CARBON OFFSETS ARE A BRIDGE TOO FAR IN THE TRADABLE PROPERTY RIGHTS REVOLUTION

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Tradable property rights-based carbon offsets are widely used as a policy tool for combating the greenhouse gas emissions that cause climate change. However, academics, non-governmental organizations, and market participants have criticized carbon offset mechanisms' economic inefficiency and dubious environmental benefits. This Article traces these criticisms to the microeconomic structure of the offset market. Offsets were envisioned as a way to use self-regulating market forces to stimulate investment in emissions mitigation projects efficiently, but tradable property rights are inherently ill-suited to that task. Consequently, policymakers ended up designing a Rube Goldberg-esque scheme that is neither efficient nor self-regulating. The financial intermediation industry through which offsets are certified and traded consumes approximately thirty percent of all carbon offset funding, such that less than seventy cents out of each dollar invested in international greenhouse gas mitigation reaches its target. At the same time, the private sector-led system inappropriately cabins the authority of public sector regulators — the only market participants with an incentive to ensure the environmental quality of the assets exchanged. Systemic risk is also a concern: the offset mechanism's substitution of abstract, tradable securities for simpler contract-based lending bears an uncanny resemblance to developments in the securitized mortgage lending industry prior to the 2008 crisis. Direct subsidies issued to emissions-reducing projects by a publicly-administered fund could likely achieve better environmental outcomes at lower cost.

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Introduction

Cap and trade is the dominant policy approach to reducing the greenhouse gas ("GHG") emissions that cause climate change. Cap and trade gives "capped" parties a choice between two compliance options: they can either reduce their emissions to match the number of emissions allowances they have been issued (i.e., the party's "cap") or purchase ("trade") enough allowances to cover the difference between their actual emissions and their cap level. The existence of the second option encourages participants who can reduce emissions cheaply to sell their emissions rights to participants who face higher emissions reductions costs, thereby reducing the cost to society of meeting the system's overall cap.

But all extant GHG cap-and-trade systems also allow participants to meet their obligations in a third way: by purchasing offsets. Offsets, like allowances, are a right to emit GHGs.[1] Unlike allowances, however, offsets are not created by government fiat, but are new rights created by additional emissions-reducing activities outside the system. For example, if an uncapped electric utility in Indonesia elects to meet new demand with a windmill rather than a coal plant, it may be entitled to offset credit corresponding

[1] *See generally* Michael Wara, *Measuring the Clean Development Mechanism's Performance and Potential,* 55 UCLA L. Rev. 1759 (2008).

to the difference in the emissions between the coal plant and the windmill.[2] It can then sell this offset credit to, for example, a capped utility in Germany, allowing the German utility to meet its obligations without direct reductions or the purchase of allowances from other capped firms. As a result of such a sale, emissions within the geographic or sectoral boundaries of the cap-and-trade system will remain above the cap level, but emissions outside of the system will decrease, such that the system's total contribution to worldwide GHG mitigation is not affected by the use of offsets.

Offsetting is at least as important as either the "cap" or "trade" compliance strategies. Nearly 4000 offset projects have been approved through the Clean Development Mechanism ("CDM"), which is administered by the United Nations ("U.N."), with another approximately 4000 awaiting validation or approval.[3] During the 2008–2012 Kyoto Protocol compliance period, these offset projects are expected to produce around 1.15 billion tons of carbon dioxide ("tCO_2") of offset credit,[4] an amount that is equal to nearly ten percent of the Kyoto Protocol's 1990 baseline emissions[5] and may account for the lion's share of all emissions reductions achieved by the Kyoto Protocol.[6] The American Clean Energy and Security Act of 2009 ("Wax-

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[2] Offsets are sometimes mistakenly equated with "sink" activities, such as forestry projects, that take carbon out of the atmosphere. In fact, sink projects are a subset of offset projects. Most current offsets are derived from avoided emissions such as clean energy generation and energy efficiency improvements. PHILIP AMBROSI ET AL., WORLD BANK, STATE AND TRENDS OF THE CARBON MARKET 2011, at 58 (2011), *available at* http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/StateAndTrend_LowRes.pdf; *CDM/JI Pipeline Overview Page*, U.N. ENV'T PROGRAMME ("UNEP") RISØ CENTRE, http://cdmpipeline.org/overview.htm (last visited May 30, 2012) (on file with the Harvard Law School Library) (showing 0.7% of CDM credits ("CERs") expected until 2012 from afforestation and reforestation activities).

[3] UNEP RISØ CENTRE, *supra* note 2 (showing 4044 registered projects and 4193 in the process of validation as of May 2012).

[4] AMBROSI ET AL., *supra* note 2, at 62.

[5] U.N. Framework Convention on Climate Change ("UNFCCC"), *Annual Compilation and Accounting Report for Annex B Parties Under the Kyoto Protocol* 9, U.N. Doc. FCCC/KP/CMP/2008/9/Rev.1 (Nov. 27, 2008), *available at* http://unfccc.int/resource/docs/2008/cmp4/eng/09r01.pdf (showing "base year" Annex I emissions of 12.03 billion).

[6] Under the Kyoto Protocol, developed nations (Annex I parties) agreed to reduce their GHG emissions to five percent below 1990 levels by 2012. Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 37 I.L.M. 22 [hereinafter Kyoto Protocol]. Annex I emissions as a whole are currently 11.5% below 1990 levels, though much of this apparent reduction is due to the economic collapse of the former Eastern Bloc. *Greenhouse Gas Emissions Excluding LULUCF,* U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/files/inc/graphics/image/jpeg/trends_excluding_2010.jpg (last visited May 30, 2012) (on file with the Harvard Law School Library). Emissions for the Annex I parties that are not "Economies in Transition," are about 2.1% above 1990 levels. *Id.* Michael Wara and David Victor suggest that in Europe, "import of [offsets] could account for up to ten times the actual reductions of emissions reductions from within the EU cap-and-trade [system]." Michael W. Wara & David G. Victor, *A Realistic Policy on International Carbon Offsets* 9 (Stanford Univ. Program on Energy and Sustainable Dev. Working Paper No. 74, 2008), *available at* http://iis-db.stanford.edu/pubs/22157/WP74_final_final.pdf; *but see* EUROPEAN ENV'T AGENCY, EEA REP. NO. 9/2009, GREENHOUSE GAS EMISSIONS TRENDS AND PROJECTIONS 2009, at 64 (2009), *available at* http://www.eea.europa.eu/publications/eea_report_2009_9 (suggesting that under the rules governing the EU cap-and-trade system, a maximum

man-Markey"), which passed the U.S. House of Representatives but not the Senate in 2009, would allow even more offsetting — up to two billion tons per year,[7] or more than six times as many offsets as are likely to be used worldwide per year under the Kyoto Protocol.[8] Indeed, the U.S. Environmental Protection Agency ("EPA")'s analysis of the bill predicts more than fifty percent of emissions reductions achieved by the bill through 2030 would come from offsetting rather than inside-the-system reductions.[9]

Additionally, climate negotiators are working to design new business sector-specific crediting mechanisms and incentive mechanisms for reducing deforestation and forest degradation ("REDD").[10] Early drafts of both of these potential new mechanisms resemble offsetting schemes in their use of tradable carbon credits.[11]

Despite their popularity with both policymakers and capped entities, however, offsetting mechanisms have been severely criticized by academics,[12] journalists,[13] and environmental non-governmental organizations ("NGOs").[14] These critics allege that the offset certification process is too

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of 13.4% of emissions reductions within the European Union Emissions Trading System may come from offsetting).

[7] The American Clean Energy and Security Act of 2009 ("Waxman-Markey"), H.R. 2454, 111th Cong. § 722(d)(1)(a)–(d) (2009).

[8] AMBROSI ET AL., *supra* note 2, at 62. EPA's modeling of the 1428 page bill, however, predicts that actual usage of offsets will be below the statutory limit, ranging from around 1000 $MtCO_2$ to 1200 $MtCO_2$ per year, or about 130 to 160% of projected worldwide offset use during the 2008–2012 Kyoto compliance period. *EPA Analysis of the American Clean Energy and Security Act of 2009 H.R. 2454 in the 111th Congress*, OFFICE OF ATMOSPHERIC PROGRAMS, EPA (June 23, 2009), http://www.epa.gov/climatechange/economics/pdfs/HR2454_Analysis.pdf.

[9] *Methods of Cost Containment in a Greenhouse Gas Emissions Trading Program*, *Before the S. Comm. on Energy and Natural Res.*, 111th Cong. 9 (Sept. 2009) (written testimony of Michael Wara, Assistant Professor, Stanford Law Sch.), *available at* http://energy.senate.gov/public/_files/WaraTestimony091509.pdf.

[10] AMBROSI ET AL., *supra* note 2, at 14, 57–59.

[11] *Id.*; RICHARD BARON & JANE ELLIS, ORG. FOR ECON. COOPERATION & DEV., SECTORAL CREDITING MECHANISMS FOR GREENHOUSE GAS MITIGATION: INSTITUTIONAL AND OPERATIONAL ISSUES (2006), *available at* http://www.oecd.org/dataoecd/36/6/36737940.pdf.

