organizational and individual components. Using the relational economic geography framework I seek to understand which organizations, relationships, and other mechanisms build carbon markets. In particular, I build on the work of Neil Fligstein (1996) by framing the markets within two key components: the first is the policy or regulatory structures which give the market existence and bound its rules of operation, the second is the financial and service components which operationalized the markets. The thesis investigates the development of both components.

I dedicate one chapter to the regulatory development of markets focusing on how policy is constructed and how it interacts with the operational components of the market. Another chapter is dedicated to understanding how the carbon markets become operationalized by organizations in financial centers. A third chapter explores the importance of space and time, both in what the markets manage and in how the markets are managed. A final chapter combines these approaches to understand how organizations build the social institution of carbon markets, and what the implications of the institution are for mitigating greenhouse gases.

As is explored in the concluding chapter, the strength of the relational economic geography framework lies in its ability to build a mechanistic understanding of the operation of carbon markets. On this basis, concerns might be raised regarding the relevance of this research given the current global financial crisis and the economic adjustments that will take place to market systems over the next few years. I would argue that the research will continue to be relevant, as it constructs an understanding of the relationships and mechanisms which shape carbon markets rather than on the format of a specific market. Indeed, as the thesis suggests, carbon markets are still nascent and, regardless of the financial crisis, will continue to adjust and develop their form. As the thesis also suggests, the relationships that are building the markets are much more socially grounded than even the basic regulatory structures which first define the markets.

1.3 Research Objectives and Significance

The thesis focuses analysis on the main geographic centers hosting carbon market organizations: London, New York and Chicago (Hamilton et al., 2008). One aspect of the research involves a series of interviews, case studies and surveys of market designers, participants and institutions from these financial centers to identify the structure and operation of the developing carbon market network—its nodes of operation and the connections of its processes.[3] This carbon market network provides the basis for explaining the dynamic interaction of actors and organizations in shaping the development and evolution of the carbon market. Interviews with policy makers and financial facilitators provide insight into the relationship between the scale of market operation and the scale of regulation. Combined, these components provide invaluable

[3] These identifying processes are similar to those employed to map institutions within the European pension industry (Clark 2000).

information to academics who wish to analyze more specific aspects of the carbon market and to intermediaries and policy makers who wish to fine-tune its operation.

The second aspect of the research takes advantage of the unique development of the international carbon market to contribute to existing debates in the literature, engaging contentious theoretical concepts including the role of space-time, design versus path dependence, and complementarities in the development and function of a market. Analyzing the nature of the carbon market's development gives important insight on who is driving market growth and why. Additionally the analysis sheds light on the relationship between various market-makers, particularly within the context of geographic regions, thereby providing valuable information about the current opportunities and barriers to establishing a truly international market for carbon emissions trading.

The thesis contributes to the existing literature and to an relational economic geography understanding of carbon market formation by investigating 1) the complementarity of institutions, products, services and expertise, 2) the role of design or path dependence of financial institutions, 3) the structure of market flows, transactions and institutions in space and time, and 4) the role organizations play in building the carbon market institution. In particular, I address the following questions:

1) What role do complementary institutions, services and products play in structuring carbon market formation?
    a. What types of products and services are developing inside the carbon market?
    b. What are the interactions between the carbon and broader financial markets?
    c. Is the market specialized or using skills and expertise in other markets?
2) What is the role of design in relation to path dependence in the construction of the carbon market?

a. What are the design criteria being used to develop the carbon market?
b. What impact do existing regional markets, their financial and information infrastructure, exert on the carbon market?
c. How does design interact with regional inertia?

3) How is the developing carbon market structured in space and time?
   a. How are regional centers within the carbon market organized?
   b. Do the centers complement each other or compete?
   c. Are the markets being structured to eventually operate in simultaneous time?

4) How do organizations build a carbon market institution?
   a. How is the regulative pillar constructed, and what are its carriers?
   b. How is the normative pillar constructed, and what are its carriers?
   c. How is the cultural-cognitive pillar constructed, and what are the carriers?

1.4 Structure of the Thesis and Scope

The relationship between theoretical and actual market operation in the literature is a contentious one, with many scholars finding significant fault in theoretical understandings of market operation and development (Merton & Bodie, 2004). These complaints aside, existing market theory offers insight and perhaps even helps to form market processes it seeks to explain (MacKenzie, 2006b). In the case of carbon markets, theory is particularly important because it can establish a framework against which the development of the markets can be compared. Markets are constantly evolving, and the markets constructed today arguably differ from markets formed 20 years ago (Shiller, 2003). Existing theory, directed at markets built decades in the past, is not sufficient to understand the development of modern markets, particularly in the unique context of the environment. This thesis furthers the literature by exploring modern market formation.

The research into the development of the carbon market sheds light on the markets' potential for success, and onto processes that might improve this potential, including the ability of the carbon markets to communicate and widely disseminate the social value of mitigating climate change and transitioning energy sources through price signaling.

1.4.1 Structure of Thesis

Following the University of Oxford degree guidelines, the thesis is built around four academic papers, which survey the themes of interest. The papers have been submitted to relevant journals. The first paper is about the complementarity of expertise, organizations, and market systems in building carbon markets. This paper has been accepted for publication at the *Journal of Economic Geography*. The second paper is about the construction of carbon market spacetime and has been submitted to a climate change special issue of the *Annals of the Association of American Geographers*. The third paper is about the political path dependence of market formation and has been submitted to *Global Environmental Change: Human and Policy Dimensions*. The fourth paper concerns the institutional development of carbon markets and has been submitted to *Economy and Society*.

Incorporating these papers the thesis proceeds with seven chapters. Chapter 2 provides a literature review and theoretical framework for reconceptualizing markets as institutions or communication networks for providing earth system governance. Chapter 3 explains the methodology used to conduct the research and my reflections on the research process. Chapter 4 investigates the nature of complementarity in developing carbon financial service centers in London and New York. In particular, there are three levels of complementarity—individual expertise, organizational services, and market systems—which develop and embed the carbon markets in these service centers. Chapter

5 explores the nature of space and time in carbon market construction and operation, suggesting that the development of carbon markets mark the beginning of a new era in the progression of capitalism—neo-modernity. Chapter 6 investigates the relationships of different organizations in shaping the political development of carbon markets in the United States, suggesting that coalition formation is constrained by path dependence. Chapter 7 investigates the overall construction of a carbon market institution, and the role organizations play in building the three pillars—regulative, normative and cultural-cognitive—of the institution. Chapter 8 concludes with a review of the significance and limitations of the project. The thematic papers contribute specifically to four different literatures, which are explained in the following subsections of Chapter 1.

1.4.2 Complementarities

A considerable debate in economic geography concerns the role of institutions and agents in structuring market processes and products and how the theory of market function varies from actual operation. In the literature, scholars focus on the role of economic theory and agency in shaping market evolution. Some suggest that market theory is critical to the development and operation of market processes (Callon 1998; Litterman 2003; MacKenzie 2006). Others argue that the market is always evolving and certain processes, such as the innovation of financial products, are necessary to drive this evolution (Merton and Bodie 2004). Since the carbon market has only recently been created, the existing literature contains little comment about its actual function or if (and how) the carbon market function differs from market theory.

Literature in the sociology of finance suggests that theory not only describes but performs market function (MacKenzie 2006). Once theory is operationalized by market actors, it becomes operative, performing and reifying functions it originally described. In

this respect theory is an engine that helps shape and drive the market, not a camera which simply records it (MacKenzie, 2006a). However, it is not just theory, but also the agency of market actors that structures market processes (Callon, 1998; Glasmeier, 1990). Theory plays a critical role in informing the participants as to the boundaries, contexts, and rules of a market and provides them a language through which to communicate. The equilibrium approach takes this a step farther and suggests that markets are never truly in a state of equilibrium, but that they are driven towards a state of stabilization (Litterman, 2003). Together these theories emphasize the importance of market agents in structuring market processes. However, their over-emphasis on stabilization leads to a neglect of the evolution of market function. For the carbon market, these theories suggest that both economic theory and the interaction of market agents will shape the actual function of the carbon market.

The functional approach contrastingly suggests that markets must not only be maintained, but that they must driven towards a state of functionality (Merton & Bodie, 2004). Intuitions and intermediaries not only compete with but also complement each other, co-evolving to dissipate transaction costs or behavioral patterns that prevent markets from functioning efficiently. For example, the complementarity of institutions (particularly rival bulge-bracket firms) and financial products has been essential to the development and growth of London's financial industry (Clark, 2002). Each and every type of complementarity is present in the global financial services industry. The market is driven towards functionality by the complementarities of financial institutions through the creation of innovative products and services. These theories suggest that the markets may not be simply designed by that a range of organizations and financial products are needed to manage and enhance the functionality of the market. In addition, the carbon

market is potentially interacting with and being complemented by other existent market operators and institutions. Engaging with this literature I seek to understand how carbon markets become operationalized.

1.4.3 Space/Time

An issue of considerable importance to the function of modern markets is the role space and time play in economic transactions. With technological advancement, particularly the digitalization of financial markets, the importance of space is arguably diminishing, possibly becoming obsolete altogether (O'Brien, 1992). Instead of conglomerating in financial centers, financial transfers could occur from countless locations around the globe. Yet, in the last decade the prominence of large financial global service centers has if anything increased (Sassen, 2001). Two key issues come to the fore with respect to markets. First, what role does geography (socio-cultural components) play in shaping market transactions? Second, how do financial centers relate to each other? For carbon markets the issue is particularly pertinent given the strongly geographic nature of current market dynamics.

Technological change has undoubtedly shaped the nature of global financial markets. The changes arguably have transformed financial markets into 'flow markets' organized in time, rather than network markets organized by space (Knorr-Cetina & Preda, 2005). Since flow markets have no central location, time is fixed to a particular coordinate of the globe to assure global identification of the correct transaction date. The fact that all operate on Greenwich Mean Time ensures each market remains independent of the time within its geographic location. The carbon market will undoubtedly be a digital market. The fact that it can operate in virtual space, and link time zones may mean that it is a more suited mechanism for coordinating and interlinking regulatory interests.

Connectivity in time might diminish the importance of space; however, the bending of time-structures makes social interactions within the market particularly important. Financial markets are now global in their reach, but interaction within them still takes the form of patterns of relatedness and coordination that are microsocial in character and that assemble and link global domains (Wojcik, 2006; Storper, 1995). The social interaction that shapes financial markets furthermore carries a cultural component (Dow, 1999; Corbridge & Thrift, 1994; Thrift, 1994). Consolidation into mass financial centers maximizes the connectivity of social and cultural components—human capital, resources, and technology (Sassen, 2004). As such, organization in space cannot be avoided.

For other scholars the issue of key importance to institutions and corporate operation is the availability of business information (Fuellhart & Glasmeier, 2003). A critical dimension of institutional structure is the role of markets not simply as locations of trading, but as centers of information collection and specialist expertise (Wilhelm & Downing, 2001; Clark & O'Connor, 1997; Thrift, 1994). Furthermore, the nature of information varies in systematic ways according to the characteristics of products, which allows for the creation of a robust territoriality (or specialty) to the global financial industry (Clark & O'Connor, 1997). Financial service centers produce competing products and services, but they also complement each other. The result is a global integrated hierarchy of financial centers, led by London, New York and Tokyo and the major financial institutions located in them. Connecting with this literature I investigate the nature of spacetime in carbon markets, as well as how the markets develop spatially within the interactions of financial centers in different time zones.

1.4.4 Design and/or Path Dependence?

One of the key questions of market development in economic geography regards the nature of the production of markets and the degree to which they can be designed or are historically contingent. If the market is solely the product of theoretical or political design, can it successfully be accepted and operate within different contingencies? The problem becomes particularly important when considering the ability of the carbon market to operate as an international conglomerate.

A market is undoubtedly a political product, or at least inseparable from political processes (MacKenzie, 2009; Lohmann, 2005; Liverman, 2004). Even if markets can operate without regulation, it is important for states to take an active role in controlling and regulating markets because markets effect the growth rate of the economy (Aglietta & Breton, 2001). The existence of a relationship between policy, regulation, and market operation suggests that markets can be designed, or that regulatory agents within states at least have the power to manage and manipulate market structures and operation. In line with this theoretical conception, the carbon market must be designed and will not function or grow without adequate political backing.[4]

Other scholars contend that markets are not the product of design but rather path dependence (Roe, 2006; Boyer, 2005). 'Path dependence' refers to the idea that chance events—'historical accidents'—and situation specific contexts can have a distinctive and unique effect on economic agencies and activities. Path dependence is used to explain the economic shape of Europe and financial preeminence of the United States (Roe 2006), the particular locations in which financial agglomerations develop, and why these locations may rise and decline in relative importance over time (Porteous, 1999).

[4] The EU Emissions Trading Scheme supports the argument for design; it was adapted from the U.S. market for SO_2 and can be traced to the theories of Ronald Coase (1968) and John Dales (2002).

A variant model suggests that inherited traditions matter, but that ultimately financial actors structure and design the path dependence of financial markets (Clark and Wojcik 2007). Most, if not all, institutions are the outcome of temporally contingent political and social conflicts embedded in a specific society (Boyer, 2005; Glasmeier, 1991). Once created, institutions exhibit both large sunk costs and increasing returns (supporting path dependence) and evolutionary reaction to technologies and human agency (design, or at least response) (Glasmeier, 2000). Interactive path dependence suggests markets are contextual to a particular environment and set of historical events, but also influenced by relationships of politics and activism.

Whether markets are designed, path dependent, or a combination will have significant implications for their development and success. If markets are designed, the success of the carbon market depends on the foresight of regulators and market-makers. The carbon market must be carefully regulated and managed throughout the various stages of its development, and perhaps according to a specific design guideline. Furthermore, the design can, and perhaps should, be drawn from analogous markets such as the successful SO_2 market in the U.S. On the other hand if path dependence theory is correct, and markets are primarily artifacts of their environmental and historical milieu, the carbon market will be subject to the constraints of the socio-economic infrastructure where it is constructed or agglomerated. In this case, the carbon market's structure and success can not be purely designed but should be more closely tied to or adapted from existing markets and financial service infrastructure in the region where it is built. In contrast, if it is possible to design, or redesign, a market in response to the past and local contingencies it may be possible to create a platform that is truly international, neither

European nor North American, but a combination. I investigate the degree to which carbon markets are designed or contingent on path dependence.

1.4.5 Markets from Institutional Theory

Work in economic geography and sociology has expanded the understanding of the nature of market systems. Theories within these fields suggest that markets are not simply places or systems of exchange, but that markets are institutions, enacted by market actors. For carbon markets this poses the interesting question of how an institution is built from scratch. Additionally, who constructs the institution? Most literature within institutional theories takes the institution for granted, and explores the impact on organizations. For carbon markets this is not possible. In order for the carbon markets to be operationalized both the institution of the market and its organizations must be built at the same time.

Institutions are one of the more enduring features of social life, giving solidity to social systems across time and space (Giddens, 1984). Institutions are broadly defined as a system of norms that regulate the relations of individuals to each other as well as what these relations should look like (Parsons, [1934] 1990). Institutional theory seeks to explain the structure and formation of social institutions. Economic geographers have turned increasing attention to institutional theory to understand the evolution of the institutions of capitalism (Thrift & Olds, 1996; Granovetter, 1985). How economic organizations come into existence, function and evolve is fundamentally influenced by the institutional environment. Equally, institutional arrangements (economic-political organizations) not only reproduce but also modify the institutional environment. How these interactions vary across space, and how they shape local economic outcomes, are

central issues of concern in institutional economic geography and issues which link scholars of economic geography to scholars of institutional theory (Martin, 2000).

There are three pillars that underpin institutions—regulatory systems, normative systems and cultural-cognitive systems. The regulative pillar is concerned with rule-setting, monitoring and sanctioning of activities and explains how institutions constrain and regularize behavior. In advanced industrial democracies, governments always play a role in adjusting market operation and in setting the rules of function (Pierson, 1996; Dobbin, 1994). The normative pillar introduces a prescriptive, evaluative, and obligatory dimension to social life, and includes both the common values (what is desirable) and norms (how things should be done) that institutions establish in society. Finally, the cultural-cognitive pillar is concerned with the shared conceptions that constitute the nature of social reality and the symbols and framing through which meaning is made. Culture is a large component of the cultural-cognitive pillar, as it is a common framework for understanding the actions and mannerisms of other individuals.