[12] *See, e.g.*, AXEL MICHAELOWA & PALLAV PUROHIT, ADDITIONALITY DETERMINATION OF INDIAN CDM PROJECTS: CAN INDIAN CDM PROJECT DEVELOPERS OUTWIT THE CDM EXECUTIVE BOARD? 4 (2007), *available at* http://www.climatestrategies.org/component/reports/category/39/162.html; Tyler McNish et al., *Sweet Carbon: An Analysis of Sugar Industry Carbon Market Opportunities Under the Clean Development Mechanism*, 37 ENERGY POL'Y 5459 (2009); Christoph Sutter & Juan Carlos Parreño, *Does the Current Clean Development Mechanism (CDM) Deliver Its Sustainable Development Claim? An Analysis of Officially Registered CDM Projects*, 84 CLIMATIC CHANGE 75, 84 (2007); Wara, *supra* note 1; Wara & Victor, *supra* note 6; Ian Fein et al., *Clean Development Fund: A "Public Option" for Carbon Offsets*, HARV. L. & POL'Y REV. ONLINE (Feb. 10, 2010), http://hlpronline.com/?p=1544.

[13] *See, e.g.*, Keith Bradsher, *Outsize Profits, and Questions, in Effort to Cut Warming Gases*, N.Y. TIMES, Dec. 21, 2006, *available at* www.nytimes.com/2006/12/21/business/21pollute.html; John Vidal, *Billions Wasted on UN Climate Programme*, THE GUARDIAN, May 25, 2008, *available at* http://www.guardian.co.uk/environment/2008/may/26/climatechange.greenpolitics.

[14] *See, e.g.*, SIMON BULLOCK, MIKE CHILDS, & TOM PICKEN, FRIENDS OF THE EARTH, A DANGEROUS DISTRACTION: WHY OFFSETTING IS FAILING THE CLIMATE AND THE PEOPLE (2009), *available at* http://www.foe.co.uk/resource/briefing_notes/dangerous_distraction.pdf; MICHELLE CHAN, FRIENDS OF THE EARTH, SUBPRIME CARBON: RE-THINKING THE WORLD'S

lax, leading to the certification of projects that would be viable even without the offset system's subsidy. At the same time, project developers and other carbon market participants complain that the environmental checks set up by offset regulators are too onerous.[15] Complex algorithms for the quantification of emissions reductions, strict evidentiary requirements for proving the financial marginality of the project, and duplicative review of project applications, these critics say, make the offsetting process unnecessarily costly, cause long administrative delays that chill investment,[16] and unfairly disfavor small projects.[17]

This Article traces both of these lines of criticism to the microeconomic structure of the offsetting market. Part I sets out the intellectual history of cap and trade and offsetting, explaining how economic theories about how markets work fed a market-focused revolution in environmental policymaking. Part II examines the current practice of carbon offsetting, explaining the roles played by buyers, sellers, market brokers, speculators, specialty software providers, rating agencies, consultants, lawyers, lobbyists, quasi-public regulators, trade journalists, and other participants in the approximately € 15 billion "business ecosystem" of carbon offsetting.[18] Part II also summarizes criticisms that the existing system is inefficient, may not adequately manage catastrophic risk, and is environmentally unsound, concluding that all of these criticisms are well-founded. Part III traces the shortcomings of offsetting back to the administrative and industrial structure of existing offset mechanisms, and in particular to such mechanisms' use of tradable property rights. Tradable instruments are a good way to design flexibility into a cap-and-trade system, but are not well-suited to the distinct problem of encouraging investment in emissions-reducing projects outside of the capped jurisdiction. The offset market is a Rube Goldberg machine — a fascinating system that does the same thing a simpler system could do, but with more complexity. Part IV sketches the outline of what a simpler system might look like, proposing the replacement of the existing model of offsetting with one centered around a publicly managed investment fund. Such "fund-based offsetting" has the potential to reduce transaction costs, leading to superior environmental outcomes at a lower price.

LARGEST NEW DERIVATIVES MARKET (2009), *available at* http://urbanhabitat.org/files/SubprimeCarbonReport_0.pdf; BARBARA HAYA, INT'L RIVERS, FAILED MECHANISM: HOW THE CDM IS SUBSIDIZING HYDRO DEVELOPERS AND HARMING THE KYOTO PROTOCOL (2007), *available at* http://internationalrivers.org/files/Failed_Mechanism_3.pdf; LAMBERT SCHNEIDER, WORLD WILDLIFE FUND, IS THE CDM FULFILLING ITS ENVIRONMENTAL AND SUSTAINABLE DEVELOPMENT OBJECTIVES? (2007), *available at* http://www.oeko.de/oekodoc/622/2007-162-en.pdf.

[15] *See, e.g.*, AMBROSI ET AL., *supra* note 2, at 41; INT'L EMISSIONS TRADING ASS'N, STATE OF THE CDM 2009: REFORMING THE PRESENT AND PREPARING FOR THE FUTURE 3–4 (2009), *available at* http://www.ieta.org/index.php?option=Com_content&view=article&catid=26%253Areports&id=77%253Astate-of-the-cdm-2009&Itemid=93.

[16] INT'L EMISSIONS TRADING ASS'N, *supra* note 15.

[17] McNish et al., *supra* note 12, at 5467.

[18] AMBROSI ET AL., *supra* note 2, at 9 (reporting approximately $20 billion per year in primary and secondary CDM transactions during 2009 and 2010).

I. An Intellectual History of Tradable Property Rights: From Smith Through Coase to the Carbon Offset

This Part begins with a digression into the intellectual history of using market-traded emissions rights to solve environmental problems. Cap and trade's tradable property rights approach was developed for the purpose of efficiently shifting regulatory burdens among "capped" polluters inside the system. It was not until the negotiation of the Kyoto Protocol in 1997 that the tradable property rights approach was applied to the distinct problem of incentivizing investment in emissions-reducing projects by unconstrained developers outside the system.

A. Adam Smith and the Beauty of Automatic Market Correction

The story starts with Adam Smith. In 1776, Smith observed that "[i]t is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest."[19] For even if these individuals do not "intend to promote the public interest," they nevertheless refrain from charging higher-than-average prices to dissuade their customers from switching to their competitors.[20]

It is this competitive constraint, Smith realized, that rationalizes the economy's dynamic adjustment to gluts and shortages.[21] When a glut of meat, barley, or wheat decreases the costs of the inputs to small businessmen, they must lower their prices as well, for if they do not, competitors willing to live on shorter rations will undercut them and take away their customers.[22] In this way, the falling prices of farm goods are transmitted to consumers, encouraging them to demand more farm goods.[23] At the same time, the farmers on the other end of the supply chain are now earning less for the same amount of work, inspiring some of them to shift to more profitable activities and decreasing the total supply of produce.[24] The scissors of rising demand and falling supply conspire to erase the glut and clear the market.[25] The most talented Soviet planner armed with a powerful supercomputer would have great difficulty pegging production and consumption quotas that accomplish this feat,[26] but the competitive market does it automatically and unconsciously. As Smith famously put it, each individ-

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[19] Adam Smith, The Wealth of Nations 45 (Edwin Cannan ed., Modern Library 2000) (1776).

[20] *Id.* at 63–66.

[21] *Id.*

[22] *See id.* at 63–64.

[23] *Id.*

[24] *Id.* at 65.

[25] *See id.* at 65–66.

[26] F. A. Hayek, The Road to Serfdom: Text and Documents 141 (Bruce Caldwell ed., Univ. of Chicago Press 2007) (1944).

ual has been "led by an invisible hand to promote an end which was no part of his intention."[27]

B. Coase and Using Markets to Solve Market Failure

Of course, environmental law is not concerned with butchers, brewers, and bakers, but with instances in which the automatic market system does not achieve optimal results — i.e., with market failures like externalities and tragedies of the commons.[28] Before Coase wrote *The Problem of Social Cost*, conventional economic wisdom suggested that market failures should be addressed with a "Pigovian tax."[29] If a firm were polluting the air, the government should levy a tax on emissions that equaled the per-unit cost of pollution to society.[30] This would inspire the firm to reduce emissions up to the point where the internal benefit it derived from polluting was less than the external social cost — the socially optimal result.[31]

Coase's genius was to render mutable and manipulable the property rights that the Pigovian taxers took for granted, and to thereby point out a different road to the optimal result.[32] Imagine that the law provides air-breathers with a civil cause of action against polluters. The polluters can still buy the right to pollute from the air-breathers by paying them to relinquish their right to sue.[33] If transaction costs are zero, polluting firms will buy pollution rights from parties harmed by their pollution right up to the point where the harmed parties begin to value clean air more highly than the polluters value the right to pollute. Conversely, if the law does not provide such a cause of action, the air-breathers will instead pay the polluters for promises to stop. The payments will now flow in the opposite direction, but the transaction between the two parties will result in the same, socially optimal level of pollution. Further, in contrast to the Pigovian system, in which this result can only be reached if the government correctly estimates the social cost of pollution, the Coasean system works without the need for government intervention. Market allocation of property rights does it all.

Of course, Coase continued, this beautifully simple result only holds if transaction costs are zero, an assumption that Coase considered "very unrealistic."[34] In reality, the cost of contracting impedes the buying and selling

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[27] SMITH, *supra* note 19, at 485.

[28] Daniel C. Esty, *Toward Optimal Environmental Governance*, 74 N.Y.U. L. REV. 1495, 1503–08 (1999).

[29] R. H. Coase, *The Problem of Social Cost,* 3 J.L. & ECON. 1, 39–42 (1960).

[30] *Id.* at 41.

[31] *Id.*

[32] *See id.* at 16–17.

[33] *See id.* at 2–5.

[34] *Id.* at 15. Friedrich Hayek apparently agreed:

> Nor can certain harmful effects of deforestation, of some methods of farming, or of the smoke and noise of factories be confined to the owner of the property in question or to those who are willing to submit to the damage for an agreed compensation. In such instances we must find some substitute for the regulation by the price mecha-

of legal rights, so the right to pollute will often remain where the law places it. From a judicial perspective, this reality means that decisions about property rights should take into account the external as well as the internal costs of a given allocation.[35] From a regulatory perspective, it means that externality problems like pollution will typically require government-implemented solutions like a Pigovian tax or "command-and-control" management. The government, Coase said, while "not itself costless,"[36] is nevertheless able to use rational management to transfer rights and factors of production frozen by high transaction costs.[37] Such intervention, he pointed out, can "save a lot of trouble."[38]

C. Market Romanticism

However, many of Coase's readers took to heart the first few pages of Coase's article, not the subsequent pages that focus on transaction costs.[39] The so-called "Coase Theorem" — that bargaining will achieve the efficient outcome irrespective of the initial allocation of rights — resonated with the growing number of academics and laypersons with whom Smithian market principles became popular during the second half of the twentieth century. The movement was diverse and complex, but its outlines can be briefly sketched with reference to parallel developments in pop political philosophy, financial economics, and public choice theory.

1. *The Rise of Popular Libertarianism*

Friedrich Hayek's *The Road to Serfdom* and Robert Nozick's *State, Anarchy, and Utopia* made influential moral cases for the superiority of decentralized, market-based decision making to central planning.[40] Hayek and Nozick argued that economic planning by definition subordinates the expres-

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> nism . . . . [W]e have to resort to the substitution of direct regulation by authority where the conditions for the proper working of competition cannot be created . . . .

HAYEK, *supra* note 26, at 87.

[35] This is a foundational insight of law and economics. *See, e.g.*, RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW 24–25 (7th ed. 2007); RICHARD A. POSNER, THE ECONOMICS OF JUSTICE 61–63 (1981) (describing how judges called upon to allocate resources in tort, contract, and criminal cases engage in "hypothetical market transactions" when transaction costs prevent actual market transactions).

[36] Coase, *supra* note 29, at 18.

[37] *Id.* at 15–17.

[38] *Id.* at 17.

[39] Robin Hahnel & Kristen A. Sheera, *Misinterpreting the Coase Theorem*, 43 J. OF ECON. ISSUES 215, 216–18 (2009) (positing that Coase was widely misinterpreted and arguing that "the Coase 'theorem,' as it is commonly known and interpreted, plays a crucial role in buttressing the free market, property rights approach to analyzing and solving environmental problems").

[40] Nozkick explained:

> Our main conclusions about the state are that a minimal state, limited to the narrow functions of protection against force, theft, fraud, enforcement of contracts, and so on, is justified; that any more extensive state will violate persons' rights not to be

sion of minority preferences to the romantic goals of the State — the essence of both fascism and socialism.[41] This market-oriented worldview was put to a popular audience by Milton Friedman, Ayn Rand, and a host of imitators,[42] acceded to the halls of power with the election of Ronald Reagan and Margaret Thatcher,[43] and remains an extremely important part of the political and popular philosophical landscape in the United States.[44]

2. *The Efficient Markets Hypothesis*

Financial economists gave policymakers more scientific reasons for appreciating market organization. These economists observed that the U.S. stock market moves randomly — i.e., that its movement cannot be predicted by any scientific theory.[45] They explained this randomness with the "efficient markets hypothesis."[46] This hypothesis postulated that the stock market works so well that at any given point in time it has *already* priced in all available information and theory, such that it cannot be moved by expected events, but only by response to unforeseen or unpredicted events, which are, by definition, random.[47] Some people saw the efficient markets hypothesis as an explanation of and justification for increasingly dominant role of Wall Street in allocating capital throughout the U.S. economy and the emergence of the hostile takeover as an instrument capable of putting poorly managed assets in new hands.[48] As suggested above, the success of large, hierarchical firms managed by rational planners is something of a puzzle for an econo-

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forced to do certain things, and is unjustified; and that the minimal state is inspiring as well as right.

ROBERT NOZICK, ANARCHY, STATE, AND UTOPIA ix (1974); *see also* HAYEK, *supra* note 26, at 87–91.

[41] HAYEK, *supra* note 26, at 59–60, 100–02; Nozick, *supra* note 40, at ix.

[42] *See* JERRY Z. MULLER, THE MIND AND THE MARKET 347 (2002) ("Hayek emerged from intellectual marginality to become, along with his American comrade-in-arms, Milton Friedman, the most important influence on the neoliberalism that reappeared on the intellectual and political scene from the 1970s through the 1990s.").

[43] *See, e.g.*, President Ronald Reagan, First Inaugural Address (Jan. 20, 1981) ("In this present crisis, government is not the solution to our problem; government is the problem . . . . It is no coincidence that our present troubles parallel and are proportionate to the intervention and intrusion in our lives that result from unnecessary and excessive growth of government.").

[44] After Glenn Beck argued that the United States was on the "road to serfdom" on his national television program, *The Road to Serfdom* became a bestseller on Amazon.com, more than 65 years after its original publication. *Essential Reading: What Would Hayek Have Made of His New Cheerleader?,* THE ECONOMIST, June 24, 2010, *available at* http://www.economist.com/node/16438630.

[45] JUSTIN FOX, THE MYTH OF THE RATIONAL MARKET 101–02 (2009).

[46] *Id.* at 43.

[47] *Id.* at 72–73. A corollary of this hypothesis is that the only way one can "beat" the market is to trade on new information that other market participants do not have access to (something that is usually illegal). *Id.* at 101. Early empirical tests confirmed the accuracy of this hypothesis and led to the articulation of a widely accepted "Capital Asset Pricing Model" ("CAPM") that suggested that a broad portfolio of stocks could achieve a risk/return balance that was superior to individual stock-picking. *Id.* at 103–04. Later studies, however, concluded that CAPM did not explain the data. *Id.* at 208.

[48] *Id.* at 164–67.

mist that believes in the intrinsic superiority of markets. Hostile takeovers and stock trading restore the primacy of market organization by subjecting firms' bureaucracies to the accountability of a competitive market for management.[49]

3. *Public Choice Theory*

The emergence of "public choice theory" as a sub-genre of political science complemented increasing trust in markets with scientific reasons to *distrust* government. For example, public choice theorists formulated a "collective action problem," which suggested concentrated minority interests enjoyed an intrinsic political advantage over the diffuse interests of the majority.[50] They also problematized the power relationship between legislators and bureaucrats, debating whether legislators' superior formal powers allowed them to control the bureaucracy, or whether the bureaucracy's superior access to information allowed it to have its way with the legislature.[51] The public choice scholars argued that America's founders had intentionally (and, many thought, wisely) designed these problems and other hurdles into our political system as a means of preserving a system of limited government and thereby guaranteeing individual liberty.[52] These ideas gave policymakers a theory of "government failure" that counterbalanced the traditional economic notion of "market failure."

These three strands of market-oriented thinking emerged from diverse areas of academia and popular culture, but they add up to a coherent "market romantic" perspective on policymaking: namely, that markets are unusually useful instruments whose performance often cannot be matched by government.[53] With these ideas in the zeitgeist, it is not surprising that some of Coase's readers wondered: if the stock market's allocation of property rights in corporations is not too handicapped by transaction costs, why not engineer a similar system to facilitate the private transfer of property rights in environmental externalities?[54]

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[49] *Id.* at 164.

[50] *See generally* MANCUR OLSON, THE LOGIC OF COLLECTIVE ACTION: PUBLIC GOODS AND THE THEORY OF GROUPS (1965).

[51] Terry M. Moe, *The Positive Theory of Public Bureaucracy*, *in* PERSPECTIVES ON PUBLIC CHOICE: A HANDBOOK 455, 460 (Dennis C. Mueller ed., 1997).

[52] *See generally id.*

[53] Joseph Stiglitz and others call this movement "market fundamentalism." JOSEPH STIGLITZ, GLOBALIZATION AND ITS DISCONTENTS 36 (2004). The reference to post-Enlightenment Romanticism is more apposite than Stiglitz's reference to religion because of the way market romantics emphasize the ability of the market's unconscious (and therefore irrational) ordering process to transcend rational human ordering, the way they romanticize individuality and self-determination, and the way they wage war on the Enlightenment-inspired attempts to improve society. *See* RUSSELL KIRK, THE CONSERVATIVE MIND: FROM BURKE TO ELIOT 39 (7th ed. 2001) (explaining conservatives' and romantics' shared hostility to meliorist Enlightenment ideas).