Organizations carry these pillars of the institution and are deeply embedded in institutional context (Scott, 2001; Jepperson, 1991). Organizations arise and gain prominence and power by developing distinctive cultural logics which are pursued and systematically codified in the institutions of a society. For carbon markets—which are being built wholesale in this century—both the institution itself and the organizations that will operate it are still being constructed. However, organizations, particularly those embedded in other financial markets and market institutions, such as large legal firms, scientific organizations and banks, may play an active role in constructing the carbon market institution. Engaging with the literature on institutional theory, I investigate the

structure of the institution of the carbon market and its relationship to other social institutions and processes at large.

1.5 Summary of Research Contribution

The carbon market has only recently been created, and the existing literature contains little comment about its actual function or if (and how) the carbon market function differs from market theory. By investigating the processes that are driving the formation of carbon markets, this project provides important information on the relationship between various components of the markets and how these impact carbon market function. Elucidating the relationship between intermediaries and other market actors gives insight into the eventual structure of the markets and their ability to serve as international regulatory devices. Of particular interest is whether or not the processes and interactions of various market drivers tend to drive regional components towards a collaborative or competitive structure, an issue this project partially addresses. This project will explore the question of complementarities and market evolution by looking at the relationship of components of the carbon market and other financial markets, and by analyzing the evolution of the carbon market's institutions and products.

Since the carbon markets involve a network of social interactions that span space and time, it is particularly important to record the dimensions of this social interactivity to understand the function of the markets. The financial service components of the markets are organized in consolidated centers. The geography (socio-cultural components) of these centers influences and interacts with the development of an international carbon market. The literature debates the relevance of geography, particularly in response to the changing nature of organization of time, and the increasing importance of social cohesion, but does not adequately theorize the development of a regulatory market intended to

operate on the scale of the carbon market. This project adds insight to understandings of the function of geography in the development and evolution of markets by investigating the role regional centers play in coordinating activity as a form of supranational regulation. This project addresses the meaning of human and natural reorganization in space and time, suggesting the development of a further phase of capitalism that assimilates the governance of nature into socio-economic productivity: neo-modernity.

The interactive nature of design and path dependence is an important component underpinning the development of the carbon market. For policymakers and financial actors, understanding whether the carbon market is purely designed, path dependent, or being designed in response to historical contingencies is particularly important to how they should view or respond to the market. However, the literature does not adequately address whether markets are designed or path dependent, particularly since the theoretical debates are not specific to regulatory-type markets such as carbon markets. At this stage it is not possible to analyze if the markets have been successful, only to forecast their potential for success. However, understanding the nature of the development of the carbon market will add insight to the theoretical debate, and will be useful for constructing a baseline of comparison for future research of the carbon market. This project investigates the nature of design and path dependence in the construction of the carbon market through interviews with key market actors and research into the historical development of the financial centers where the market is developing. Through investigation in the United States where the carbon markets are still being designed, I find that the key to the question lies in the regulative construction of markets. However, this process is structured in time by a balance of positioning, or of field stabilization, between conflicting organizational interests, which gives the policy process a directional inertia.

Market design is constrained by the balance of organizations interests or historical context, making it subject to path dependence.

Finally, the thesis contributes to understanding of the institutional nature of markets. Considerable literature explores the role institutions play in structuring organizational systems, behaviors and relationships. Building from the work of Neil Fligstein and Richard Scott I investigate the institutional nature of the carbon markets. In particular, I look at how the market serves as a social institution which organizes the expectations and values of an expanding collective network. However, in contrast to Fligstein and Scott, I reverse the causal arrow and investigate the role organizations play in constructing a carbon market institution. The carbon markets are built in collaboration between regulatory agencies and market organizations (service firms, particularly legal and financial). In some respects the organizations are more important than the regulative components as they build all three pillars of the carbon markets. Nevertheless carbon markets need regulation to succeed. My investigation of the institutional construct of markets contributes to the literature by suggesting first that the carbon markets are a social institution, and second by suggesting that the markets are only as strong or deeply embedded as the organizations that build them.

1.6 Limitations of Research

The advent of carbon emissions trading schemes is both very new and the preferred policy vehicle for addressing the potential of climate change. The novelty of the markets and their policy importance present a unique research opportunity on both the theoretical and policy levels. Theoretically, this project breaks new ground by identifying the components and processes of the emerging markets and in turn using this map to test two existing explanations of market formation: path dependency and design. The

newness of the market also presents a unique opportunity to test theoretical expectations regarding market complementarity and the importance of locality as well as the potential influence of markets on technology development. This thesis offers strong insight on existing market theoretical frameworks as well as providing a distinctive, theoretically relevant identification of the emerging market.

From a policy perspective, the importance of this project is manifest. The carbon emission trading scheme is the chosen policy vehicle for addressing what is, arguably, one of the most pressing environmental concerns that has ever faced human civilization. The potential effects of climate change are global in scope, and the costs are potentially tremendous. Research on the markets facilitates a better understanding of how they are developing and operating, and is essential in giving the markets the best chance to succeed. While this thesis does not provide all the answers, it holds the potential to offer policy makers increased leverage on the markets.

While this project is a valuable step forward in understanding the carbon markets specifically and markets more generally, it does have limitations. In particular, it comments only on markets in the context of the large financial centers of Europe and the United States. Different financial priorities and societal norms in other regions will contribute different aspects to market operation. The effects of climate change will vary globally. As indicated by the upcoming Intergovernmental Panel on Climate Change 'Impacts, Adaptation and Vulnerability' report, the worst affected areas will be in the developing world; however they have contributed the least to carbon emissions. These regions will need considerable support to develop by low carbon means, which will affect the long term political stability and the nature of carbon trading. Developing countries are particularly important in terms of the supply and generation of CDM credits to the

market. Unfortunately, this project does not have the scope to address the dynamics of carbon trading from the developed world. Furthermore, the project offers only an initial glance at the developing carbon markets. Structure and mechanisms will undoubtedly change as the market evolves and will need to be reconsidered.

Of course, no single project can address every relevant parameter, and this project is already quite extensive in scope, making it difficult to account for these shortcomings. Instead, the weaknesses in the project offer opportunities for future research geared specifically towards finding the answers that the shortfalls suggest to be missing. As an international carbon market gains global momentum, its operation in developing states, and the impact this has on market mechanisms should be observed. Furthermore, the development of the market over time will need to be researched to enable both comparison to mature markets and better understanding of the evolution of market mechanisms. In any event, this project contributes to a wide range of exciting avenues for future research.

Chapter 2 | Carbon Economy, the New Governance Regime— Reconceptualizing the Role of Markets

2.1 Introduction

This thesis explores the current state of the developing policy response to reduce the greenhouse gas emissions causing anthropogenic climate change. Addressing climate change is a colossal collective action problem which requires a unified response unprecedented in history. As Todd Sandler points out, countries and corporations that emit gases reap economic benefits locally while spreading the costs of their behavior globally in the form of climate change (Sandler, 1997). The climate change problem presents a classic case of tragedy of the commons as well as a prisoner's dilemma. Solving climate change requires collaborative and international management of a range of socio-economic processes that produce greenhouse gas emissions; in effect, it requires the construction of 'earth system governance' (Biermann, 2007). The challenge of addressing climate change therefore becomes the challenge of achieving earth system governance on the global scale and scope that is required. One possible channel for constructing global earth system is through achieving international consensus and supranational command and control regulation. However, weak political leadership, as evidenced by the reticence of the United States to sign onto binding emissions control agreements, leaves this as an unlikely sole solution to the problem (Busby, 2003). Another avenue is the construction of global response through the inter-linkage and convergence of regional initiatives.

Standardization of climate response through inter-linkage of regional responses is a viable possibility for constructing global earth system governance, which may utilize regional market mechanisms already under construction. However, to understand how

this can be achieved, and in particular the central role that market mechanisms will likely play in this process, I argue for the need to re-conceptualize the market. Markets have been described for centuries purely as economic devices. They are thought to be places of exchange and competition devoid of collective action. What is often overlooked, but equally, if not more important are the social components of markets that drive their function and development. Understanding the social complexities of markets might enable them to be better conceptualized as organizational processes, which bolster collective action.

Reconsidering the market as a tool with the ability to organize collectivize action, stimulate cooperation and standardize aspiration and expectation, explains the potential for the market to contribute as a component of a global governance regime. It is perhaps easier to see the tenants of building cooperation in the most basic of markets, where exchange is directly linked to production and consumption. Advanced financial markets, such as the ones situated in Canary Wharf and on Wall Street, which trade derivatives, futures and other extensions of commodities, seem abstracted from the function and organization of society. Nonetheless, these markets also play a critical role in organizing social function and collaboration.

This chapter highlights the importance of the financial service industry in constructing governance. In this chapter I first review the concept of earth system governance. I then explore the debate surrounding the use of markets to achieve environmental objectives. I argue for the need to reconceptualize the market, and come to the conclusions that markets have the power to organize collective action, but they themselves must be regulated and managed, and in the case of carbon markets they may even be an important driving force for regulation. As such, London and New York are

well situated (at the heart of the global economy, and developing carbon markets) for investigation into the nature of market development and particularly the role it plays in constituting governance.

2.2 Constructing Earth System Governance

> Many expect the European Union to lead in this daunting challenge. Future generations might consider the current construction of a climate governance architecture as one of the largest collective institution-building efforts that humankind has ever faced, and on a par with the San Francisco conference that saw the creation of the United Nations Organization (Biermann, 2005, p. 287).

Reports of the dangers of climate change are now widely accepted, and the nature of the threat is becoming clearer (IPCC., Alley et al., 2007; Stern et al., 2006). Although the exact impacts of anthropogenic climate change in the next century are unknown, it has become evident that the challenge it presents to humanity is unprecedented. Scientists now largely agree that a failure to act on a global scale to reduce greenhouse gas emissions will likely result in dangerous rates of temperature rise, sea-level rise, drought, climatic catastrophes and population displacements on the scale of millions (IPCC., Adger et al., 2007). To overcome the challenge of climate change, humanity must overcome political, social, cultural and parochial self-interests by bringing the great powers together into a collective force. What is required is a global earth system governance regime (Biermann, 2007). The concept of earth system governance is drawn from James Rosenau's definition of global governance, which include systems of rule at all levels of human activity—from the household to the international organization—in which the pursuit of goals through the exercise of control has transnational repercussions (Rosenau, 1995). This conception of global governance departs from traditional conceptions of international relations in four key ways: 1) it attaches equal importance to state and non-state actors, 2) it conceives of world politics as a multi-level system in

which local, national, regional, and global political processes are inseparably linked, 3) it recognizes that a wide variety of forms of governance exist next to each other and a hierarchy among these various mechanisms is hard if not impossible to discern, 4) it recognizes that authority exists outside the nation state (Dingwerth & Pattberg, 2006). In effect, earth system governance is a new social phenomenon, an attempt to govern the earth's natural systems through a global architecture that combines socio-political, legal and economic forces across a number of scales.

Given the scale and nature of the problem of climate change, the need for a response on the scale of global earth system architecture seems apparent. However, the challenge lies in achieving this type of unified collective response. The leadership of the United States and Europe and the collaboration of these Western powers will be essential in initiating a global consensus. Alignment between Europe and the United States is undoubtedly the key to bringing Asian powers of China and India into the accords (Biermann, 2005). In fact inspired leadership from these powers, a willingness to lead by example, to establish the greatest targets for cutting emissions, to push the technological frontier and freely share ideas and information might easily induce the momentum necessary for a global consensus and response to climate change. In this case, the creation of a global governance architecture could be based on international agreements, such as the Kyoto protocol. The potential for consensus among world leaders has gained some currency with the recent agreement among all G8 leaders that climate change is a problem, and that emissions must be slowed, and eventually cut. However, judging from the conditions of the G8 agreement, and the general inability of the Kyoto Protocol to

induce significant participation and compliance, the developing global political regime is too weak to stand on its own (Barrett & Stavins, 2003). [5]

Clearly, a collective action problem exists. The largest pollution emitters, the United States and China, remain effectively outside existing frameworks to constrain emissions and the political leaders of both states have shown significant reluctance to expend the political capital necessary to commit their countries to a Kyoto style mandatory emissions reduction framework. There is, however, another channel through which a global consensus might be achieved; it is inter-linkage and integration of regional policy responses. The collective response to climate change could in effect be achieved by building first sub-global or regional responses to the climate change problem, exemplified by the emerging emissions trading schemes and associated political frameworks, rather than through global, predominantly political, channels as embodied in the Kyoto regime. The regional inter-linkage would help to overcome the collective action problem by reducing the number of actors and, if regionally based, aligning socio-cultural frameworks that influence how the problem is perceived and how to address it.

If the response must be accomplished through regional efforts of cooperation building, than the market system is the most likely and most efficient mechanism for tying regional policy responses into a global framework for reducing greenhouse gas emissions. The lack of true political leadership may make the market the best channel for achieving a coalesced global architecture of earth system governance. The market has this potential because, at its core, the climate change problem is an economic as well as social problem. The main greenhouse gasses that cause climate change are the byproduct

[5] The G8 for example has recently announced a ground breaking agreement to stop and then eventually agree targets to cut greenhouse emissions. However, the language of the agreement had to be stringently revised and in effect watered down to bring the United States into the fold. The agreement is non-binding, but has left open channels for further Kyoto negotiations.

of economic processes and successful efforts to control the economic byproducts will inevitably resort to economic mechanisms. Indeed, perhaps because of the strength of the market in organizing and achieving complex initiatives, emissions trading has become the preferred policy instrument to comply with emission reduction targets, including those set under the Kyoto Protocol, as well as in regional and national targets for greenhouse gas (GHG) emissions reductions (Christiansen et al., 2005). Although the carbon market is only emerging, the evidence of increasing activity levels and transactions of a range of new 'carbon products' and services suggest that carbon trading will only continue to develop (Hamilton et al., 2008).

Despite the rising importance of carbon markets, they remain regional in their scope, limiting their impact on a global phenomenon. More fundamentally, although carbon emissions trading schemes are becoming more prevalent, they are still not very well understood. As components of a market system and of a broader governance regime, trading schemes remain poorly conceptualized. A popular view sees these schemes as the embodiment of neo-classical economic hegemony (Davis, 2006; Gorg & Brand, 2006; Okereke, 2006; Smith, 1995). This perspective neglects to see any social utility in the schemes, or the market concepts from which they are derived. However, exploring why markets are so prevalent, as well as their basic utility, can be useful in understanding how to more successfully construct, operate, and interlink them. This ultimately requires a more precise understanding of the market and the mechanisms that drive and sustain it.

2.3 The Role of the Market

> Regimes are social institutions that consist of agreed upon principles, norms, rules, decision making procedures, and programs that govern the interactions of actors in specific issue areas (Young 1997, pp.5-6).

2.3.1 Discussion in Economics

The idea of using the market to control pollution can be traced to Coases Theorem, which suggests that well-defined property rights could overcome the problem of externalities (Coase, 1960). Two of the most common ways to assign property rights to the externality are through taxes, by assigning a price to the pollutant, and through quotas, or assigning a permit for the pollutant. Economic theory has widely discussed the merits of both forms of pollutant control. Martin Weitzman initiated the debate on whether it would be better to control certain forms of pollution by a system of tradable emission quotas or by charging pollution taxes (Weitzman, 1974). He studied the costs and benefits of two market based instruments—taxes and quotas—and demonstrated that uncertainty with respect to the costs of producing the good affects the choice between a price and a quantity control. Controlling the quantity makes the marginal cost uncertain, whereas a price control leaves the quantity produced uncertain. Weitzman showed that if the goal is to maximize net benefits, than a quantity control performs better than a price control, but if and only if the marginal benefit curve is steeper than the marginal cost curve.