[54] *See* David M. Driesen, *Capping Carbon*, 40 LEWIS & CLARK ENVTL. L. REV. ONLINE (2010), *available at* http://elawreview.org/elaw/401/capping_carbon.html (explaining that

D. The Birth of Cap and Trade

The first concrete explications of how a Coasean system might be employed as a policy solution came in 1966 for air pollution[55] and 1968 for water pollution.[56] Basically, the idea was that the public-sector agency responsible for organizing a pollution control system would set a system-wide "cap" on emissions. It could then issue tradable emissions permits ("allowances") in a quantity equal to the overall cap, and distribute these permits to participating entities. As explained in the introduction, cap and trade gives each participating entity two options for meeting its obligations under the program. The entity can (1) reduce its own emissions by enough to match the permits it initially received from the government or (2) purchase enough permits to cover its emissions. Firms that can reduce pollution cheaply do so, and sell their allowances to firms who cannot. Because the permits are standardized and government-guaranteed, they can be cheaply sold at a commodity exchange, thereby avoiding the need for bespoke contracts between the polluting and affected parties which would otherwise make the exchange of property rights impractical.[57] In the end, the burden of the system-wide cap is divvied up in an efficient way — as in both the Smithian and Coasean models, firms' incentives for maximizing profitability are aligned with the interest of society.

EPA put the cap-and-trade idea into practice in the late 1970s in rulemakings pursuant to the Clean Air Act ("CAA").[58] Subsequently, it applied the tradable property rights approach to its implementation of the lead phase-out program in the mid-1980s and its implementation of the international Montreal Protocol on Substances that Deplete the Ozone Layer in the late 1980s.[59] The first legislative recognition of cap and trade came with

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economists saw emissions trading as a way to more efficiently implement environmental policy).

[55] T.D. Crocker, *The Structuring of Atmospheric Pollution Control Systems*, *in* THE ECONOMICS OF AIR POLLUTION 61 (H. Wolozin ed., 1966).

[56] J.H. DALES, POLLUTION, PROPERTY, AND PRICES (1968); *see also* Driesen, *supra* note 54 (stating that Dales was an influential advocate for the use of tradable permits as an environmental policy instrument).

[57] The technique by which cap-and-trade systems address the transaction costs problem identified by Coase mirrors the development of modern commodity markets. *See generally* WILLIAM CRONON, NATURE'S METROPOLIS: CHICAGO AND THE GREAT WEST 109, 145–46 (1992) (explaining how the standardization of grades in wheat in Chicago facilitated the replacement of traditional transactions in physical wheat with lower-cost exchange of paper representing a property right in unidentified wheat held in communal grain elevators).

[58] T.H. TIETENBERG, EMISSIONS TRADING: PRINCIPLES AND PRACTICE 5–7 (2d. ed. 2006). EPA's 1974 "netting" rule allowed polluters to avoid New Source Review of a new pollution source at an existing facility by showing that it had reduced total net emissions from the facility as a whole. Barry D. Solomon, *New Directions in Emissions Trading: The Potential Contribution of New Institutional Economics*, 30 ECOLOGICAL ECON. 371, 372–73 (1999). EPA's 1976 "offset rule," expanded the scope of such netting between plants. *Id.* EPA's subsequent "bubble" and "banking" policies allowed polluters to generate emissions reduction credits and use them for later compliance. *Id.* In 1986, EPA's Emissions Trading Policy Statement codified and extended these rules. *Id.*

[59] TIETENBERG, *supra* note 58, at 8–10.

Congress's 1990 acid rain amendment to the CAA. EPA's implementation of this section created the most ambitious cap-and-trade system yet, one that included an auction market run by a commodities exchange and allowed speculators and environmental groups to purchase and "retire" credits.[60]

These U.S. experiments with cap and trade worked in the sense of observably improving air quality in the United States.[61] They have also probably worked in the sense of making this improvement less costly than it would have been under an alternative policy design. Empirical studies of various tradable property rights systems have found cost savings of between six and ninety-six percent over a command-and-control approach.[62]

The early cap-and-trade programs did not have offset programs comparable to those used by carbon cap-and-trade programs, but they did develop the concepts that would later evolve into carbon offsetting as currently understood. For example, the term "offset" may have its origins in EPA's 1976 "offset rule," which allowed new sources of air pollution in "nonattainment areas" to emit pollutants if those emissions were offset by a voluntary reduction in emissions from another source in the nonattainment area.[63] Over the next decade, several international voluntary forest projects aimed at funding projects that created carbon sinks also came to be described as offset projects. For example, Mark Trexler suggests that a 1989 AES-funded forestry project in Guatemala was the first "offset project" in the sense that term is used today.[64]

E. Carbon Offsets

The perceived success of cap and trade in the United States during the 1990s brought market-focused ideas to the forefront as policymakers began to address the GHG problem. At the Kyoto Protocol meeting in 1998, the

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[60] *Id.* at 11–12.

[61] *Id.* at 72.

[62] *Id.* at 58–59; *see generally* Byron Swift, *U.S. Emissions Trading: Myths, Realities and Opportunities*, NAT. RESOURCES & ENV'T, Summer 2005, at 3. However, many of the most complete studies are ex ante simulations based on incomplete information, and ex post studies tend to be dogged by the difficulty of estimating what the cost of compliance would have been under the counterfactual command-and-control approach to which the actual system must be compared. Robert N. Stavins, *What Can We Learn from the Grand Policy Experiment? Lessons from SO_2 Allowance Trading*, 12 J. OF ECON. PERSP. 69, 83 (1998) ("[T]radable permits will work best when transaction costs are low, and the SO_2 experiment shows that if properly designed, private markets will tend to render transaction costs minimal.").

[63] TIETENBERG, *supra* note 58, at 6–7. This form of "offsetting" was actually the earliest form of allowance trading, but before the emergence of a broad liquid market in emissions reductions, regulated entities spoke of offsetting emissions from a new power plant by tying it, for regulatory purposes, to the shutdown of another (often, the same corporation owned both projects). After later rulemakings replaced such project-based transactions with a liquid allowance trading market, this sort of substitution became known as "emissions trading" rather than "offsetting."

[64] Mark C. Trexler, Derik J. Broekhoff, & Laura H. Kosloff, *A Statistically-Driven Approach to Offset-Based GHG Additionality Determinations: What Can We Learn*, SUSTAINABLE DEV. L. & POL'Y, Winter 2006, at 30, 30.

United States advocated non-binding targets and the use of tradable allowances to reduce compliance caps.[65] Europe wanted binding targets and was suspicious of trading. The Kyoto Protocol cap-and-trade system was an Al Gore-brokered compromise under which the United States agreed to binding targets and Europe agreed to emissions trading.[66]

The negotiators appended offsetting to this cap-and-trade system at the eleventh hour, leading one commentator to dub the CDM the "Kyoto Surprise."[67] In the run-up to the negotiations, Brazil had proposed a "Clean Development Fund" that would use non-compliance penalties imposed on developed nations to finance clean development in the developing world.[68] Like other previous funds such as the Global Environmental Facility and the Montreal Protocol's multilateral fund, the Clean Development Fund would have transferred funding from the developed to the developing world by making fund-administrated investments such as grants of loans to emissions-reducing projects.[69] The G-77 group of developing nations signed on to the proposal at the Kyoto negotiations, making it clear that the Kyoto treaty would need to include some form of development finance to attract worldwide support.[70]

Under U.S. influence, however, Brazil's fund-based vision for how such transfer payments would take place evolved into a private sector-led flexibility mechanism.[71] The mechanism proposal replaced the managed fund at the center of Brazil's vision with a tradable property rights system. Instead of functioning as a depository and distributor of funds, the U.N. Framework Convention on Climate Change ("UNFCCC") itself would be only a rulemaker and a processor of transactions initiated by private-sector firms.[72] Europe was also wary of this new market-based proposal, preferring to maintain the Global Environmental Facility as the primary means of fund transfer between developed and developing parties.[73] However, it eventually signed on when the United States made market-based flexibility the quid pro quo for its acceptance of binding targets, Europe's primary goal.[74] Carbon

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[65] David M. Driesen, *Sustainable Development and Market Liberalism's Shotgun Wedding*, 83 IND. L.J. 21, 34 (2008).

[66] *Id.*

[67] Jacob Werksman, *The Clean Development Mechanism: Unwrapping the "Kyoto Surprise"*, *in* ENVIRONMENTAL MARKETS: EQUITY AND EFFICIENCY 218 (Graciela Chichilinsky & Goeffrey Heal eds., 2000).

[68] *Id.* at 228–29.

[69] *See generally* MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL, http://www.multilateralfund.org/default.aspx (last visited May 30, 2012) (on file with the Harvard Law School Library). The goal of the Montreal Protocol's multilateral fund was to shift some of the financial burden for the mitigation of ozone-depleting emissions from developing nations to developed nations, as the CDM would later aim to shift the financial burden of GHG mitigation from developing to developed nations.

[70] Werksman, *supra* note 67, at 230–31.

[71] *Id.* at 232.

[72] *Id.*

[73] *Id.* at 231.

[74] *Id.* at 230–32.

offsetting as currently understood was born in the form of the CDM created by Article 12 of the Kyoto Protocol.[75]

Article 12 aims to accomplish two goals.[76] First, the CDM is intended to moderate the costs of cap-and-trade compliance.[77] Because the cost of emissions reductions in developing countries is lower than the cost of emissions reductions in developed countries, offsets will often be cheaper than allowances. Thus, if the marginal cost of compliance within the cap-and-trade system (i.e. allowance prices) climbs too high, participants can source emissions reductions from outside the system (offsets) at a lower cost.[78] Second, the CDM is intended to broaden participation in the Kyoto regime by stimulating emissions-reducing investments in geographic areas or industries that would otherwise be beyond the reach of the cap-and-trade system.[79]

The Kyoto Protocol itself is vague enough to admit a number of different structural options for the CDM: it says "mechanism" instead of "fund," and explicitly mentions private-sector certification, a role now played by Designated Operational Entities ("DOE"),[80] but it does not make explicit the key structural details of the present-day system, such as the right of the private sector to initiate projects.[81] Indeed, the debate on the elaboration of the CDM idea in the international meetings that followed Kyoto presaged the questions about the relative roles of the public and private sector raised in this Article.[82] For example, a contemporary observer wrote that the debate could be characterized as "pitting a market-based approach against an interventionist approach based on traditional public sector development assistance."[83] It was not until the Marrakesh meeting in 2001 that the parties to Kyoto elaborated the private sector-led system, setting out the relative roles of project developers, investors, the Executive Board, and the DOE.[84]

Tradable property rights also won the day in the biggest national implementations of the Kyoto Protocol,[85] even after the United States' decision not

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[75] Kyoto Protocol, *supra* note 6, at art. 12.

[76] *See, e.g.*, *id.* art. 12 ¶5 (specifying that the goals of the CDM are to (1) "assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments," and (2) "assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention").

[77] WILLIAM WHITESELL & STACEY DAVIS, CTR. FOR CLEAN AIR POLICY, COST-CONTAINMENT IN CAP-AND-TRADE SYSTEMS: A REVIEW OF THE OPTIONS 4 (2008), *available at* http://www.ccap.org/docs/resources/542/Cost%20Containment%202008%20(2).pdf.

[78] *See id.* at 5.

[79] Kyoto Protocol, *supra* note 6, at art. 12.

[80] *See infra* section II.A.1.

[81] *See* Kyoto Protocol, *supra* note 6, at art. 12.

[82] Werksman, *supra* note 67, at 233–34.

[83] *Id.*

[84] U.N. Framework Convention on Climate Change, *Report on the Conference of the Parties on Its Seventh Session, Held at Marrakesh from 29 October to 10 November 2001, Addendum Part Two: Action Taken by the Conference of the Parties, Vol. II*, 20–49, U.N. Doc. No. FCCC/CP/2001/13/Add.2 (Jan. 21, 2002), *available at* http://unfccc.int/resource/docs/cop7/13a01.pdf [hereinafter Marrakesh Accords]. For more detail on this system, see *infra* section II.A.1.

[85] Kyoto targets are binding on national governments. Kyoto Protocol, *supra* note 6, at art. 1. National governments are responsible for allocating emissions reductions to firms and indi-

to ratify the Kyoto Protocol left the Protocol without tradable property rights' biggest advocate. Europe implemented a regional cap-and-trade system called the European Union Emissions Trading System ("EU-ETS"). Australia, a late adopter of the Kyoto Protocol, is also in the process of designing a national cap-and-trade system.[86] Further, after the United States declined to ratify the Kyoto Protocol, several U.S. states created cap-and-trade systems (such as New England's Regional Greenhouse Gas Initiative and California's AB 32), and a cap-and-trade system almost passed the U.S. Congress.[87] While the details of some of these systems are still under development, all of them contemplate a role for carbon offsets.[88]

II. Offsetting Practice: The CDM

The preceding Part explained that carbon offsetting can be conceptualized as an attempt to extend the traditional cap-and-trade tradable property rights framework into the world of the Kyoto Protocol, where developed countries are expected to take some financial responsibility for emissions reductions that belong geographically to the developing world. Because tradable instruments already change hands inside Kyoto and other cap-and-trade systems, it makes sense that outside-the-system reductions should enter the system in the same tradable form.

But offsetting is different from allowance trading. Given the numerous transactions, legal requirements, risks, and parties involved, offsetting is better thought of as a process of creation than a process of trade — more like planting, harvesting, and taking to market physical wheat than selling a futures contract for wheat on a commodity exchange. This Part explores the consequences of the extending tradable property rights into such unfamiliar territory by describing the practice of offsetting in the largest extant offset system — the CDM.

A. CDM Procedures & Substantive Standards

As described above, there are several extant GHG cap-and-trade systems, all of which allow offsetting. In practice, however, most current offsetting is conducted via the CDM, whose "Certified Emissions Reductions" ("CERs") are given full faith and credit in the EU-ETS — the largest GHG cap-and-trade system.[89] The CDM certifies eighty-seven percent of all off-

viduals, and can do so in whatever way they prefer. *See id.* at art. 3. Conceivably, one nation could choose a direct command-and-control allocation system and another nation could choose a national cap-and-trade system that would sit within Kyoto's international cap-and-trade system. *See id.*

[86] Ambrosi et al., *supra* note 2, at 22.

[87] *Id.* at 30–33.

[88] *Id.* at 22, 30–33; Wara, *supra* note 1; *see also* Waxman-Markey, H.R. 2454, 111th Cong. §§ 728, 743(d) (2009).

[89] Ambrosi et al., *supra* note 2, at 9.

sets.[90] Most of the remaining thirteen percent are "voluntary offsets" sold to firms and individuals whose emissions are not legally constrained, but who have decided to reduce emissions voluntarily.[91] Even many of these voluntary programs, however, give full faith and credit to CDM-certified offsets or rely on certification procedures that track those of the CDM, making the CDM's substantive rules and procedures the de facto world offsetting standard.[92] And the dominance of the CDM might continue even after a U.S. climate change bill passes. Waxman-Markey would allow offsets to be certified either through the extant CDM system (or its successor),[93] or through a new U.S.-administered system that appears to contemplate procedures and substantive standards similar to those of the CDM.[94] Indeed, given that existing carbon market firms have developed expertise in the CDM system and are likely to play a role in negotiating the details of any future offsetting system, the CDM's basic procedural contours and the legal standards and concepts it developed are likely to survive even if the CDM itself does not.

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[90] *Id.* (showing value of primary CDM transactions from 2005–2010 as $26.5 billion and value of "other offsets" transactions during the same years as $4.1 billion). This figure may be an underestimate, as some of the "other offsets" reported by the World Bank reports may be "secondary" transactions, i.e. re-sales of already-certified offsets.

[91] *Id.*; *see generally* MOLLY PETERS STANLEY ET AL., ECOSYSTEM MARKETPLACE, BACK TO THE FUTURE: STATE OF THE VOLUNTARY CARBON MARKETS 2011 (2011), *available at* http://ecosystemmarketplace.com/documents/acrobat/StateoftheVoluntaryCarbonMarket18July_Final.pdf (noting that voluntary credits are typically purchased by U.S. firms and European firms in un-capped industries, with a small percentage purchased by individuals, particularly for the offset of emissions associated with air travel).

[92] KATHERINE HAMILTON ET AL., ECOSYSTEM MARKETPLACE, FORGING A FRONTIER: STATE OF THE CARBON MARKETS 2008 9, 48 (2008) (reporting that CDM-certified credits accounted for fourteen percent of all credits sold on voluntary markets during 2007); STANLEY ET AL., *supra* note 91, at vi-vii (reporting that CDM-certified credits accounted for one percent of all credits sold on voluntary markets during 2010 and that the VCS is the largest certifier of voluntary offsets); *Methodologies*, VERIFIED CARBON STANDARD, http://www.v-c-s.org/methodologies/what-methodology (last visited May 30, 2012) (on file with the Harvard Law School Library) (explaining that the VCS allows offset developers to certify their credit by any CDM-approved methodology).

[93] Waxman-Markey would give EPA discretion to make rules allowing the use of emissions allowances and offsets from qualifying international programs. Waxman-Markey, H.R. 2454, 111th Cong., §§ 728, 743(d)(1).

[94] EPA is to promulgate detailed offset requirements in conjunction with an "Offsets Integrity Advisory Board." *Id.* § 731. These rules must ensure that offsets represent emissions that are "additional and verifiable" and measured by reference to additionality and baseline methodologies to be established by EPA. *Id.* §§ 732(b), 734. Offset developers are to submit petitions to EPA, which approves them if they comply with its requirements. *Id.* §§ 735–37. A separate certification track, also administered by EPA, would allow the use of credits from sector-wide activities and avoided deforestation activities in developing countries, something currently unavailable under the CDM. *Id.* § 743.