Howe (1994) agrees with the basic principles of Weizman's argument, but suggests that the method of distribution of tradable permits (TDPs) is crucial to the acceptability of TDPs by polluters and to the comparison of taxes and TDPs. He suggests that comparative efficiencies of taxes and TDPs as control devices depend on the source of the uncertainty. The best instrument leads to the smallest expected loss of net benefits depends on the distribution of the random error terms and the shapes of the marginal benefit and marginal cost functions. To maximize the net benefit tradable permits should be auctioned (Howe, 1994).

Working with a slightly different model, Baldrusson and von der Fehr (2004) conclude that taking into account the fact that agents' decisions may be irreversible does not lead to policy implications significantly different from those reached in a simpler model in which irreversibility is ignored (Baldursson & von der Fehr, 2004). Consequently, if the market price of emission quotas is highly variable, producers will avoid abatement technologies that involve a large amount of sunk costs. Such uncertainty would not arise if emissions were controlled by taxes, as the opportunity cost of pollution would equal the tax rate. As such the irreversibility aspect of agents' decisions may be neglected when calculating the optimal policy and deciding whether to use a price-based or a quantity-based regulatory instrument. In agreement with this notion, Hoel (1998) recommends that if environmental taxes are not imposed, tradable emission permits rather than direct regulation of the command and control type should be used. Command and control instruments may be justified if the regulator has high costs of monitoring emissions, but even with high monitoring costs, some form of environmental taxes may be preferable to various forms of direct regulation (Hoel, 1998).

In contrast Koenig (1985) argues that taxes are a better form of regulation. He finds that the steeper the marginal private benefit and cost curves relative to the marginal external cost schedule, the greater the likelihood that taxes will outperform quantity standards (Koenig, 1985). Kaplow and Shavell (2002) find that particularly in cases where the state can adjust taxes up, they are a more effective form of regulation. Quantity regulation, in the form of quotas, gains appeal when the state is uncertain about the harm caused by an externality. Nevertheless, when the externality can be measured a corrective tax schedule can be adjusted to equal to the expected harm schedule (Kaplow & Shavell, 2002). However, as Finkelshtain and Kisleve (1997) stress the conditions for

preference of a tax or a quota regime can be identified for negative externalities, but not for positive effects. Furthermore, the comparative advantages of the control regimes are the same for markedly different modes of political activity (Finkelshtain & Kislev, 1997). Therefore neither a tax nor quantity control regime determinedly better model for controlling pollution.

The debates and various models of comparing taxes illustrate the uncertainty in economics about the better model for controlling pollution. Furthermore, each of the models is designed to compare the relative merits and detriments of quantity versus prices control and focuses exclusively on variables like cost and benefit. The discussion started by Weitzman 30 years ago, ignores altogether, perhaps for reasons of simplicity, two important components of the regulatory choice between taxes and markets: 1) the impact on future policy decisions, and the 2) the potential for financialization in instances where market mechanisms are used. This is an important distinction, because the carbon market has the potential, and seems to already be generating a secondary market. The secondary market for carbon credits will undoubtedly impact, if not directly the underlying amount of carbon reduction. Furthermore, while Finkelshtain and Kisleve's look at political activity, the models altogether neglect social factors and impacts of the two forms of regulatory regime. How individuals respond to the control regimes and to each other within the regime undoubtedly has an impact on the potential of the two control mechanisms.

2.3.2 Discussion among Environmentalists

The prevalence of markets as regulatory structures is a common theme in the environmental literature. Many scholars have recently written on the phenomenon of the 'financialization of the environment' along with the financialization of most other spheres

of life. The financialization or commoditization process is generally treated with disdain and understood as a process of neo-liberal economic hegemony and an excuse for the finance industry to generate profit from environmental problems without achieving substantial solutions (Liverman, 2004). Many environmentalists see market mechanisms as a means to further institutionalize the prevailing international normative structure in the environmental issue area, characterized as 'liberal environmentalism' (Bernstein, 2002). Latent in liberal environmentalism is the assertion that economic growth, liberal markets and environmental protection can be made mutually supportive. However, this does not always easily translate into effective climate change policy.

Environmentalists are particularly dubious of the Kyoto protocol and Clean Development Mechanism (CDM), and the potential to harm economic development in developing countries (Cazorla & Toman, 2000). The fear also exists that if more radical changes in practices are needed than can be accomplished by market mechanisms, governments may be unable to providing incentives for technological innovations and hamstrung in their ability to meet Kyoto targets. While enabling some actions, Kyoto is seen to risk justifying inaction when tough regulatory choices are actually necessary to get the desired ecological effects (Bernstein, 2002). Environmentalists argue that if it is to be built around economic principles the regulatory regime needs devices built in to protect the social and environmental interests of member states.

In particular, environmentalists are displeased that the developing international regime on climate change organizes policy formulation around commoditization of the atmosphere (Glover, 1999). Glover emphasizes, that this has been an outcome of the dominance of anthropocentric and ethnocentric values in the discourse represented by the negotiations around the United Nations Framework Convention on Climate Change

(UNFCCC). Environmentalism is thought to offer an alternative value system from which a critique of the emerging global climate change management regime can be undertaken. For Glover, economic approaches based on commoditization of the atmosphere to protect the global environment are considered inadequate because they fail to include a variety of actors, values, and approaches in the climate change policy debate.

Environmentalists are concerned, and rightfully so, about the social and environmental welfare of any regulatory regime built on financial mechanisms. However, like the economic perspectives explored, these perspectives ignore the social utility of a market. Much of the skepticism of markets arises because they are thought to be purely components of a successful neoliberal regime or as devices designed solely to procure economic gains. However, markets are successful because they have real social and material utility, not merely because they are components of a successful ideology. In order to understand the ability of market mechanisms to contribute to the global governance architecture, particularly how to make them successful in this aim, markets need to be re-conceptualized both for what they are and what they do, particularly with respect to the social utility of markets embodied in their ability to collectivize action.

2.4 The market re-conceptualized

> What is a market?...If the market, based on the interplay of individual buyers' and sellers' self-interested decisions, is the best way to distribute goods and services, and the collapse of centrally planned systems in Eastern Europe and the Soviet Union seems to confirm this, then it is not unreasonable to expect social scientists to provide an adequate general definition of the market process. Oddly, in all of the invective among anthropologists, economists, and sociologists on the topic of economic exchange, no one has criticized the others for this failing (Cantor et al. 1992, p.1).

Considerable work within the sociology of finance has sought to expand the concept of the market beyond basic economic notions of the market as spheres of

exchange and institutions free from collective action (Brenner, 1987). One of the key arguments is that a market is socially, or at least politically, constructed (Smith et al., 2006). Indeed, without regulatory frameworks to support them, markets cannot operate. Political regulation is a particular necessity for carbon markets because, barring voluntarism and corporate social responsibility, it is needed to generate the demand for carbon credits. Nonetheless, a market requires more than political structure. The market is a network (Knorr-Cetina and Preda, 2005). Like other forms of network it is constantly processed and enacted, and does not function a priori the actors and institutions that construct it (Latour, 2005). Along this line of thought, Michael Callon has described the market as coming into existence through framing by its participants (Callon, 1998). Donald MacKenzie develops this notion further, suggesting that theories of market function can in effect act as engines driving market operation (MacKenzie, 2006b). Similarly Robert Merton and Zvi Bodie conceptualize the market as a product of the innovation and co-evolution of institutions, intermediaries and products, which develop to break down transaction costs (Merton & Bodie, 2004). What these scholars recognize is that the market is not itself a product, or a place of exchange, but rather a set of processes that require the collaborative activity of numerous actors and institutions (from traders, to consumers, to investment banks) within the network (Knorr-Cetina, 2005). The network of a market requires considerable infrastructure (both in the form of places of trade, and places of management) and its processes are under a bureaucratic form of constant management, as such the market and behavior form simultaneously (Clark & Thrift, 2005). Furthermore, the market is not born whole; it must be constructed and developed over time.

As a body of work, the sociology of finance recognizes that the market is composed of a number of actors and driving forces. It is constituted by a set of political, social, legal and economic process working in tandem. Critical to this argument, and yet often overlooked, is the fact that at the heart of these processes is social collaboration. The collaborative function of a market has indirectly been explained through its ability to pool risk. Risk management is indeed understood to be a central function of market operation. Robert Shiller takes the concept a step further and suggests that by extending risk-sharing, markets will enhance social welfare by encouraging more positive risk-taking behavior, better development and use of individual skills, and greater personal fulfillment (Shiller, 2003). Although Schiller importantly recognizes that the sharing of risk is a productive component of building social welfare, his perspective fails to fully recognize a market's collective benefit.

The notion of collective enterprise has perhaps been best developed by Robin Cantor and her colleagues (1992). They seek to redefine the market by analyzing a gradient of poorly-developed to highly-developed market structures under a range of different regulatory regimes. They come to the conclusion that even the most advanced markets are still tightly integrated to non-market processes of exchange, and the basic social rules that promote exchange (Cantor et al., 1992). They suggest that interdependencies between market and non-market exchange structures provide mutually supporting conditions, since these interdependencies encourage the development of credit and currency systems, an atmosphere of trust, and contract compliance among traders, and thus contribute to continued market evolution. The market is built on reciprocal relationships of trust. In understanding formal markets as based on reciprocal

relationships, Cantor and her colleagues assert that the market must serve as a platform for the communication necessary to generate this trust:

> Exclusive emphasis on the concept of price as a signal of scarcity recognizes only one form of communication in exchange behavior: the transmission of information. We can borrow from the field of risk communication to illustrate the implications of such a limited concept of communication…while the quantitative signal is important, risk communication is also an issue of constructing a shared meaning about the world among those who generate and those who bear the risk. Important components of this shared meaning include processes for establishing trust, distributing liabilities, and obtaining consent to the whole package of societal concerns accompanying the numerical risk estimate. Similarly, social status, a dimension of market activity typically regarded as external to economic exchange in whatever forms this takes (e.g. class, gender, ethnicity, age) may be involved in the process of establishing a convergence of meaning between buyer and seller (Cantor et al., 1992, p.9).

In effect, Cantor and colleagues argue that the market must communicate or enable collaboration to build trust and confidence. In a similar vein**,** Gordon Clark and Kendra Strauss suggest that institutions are crucial in framing behaviour, and that the coherence, integration, and persistence of institutions can promote human welfare (Clark & Strauss, 2007).

The signals the market creates have the ability to organize reciprocal relationships and expectations. When the effects of these signals are expanded across space and time, the market has the potential to become an organizing force for collective activity on a vast scale. In participating in a market, actors through a set of exchanges, participate in a collaborative process and contribute not only to a set exchange, but a system of structured behavior and expectation. This system is essential to organizing collective productivity through division of labor, in that it constructs the framework for exchange and productive supply and demand, and does so across ever greater economies of scale. Envisioning the market as such, as a system that organizes collective productivity on a macro scale through reciprocity and collaboration on a micro scale, might help explain the ever

increasing integration of financial markets into the economy, down to the level of households, possibly even the credit system, and growth of derivatives and futures markets as collective organization not only across geographies of scale, but now time as well.

This conceptualization of the market shares in a Marxian notion of economy, however it differs from conventional neo-Marxian frameworks in that it understands the key to profit creation and progress not as exploitation but collective organization; capitalism is in effect a system designed to organized economies of scale and participation. The market, by harnessing and communicating reciprocal agreements from the micro to the macro, is the mechanism through which this is accomplished. In this respect the theory also shares in a free-market perspective that in capitalist exchange every boat can rise.[6] If collective action is the source of all value creation than the greater the size of the collective that can be successfully organized and integrated, the greater the output. This is perhaps the reason that the market itself is designed to build ever greater economies of scale. Well-regulated markets can have the impact of inducing collective action and collaboration across a multitude of scales. The claim deserves real empirical attention; however it has the potential to contribute to the explanation of why financial markets and the global economy—even down to the function of households—are becoming ever more tightly integrated.

While the concept of market as a process of social collaboration needs further development, this direction of inquiry may be useful in explaining the utility of market

[6] This is not to say that every boat will rise, or to diminish the in equality of collective gains. It has been demonstrated time and time again that unregulated markets can be dangerous. They produce uneven growth, and social injustices. It is the role of regulators to control market processes and to protect against injustice. The point is not to suggest that markets are fair, just, or equitable, merely that they help organize collective action (ever more extensive division of labor and exchange), and through this organization create wealth.

mechanisms as building components of regulatory regimes. For carbon markets, the theory of collective activity suggests that these markets are not just components of a neo-liberal economic hegemony; they have the potential to lead the construction of global earth system governance, by pulling regulation forward, building collaboration between regions and driving innovation. If well designed and regulated, the market has the ability to overcome powerful collective action problems by coordinating actors and activity across a number of countries and standardizing and harmonizing political responses.

2.5 Finance and 21st Century Markets

> What differentiates a financial market from other markets is that no tangible good or service is exchanged for the monetary consideration. Instead, a piece of paper, which may be broadly described as a financial claim will generally change hands…Financial markets play an important part in bridging the gap between what may be described as the spendthrift economy—an economy of the here and now, where all income is spent on goods and services for current consumption and all current output is consumed-and the frugal economy—where households and firms look to the future, and as a result saving and investment occur (Honeygold, 1989 p.5).

The most advanced financial markets may seem abstracted from social function. Yet, trust, cooperation and confidence are still central to the operation of these markets even if they seem disconnected from the social and material strata that underlie them. Perhaps these markets seem disconnected because as they become more advanced they deal increasingly in ethereal products such as derivatives, options, and futures, which operate without transferring any underlying. However, the key to these products is the organization of future income streams. Financial intermediaries perform several useful, indeed crucial functions. They collect and parcel up savings from those units in surplus (often smaller units), and they consolidate them into larger loan packages which are more attractive to units in deficit (larger ones). In so doing, they pool and spread risks by

taking small amounts of saving from many different savers and lending them to a portfolio of firms (Honeygold, 1989).

As such, financial markets enable a "transmutation of claims"—borrowing money on a short-term basis and lending it on a longer-term basis. This had the immediate impact of reducing transaction costs of borrowers and lenders alike, and also extends the timeframe of interaction and organization. Advanced financial markets, in the sense that they are deeply integrated into the economy and all of its social and institutional components, communicate and thus organize collective, productive and social function not only across economies of scale, but now time as well. If the value futures markets represent seems over-inflated, it is in part because these markets organize value that has not yet been created. The trust these markets rely on is immense but delicate. Their connections to the future are tenuous, yet they exert powerful socio-economic effects.

Financial markets have a second general tendency, towards internationalization, which can be exemplified by the drive to produce the elusive concept of the global seamless market. Such markets offer a broad choice of securities, all being traded through a twenty-four hour time span in a large number of financial centers in time zones stretching from the Far East through Europe to the United States (Honeygold, 1989). Internationalization creates bigger pulls of credit for intermediaries to generate and manage. They expand the scope of organization, and having financial liquid products, which move seamlessly in space, as well as time, making ever greater scales of internationalization possible.

Financialization of markets expands the time horizon upon which markets operate and organize and in so doing makes ever greater scales of operation possible. Carbon markets are pursuing a similar trend. Emissions markets operates more closely to a

financial market or more specifically a futures market in that the credits are traded before reaching maturity and are to be cashed in at a future target date. As with other derivates, an underlying commodity is not actually exchanged, only the permit or contract of ownership is exchanged. Furthermore, the carbon markets are already developing secondary or advanced futures markets. These markets will arguably have the effect of generating predictable price structures in the future. Such a prediction of future outcome allows for a stabilization of current and future carbon activity, if for no other reason than assumption of the market moving forward boosts confidence and participation of social actors now. In comparison, taxes cannot be easily forecast into the future, and certainly cannot be used to control future rates of production. Financial markets control, stabilize the rate of production of an underlying into the future. The same concept can be found in carbon markets, which generate carbon futures and other instruments to coordinate the rate of production of carbon emissions.