1. *CDM Procedures*

The process of creating a CDM offset can be described as a seven-step process:[95]

1. Project Design Document ("PDD"). The project developer and its consultants complete a PDD describing the project. The document uses an approved methodology to measure the emissions reductions from the project. It also presents evidence that the project is additional, and fulfills other requirements established by the CDM Executive Board.
2. Designated National Authority ("DNA") Letter of Approval. The project design document is approved by the governmental entity in the host country responsible for ensuring that CDM projects conform to national development goals.
3. DOE Validation. The project's application of baseline measurement methodologies and additionality assessment is validated by one of forty-one U.N.-chartered DOEs.[96] Some DOEs are for-profit businesses, while others are non-profits or governmental organizations; the largest are Scandinavian consulting firms.
4. Registration by the CDM Executive Board ("EB"). The EB certifies the DOE's validation and registers the project. If the EB doubts the DOE's conclusion, it may request review and, if it disagrees with the conclusions of the DOE upon review, reject the project. Currently, the EB rejects about five percent of the projects recommended for registration by the DOEs.[97]
5. Monitoring. After the project is built, the project developer must begin measuring the actual emissions reductions it achieves by implementing the monitoring plan set out in the project design document.
6. Verification/certification. On a periodic basis, the project developer submits a monitoring report to the DOE. The report is verified by the DOE, which certifies the credits and makes an issuance report to the EB.
7. Issuance of CERs. The EB typically issues offset credits within fifteen days of the receipt of the DOE's certification report, and on a yearly basis thereafter. However, as at the

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[95] *CDM Project Cycle*, U.N. Framework Convention on Climate Change, http://cdm.unfccc.int/Projects/diagram.html (last visited May 30, 2012) (on file with the Harvard Law School Library).

[96] *CDM: List of DOEs*, U.N. Framework Convention on Climate Change, http://cdm.unfccc.int/DOE/list (last visited May 30, 2012) (on file with the Harvard Law School Library).

[97] *See* UNEP Risø Centre, *supra* note 2.

project certification stage, the EB can put issuance under review if it is not satisfied with the report.

2. *CDM Substantive Standards*

The DOEs and Executive Board base their review of a project's documentation on substantive criteria established in Article 12.5 of the Kyoto Protocol:

(a) Voluntary participation approved by each Party involved;
(b) Real, measurable, and long-term benefits related to the mitigation of climate change; and
(c) Reductions in emissions that are additional to any that would occur in the absence of the certified project activity.[98]

The 2001 Marrakesh Accords provided some limited additional interpretation of these criteria,[99] but their construction has largely fallen to the EB.[100] It has done so by promulgating "methodologies." Each methodology is a twenty to one hundred page document of rules, procedures, and quantitative algorithms that apply to a specific class of projects.[101] Most of these methodologies are detailed and industry-specific. For example, a refinery facility applying for offset credit for capture of waste gas would need to apply methodology #AM0055, "Baseline and Monitoring Methodology for the recovery and utilization of waste gas in refinery facilities."[102] This methodology requires the facility to set the baseline against which its emissions reductions will be measured as the lower of two calculated values: (1) the "[h]istoric annual average amount of waste gas sent to the flares during the last three years before the project implementation minus amount of waste gas released due to emergencies or shutdown and amount of waste gas required to maintain the pilot flame" and (2) the "[s]ystem recovery capacity (Nm^3/hr) mul-

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[98] Kyoto Protocol, *supra* note 6, art. 12 ¶ 5.

[99] Marrakesh Accords, *supra* note 84, at 36 ¶ 43.

[100] The EB itself receives periodic guidance from the "Conference of Parties serving as the Meeting of the Parties" — i.e., the meetings of representatives of the parties to the Kyoto Protocol. For example, although negotiations over the CDM were not a main subject of the 2009 Copenhagen meeting, the Meeting of Parties issued "Further Guidance Regarding the Clean Development Mechanism." U.N. Framework Convention on Climate Change, Dec. 7–19, 2009, *Report of the Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol on Its Fifth Session, Addendum Part Two: Action Taken by the Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol at Its Fifth Session*, 4, U.N. Doc. FCCC/KP/CMP/2009/21/Add.1 (Mar. 30, 2010), *available at* http://unfccc.int/resource/docs/2009/cmp5/eng/21a01.pdf#page=4 [hereinafter Copenhagen Guidance].

[101] *See Approved Baseline and Monitoring Methodologies for Large Scale CDM Activities*, U.N. Framework Convention on Climate Change, http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html (last visited May 30, 2012) (on file with the Harvard Law School Library) (showing the list of methodologies).

[102] U.N. Framework Convention on Climate Change, Baseline and Monitoring Methodology for the Recovery and Utilization of Waste Gas in Refinery Facilities (2008), *available at* http://cdm.unfccc.int/UserManagement/FileStorage/8AYSHE6ZDLG2PML0V4QVK2U1MXVG9K.

tiplied by number of operating hours of waste gas recovery system in year y."[103] If the project is registered, the facility will subtract this baseline value, which represents what would have happened under "business as usual" but for the CDM incentive, from the actual yearly waste gas emissions. The difference, which represents the project's emissions savings, is the amount of offset credit the facility is entitled to receive from the CDM in the measured year.

In addition to the substantive requirements established by the baseline methodology, the CDM requires projects to show that their project is "additional" to projects that would have been undertaken in the absence of the CDM.[104] If a project would have been implemented in the absence of the CDM incentive, its purported "reductions" are not actual reductions, but merely "business as usual," and should not be used to offset non-compliance with cap-and-trade obligations.

The CDM's additionality requirement has several prongs,[105] but at its heart is the implementation of either an "investment analysis" or a "barriers analysis."[106] Under the investment analysis, additionality will be established if developers submit financial evidence showing that the project's return on investment would be too low (given its risk) to attract financing without the CDM revenue stream. For example, a windmill project would need to show that profits from electricity sales alone would not justify the project. Under the barriers analysis alternative, the project instead need only show that it faces costly barriers to implementation, a task that is typically assumed to be easier than making an investment-analysis showing.[107] For example, the windmill project might show that the national regulatory framework makes it difficult for independent power producers to obtain financing and compete with traditional generation facilities.

B. The Structure of the CDM Marketplace

The CDM, of course, is not merely a clever public policy idea or a set of legal standards, but also a € 15–20 billion industry.[108] Projects, regula-

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[103] *Id.* at 7.

[104] Theoretically, a project is additional if its baseline calculation yields a value that is less than actual emissions. However, as is evident from the description of the calculation above, baseline estimation often scrutinizes scientific or technical data, not the business and legal motivations that are the focus of the additionality requirement. The CDM imposes a distinct "additionality" test to examine these motivations.

[105] Other prongs include a "common practice test" requiring applicants to show that the practice or technology they propose to implement is not already common practice in their industry, a "timing test" that requires applicants to show that the CDM incentive was seriously considered in the project decision-making process, and a "government incentive test" that requires an applicant to show that it does not already have a legal duty under national law to implement the project. For a discussion of the most common additionality tests, see Trexler et al., *supra* note 64, at 38–40.

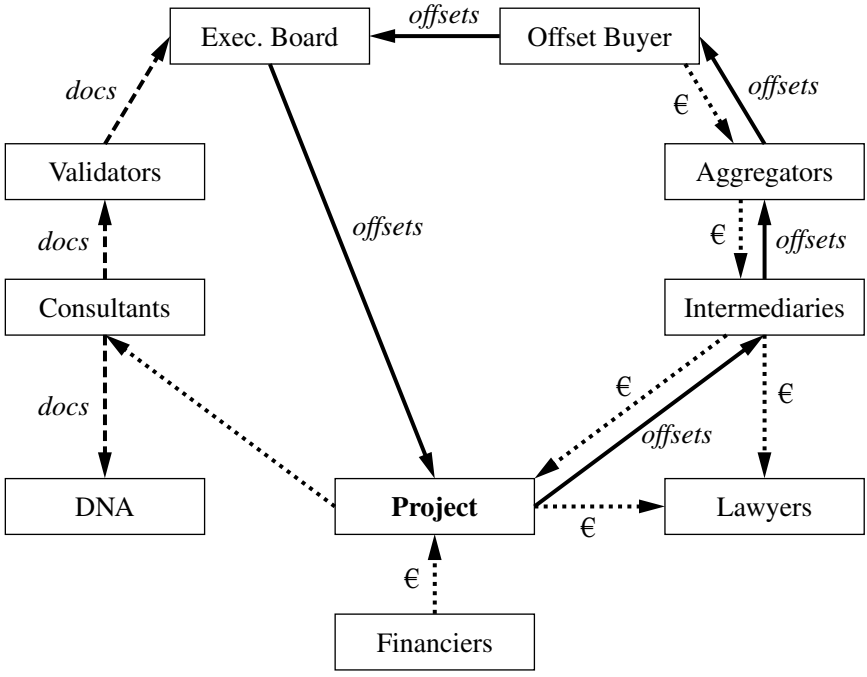
[106] SCHNEIDER, *supra* note 14, at 28–34.

[107] *Id.*

[108] AMBROSI ET AL., *supra* note 2, at 9.

tors, and buyers are not the only participants in this industry — there is also a complex "business ecosystem" of brokers, investment banks, speculators, specialist software providers, rating agencies, consultants, lobbyists, regulators, trade journalists, and other entities. Figure 1 offers a framework for understanding the roles the most important of these entities play in keeping the offsetting system going.

FIGURE 1: FLOW OF DOCUMENTS, MONEY, AND OFFSETS IN A TYPICAL OFFSET PROJECT



As shown in the figure, each offset project involves three distinct streams of transactions.[109] First, there is the financing transaction. Imagine a proposed windmill project in a non-Annex I nation. The project developers must compare the project's costs — purchase price of turbines, obtaining a site lease, negotiating a construction contract, paying taxes on revenue, and so on — against the expected revenue that they can obtain from the sale of power. They take these estimates to financiers like banks and venture capi-

[109] The structure of this industry has been more briefly described in KARAN CAPOOR & PHILIPPE AMBROSI, WORLD BANK, STATE AND TRENDS OF THE CARBON MARKET 2008, at 59 (2008), *available at* http://siteresources.worldbank.org/NEWS/Resources/State&Trendsformatted06May10pm.pdf; Fein et al., *supra* note 12, at 3–4; McNish et al., *supra* note 12, at 5465–67.

talists; if the return is attractive enough to suit the equity investors, and the risk low enough to suit the debt holders, they will finance the project.