2.5.1 The Role of the Financial Services Industry

The political component is very important to developing a market, but so are the market architects, in the form of the financial service industry. Indeed as Louis Pauly (2007) illustrates with the case of the European financial integration, regulatory innovation can be driven by market processes leaping a step ahead of the regulatory structures needed to govern them (Pauly, 2007). In their ability to construct markets, and perhaps to construct them one step ahead of regulatory structures, financial centers are an important component of the construction of overall market and regulatory system. Even when not a step ahead of regulatory processes, financial centers represent the financial expertise political bodies tend to lean on when conducting financial policy. To a certain extent the development of the carbon market, and its ability to serve as a global dial on

greenhouse gas emissions depends on the service sector and its ability to coordinate across national and political boundaries.

The developing carbon markets have the potential to become interlinked, and at least from the standpoint of the financial service industry, it makes sense for the market to be designed for interconnection and globalization. A larger carbon market will improve the efficiency of emissions trading for two reasons: first, a larger market is inherently more efficient, liquid, and competitive, and second, a larger market provides a broader pool and greater variety of abatement costs in which to discover opportunities for low cost abatement.

Without political force to drive the expansion and inter-linkage of a carbon market, the financial service industry has to take the lead. There are already some indications that market makers are working to construct a global market or at least one where credits can be traded internationally. For example, the platforms for trading in the all of the largest developing emissions trading schemes—Chicago climate Exchange, European Climate Exchange (2005), New York Climate Exchange (Announced), Northeastern Climate Exchange (Announced) (Montreal Climate Exchange)—are owned by Climate Exchange PLC. In addition to Climate Exchange PLC's efforts to create a global platform for trading, the European Climate Exchange in partnership with Intercontinental Exchange launched futures and options trading in 2008. The development of advanced financial products, aside from offering more incentive for profit, will arguably pull investment into the market, and stabilize its existence into the future.

The carbon markets offer a unique opportunity to investigate how markets are actively constructed and interlinked, and the role they play in driving regulation. In

addition they offer insight into the role markets may play in constructing global governance. To understand this process detailed empirical research is needed. The nature of the developing carbon markets suggest that a detailed study of the operations of the financial service industry, particularly, London, and New York, which lie at the heart of the global economy and indeed the developing carbon market, should lie at the heart of this investigation.

2.6 Conclusion

Climate change indeed presents a most challenging dilemma for humanity. It is first and foremost a challenge of organizing collective action on a global scale, of creating an earth-system governance architecture. While this might successfully constructed through real and inspiring political leadership and determination, the current status of global political affairs is such that a strong supranational coordinated effort is unlikely. However, when political channels fail, economic processes have the potential to succeed. Through the mechanism of the market, global governance may still be constructed through an interconnected regional response. To understand the capacity for market mechanisms to be used to organize this type of response to climate change it is important to re-conceptualize what a market is and how it functions.

Markets are traditionally understood as systems of exchange lacking in collective action. They are perceived as devices to achieve specific economic tasks, such as exchange of goods and services. I argue that while this captures the basic mechanism of a market, it produces an incomplete understanding of what a market is and how it operates. The market, as a set of socio-political, legal and economic processes, has the ability to create social utility, in that it not only pools risk, but organizes collective productivity and social organization. Once the market becomes financial, trading derivatives, futures and

options rather than the underlying commodity, it enables organization to occur on future timescales, and provides the liquidity necessary for the market to operate on an international, if not global, scale.

This argument means to imply neither that a market is in itself efficient, nor that it operates well without regulatory partnership and intervention. Contrary, it suggests the need for well coordinated design and collaboration (both among and between financial designers and politicians), but that functionality can be built over time. Furthermore, the individuals who structure market processes and platforms play a particularly important role in safeguarding a market's function and potential for success, especially if they are on the leading end of the innovative process.

Although the concept of market as a process of social collaboration needs to be further developed, this re-conceptualization of the market is important to understanding why or how the market mechanism can successfully contribute to a global governance architecture. Measuring and observing the construction of the market is a tricky matter. After all, the market is not a concrete object but a social construction with varying degrees of functionality. One option is to look at the regulatory regimes associated with the market, but a potentially more insightful locus for market construction is the financial service industry. It is at the nodes of the financial service industry that we should expect the market to be actively constructed as economic players interface with economic processes in real time.

The places of construction offer the greatest opportunity for understanding not only how the market is built, but also how it serves as a mechanism for cooperation. Therefore understanding the development of earth system governance and the markets role therein, requires a thorough investigation of the financial service centers at the heart of these

processes. This chapter establishes the rational for a detailed study of the developing carbon markets.

Chapter 3 | Research Design and Methodology

3.1 Overview

I aim to broaden understanding of market institutions and how they are constructed. This thesis looks at the organization, evolution, innovation and interaction of carbon markets using a relational economic geography framework (Bathelt & Glückler, 2003; Boggs, 2003). Relational economic geography enables a complex understanding of economic action and its localized consequences by focusing on those people, firms, institutions and other organizations which are involved in economic decision-making, as well as on those people and environments that are subject to the consequences of economic action. It suggests that spaces of concentrated activity can be used as a lens to gain a perspective on broader market function. Market institutions are not only subject to spatial attributes, but also help to shape these attributes.

This thesis traces the development of the carbon market through the geographical lens of the financial centers of London and New York. The first stage mapped the development of the carbon market. Little information exists about the institutions and actors that are actively shaping the carbon market. The first stage of the research was used to gain a perspective on who is shaping the market. Information was gathered through literature reviews and online searches of information. In addition, I attended a number of carbon market conferences in New York and London to get a first hand understanding of who was developing and operating in the markets. The attendee's lists of these conferences as well as business cards I gathered during conversations at the conference served to provide initial contacts.

Once I had an understanding of who was shaping market development I drew up a list of interviewees for each city. Through snowballing, this list expanded in time. I then set a schedule of interviews and conducted semi-structured interviews with bankers, brokers, industry officials, consultants, financial service experts, and intermediaries operating on the carbon market. The plan was to focus on themes with each round of interviews with adjustments to try to incorporate as many of the individuals as possible. The interviews were used to analyze the role of complementarities in developing new markets, design in relation to path dependence, space-time in the development and function of a market, and the structure and formation of a market institution. To a large extent the research was conducted as planned as unfolded without substantial complications. However, despite the careful planning of the fieldwork, 'luck, chance and intuition' played a role in determining the direction and outcome of the research (Parry, 1998). Due to the human nature of the investigation, the research methods and plan had to remain flexible. The next sections of this chapter discuss how I chose my project sites and interview lists, the collection and analysis methods used, and my reflection on the fieldwork process.

3.2 Research Design

3.2.1 Interview Methodology

Since the carbon market is conceptualized as a relational set of institutions and processes the primary method used to analyze market development and function was semi-structured interviews with market principles. Other potential methods were considered, but interviews can capture the dynamic development of a market better than methods such as questionnaires, surveys, or analysis of quantitative measures (Pryke et

al., 2003). In effect, I sought to record data that otherwise would not be captured. Quantitative data about the size and shape of the market, the institutions that exist, the timing of regulatory frameworks etc. will still be available for analysis forty years from now. The perceptions, interactions and thought processes of the individuals constructing the market will not. To maintain the possibility of study replicability, I used a rigorous, transparent process to identify interviewees, topics of investigation, and to analyze the results. The methodology was similar to that used by Pratima Bansal and Kendall Roth (2000) to study corporate ecological responsiveness. The method is in effect a form of analytic induction; data is collected from both interviews and textual documents and used to refine the study hypothesis and to develop theory, before additional data is collected in a subsequent round (Bansal & Roth, 2000).

Interviews were conducted in rounds and supplemented with context analysis of documents. The primary interviews were used to generate a knowledge base of issue areas influencing market development, and to use these to refine the study parameters. Interviews were conducted with principals in each industry or service sector to gather in-depth information about market formation, the relationships between institutions, the carbon market and other markets, regional structure of the market, the importance of products and services, and the barriers and opportunities for interconnecting the carbon market. Before conducting the interviews I met with several market experts to inform and refine the design of methodology used, and to test the interview questions. The interviews were semi-structured to enable both broadly consistent interview standards and close dialogue with interview participants. Close dialogue has been revitalized as a method of research in economic geography (Clark, 2005a, 1998). Close dialogue or

semi-structured interview provides a means to conduct inductive research, as it allows respondents to explain the complexities of a phenomenon or mechanism.

Interviewing is a particularly useful method since it allows for the production, in a systematic fashion, of knowledge and understanding that is to a large degree democratic, in the sense that it is constructed with input of a broad range of individuals. It offers space for the researcher and interviewee to have a far more wide-ranging discussion than would be possible with a survey or questionnaire (Silverman, 2004). Furthermore, the approach is constructive by enabling the production of maps of causality that will allow others to assess alternatives for intervention. Since the market approach is currently the preferred policy solution to climate change, the ability of this thesis to add insight into how the market can be made more successful has the potential to be incredibly valuable to policymakers attempting to structure the system for success. It is therefore also important for the process to be as democratic as possible. Interviews allow for a sort of democratic information production in that they are interactive and take account of the subject's perspective.

3.2.2 Project Sites

Conducting research in multiple locations is an innovative way of investigating dynamic transnational processes. However, it is also challenging. Carbon markets are developing around the globe. To understand the development of carbon markets it was necessary to conduct research in multiple sites. However, it was also necessary to narrow the selection of sites for investigation to make the study manageable. In this case I focused my analysis on the financial city centers most heavily involved in market developement—London and New York—and on the political centers which are interacting with these financial centers—Washington D.C., San Francisco and Los

Angeles. The idea of looking through the lens of city centers to understand broader socio-economic systems particular fits well within the frame of relational economic geography (Bathelt & Glückler, 2003). In addition, the carbon market, as composed by regional units, is transforming rapidly. Focusing on institutions within financial service centers, which are rooted in space, enabled a steadier frame from which a dynamic market could be analyzed. In addition, financial centers, particularly those chosen for the study, represent a conglomeration of market actors and activity (Wójcik, 2007). Although there are a number of potential cities which are contributing to the developing markets for emissions trading, this project focused on London and New York, which are situated at the heart of the global economy, and the developing carbon markets. Since the Chicago Climate Exchange, one of the first active carbon markets was developed in Chicago the city was also chosen as an investigation site. However, I found that limited activity is taking place in Chicago outside of the voluntary exchange. Therefore the financial analysis of the thesis focuses on London and New York.

Carbon trading is done through electronic platforms, however much of the infrastructure for trading (including technological, institutions and financial expertise) is located within these centers. London hosts a number of institutions which are active components of the carbon market from non-profit organizations (Carbon Disclosure Project) to consultancies (New Carbon Finance). Additionally, all of the large financial intermediaries, such as JP Morgan and Barclays, have branches in London. New York likewise hosts a number of carbon trading organizations and is the financial center for the developing Regional Greenhouse Gas Initiative, which is likely to be the basis for further policy in the United States and has already discussed linking with California's AB32 initiative. On the policy side several books and papers already provide a review of how

policy was developed for the EU ETS (Tilford, 2008; Skjµrseth & Wettestad, 2007; Grubb et al., 2006) therefore the analysis was focused on the United States where climate policy is still being developed. The interviews sought to draw out the relationship between policy and finance in constructing new markets.

3.2 Data Collection

3.2.1 Selection of Interviewees

Since the development of carbon markets is fairly recent, little is know about their structure and function. The first step of the analysis was to identify the major players in the developing financial services infrastructure of the carbon markets. Infrastructure development was investigated in London, New York, and Chicago, using a process similar to one used to map the functional and spatial structure of investment management for pensions schemes (Clark, 2000). I identified an initial institutional network structure through literature reviews, online research, and conversations with individuals actively working in the carbon markets.

Interviewees were then selected through a snowballing process utilizing contacts who are actively working in sectors of the carbon market in the three target centers, and through initial contacts made at carbon market conferences. For London, Jeremy Smith (Tersus Energy Consultant and founder of the Carbon Disclosure Project) provided an initial list of contacts representing the basic structure of the financial services industry for carbon trading. In addition, I made a number of contacts while attending Environmental Finance's Carbon Finance Europe Conference in October of 2007. A list of key institutions and interviewees for New York were drawn through consultation with Peter Fusaro, the founder of Global Change Associates Inc. In addition, I made contacts with

consultants, bankers and brokers while attending the April 2007 Wall Street Trading Summit. In Chicago, interviews were initiated through meetings with individuals attending Point Carbon's Carbon Market Insights Americas 2007 Conference in New York in October of 2007.

Once initial contacts in the market were made, snowballing was used to reach out to additional members (Gilbert, 2001). In particular, I concluded each interview by asking: Who are some of the key individuals/institutions developing these markets? Who else would you recommend I contact for this study? Interviews were conducted in city rounds to allow for follow up with recommended contacts and some interviews were conducted over the phone. In many cases more than one person was interviewed from the same firm because they operated in different geographies or different specialties. Due to the confidentiality guarantee of the study, access to institutions approached was very high (close to 80%) and many institutions provided good recommendations and contacts both within and outside of their organizations.

In addition to interviews with various service sectors and market compliance parties, I conducted interviews with policymakers and regulators developing carbon emissions policies in the United States, including in Washington D.C., in New York for RGGI and in California for AB 32. The same techniques used in the market interviews were carried over to establish contact with policy makers. A number of policy makers and staffers were introduced via study participants. Others were identified through online research of which committees, senators, and representatives were developing legislation. For a full list of interview participants, see Appendix 2.

3.2.2 Conduct of Interviews

Interviews were conducted using a semi-structured format with an initial list of 19 questions. However, interlocutors were allowed and encouraged to explore other topics they felt relevant to their carbon related activities. The standard interview format required one-hour, but the interview length varied between 45 minutes and 2 hours depending on participant availability and interest. I kept the questions as short as possible to avoid directing the respondents (Denzin & Lincoln, 2003). I also attempted to keep the pace and flow of the interview on target following relevant themes (for an example see Appendix 3). However, I often followed up on relevant themes or points that were raised to explore interesting aspects of the participants work or firm. To meet the confidentiality requirements of two ethics review committees (at Pennsylvania State University and Oxford University) interviews could not be tape-recorded. Rather detailed notes were taken during the interview and typed up subsequently. Each interview transcript was labeled with the type of institution and position of the individual interviewed, as well as with the date, time and location of the interview.

In order to allow for the exploration of different themes, and to include as many respondents as possible I conducted the interviews in two-week trip intervals. I scheduled the interviews in advance, usually conducting two or three interviews per day during weekdays. In order to facilitate the ease of access, I met interviewees at their place of work. I began the interview schedule with a two-week trip to New York in November of 2007. I conducted a two-week trip to London in the beginning of December 2007. Roughly 30 interviews were conducted during these trips, which allowed me to identify and refine themes of investigation. The questions of the first trips to London and New York focused on professional service relationships and financial expertise. This provided

valuable information which was followed up with further online and document research and which allowed me to write the first thematic paper.

In May of 2008 I began the second round of interviews with a two-week trip to New York and a week long trip to Chicago. I had originally planned to conduct an additional trip to Chicago, but realized that Chicago was less active than I had initially thought. Since I was able to conduct all of the relevant interviews in one trip, I transferred the time and funding of the second trip to a more extensive research trip in California. In June 2008 I finished the interviews in London, and traveled to Paris to interview exchange members. Another 40 interviews were conducted in the second set of trips. The questions focused more on the relationship of space time management, and provided valuable information for the second thematic paper. With the final round of interviews I investigated the nature of policy development with trips to Los Angeles, Berkley, San Fracisco, Sacramento and Washington D.C. in August and September 2009. Allowing time between each trip enabled me to reflect on the data that was collected and to conduct analysis. It also allowed me to intersperse the writing, which made the thesis more manageable.

I tried to be as comprehensive as possible in my interviews given the allotted time-frame and funding. I feel that I captured a reasonably comprehensive market spread of infrastructure, policy, service firms, and compliance parties. However the data reflects on a particular (pre-crisis) time moment in the financial and policy centers, and it is always possible to continue to collect data. In particular, I would like to conduct interviews in both London and New York after the United States has come on board and the markets become more sophisticated. In addition, I would like to extend the geography

of the research to Asia and Latin America. In this sense, I view the data that has been collected as one piece in an extending puzzle.

3.3 Data Analysis

The interviews were coded and analyzed using NVivo, a software package which assists with data queries and dialogue searches of coded text. The transcripts were formatted in Microsoft Word and uploaded to an NVivo file. Relevant questions were coded into separate nodes, which allowed for the question responses to be grouped (yet remain distinguished with an institution/position label) and analyzed across institution type. NVivo was primarily used to sort the interview data, and conduct node organization along question lines, as well as to conduct word searches. NVivo also allows data to be saved so that it can be further coded according to specific themes for future research.

The responses from interviews were triangulated within and across institution type. I looked for common themes, perspectives, and language in the transcripts. In reporting on market perspectives I ensured the perspective appeared as a common themes among study participants. Most of the interview data provided information about the operation of firms or market mechanisms. I was able to verify this information through online research. In particular, I carefully verified organizational partnerships, and market positions through consistency checks on institutional websites. I discovered that a number of coalitions and industry groups are guarded by members and do not have online webpages or other information. I confirmed the existence of these through repeated inquiry among different industry members. Finally, since the geography of each respondent was recorded, it was possible to look for regional perspectives regarding geography. NVivo was used to conduct dialogue and keyword search and compare

regional response. While the methods used to conduct and analyze interviews are qualitative, they were rigorously applied and could be replicated in other studies.

Veracity was tested though successive interviews, collection of third-party data, and comparison of responses to common issues and questions. Successive attempts to understand the market structure at large were built slowly through an interactive framework of perceptions of those working as part of the carbon market. This methodology allows for the organic construction of a more democratic map of the carbon market (Baxter & Eyles, 1999). The analysis was used to understand the institutional structuration and relationships of market participants. In addition, I investigated three other specific themes: the nature of complementarity, the nature of time and space in market construction and path dependence vs. design.

3.4 Ethics and Reflexivity

It is important to maintain ethical conduct in a study, particularly when dealing with human subjects. Interviewing is not invasive, but it is important to maintain a safe environment and to protect the privacy of those providing information (Denzin & Lincoln, 2003). Maintaining ethical conduct with participants affected the study in two important ways. First, due to the sensitive nature of some of the questions asked in the interview (regarding market partnerships and activity) all of the interlocutors had to be anonymous. Additionally, I decided to protect the identity of the firms which participated as it would have been difficult to determine who could grant permission for the firm to take place and to confirm that what was said by particular employee matched the organization's public line. Doing so would have severely limited the inquiry of the study. Furthermore, the type of firm and industry activity was more important to the study, than

the particular firm because the study was interested in broader market-wide relationship trends and mechanisms rather than specific instances.

Leaving both individuals and their firms anonymous was advantageous in that it gave the experts the opportunity to speak freely without fear of repercussion. This was also important to ensuring that the study would not have any impact on their job situation. As a result of the promise of complete anonymity the response rate was very high. The disadvantage is that there is no accountability in the sense that those individuals who have been quoted do not have to account for what they have said. Granted, most of the things written in the thesis and the papers published as a result of this work are not controversial, and a number of individuals suggested that they would not mind having themselves quoted. However, to maintain the ethical guarantees the identities of those interviewed are protected.

The second result of the ethical considerations for the study, and of the two ethics review board specifications (one at Oxford and one at the Pennsylvania State University which enabled me to receive an NSF grant) was that I could not tape record the interviews. Instead, I worked very diligently to record what was said in writing, but my transcriptions will never be as accurate as a tape-recorded interview. In addition, I could not capture the expression and nuance in each interview. It is difficult to punctuate in writing the inflection of what is said. However, there may also be advantages. Interview subjects often feel nervous in front of a tape recorder and are less willing to speak freely (Gilbert, 2001). The experts who were interviewed soon seemed to be very relaxed and conversational during the interviews. Their discussions gave me insights into the operation of their firms and industries, topics that may not have been broached had I tape recorded the sessions.

Additionally, the lack of tape recording made the setting feel more informal, less researcher and subject and more two professionals having a conversation.
A number of participants shared valuable company and union documents with me, perhaps because I seemed more like an inquisitive student than a scientific researcher. The openness of the research setting which was achieved in many interviews deeply facilitated the insights of the thesis, but it is difficult to weigh the advantage of this setting against the loss of not having tape recorded transcripts. Even if the notes that I took adequately captured the words that were spoken, the personalities behind them have been lost. Part of the reason I wanted to record this type of data was to capture the social quality, perspectives and personalities that build markets.

In general, I found the process of conducting interviews to be very rewarding. In the past, my academic research had been restricted to the conduct of quantitative analysis with datasets. It was a challenge to come to terms with the qualitative nature of the study. First, I quickly learned that conducting interviews requires skill in managing personalities. Additionally, it can be difficult to make sense of interview data without being overwhelmed. Both the collection and the analysis of interview data are fluid. To be effective I had to let go of complete the control of the process, while still maintaining direction. I found that flexibility was very important in managing the interviews and interviewee styles. All of the interviewees were sent the questions in advance. From my perspective the questions were intended to lead discussion topics rather than to constrain the interview. Some individuals were inclined to stick to the structure, and even led me question by question to their direct responses. Other interviewees resisted the structure altogether with a flood of random ideas and chains of thought, forcing me to constantly work to bring the interview back to focus.

I discovered that balancing the need to cover all topics and maintaining openness for inquiry and respect for the thought direction of the interlocutor is more of an art than a science. In a few of the interviews I must admit to abandoning the structure altogether, because the interviewee had led into a discussion either of the history of the firm or the market that was so interesting and dynamic that I could not dare to interrupt the flow of their thoughts and ideas. Interviews like this were incredibly rewarding, both in the nature of the data revealed, but also in the personal interaction. In some ways, they were more a dance of ideas than an interview. Occasionally interviews were very difficult as I struggled to get the interlocutor to speak beyond a couple of sentences while still trying to seem enthusiastic and positive. This is the challenge and the reward of social inquiry. It is messy, human and interactive. What was most rewarding though was the sense that I learned something new with every interview. I was very much still a student and each interview was a private lecture with a specialist who could teach me something. When I work with quantitative data, I impose myself upon it; I direct it, command it and operate it. It was incredibly rewarding to sit and listen and learn from those providing the data in the interviews.

The process of analyzing interview data was also very challenging for me to come to terms with. Quantitative data provides the safety of a certain level of confidence, a mathematically determined 95% confidence level for example. With qualitative data, confidence is self-built and the relationships and themes are not tested, they are explored. The process of analyzing qualitative data reminds me of something that was written by Kenichi Ohmae in *The Borderless World:*

> Strategists do not reject analysis. Indeed, they can hardly do without it. But they use it only to stimulate the creative process, to test the ideas that emerge, to work out their strategic implications, or to ensure successful execution of high potential 'wild' ideas that might otherwise never be implemented. Great strategies, like great works of art or great scientific discoveries, call for

> technical mastery in the working out but originate in insights that are beyond the reach of conscious analysis. (Ohmae, 1990, p. 3)

In some sense, I felt as though the research process was a matter of collecting the insights and knowledge of the experts that were interviewed through interaction, incubating them, and allowing new ideas and thought processes to gestate. After a very intense two-week research trip my mind was brimming with ideas. The interactions of the interview brought these ideas to life. The process of analyzing the data was one of matching intuition with the patterns in the hard data. It was a very intellectually stimulating research experience, and yet very fluid and difficult to control.

In some sense I think the process of conducting qualitative social inquiry is a process of gathering knowledge from as well as getting to know the thing that is explored. It felt as though I was attached to the research. I became very deeply embedded in the carbon market networks I discovered through the interactions that were shared with its agents and the stories that were told. The danger of this approach is that the analysis has too much of my perspective in it. The advantage is that the connections and can only be achieved by embracing the process, by experiencing the 'thing' that is researched. Bruno Latour suggests that the artifacts of the research, the data that we collect and the things that we write, are still connected to the fields, trees and streams, to the things that are left behind (Latour, 1999). As a researcher, we are never fully removed from the research process or separated from the thing that is researched. My interview dataset still holds a bit of the carbon market institution itself. The research was a process of interacting with so many individuals, such that the market became real to me. I connected with it and understood it in a way that would not have been possible had I kept myself removed. This introduces the potential for bias, but enriches the understanding and overall research experience.

I believe there is great potential for inductive theorizing and qualitative methods to add insight to our understanding of markets and of economics. The overwhelmingly quantitative focus of market and economic studies in general leaves the disciplines weak in terms of understanding the causal mechanisms underlying the observed phenomena. The most potent remedy is more qualitative research that can examine causal forces and pathways. Many anticipate that carbon markets will become a colossal socio-economic mechanism with a critical mission to address climate concerns. Knowledge of the human processes that initiated and formed these markets will be invaluable. As one of my interlocutors pointed out, "At every single one of your market institutions there is an individual who drove the process." Quantitative data can give some sense to the economic form and structure of a market, but markets are composed of individuals as well. Without understanding them, we cannot truly understand or shape the markets.

Chapter 8 | Conclusion

8.1 Introduction

This thesis examines the development of carbon markets in Europe and the United States using a relational economic geography framework incorporating institutional theory. The thesis sheds light on the political and financial components of carbon markets as well as on the organizations and mechanisms that develop them. I investigate the development of carbon market services and infrastructure by focusing on the service firms, NGOs and policy agencies engaged in building carbon markets. Through the interviews, I develop empirical evidence demonstrating that markets serve as an institution for organizing socioeconomic and natural productivity in space and time. Organizations, using borrowed expertise, play a critical role in constructing the market, shedding light on their ability to shape the institutional contexts within which they operate.

In this concluding chapter, I draw together my findings and comment on the broader implications of the thesis. I first highlight the principal findings of the four substantive chapters, suggesting how each of these chapters contributes to existing literature. I then use the findings to discuss implications of the socioeconomic meaning of carbon markets and the potential for these markets to address climate change. In the next section I address concerns that the global financial crisis raises for the relevance of the research. The final section of the chapter assesses the limitations of the research and suggests possible directions for future research.

8.2 Principle Findings and Contributions to the Literature

This thesis uses a relational economic geography framework to understand the development of carbon markets. It suggests that contrary to neo-liberal economic theory markets are not simply systems of exchange. Rather markets are social institutions which organize socio-economic productivity among expanding capitalist collectives. Carbon markets are likewise built from systems of relationships among organizations and individuals. In particular, the carbon markets are framed with two key components: 1) the policy and regulatory structures which give the market existence and bound its rules of operation, and 2) the financial and service components which operationalized the market. The thesis explores the development of both components and suggests that carbon markets have the potential to organize a collective response to climate change by communicating social value. This adds to the original framework by informing not only the relational shape, but also the function of markets. The carbon markets function as systems of communication.

The thesis is structured around four key chapters, each prepared as an article for submission to an appropriate academic journal. Each substantive chapter is focused on a specific theme of importance to economic geography literature: complementarity, spacetime, design versus path dependence, and institutional structure. In addition, my research sought to contribute four distinct literatures: the geography and sociology of finance, spatial political economy, coalition theory, an institutional theory. This section presents the principal findings as a whole. It is organized in accordance to each chapter's theme and research aims. The following sections discuss the theoretical frameworks, empirical findings, insights and contribution to the literature of each chapter.

Complementarities: How do markets become operationalized and what is the importance of geography and market formation?

Chapter 4 examines the role of complementarity of exiting financial infrastructure in London and New York in the context of developing new carbon markets. Building on the work of Richardson (1960) and Clark (2002), I develop a framework of market operationalization involving three levels of complementarity both between (existent and new) markets and within the new carbon markets: complementarity of expertise and information, complementarity of institutions and services, and complementarity of market systems. I find—based on expert interviews in London and New York—that the financial infrastructure of the market is built by borrowing expertise, services and infrastructure from other firms within the financial service centers of London and New York.

Developing a market from existing financial infrastructure through complementarities is more efficient because it economizes on sunk costs, relies on the marginal pricing of new initiatives, and generally reduces the costs of infrastructure development. Utilizing the three levels of complementarity to develop carbon markets allows the markets to be operationalized much more quickly than if the service components and infrastructure had to be built wholesale. However, complementarity limits innovation. Services and products are adopted directly from other markets. Additionally, the market becomes embedded in existing financial service centers and serves to perpetuate financial geography.

This chapter contributes to literature on the geography of finance by explaining the dialectical nature of market development and financial operation. In contradiction to the work of Castells (1996) and O'Brien (1992) the chapter suggests that geography is important in market development regardless of the changing technological landscape,

which makes communication boundless. Financial service centers are held together by face to face contact; even in new, technologically advanced developing markets proximity matters. In this respect, the chapter also contributes to work in the sociology of finance (Knorr-Cetina & Preda, 2005) by demonstrating that market development is a social process. Market services and products are developed through expertise adoption, which requires tacit knowledge transfer.

Spacetime: What role do carbon markets play in organizing human activity in space and time? How are markets constructed in space and time?

Chapter 5 examines the nature of carbon market spacetime construction and the implications for the progression of capitalism. Capitalist development is framed in two eras with distinctive (if overlapping) socio-political, economic and cultural features—modernity and post-modernity. Constant through each era has been the drive to increase control of collective organization in space and time. This chapter suggested that a new era—neo-modernity—has emerged in which humanity has become a 'force of nature,' able to destabilize its own environment and ultimately threaten its survival. I suggest that carbon markets use the valuation of the absence of the emission to control development trajectories.

I find that carbon markets are an important infrastructure enabling humanity to integrate natural processes into its socio-political and economic organization. The carbon markets are the embodiment of a process designed to reorganize human activities as well as organize a newly elevated natural environment. As with other eras, the key to success in neo-modernity is organizing complex and divergent human activities across space and time. Using a case study institutional approach built from close dialogue with market participants in the London, New York, Chicago, Paris and Washington D.C., I analyze the

construction of carbon market infrastructure including 1) how the markets organize the environment in space and time, and 2) how market members organize themselves in space and time. Carbon markets direct future activity by creating a commodity that lacks spacetime. By valuing the absence of the emission, the commodity creates and communicates aspiration to reduce emissions. The creation, trade, and expiry of a commodity without a tangible underlying require the construction of considerable infrastructure, namely platforms, exchanges and verifiers. In the chapter, I explain how this infrastructure is built through international coordination and argue that carbon markets are coordinating networks—the epitome of neo-modernity infrastructure.

This chapter contributes to the literature on spatial political economy by building on the work of David Harvey (1989), Manuel Castells (1996), and Peter Galison (2003) to understand the role of space and time in the operation of capitalism. Harvey suggests that capitalism has been the expansion of collective productivity, and ever greater control of the organization the activity of these collectives in space and time—spacetime compression. Castells suggests that capitalism is creating a virtual world of timeless time in which any time context can (past or future) can bring value into the present. Capitalism is integrating every society into the network society. He suggests the last barrier to the incursion of timeless time is 'glacial time,' i.e. the natural environment. In this chapter, I suggest that the creation of carbon markets is a process designed to break down the glacial barrier by incorporating natural processes. Indeed, the carbon markets are just the beginning. Markets are increasingly proposed as control mechanisms facilitating eco-systems services for every imaginable natural system, including biodiversity. This chapter provides insight into the mechanisms through which this is accomplished. Finally, the chapter comments on Galison's work on simultaneity and

relativity by suggesting that they are countervailing tendencies. Although the carbon markets are very much virtual, the command centers are restrained to particular space time contexts.

Design and/or Path Dependence: Can markets be designed or are they constrained by historical context—path dependence?

Chapter 6 explores the development of carbon emissions markets through analysis of policy formation in the United States. Whether the emissions markets can be developed and operate quickly enough to have an impact in mitigating greenhouse gas production will be determined in large part by their stringency and quality of design. In addition to the political challenges, the carbon emissions markets now must be developed in the face of financial crisis. The conditions surrounding the development of these markets raise doubt as to whether carbon emissions markets can be successfully designed. The formation of carbon markets raises a question central to the study of markets in general: are markets inevitably path-dependent, subject to historical events and driven by socio-cultural activity?