Of course, only unviable ("additional") projects where the return is *not* attractive enough are entitled to offset credit; as a result, offset project developers turn to the CDM registration process to obtain offset revenue. Few project developers have the in-house resources to navigate the stream of approval transactions themselves. Therefore, the project will typically hire a consultant that specializes in CDM approval to apply the CDM methodologies. As discussed above, the consultants submit their work to two regulatory organizations: the host-government DNA and the international DOE. The UNFCCC's EB is the ultimate approval authority and acts on the recommendations of the DNAs and DOEs.

After completing the project approval transactions, project developers still need to get their credits to market, which requires transactions with a number of other supporting players. At a minimum, the project needs a broker to place the credits on an exchange, just as for selling a stock. However, in order to attract loans, project developers typically seek to sell the credits they expect to receive over the lifetime of the project through a forward contract, rather than selling them as they receive them on a spot market.[110] This means that the projects typically need a more full-service intermediary, one that can structure a bespoke "over the counter" transaction between buyer and seller. This intermediary helps the parties negotiate an "Emissions Reductions Purchase Agreement" that sets price and delivery terms and allocates several dimensions of risk,[111] a task that implicates another category of supporting players — lawyers.

Moreover, in many cases, neither the project developer nor the capped Annex I firms who need carbon offsets for compliance want to assume the risk of project failure, the risk of lower-than-expected emissions reductions, the risk of price changes, or the risk of regulatory changes that vitiate the value of the offsets.[112] And even when a project developer is willing to guarantee delivery of credits at a fixed price, such guarantees may be unenforceable.[113] Therefore, aggregators often step into the transaction between the buyer and seller to partially assume these risks.[114] Aggregators purchase

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[110] CAPOOR & AMBROSI, *supra* note 109, at 33–34.

[111] *See, e.g.*, Int'l Emissions Trading Ass'n, *Emissions Reductions Purchase Agreement* (Nov. 9, 2006), http://www.ieta.org/assets/TradingDocs/cdmerpav.3.0final.doc (on file with the Harvard Law School Library).

[112] *See* KARAN CAPOOR & PHILIPPE AMBROSI, WORLD BANK, STATE AND TRENDS OF THE CARBON MARKET 2007, at 34 (2007); Christopher Carr & Flavio Rosenbuj, *The World Bank's Experience in Contracting for Emissions Reductions*, 2 ENV. LIABILITY 114, 117–19 (2007), *available at* http://wbcarbonfinance.org/docs/Banks_experience_in_contracting_emission_reductions.pdf.

[113] ALEXANDRE KOSSOY & PHILIPPE AMBROSI, WORLD BANK, STATE AND TRENDS OF THE CARBON MARKET 2010, at 38–39 (2010), *available at* http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/State_and_Trends_of_the_Carbon_Market_2010_low_res.pdf.

[114] *See* CAPOOR & AMBROSI, *supra* note 109, at 3. The sale of carbon credits through an intermediary-aggregator appears to be the dominant model in the CDM market. McNish et al., *supra* note 12, at 5465 tbl.7 (showing that sixty-seven out of ninety-seven bagasse energy

relatively risky carbon offsets under a forward contract and pool them into a portfolio that contains offsets from projects in other locations or other technology classes.[115] Because this pooling reduces the variability of their expected credit "harvest," the aggregators feel comfortable guaranteeing future delivery of credits to end buyers; they make their money on the price differential between these guaranteed credits (a species of financial derivative) and the relatively risky "primary" credits they buy from project developers.[116] As in other complex financial markets, there is a demand by financial firms' contract counterparties and shareholders for independent estimates of the risks of these securities, which means that carbon ratings agencies have emerged to play the role that Moody's and Standard & Poor's play in the traditional financial system.[117] Finally, while the core demand for carbon offsets comes from compliance buyers, there is no limit on market speculation.[118] Accordingly, carbon credits and derivatives may pass through the hands of several speculators who hold the credits on their balance sheet in anticipation of a price increase (or, in the case of some derivatives, a price decrease) before re-selling them.[119]

Figure 1 and the preceding paragraphs portray the financing, project approval, and credit sale transactions as though a different firm undertakes each role. Such separation of roles is an oversimplification, for multiple roles can be combined within a single firm. Some firms combine intermediation, aggregation, and consulting services to become something of a "one

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projects for which data was available listed an intermediary or aggregator as credit buyer); *see also* KARAN CAPOOR & PHILIPPE AMBROSI, WORLD BANK, STATE AND TRENDS OF THE CARBON MARKET 2009, at 2, 33–34 (2009) (noting that London-based private-sector entities are the largest buyers of CDM credits overall).

[115] *See* CAPOOR & AMBROSI, *supra* note 109; CAPOOR & AMBROSI, *supra* note 112, at 33–34; McNish et al., *supra* note 12, at 5465. Typical deal structures allocate price risk to the intermediary-aggregator by specifying a fixed forward price, but allocate "project" or "delivery" risk to the seller by specifying payment on delivery. U.N. DEVELOPMENT PROGRAM, THE CLEAN DEVELOPMENT MECHANISM: A USER'S GUIDE 70–74 (2003), *available at* http://www.undp.org/content/undp/en/home/librarypage/environment-energy/climate_change/mitigation/undp_cdm_manual.html (explaining the risks of various CDM transaction structures and reporting that forward contracts are the most common choice); *see also* CAPOOR & AMBROSI, *supra* note 109, at 33 (reporting that most CERs are sold under a forward contract).

[116] In fact, in some cases, aggregators add another layer of financial engineering to these risk pools by offering buyers a menu of "tranched" securities with diverse risk/return signatures. Lisa Kassenar, *Carbon Capitalists Warming to Climate Market Using Derivatives*, BLOOMBERG, Dec. 4, 2009, http://www.bloomberg.com/apps/news?pid=Newsarchive&sid=AXRBOxU5KT5M. This type of innovation has been limited to date, but Commodity Futures Trading Commissioner Bart Chilton has predicted that if the United States passes cap-and-trade legislation, carbon derivatives could become "the biggest of any derivatives product in the next four to five years." CHAN, *supra* note 14, at 2 (quoting Raphael Minder, *Regulator Forecasts Surge in Emissions Trading*, FIN. TIMES, Mar. 10, 2008).

[117] Fiona Harvey, *Stern to Launch Carbon Credit Rating Agency*, FIN. TIMES, Jun. 25, 2008, *available at* http://www.ft.com/cms/s/0/e36c5964-424e-11dd-a5e8-0000779fd2ac.html#axzz1W29aXaKe.

[118] CHAN, *supra* note 14, at 2.

[119] CAPOOR & AMBROSI, *supra* note 114, at 31 (reporting that the value of secondary CDM transactions, defined as the re-sale of offsets originally purchased by another party, greatly exceeds the value of primary CDM transactions like those discussed above).

stop shop" for projects seeking to access the CDM. Ecosecurities LLC, one of the largest private-sector carbon market participants, appears to operate on the one-stop-shop model.[120] So do the World Bank-managed "prototype" carbon funds that national governments used to help jump-start CDM investment.[121]

Another pattern of integration may be employed by large compliance buyers who are willing to take on much of the intermediation work themselves.[122] Typically these buyers are either large utilities or government agencies that have direct responsibility for meeting their nation's Kyoto targets.[123] Because of their large size or their public mission, they may be more willing than other compliance buyers to undertake the market-making work and expose themselves to default and price risk.

C. How Much Does it Cost Projects and Developers to Use the CDM System?

The foregoing discussion hints already that transaction costs are likely to be more significant for offsetting than for allowance trading. This section attempts to quantify how significant such costs are, arguing that there is reason to believe that most empirical studies of CDM transaction costs fail to take into account some of the most important costs, including the cost of intermediation and risk mitigation by aggregators. A more comprehensive methodology suggests that transactions absorb over thirty percent of all the money spent by offset investors such that less than seventy percent of offset funding reaches the emission reducing projects themselves.

1. *Existing Estimates of CDM Efficiency*

The results of the existing studies of CDM transaction costs vary widely (see Table 1). Based on a study of two early, experimental CDM investment funds — one managed by the government of Sweden and the

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[120] *See* ECOSECURITIES, http://www.ecosecurities.com/ (last visited May 30, 2012) (on file with the Harvard Law School Library); *see also* McNish et al., *supra* note 12, at 5466 (noting that some consultants in the CDM bagasse electricity subsector are also large "buyers" of credits from bagasse electricity projects).

[121] Carr & Rosembuj, *supra* note 112, at 114; *About World Bank Carbon Finance Unit (CFU)*, CARBON FINANCE UNIT, WORLD BANK, http://wbcarbonfinance.org/Router.cfm?Page=About&ItemID=24668 (last visited May 30, 2012) (on file with the Harvard Law School Library).