Drawing insight from coalition and field stabilization theory, I argue that carbon emission market formation is path dependent, but only to the extent that it is shaped by prior existing conditions and perceptions of civil society. Case studies of policy formation the United States and California legislatures demonstrate the process of coalition formation and policy field stabilization. The chapter suggests that policy formation is a path dependent process structured by equilibrium of the motivations the institutions that build coalition. The history of legislation in a particular policy field builds a policy direction and inertia. The longer the history and the greater the scope of the policy, the more difficult it becomes to shift this inertia. As a result, I conclude that

carbon market development is already becoming locked in at the federal level in the United States.

This chapter contributes to literature on path dependence and coalition theory. In particular, I seek to break down the barrier between the European politics tradition of empirical inquiry and the game theoretical tradition of model construction (Laver & Schofield, 1998). Utilizing a neo-Gramscian perspective to investigate the ways in which political fields are stabilized through balance of interests and coalition formation (Levy & Egan, 2003), I develop a model for understanding policy formation in the legislative process based on empirical case studies, which could be further refined and mathematically tested. This chapter also contributes to debates within economic geography regarding the nature of path dependence in market formation, by extending analysis beyond firm operation and technological development to policy formation (Martin & Sunley, 2006).

Institutional Theory: What is the nature of a market institution and how is the carbon market institution being built?

Chapter 7 investigates the development of carbon emissions markets from an institutional perspective to understand how markets specifically and social institutions in general are constructed. Countries around the world are developing carbon emissions markets as a governance mechanism to reduce greenhouse gas emissions and mitigate anthropogenic climate change. In this chapter, I suggest that carbon markets are social institutions, designed to solve the global collective action problem of climate change. Drawing on seminal work by Richard Scott and Neil Fligstein, this chapter explores the way in which already existing organizations build the institution of the carbon markets. The chapter demonstrates that it is not regulatory bodies that truly construct the market

institution. Rather, a number of public and private organizations, ranging from development agencies to legal firms and banks build and operationalize the market.

In particular the chapter analyzes the development of three pillars of the carbon market institution: regulative, normative and cultural-cognitive constructs. Property rights are the most important carrier of the regulative pillar and are constructed by legal firms rather than governments. The normative carriers of the market are public awareness of climate change and price signaling of the value of reducing emissions. These carriers are constructed by NGOs, scientific agencies, and financial firms. The cultural-cognitive pillar of the carbon market institution is carried through the construction of carbon culture and conceptions of control. Consultancies play an important role in shaping this pillar by hosting carbon market conferences. I find that since organizations build the institutional pillars of the carbon market, the strength of the institution cannot be determined by regulation alone. Certainly regulation gives the carbon markets credibility, but their ability to become an institution of common practice relies on the strength and embeddedness of the organizations that build them.

This chapter contributes to institutional theory, building on the seminal work of Richard Scott (2001) and Neil Fligstein (2001) which treats the market as an institution. Whereas prior work has focused on the way in which organizations are impacted by institutions, this chapter reverses the causal arrow to investigate the way in which organizations build institutions. Even though the carbon markets are a regulatory process, most of their construction and operation is not done by governments, but by public and private organizations. As a result the markets can quickly spread beyond the boundaries of regulated jurisdictions. Furthermore, the power of the carbon markets lies in their ability to communicate social value, which creates a normalized belief in and response to

climate change. Investors, corporations, and consumers tap into and respond to the communication of this value, even if they are not directly regulated.

8.3 Broader Implications of the Thesis

As I suggest in the introduction and framework chapters of the thesis, addressing climate change is one of the greatest challenges human society has ever faced. The greenhouse gas producing activities of literally billions of individuals must be adjusted. We must either change our way of life or develop and transmit low carbon technologies on a global scale. Climate change is a problem on the scale of world systems. No existing regulatory system has the authority needed to address the scale or the scope of the problem. Supranational regimes such as the Kyoto Protocol will struggle to get the United States to form a binding commitment because of sovereignty issues. In addition, India and China, two of the largest emitters, are unlikely to commit to mandatory reductions while they continue to industrialize. In the absence of a unified government response, carbon markets have been growing in prevalence. The question this thesis posed was whether or not these markets have the capacity to serve as a form of earth system governance. Can they produce a coordinated response to mitigate climate change? The markets are still nascent, so it is difficult to answer this question conclusively. However, the evidence presented in this thesis suggests they have the potential to do so. The power of the markets is not tied to directly reducing emissions, but to their ability to communicate social value.

The biggest criticism of carbon markets is that their impact is too small to capture the overall problem. Evidence suggests that in Europe, despite the EU ETS emissions are still rising (Egenhofer, 2007). However, emissions were intended to initially continue to rise while the rate slowed. The rate of rise has undoubtedly slowed, but by how much?

Critics contend that the impact is so small that it only diverts attention, and creates the sense that a solution is being undertaken when in fact carbon markets are insufficient (Böhringer et al., 2006). First, as I suggest in Chapter 5, it is difficult to answer the question of impact conclusively because of the nature of the carbon commodity. Reduction requires us to measure against a future counterfactual that has not happened. The emphasis on quantifying emissions and reductions is important but to some extent it misses the forest for the trees. Looking at the larger picture, this thesis suggests that the role of carbon markets and their potential for success lies not in reducing emissions, but in mobilizing public, political, and corporate will.

The power of the market lies in its ability to communicate, disseminate and strengthen collective social value and aspiration to address climate change. The market does this by building a price signal for the absence of carbon. The positive price for the absence of carbon automatically creates a negative price for the existence of the emission. That price signals value—social belief or aspiration to reduce emissions—and this spreads quickly through the market network. It is perhaps easier to see the impact of social value from the reverse perspective. Work on social repugnance produces insight into the flip side of the coin—what is not marketed: aversion to transactions by a critical mass of social actors may constrain or even prevent the transactions, even when there are willing buyers and sellers (Roth, 2007). Things that are socially repugnant—kidneys, eyes, horse meat—are not marketable in certain societies; they cannot be communicated with a price signal of social value. Society decides what is marketable according to the values and belief systems it holds. In understanding what is not marketed and why, it is possible also to understand what *is* marketed and why, what things have social value. Addressing climate change has social value. Once a market communicates this in a

normalized way through the price signal, organizations and individuals begin to accept that the value is a social norm and begin to ascribe to it.

Furthermore, as I suggest in Chapter 4, the carbon market is intricately linked to other financial markets in the process of its construction. The price signaling in carbon markets as a result is transferred and communicated to these other markets. Even in unregulated regions and sectors, investors, corporations and consumers are beginning to consider carbon assets and liabilities in decision making. As demonstrated by the existence of the Carbon Disclosure Project, the Greenhouse Gas Protocol, and the growing international voluntary market, the price signal in a regulated region is transferred through the market to unregulated regions. The attention and awareness of this signal creates public, political and corporate support to regulate the market.

This speaks directly to the nature of market societies. The findings of the thesis suggest that all consumer markets are interconnected, perhaps to varying degrees. The carbon market is regulated only in Europe, and yet through direct organizational connections (service centers of London and New York) and through connections to other financial markets (especially venture capital and clean technology markets) it is transferred literally around the globe. This thesis does not measure or model the impact, but it would be an interesting and valuable avenue of future research. The implication of these findings is that markets are linked and play a role in shaping the organization of capitalist societies. In the case of carbon markets, there is a homogenization of value that becomes connected to the absence of carbon dioxide. Taxes and other command and control mechanisms do not translate or communicate the way that markets do. They are easily localized. The values and aspirations that are communicated through markets cannot be contained; they spread without direct intention or effort.

In this respect, the thesis suggests that capitalism is as much a culture as a system of production. Over the last two hundred years it has permeated virtually every society, slowly claiming every way of life. As it globalizes it binds and integrates the function of vast societies ever closer together. The market is the system, the mechanism that organizes these collectives. The true power of the market is in building common expectation and aspiration. The market does this by communicating social value, but it is only successful if people accept this value. Shared belief enables collective coordination.

For whatever reason, the values of the market are accepted as much as if not more deeply than any religion or culture. Perhaps this speaks to the nature of the institution. It is subtle but incredibly pervasive. Around the globe, societies, organizations and individuals subscribe to and buy into the order of capitalism. In doing so they begin to accept broader collective norms of operation—formal education, a job, consumer goods. They mold themselves and their lives into the shape of the collective, ascribing to its belief systems and values. Scholars have written about this phenomenon—globalization—in a number of different ways (Sassen, 2004; Stiglitz, 2002; Sen, 1999). As a part of this system, and more than any other government or culture the carbon market has the power to shape aspiration and value in addressing climate change. The markets are neither the most efficient nor direct means to addressing climate change, but they are perhaps the only mechanism capable of achieving the scale and scope of coordination possible.

This thesis has followed in the footsteps of scholars who are challenging the fundamental assumptions of neo-liberal economics (Fligstein, 2001a; Cantor et al., 1992). Scholars like Fligstein have opened inquiry into the social nature of markets, but the scholarship on understanding social value is insufficient. By applying social theory to the

understanding of markets, this thesis begins to address questions at the heart of the social institution of markets, and to understand what role these institutions play as systems of governance. In general, this research suggests that we need to reconsider the nature of markets as something more than a place for or system of exchange. Such reconsideration is of benefit to economics and other social sciences, as it opens new lines of inquiry. With the growing financial crisis, scholars and politicians have struggled to come to terms with the failures of the free market system. Perhaps the failure to manage these systems has come from a fundamental failure to understand how these systems operate and why. In particular, what is the free market, how should it be regulated and what role should it play in the organization of economies?

When applied generally, the research of this thesis offers an initial perspective in this direction. It suggests the debate is not so much whether markets should be regulated but how the actors in markets should be regulated. The market is not an independent entity; it is a form of communication and organization that involves those who are communicating as much as much as the goods and services which are exchanged. To an extent, blaming the market for the failure removes the focus from the economic policies that have driven stagnation and from the elite who communicated value where none existed—value that had no materiality. There is a need to reconnect to the meaning of markets and social value. This thesis provides only an initial attempt. Further research and investigation would be of great benefit to economics and to the social sciences in general.

8.4 Impact of the Global Financial Crisis

Most of the research presented here took place before the brunt of the current global financial crisis struck. The crisis and subsequent restructuring of market systems

raises the question of whether or not the research in this thesis is still relevant. I argue that the research is indeed still relevant. Since the research was built using a relational economic geography framework, it has constructed an understanding of the organizations and relationships that develop markets. This thesis has added insight into the fundamental policy and financial mechanisms which construct and operate the markets. The form that the market develops into is likely to change as a result of the crisis, and new organizations will develop to process the markets, but the basic and fundamental structures and mechanisms will not change.

More specifically, the crisis is generating two responses from world leaders: 1) they are working to restructure and tighten the regulation which controls market operation, and 2) they are seeking to reign in the reach and excess of the markets. The first response limits the degree to which risk can be securitized and will limit the construction of exotic products. The rules regarding the trade, sale and hedging of these exotic securities are also being adjusted. Since carbon markets are still being developed, the products are not yet as complicated or as deeply ingrained in other financial markets. Limiting financialization and the construction of exotic securities will constrain the possible carbon products that can be traded in the future, as it will change financial products in general. However, at the moment carbon products are not that sophisticated. This can be seen by the absence of dramatic fluctuation in the carbon price as the crisis unfolded. Both before and after the crisis, carbon credits neatly tracked the price of oil, gas and electricity (Capoor & Ambrosi, 2008). The second policy response will potentially affect the incentive structures of financial employees, particularly bonus structures and salaries. As with other financial markets this will affect employees working in carbon markets in the future. However, it will not fundamentally change the

function of the markets. Furthermore, carbon is still a nascent and small enough market that its employees were not receiving the top end bonuses and incentives of other market practitioners. Many of the investment banks interviewed indicated that their teams were still a niche consisting of a few members rather than hundreds or thousands.

There is additionally concern whether the financial crisis will inhibit the materialization of carbon markets in countries like the United States which are still generating the regulation to support carbon markets. The crisis could have two impacts: 1) fear of markets could shift the policy field and create demand for another policy response, such as a carbon tax, command and control regulation, or nothing at all, or 2) the drive for a 'Green New Deal' to revitalize the economy could accelerate the development of a carbon market in the United States. As outlined in Chapter 6, the evidence suggests that the crisis will have the latter effect. President Obama has requested that Congress pass a carbon bill this year, and if at all possible before the Copenhagen talks in December (Galbraith, 2009). This timeline is unlikely to be met, but it shows that the crisis has not deterred political will.

Finally, one of the platforms of President Obama's economic policy has been a 'Green New Deal' or the construction of green energy and infrastructure. This has manifested in a number of clean energy initiatives including talks with China for the development of shared technology (BBC, 2009a). Developing green energy to revitalize the economy makes sense, as it would produce a number of jobs and industry to develop technologies and infrastructure. It would also provide a cheap and reliable source of energy which would mitigate U.S. concerns over energy security. However, as President Obama has indicated, the government cannot act alone to establish an energy signal; a carbon market is needed to send the price signal to investors and entrepreneurs (BBC,

2009b). Financial concerns in the United States could still slow the rate and format of developing carbon markets, but in the meantime the outlook is favorable.

8.5 Future Research

Like all research the study has its limitations. In this case, it has captured only an early stage of carbon market development. Nevertheless, the mechanisms that have been uncovered will likely remain relevant as the markets develop further. In addition, the thesis has been restricted to inquiry in the United States and Europe. These limitations offer an opportunity to expand the research into important avenues. There are three specific projects or avenues of research I would like to undertake. First, I would like to develop a computer model of market networks to better understand how price signaling communicates social value and links markets. Second, I would like to conduct a comparative study of policy development in the United States and Europe. Third, I would like to expand the geographic reach of the research into Asia. Each of these is a large project I could see developing over the course of several years.

One of the interesting implications of the thesis is that the market is an institution which accomplishes collective organizations by communicating and disseminating social value. The organizational needs of vast capitalist collectives—in a sense imagined communities—are structured and communicated through market systems (Anderson, 1991). I would like to investigate more specifically how this process happens, by modeling the market communication network. The market might be divided into zones of influence, the primary being the direct actors of exchange, the secondary system might be the corporations that link into organizations of exchange and finance, and the tertiary level the consumers who purchase from corporations. In particular, I would like to investigate how the pricing of carbon reductions in one market links to other markets and

then is communicated to other regions. Perhaps there is a way to borrow from complexity system modeling to model market communication networks. This would be very useful to understand the connection between price signaling, public awareness and regulatory demand.

In addition to modeling market networks, I would like to conduct a comparative policy study between Europe and the United States to research the role of securitization in the formation of new markets. Politically the study has focused on the development of the United States. I decided to approach the study this way in part because of the practical limitations of research funding and time, but also because the legislation is currently being developed in the United States. A number of studies have already been written on the development of the EU ETS in Europe (Tilford, 2008; Skjµrseth & Wettestad, 2007; Grubb et al., 2006). Nevertheless, it would be interesting to compare the development of policy in the United States with the historical development of the EU ETS in Europe. A few interviews with individuals who were involved in shaping the EU ETS led to an interesting preliminary finding. Security is playing an important role in shaping the policy discourse in the United States. Some of the key staffers interviewed indicated that legislation needs a security element to move through the Congressional floor. Those who were involved in shaping the EU ETS suggested that this was not the case in Europe.

In the future, I would like to conduct extensive research to understand this difference, what drives it and what its implications are, especially as policy becomes more developed in the United States. In particular, I would like to trace and interview the individuals who directly contributed to developing the EU ETS while in office. This will be difficult as a number of them have since left office or changed positions. However, I

can draw on the work of European scholars such as Jon Birger Skaerseth and Jorgen Wettestad. In addition, I would like to investigate the popular dynamics which drive securitization. In particular, the United States had an important period of climate change doubt and debate. Other studies have suggested the reason for this uncertainty, driven either by the Bush Administration (Shulman, 2007), by corporate owned media (Antilla, 2005) or by corporate resistance and public miseducation (Levy & Egan, 2003). For whatever reason, Europe does not have as identifiable a period of refuting climate change. I would like to investigate why this is, and particularly the history of climate science and policy response construction in Europe.

I would like to expand the research on the carbon market institution, to see how the rationale for carbon markets—the belief in climate change— becomes publically institutionalized. This might be done through surveys, which investigate whether there is a clear pubic difference in opinion over climate science between the United States and Europe and if so where this difference lies. If the difference is not in the public domain, it may indicate a difference in the location of public policy and the nature of democracy. In the United States policy is very much located in the public domain. As a result, the construction of a response to climate change, of a new structure for political economy, takes considerable time. However, once operationalized the policy may become more deeply ingrained in the public domain. In Europe, there may be a level of removal between pubic debate and European Commission policy. Regardless of this potential removal, Commission policy is very powerful, as demonstrated by the quick initiation of the EU ETS. It would be interesting to investigate this phenomenon and the implications for the embeddedness and potential for success of the carbon market institution in the two regions.

Finally, the study has been geographically limited in scope to Europe and the United States. I would like to expand the geographic reach of the research to Asia and eventually Latin America. In particular I would like to investigate the development of carbon markets in financial and political centers of Asia using the same techniques as in this study. This will contribute to a better understanding of how context and culture affect market development. It would be interesting to see if the Asian market service centers are built using complementarity as well, and what impact this has on shaping market geography, since many of the Asian financial centers are not as well established as London and New York. Preliminary evidence from this study suggests that Tokyo, which is one of the three primary centers for global finance will not be as significant as other contenders such as Shanghai, Hong Kong and Singapore. I would like to investigate the role carbon markets are having in shaping the dynamics between these centers in Asia.

In addition, I would like to further investigate the nature of culture and context in market development by researching the response of Asia, particularly India and China, to growing international carbon markets. Adjusting Asian economies to develop low carbon energy sources and infrastructure is a critical component in mitigating climate change. Carbon markets have become the policy mechanism of choice, and as this study has aimed to demonstrate they are highly communicable or contagious. They are building a normalized institution or regime for addressing climate change and yet they are a product or invention of the West. I am interested in researching Asian perspective and response to these markets. Will they be accepted or resisted, and what impact will this have on balance of power between developed and developing countries? This research could also provide useful insights into the relationship between price signaling and technology

development in emerging markets. I would like to research the influence of U.S. and European carbon markets on technology markets in Asia. This could be done through a number of methods including data analysis of the volume and distribution of clean technology in relationship to financial and corporate clusters.

Appendix 1. List of Abbreviations

AAU	Assigned Amount Units
AB 32	Assembly Bill 32: California's Global Warming Solutions Act
CalEPA	California Environmental Protection Agency
CARB	California Air Resources Board
CCAR	California Climate Action Registry
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CDP	Carbon Disclosure Project
CEC	California Energy Commission
CER	Certified Emissions Reduction
CITL	Community Transaction Log
CME	Chicago Mercantile Exchange
CO_2	Carbon Dioxide
DOE	Designated Operational Entity
EB	Clean Development Mechanism Executive Board
ECX	European Climate Exchange
ERPA	Emissions Reduction Purchase Agreements
ERU	Emissions Reduction Unit
EU ETS	European Union Emissions Trading Scheme
EUA	European Union Allowance
GHGP	Greenhouse Gas Protocol
ISDA	International Swaps and Derivatives Association
ITL	International Transaction Log
JI	Joint Implementation
NYMEX	New York Mercantile Exchange
OTC	Over the Counter
PDD	Project Design Document
PSF	Professional Service Firms
RGGI	Regional Greenhouse Gas Initiative
RMU	Removal Units
TDP	Tradable Permits
TCX	Tianjin Climate Exchange
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Voluntary Carbon Standard
VER	Verified Emissions Reduction
WCI	Western Climate Initiative

Appendix 2. List of Participants

Interview Number	Date	Organization Label	Interlocutor Position	Interview Location
1	9/14/2007	Investment Bank A	Carbon Originator	New York
2	10/20/2007	Exchange A	Commercial Director	New York
3	10/26/2007	Investment Bank A	Carbon Originator	New York
4	10/29/2007	Consultancy A	Chairman and Founder	New York
5	11/1/2007	News Wire A	Correspondent	New York
6	11/2/2007	Carbon Asset Developer A	Country Director of U.S. Operations	New York
7	11/2/2007	Hedge Fund A	Fund of funds manager	New York
8	11/5/2007	News Wire B	Publisher	New York
9	11/6/2007	Carbon Asset Developer B	Director of Carbon Financial Services	New York
10	11/6/2007	Investment Bank B	Carbon Sales Associate	New York
11	11/7/2007	Carbon Asset Developer B	Vice President of Emissions Reductions Projects	New York
12	11/7/2007	Investment Bank C	Associate Director of Institutional Equities	New York
13	11/7/2007	Investment Bank D	Director, Office of the Environment	New York
14	11/8/2007	Investment Bank E	Director of Energy and Environmental Market Regulation	New York
15	11/8/2007	Exchange B	Vice President, Institutional Marketing	New York
16	11/9/2007	Hedge Fund B	Partner	New York
19	11/23/2007	Consultancy B	Director	London
20	11/23/2007	Cleantech Investment Firm	European Director	London
21	11/23/2007	Investment Bank F	Vice President, Carbon Emissions Originator	London
22	11/27/2007	Reinsurance Firm	Managing Director, Environmental Markets	London
23	11/28/2007	Investment Bank G	Global Head of Carbon Emissions	London
24	11/29/2007	Energy Organization	Executive Director	Washington D.C. (Phone)

Interview Number	Date	Organization Label	Interlocutor Position	Interview Location
25	12/3/2007	Consultancy C	Head of Advisory Services	London
26	12/3/2007	Global PSF/ Consultancy D	Consultant	London
27	12/4/2007	Boutique Investment Bank H	Associate in Advisory	London
28	12/4/2007	Investment Bank A	Associate Investment Banking	London
29	12/6/2007	Brokerage A	Vice President of European Environmental Markets	London
30	12/6/2007	Hedge Fund C	Director, Global Environmental Finance	London
31	12/6/2007	Investment Bank G	Carbon Trader	London
32	12/7/2007	Carbon Asset Developer C	Head of Corporate Communications	London
33	12/7/2007	Carbon Asset Developer C	Asset Marketer	London
34	12/7/2007	Carbon Asset Developer C	Resource Manager	London
35	12/7/2007	Legal Firm A	Associate	London
36	5/5/2008	Regulatory Agency A	Economist	New York
37	5/5/2008	Environmental Think Tank A	Senior Analyst	New York
38	5/6/2008	Financial Services Company A	Manager, Technology and Business Development	New York
39	5/7/2008	Legal Firm A	Partner	New York
40	5/7/2008	Legal Firm A	Associate, Europe	New York
41	5/7/2008	Financial Services Company B	Managing Director, Commodity Futures	New York
42	5/7/2008	Financial Services Company B	Global Head, Commodity Futures	New York
43	5/7/2008	Financial Services Company B	Marketing, Commodity Futures	New York
44	5/8/2008	Legal Firm B	Structured Finance Lawyer	New York
45	5/8/2008	Investment Bank D	Executive Director	New York
46	5/8/2008	Carbon Asset Developer A	Country Director of U.S. Operations	New York
47	5/9/2008	Brokerage B	Environmental Markets Broker	New York
48	5/9/2008	Market Technology Service Provider	Managing Director, Environmental Markets	New York
49	5/13/2008	Energy Supplier A	Director Supply Origination	New York

Interview Number	Date	Organization Label	Interlocutor Position	Interview Location
50	5/13/2008	Energy Supplier A	Vice president Product Management	New York
51	5/13/2008	Investment Bank A	Vice President, Energy-Trading and Env. Markets	New York
52	5/14/2008	Consultancy F	Sustainability Consultant	New York
53	5/14/2008	Consultancy F	Sustainability Consultant	New York
54	5/14/2008	Asset Manager	Associate	New York
55	5/14/2008	Investment Bank B	Carbon Sales Associate	New York
56	5/15/2008	Brokerage C	Managing Director	New York
57	5/16/2008	NGO A	Senior Finance Fellow	New York
58	5/16/2008	Venture Capital Fund	Managing Director	New York
59	5/20/2008	Financial Services Company C	Hedge Fund Trading Manager	Chicago
60	5/21/2008	Exchange C	Director	Chicago
61	5/21/2008	Intergovernmental Organization A	Policy Developer	New York (Phone)
62	5/22/2008	Retail Bank	Principal, Global Commodities	New York (Phone)
63	5/22/2008	Retail Bank	Principal, Commodities Group	New York (Phone)
64	5/22/2008	Legal Firm C	Partner	Chicago
65	5/22/2008	Exchange D	Senior Vice President	Chicago
66	5/22/2008	Exchange D	Derivatives Developer	Chicago
67	5/23/2008	NGO B	Associate Director	Chicago
68	5/23/2008	NGO B	Associate	Chicago
69	6/17/2008	Exchange E	Director of Business	Paris
70	6/30/2008	Financial Services Company D	Director Environmental Products	London
71	6/30/2008	Investment Bank A	Vice President Fixed Income and Energy Trading	London
72	7/1/2008	Investment Bank J	Associate Environmental Products	London
73	7/1/2008	News Wire A	Correspondent Environmental Markets	London

Interview Number	Date	Organization Label	Interlocutor Position	Interview Location
74	7/1/2008	Multinational Oil Company	Environmental Products, Team Leader	London
75	7/1/2008	Multinational Oil Company	Environmental Products, Senior Trader	London
76	7/1/2008	Government-funded Carbon Services Firm	Chief Economist	London
77	7/2/2008	Carbon Rating Agency A	Associate, Strategic Advice	London
78	7/3/2008	Carbon Asset Developer D	Senior Vice President, Trading Group	London
79	7/3/2008	Legal Firm C	Partner	London
80	7/4/2008	Financial Services Company E	Vice President	London
81	7/4/2008	Carbon Rating Agency B	Director of Research, Europe	London
82	8/14/2008	Global PSF/ Consultancy D	Managing Director	Los Angeles
83	8/19/2008	Energy Supplier B	Climate Program Manager	Los Angeles
84	8/20/2008	NGO A	Project Attorney	San Francisco
85	8/20/2008	Sovereign Wealth Fund	Vice President	San Francisco
86	8/21/2008	Financial Services Company E	Managing Director	San Francisco
87	8/21/2008	Consultancy F	Senior Sustainability Consultant	San Francisco
88	8/22/2008	Regulatory Agency B	Senior Policy Advisor	Berkeley
89	8/22/2008	California Senate	Senior Policy Advisor	Sacramento
90	8/26/2008	California Congress	Policy Maker	Los Angeles
91	8/27/2008	Registry	Vice President of Business Development	Los Angeles
92	8/27/2008	Registry	Vice President of Policy	Los Angeles
93	9/08/2008	U.S. House of Representatives	Legislative Assistant	Washington D.C.
94	9/08/2008	NGO C	Climate Scientist	Washington D.C.
95	9/09/2008	Legal Firm C	Partner	Washington D.C.
96	9/09/2008	Legal Firm D	Partner	Washington D.C.
97	9/09/2008	Asset Manager	Research Analyst	Washington D.C.

Interview Number	Date	Organization Label	Interlocutor Position	Interview Location
98	9/09/2008	NGO B	Policy Director	Washington D.C.
99	9/10/2008	Legal Firm E	Attorney	Washington D.C.
100	9/10/2008	Environmental Think Tank B	Senior Associate	Washington D.C.
101	9/11/2008	Legal Firm F	Partner	Washington D.C.
102	9/11/2008	Trade Association	Director	Washington D.C.
103	9/12/2008	Legal Firm G	Attorney	Washington D.C.
104	9/12/2008	Intergovernmental Organization B	Senior Financial Specialist	Washington D.C.
105	9/12/2008	Environmental Think Tank B	Director	Washington D.C.
106	9/15/2008	Regulatory Agency C	Deputy Assistant Secretary	Washington D.C.
107	9/15/2008	U.S. House of Representatives	Legislative Assistant	Washington D.C.
108	9/15/2008	U.S. Senate	Counsel and Legislative Assistant	Washington D.C.
109	9/16/2008	U.S. Science Agency	Director	Washington D.C.
110	9/17/2008	Environmental Think Tank C	Senior Fellow	Washington D.C.
111	10/08/2008	U.S. Senate	Senior Legislative Assistant	Washington D.C. (Phone)

Appendix 3. Sample Interview Transcript with Edited Text and Comments in Brackets

Q.01 Role in Carbon Trading

What is the role of your institution in carbon emissions trading or carbon market construction?

> We provide legitimacy. The market was previously run and managed, by small shops, consultancies, etc. While these institutions have very intelligent people working for them, [Investment banks like ours] fast track the market. Deals can be done now. That creates market credibility and legitimacy.

Q.02 Market in 5 Years

Where do you see the market in 5 years?

[Our Institution] is a liquidity provider. The market should be like oil and gas, 80% speculation, tight margins, liquid, with thousands of traders. This is where it should be in five or ten years. At the moment it takes days, weeks, even months to establish and process a trade.

In 5 years we should have a proper flow market. At the moment we go much deeper into projects than we should go, talking to developers in Latin America, tracking hedge funds for credits etc.

In the future there should be more private equity firms. Private equity is different in that the principal risk is different. Private equity firms will buy into company, development companies or utilities. This is very rare for an investment bank. Normally we will invest in credits, projects or deal, but not buy stock in companies. For example, the deal we recently did with [Carbon Aggregator] is rare.

Right now [our] mandate is to start the business, spectrum is huge: trading, buying projects, trading credits, buying credits from a hedge fund, investing in development projects, etc. Eventually that spectrum will tighten towards more trading and fund raising for projects, but not trading. [Our institution] is filling a number of roles for institutions and services that are as of yet missing in the market. It is providing a number of generalized services. This is unusual and not always the case.

Q.03 Role of Institution in 5 years

What will be the ideal role of your institution in 5 years?

We are an emerging markets bank...on the ground with clients. [Other bank] is more a hedge fund type, more trading and scattered activity. This is my impression of what they do. [Our institution] has to explain the market to its clients and to justify its use, procedure etc. It is almost like a teacher. This should not be the case. [Our institution] has to explain to chemical companies for example what the market is, and how to be involved. This should not be the case in 5 years.

Q.04 Primary Clients

Who are your primary clients?

Credits are always coming in and out. Our job is to send credits in and out.

Our clients are the credits coming in (or credits being sold) in the sense of where they are coming from or where they are being sourced to. We talk to people releasing gases in emerging market countries: project developers, hedge funds, etc, aluminum plants...those are the clients. We have a deal in Mexico with [Company Name] to invest in the development of their cogeneration plants. I am responsible for sourcing the credits. [Lead carbon Trader] is responsible for selling the credits. We have to work together to figure out how long to hold the credits etc.

What is the typical holding time?
Ideally you would hold them according to a theory (speculation), for example there is an expected weather pattern in Mexico. We buy oil and then sell it after the weather pattern because we expect that supply will be cut so the price rises. This is in an ideally liquid market. There are 2 types of trading: spot and forward trading. 1) spot, you buy today, sell today, deliver today. This is not possible with carbon-emissions trading since the market is still so illiquid. Each transaction comes with so much paper work, OTC, meet to agree contracts and sign documents. This takes times. The credits are insured by the UNFCCC 2) with forward trading you have a set date in the future to buy or sell, for example calander8 is purchased to sell in calendar12. With the EU ETS we can buy these credits at 9 and sell them for 12. However this is tricky, because supply is risky and not guaranteed. For example if we buy 1 million forward credits in Brazil, but we know there is a weather problem, and we own the credits for five years. We will collect them at the end of five years. If you sell 1 million and in 5 years only half of these are supplied, then you are short and that is a problem. This is one of the risks that has to be hedged.

Q.05 Relationship with Regulatory Agents
What is the relationship between your institution and regulatory agents?
There is no direct relationship, in terms of consultation. [Our lead carbon trader] has worked on ICIS (look up) group of investment banks who put one member forward to lobby, but they write about the financial community's response etc. They sometimes also make policies. For example they set standards (gold standard etc) for the types of VERs they will accept. We have to follow these standards if we want to participate in this market. We are participating in the market to make profit, but we want to operate according to the rule. Regulatory agencies create the market, we operate within it to the extent that is legally possible. [Our lead carbon trader] has a different perspective, but we are not policy people. [Our lead carbon trader] thinks it is our role to give back and educate lobbyists, policy makers, senators, etc. She tries to convince people to participate in the market, particularly in the United States.

What will happen in the future, will [your institution] be more or less involved in policy?
There will be less of a policy role in the future; it is in its infancy. Now is the time to get people on track, and informed so that they can make the right decision--cap and trade. Presidential candidates are now being interviewed on their policy perspective on cap and trade or taxes. This is an indication of the United States' involvement. It used to be a question of whether or not climate change is a problem. Now it is a question of what the best approach to address it is.

Q.06 Relationships with other organizations

Are there any particularly important relationships between your institution and other organizations, in the U.S. and overseas?
Yes. We are not exclusive to [Carbon Aggregator Partner]. For example we work with [Large Consulting Firm] out of the U.K. They do engineering work with our clients. Brokers will help sell credits, and buy credits as well. We work with [New York based brokerage], and other companies like [insulation contractor]. [Ecological investment firm] does a lot of our projects in Brazil and Latin America. They help companies develop a carbon project. This is a bureaucratic process, so they help to reduce emissions or get credits. We also work with [carbon aggregator] in India. Personal relationships are crucial to this network. The relationships do become personal. For example, [my wife and I] are double dating with one of the people I work with at [this carbon aggregator] during our trip to India. Conferences are crucial to establishing these relationships as well. A lot of business comes out of them. At the moment it is a small universe, people know each other. The market network has its own unique culture. It is different from the energy market. The oil and gas market is a lot of fat white guys in conference rooms. They are well established and set in their ways. The carbon culture is much more dynamic. There are a lot of young people, women, tri-athletes, and vegetarians. It is an exciting dynamic community. People are not wearing suits. It raises the interesting question of which comes first the culture of the market or the people in it. Will the carbon markets culture stay this way? Does it reflect the time epoch in which it is constructed?

Q.07 Importance of Financial Expertise
What is the importance of financial expertise in market construction?
Market construction is the wrong word, development would perhaps be better. The market was built outside of finance by regulators, academics, consultants etc. They know finance exists and that it is important, but not specifically how to apply it. [hints at a role for finance that is not understood] we put the market in place and let market do its thing to operationalize it. UNFCCC, Kyoto, Presidents etc agreed to a market, and to cap and trade. They set it in place and then let us loose to do our thing. That is what banks go in and do. They are 'developing the market'. You can put it in place, but for it to operate effectively you need finance to operationalize the market.

Edwards wants taxing and then investing. But this does not capture the full opportunity of the market. Development of new technologies, new investment and new ideas comes from the market approach. We create incentives for these things. That is the role of finance. We exploit opportunities. Academics understand that industry is dirty in China, or that agriculture is poorly managed in Latin America, they say fix it. We exploit the opportunity of how to fix it. The finance industry makes the market sophisticated. For example we are developing products like letter of credit (from banks) India and forward credits.

In India there is a need for power, a need for money —$200 million—to produce power. We won't just drop money on someone. We ask them to go to their local bank and get a letter of credit. We then loan the bank $200,000 million and the bank lends them $200 million at a fixed interest rate. The delivery of credits is so risky, but if it falls through the bank will repay our $200 million. This is a lot better, because they have established relationships with the companies on the ground. They can better hedge the risks, and they

often have funded other assets of the company that they can lean on if something goes wrong. There is very little new expertise in the market. Most of the services and products are borrowed from already established markets. For example portfolio trading is already used in mortgages, letter of credits applied from wind farms, etc.

Q.08 Your Institutions Expertise
What is the nature of your institution's expertise?
These are emerging markets, and we provide liquidity.

Q.09 Carbon Products Developing
What sort of carbon products is your institution developing or using?
We do not do many VER trades, because the market is very illiquid. Buy VERs if you are going to use them, but not to sell, or trade, because there is so much guess work on what the standard means, and on what is actually being bought or sold. 5% of our market is a voluntary market; the rest is EU ETS--standardized hard standard CERs. Don't need to be an environmental expert. [Lead carbon aggregator partner] are mostly CER, JI, people who criticize the VER market. VER's have problems, particularly with regulatory standardization. Even with [lead carbon aggregator partner], we don't want VER's, only CDM or JI projects. Delivered over 5 or 10 years these are high risk, but still more secure than VERs.

Q.10 Products to Market
Where do you bring these products to market?
NA

Q.11 Developing Project Types
What sort of projects is your institution involved with?
Anything that reduces (industrial gases, heat, waste generation) or offsets, wind farms etc.

Q.12 Advantage-Disadvantage of Cap and Trade
What does your institution see as the advantage or disadvantage of a market approach as opposed to taxes or other incentives for emissions reduction?
If we go, cap and trade goes. It puts into motion forces that wouldn't be there otherwise. The beauty of cap and trade is that it puts into motion forces that wouldn't be there otherwise. [Commented on in previous interview as well.]

Q.13 Relationship Between Carbon and Regulatory Agents
What do you see as the primary relationship between carbon market institutions and regulatory agencies?
See question above and prior interview

Q.14 Role of Finance
What role does finance play in carbon market construction?
See Q.07

Q.15 Role of Financial Centers
What role if any do financial centers such as London, New York and Chicago play in the development of the carbon market?

It is about the identities of cities. The market is so global there will be other centers. NY will run Latin America because of the time zone. London will run the EU, Central Asia, and if projects are developed there, also Africa. Singapore or Hong Kong will be needed to manage Asia. At the moment [our institution] does it all. We expect that in the future the market will be more segmented. We don't trade on Nordpool, we could but we trade OTC. We get better margins [on returns] this way. Strong pricing signal is important because everyone knows what the price is. It helps us to know what the market is. But illiquidity is something we take advantage of. We get better returns, because institutions don't know exactly where the price is. It is not just arbitrage, but a lot of it is risk adjusted profit because of the 5 year margins etc.

Q.16 Other Important Financial Centers

From the perspective of your institution what other major financial centers are important to the operation of the carbon market?

There needs to be a market in Asia--Singapore or Hong Kong are likely, because it is too difficult to manage this time zone otherwise.

Could another center overtake New York?

No, it is distinct.

Q.17 Primary Market Location in 5 years

What will be the primary location of the carbon market in 5 or 10 years?

London owns this market, now, because it got it early, it is in Europe, it is part of Kyoto etc it makes sense. London owns the market and it is proud of this fact. If the U.S. participates we will take more market share. I don't see Chicago as important. You can buy on the exchanges there, but the finance is in New York not Chicago.

Do you think Climate Exchange Plc is important?

We don't go that far into the market. The exchanges are there, but we are dealing more OTC, there is more profit there. We mostly trade CERs (Nordpool is the best platform for this) ECX is better for EUA's etc.

Is it concerning that London owns the market?

No, I don't care, not in a world where trading is not done on a floor but across time zones anyway [flow world]. As long as you can trade the commodity universally it doesn't matter. I don't care unless there is a CERL (London) and a CERN (New York). This becomes problematic. Also, it matters if the jobs are all in London. If for some reason the U.S. does not get involved and all of the jobs for carbon expertise move to London, this is a problem.

Is this happening?

No, the banks in New York have been developing carbon trading teams and adding new members.

Q.18 Role of Financial Center

Q.18a Role of New York

What particular role do you see New York having now and in the future?

New York, is it just time zone?

No the time zone is important for client coverage. At the moment we are in a holding pattern, everyone is watching. When we are in (the U.S.) the market will explode. Overnight, there will be huge buyers, probably a bit of initial chaos, but the market is in the backyard of the U.S. Overnight it will double. Everything is done in Euros, but a currency FCX is really is easy to do.

Is this a disadvantage for the U.S., if the market is a Euro based market?
No, not if you are buying and selling in different currencies anyway.

Q.19 Challenges and Opportunities
What are the major challenges and opportunities for the operation of a truly international carbon market?
Challenges: It works; the market works because Wall Street works. If Countries drop out or start cheating etc...example Poland, it is developed (sort of) but still also a kind of transition economy, it felt it was kicked too hard but the emission cuts...what if it just decides to drop out of the market or drop out of the EU (unlikely). What is the role of peer pressure in market construction as well...why can't Poland drop out of EU.

This market is not like an oil market. If countries lose interest, if the public loses interest it can fall apart. Carbon is not a commodity in the sense that it only has legislative value, maybe also public value. What if there is a recession, and there is a shortage of foods and jobs. Will people care about the environment, or if we move into another war. Carbon credits are a priority, a privilege. If priorities change, the market stops. At the same time if catastrophes get worse etc, the market could get better.

Opportunities: This is putting the fire under people to invent new things. It gives them the incentive to change. It is also an opportunity to fix global warming. For so long no one could beat the coal and oil industry...perhaps in some places gas can compete (if you are sitting on it). The dynamic has changed since the market was started. More money is being invested in new technology. New technologies are becoming viable...the types of technologies that are being pushed out are amazing. In 5 years the power generation grid in the U.S. could be completely different. That is exciting. In Kansas, a coal plant was voted down, simply because there is a sense it soon won't be viable.

People are beginning to see a new energy future. We will change more than the amount of pollution, but where we get power, the technologies that are produced etc.

Q.20 Carbon Culture
Is there a carbon market culture and if so how does it vary from other market cultures?
From Answer to Question 6: At the moment it is a small universe, people know each other. The market network has its own unique culture. It is different from the energy market. The oil and gas market is a lot of fat white guys in conference rooms. They are well established and set in their ways. The carbon culture is much more dynamic. There are a lot of young people, women, tri-athletes, vegetarians. It is an exciting dynamic community. People are not wearing suits. It raises the interesting question of which comes first the culture of the market or the people in it. Will the carbon markets culture stay this way? Does it reflect the time epoch in which it is constructed?

Appendix 4. Timeline of Emissions and Energy Efficiency Legislation

Timeline of bills passed at the California State and National Level[35] (Bills passed by the U.S. Congress in Bold)

- 1947 – California creates the Los Angeles Air Pollution Control District, the first air pollution agency in the United States
- 1960 – California Motor Vehicle Pollution Control Board was established to test and certify devices for installation on cars sold in California
- 1961– California Department of Public Health mandated positive crankcase ventilation on new vehicles sold in California starting in 1963
- **1963 – Congress passes the Clean Air Act (amended in 1965, 1966, 1967, 1969, 1970, 1977, 1990)**
- **1965 – Congress passes the Motor Vehicles Air Pollution Control Act, which adopted California emissions standards**
- 1966 –California Motor Vehicle Board adopted tailpipe emissions standards for hydrocarbons and carbon monoxide
- 1967 – California Air Resources Board (CARB) created by combining the Motor Vehicle Board and units from the State Department of Health.
- 1967 – California seeks and is a granted a waiver to impose emissions standards on stationary sources.
- 1974 – California Clean Energy Commission (CEC) is established
- 1977 – California establishes energy standards for new appliances
- **1987 – Congress passes the National Appliance Energy Conservation Act (NAECA), adopting specific standards on many major appliances, which would preempt state standards**
- 1988 – California Clean Air Act passed, which sets forth the framework for how air quality will be managed in California for the next 20 years.
- 1988 – California passes AB 4420 which calls for the compilation of and inventory of GHG emissions from all sources in California.
  1990 – Congress passes the Clean Air Act Amendments of 1990 which adopts many of the standards of the 1988 California Clean Air Act.
- 1996 – California passes AB 1890, a restructuring law, which decouples utility providers from generators.
- 2000 – California passes SB 1771, which establishes the California Climate Action Registry to record and register voluntary GHG emissions, and directs the CEC to update the inventory of GHG emissions from all sources in California
- 2001 – California passes SB 1170, which requires CARB, CEC and the California Department of General Services to develop and adopt fuel-efficiency specifications for all State purchased vehicles
- 2002 – California passes AB 1493, which sets standards for emissions of CO2 and other greenhouse gases from automobiles and light duty trucks.
- 2002 – California passes SB 1078, which requires California to generate 20% of its electricity from renewable energy no later than 2012
- 2006 – California passes AB 32 requiring CARB to implement programs, including cap and trade to reduce California's greenhouse gas emissions to their 1990 level by 2020.

[35] As a frontrunner California has had to establish coalitions to pass clean air and energy policies. In many instances legislation in Congress is a direct reaction to the pressure created by California, and other states following its lead. In the case of automobile emissions and energy efficiency standards the pressures is generated by industry requesting a unified national standards as opposed to patchwork production standards across the states (Hanemann, 2008).

Timeline of Bills at Initiated in U.S. Congress (Bills that moved to Senate floor in bold font)

- **2003 – S.139: Climate Stewardship Act of 2003 — Considered on Senate floor, vote to open cloture failed, returned to committee without accepted amendments**
- 2005 – S.1151: Climate Stewardship and Innovation Act of 2005 — Referred to Committee on Environment and Public
- 2007 – H.R.620: Climate Stewardship Act of 2007 — Referred to Committees on Energy and Commerce, Science and Technology, and Natural Resources
- 2007 – H.R.4226: Climate Stewardship and Economic Security Act of 2007 — Referred to Committees on Energy and Commerce, Science and Technology, Natural Resources, Foreign Affairs, Agriculture, and Ways and Means
- 2007 – S.280: Climate Stewardship and Innovation Act of 2007 — Referred to Committee on Environment and Public
- 2007 – S.317: Electric Utility Cap and Trade Act of 2007 — Referred to Committee on Environment and Public
- 2007 – H.R.4067: Climate Stewardship Act of 2004 — Referred to Committees on Science, and Energy and Commerce
- 2007 – H.R. 1590: Safe Climate Act of 2007 — Referred to Committees on Energy and Commerce, and Foreign Affairs
- 2007 – S. 1389: Climate Change Education Act — Referred to the Committee on Health, Education, Labor, and Pensions
- 2007 – S. 2355: Climate Change Adaptation Act — Referred to the Committee on Commerce, Science, and Transportation
- 2007 – H.R 6186: Investing in Climate Action and Protection Act — Referred to Committees on Energy and Commerce, Ways and Means, Science and Technology, Natural Resources, Agriculture, Foreign Affairs, Education and Labor, Transportation and Infrastructure, Oversight and Government Reform, and Rules
- 2007 – S.2191: (Lieberman-Warner) America's Climate Security Act of 2007 — Moved to the Senate floor as Amended bill S.3036
- **2008 – S.3036: Lieberman-Warner Climate Security Act of 2008 —Moved to the Senate Floor, Considered by Senate for Cloture (Did not receive 3/5 majority for cloture)**

Timeline of Senate Actions on the Lieberman-Warner Climate Security Bill

- 10/18/2007: Lieberman Warner make introductory remarks on measure
- 10/18/2007: Read twice and referred to the Committee on Environment and Public Works.
- 10/24/2007: Hearings held in the subcommittee on Private Sector and Consumer Solutions to Global Warming and Wildlife Protection.
- 11/1/2007: Considered in the Committee on Environment and Public Works Subcommittee on Private Sector and Consumer Solutions to Global Warming and Wildlife Protection. Approved for full committee consideration.
- 11/8/2007: Hearings held in the Committee on Environment and Public Works
- 5/20/2008: Reported by Senator Boxer (Chair of the Committee on Environment and Public Works) to the Senate floor with Amendment
- 5/20/2008: Placed on Senate Legislative Calendar under General Orders. Calendar No. 740 as Amended bill S.3036
- 5/20/2008: Introduced in the Senate. Read the first time. Placed on Senate Legislative Calendar under Read the First Time.
- 6/2/2008: Cloture on the motion to proceed to the measure invoked in Senate by Yea-Nay Vote. 74 - 14.
- 6/4/2008: Motion to proceed to consideration of measure agreed to in Senate by Unanimous Consent.
- 6/4/2008: Motion by Senator Reid to commit to Senate Committee on Environment and Public Works with instructions that the Committee report back forthwith with the following amendment (SA 4830) made in Senate.
- 6/6/2008: Considered by Senate, vote to close cloture failed
- 7/8/2008: Returned to the Calendar.

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