[122] Axel Michaelowa & Frank Jotzo, *Transaction costs, Institutional Rigidities, and the Size of the Clean Development Mechanism*, 33 ENERGY POL'Y 511, 512–14 (2005) (describing a pilot program under which the government of Sweden purchased carbon credits); *see also* Hannah Mari Ahonen & Kari Hamekoski, *Transaction Costs Under the Finnish CDM/JI Pilot Programme* (Univ. of Helskinki Dept. of Econ. & Mgmt. Discussion Paper No. 12, 2005), *available at* http://www.helsinki.fi/taloustiede/Abs/DP12.pdf (describing a similar Finnish program).

[123] Ahonen & Hamekoski, *supra* note 122; Michaelowa & Jotzo, *supra* note 122; *see also* McNish et al., *supra* note 12, at 5466.

other managed by the World Bank — Axel Michaelowa and Frank Jotzo estimate that transaction costs in the CDM amount to about € 1.22 per tCO_2-equivalent ("tCO_2e").[124] At the low carbon prices prevailing at the time of their study, these transaction costs would siphon off thirty-three percent of total CDM investment.[125] At the more mature price of about € 10,[126] they would amount to a more reasonable, yet still significant, twelve percent of total investment. A study of twenty-six voluntary market offset projects conducted two years later by the Lawrence Berkeley National Laboratory ("LBNL") reached a more optimistic conclusion, estimating an average transaction cost of just € 0.56 per tCO_2.[127] A similar study of incomplete data from fifteen projects in India came up with an even lower number: € 0.04 to € 0.31 per tCO_2.[128] But a more recent close examination of a single proposed small project in Ghana led to an estimate an order of magnitude higher: € 6 to € 16 per tCO_2.[129]

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[124] *See* Michaelowa & Jotzo, *supra* note 122, at 519.

[125] *See id.*

[126] CAPOOR & AMBROSI, *supra* note 109, at 31 (reporting that the prices of primary CERS during 2007 and early 2008 averaged between _8 and _13); CAPOOR & AMBROSI, *supra* note 110, at 31 (reporting that the prices of primary CERs bought in 2006 ranged between € 6.80 and € 24.75, with an average of around € 11). The financial crisis and the failure of the UNFCCC to negotiate a post-2012 replacement for the Kyoto Protocol caused prices to fall after 2008. CAPOOR & AMBROSI, *supra* note 114, at 44; KOSSOY & AMBROSI, *supra* note 113, at 5; AMBROSI ET AL., *supra* note 2, at 49–50. This Article uses the 2007–2008 price of approximately € 10. This price is more representative of market conditions when the Kyoto market was in full swing. *See id.*

[127] CAMILLE ANTINORI & JAYANT SATHAYE, LAWRENCE BERKELEY NAT'L LAB., ASSESSING TRANSACTION COSTS OF PROJECT-BASED GREENHOUSE GAS EMISSIONS TRADING 31 (2007), *available at* http://are.berkeley.edu/~antinori/LBNL-57315.pdf. The study also found that many transaction costs did not increase with project size, such that small projects had an average transaction cost of € 1.38 per tCO_2, while large projects had costs of only € 0.24 per tCO_2. *Id.* at 30. Here and throughout, this Article reports currency value in euros, the currency in which most carbon transactions are denominated. *See, e.g.*, AMBROSI ET AL., *supra* note 2, at 70. When a source reports figures in dollars, the figures are converted to euros using the November 2009 exchange rate of approximately 1.45 dollars per euro. *Euro (€) / US Dollar ($),* GOOGLE FIN., https://www.google.com/finance?hl=en&biw=1280&bih=911&q=CURRENCY:EURUSD (last visited May 30, 2012) (on file with the Harvard Law School Library).

[128] MATTIAS KREY, HAMBURG INST. OF INSTITUTIONAL ECON., TRANSACTION COSTS OF CDM PROJECTS IN INDIA — AN EMPIRICAL SURVEY 98 (2004), *available at* http://www.econstor.eu/dspace/bitstream/10419/32919/1/385360975.pdf.

[129] Bruce Chadwick, *Transaction Costs and the Clean Development Mechanism*, 30 NAT. RESOURCES F. 256, 266 (2006).

TABLE 1: ESTIMATES OF TRANSACTION COSTS FOR CARBON OFFSETTING

Category	Description	Swedish Pilot (n=51)[130]	World Bank Pilot (n=4)[131]	Finnish Pilot (n=6)[132]	LBNL (n=26)[133]	Krey (n=7)[134]	Chadwick (n=1)[135]
Search	Cost of finding potential project partners (including consultants, DOEs, and credit buyers); cost of developing preliminary proposal.	€ 15,000		€ 3,000-€ 17,000	€ 0.19 / tCO_2	€ 0.003-€ 0.06 / tCO_2	€ 28,000
Negotiation	Contract of negotiation between project partners.	€ 25,000-€ 400,000	€ 250,000	€ 3,000-€ 15,000	€ 0.12 / tCO_2	€ 0.001-€ 0.03 / tCO_2	
Project Documentation	Consultant's fee for estimating emissions reductions and developing other required project documents.	€ 35,000	€ 75,000	€ 3,000-€ 15,000	€ 0.21 / tCO_2	€ 0.003-€ 0.9 / tCO_2	€ 24,000-€ 162,000
DNA Approval	Cost of achieving DNA approval.	€ 40,000	€ 75,000				€ 5,000
Validation	Fee paid to DOE validator.	€ 15,000-€ 30,000	€ 30,000	€ 3,000-€ 14,000	€ 0.02 / tCO_2	€ 0.002-€ 0.06 / tCO_2	€ 28,000
Registration	Registration fee used by EB to fund its regulatory activities.	€ 10,000		€ 1,000-€ 7,000		€ 0.004-€ 0.03 / tCO_2	€ 7,000
Monitoring	Cost of implementing monitoring methodology.	€ 10,000		n/a			
Verification	DOE's fee for verifying yearly project emissions claims.	€ 8,000 / yr		€ 3,000-€ 18,000			€ 6,000 / yr
Certification	Cost of EB certification of yearly crediting.	n/a		€ 1,000-€ 8,000			
Enforcement	Cost of ensuring contract performance.	n/a		€ 1,000-€ 8,000			
Transfer	Brokerage costs for credit transfer; fees/taxes levied by regulators to fund market oversight operations.	1%					
Registry	Fee for holding account in national registry.	0.03%					
Aggregation	Cost of pooling risky credits to create less risky credits.				€ 0.06 / tCO_2 ("ins. costs")		
Final Estimate		€ 1.22 / tCO_2		€ 0.60 / tCO_2	€ 0.56 per tCO_2	€ 0.02 - € 0.39 / tCO_2	€ 6 - € 16 / tCO_2
Data Notes		Costs tracked by public CDM investment fund interacting directly with projects as both consultant and final buyer, without the use of separate intermediation or aggregation services.			Survey responses by project developers, private sector consultants, and public sector funds.		Academic's estimates for one cook stove project.

[130] Michaelowa & Jotzo, *supra* note 122, at 512–14.
[131] *Id.*
[132] Ahonen & Hamekoski, *supra* note 122, at tbl.3.
[133] Antinori & Sathaye, *supra* note 127, at 31.
[134] KREY, *supra* note 128, at 84.
[135] Chadwick, *supra* note 129, at 266. The high value includes development of a new methodology; the low value does not.

All of these estimates are problematic for at least five reasons. First, the wide variation in the categories of transaction costs reported suggests that at least some of the studies leave out relevant categories. For example, several studies do not report the costs of Designated National Authority certification. All but one neglects to report any form of transaction cost related to the credit sale itself. Moreover, because all of the studies were conducted with projects that are not yet complete, none of them report figures that represent the actual costs of ongoing monitoring of emissions and verification of emissions reductions claims.

Second, there is reason to believe that no study quantifies the transaction costs of all the parties involved in the transaction. The Swedish data appears to report the costs borne by the offset purchasing fund itself, but not the costs borne by the projects from which they purchased the credits. Moreover, with the exception of the Chadwick study, all of the studies focus on projects that were actually submitted to the CDM, leaving out data from projects that considered submitting applications but were dissuaded from doing so by high transaction costs. From the perspective of a proposed project, this introduces a "survivorship bias"[136] into the data that likely skews the transaction costs estimates downward.

Third, all of the studies involve CDM projects submitted during the first few years of the mechanism's existence. This timing could bias the data in either direction. On the one hand, early transaction costs may be higher than they are currently because the organizations involved were spending extra time learning how to conduct their work and developing efficient processes. On the other hand, the earliest projects may have received discounts from consultants and intermediaries seeking to expand their market share.

Fourth, much of the otherwise most-reliable data — especially those reported in the Swedish and Finnish pilot studies — describe CDM transaction structures that are atypical of the market as a whole. The early government-run purchasing initiatives sought out projects on their own, helped the projects estimate expected emissions reductions and compile the other required documentation, bought the credits themselves, and assumed the risk of variable credit yields.[137] As described above, this work is more typically split between buyers and one or more different private-sector intermediaries.

Fifth, none of the studies make an effort to construct a sample composed of project types and sizes that are representative of the offsetting market as a whole. This problem is particularly important for the LBNL study, which is mostly composed of voluntary market offset projects rather than CDM projects. Forty-three percent of the projects in the LBNL data set are

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[136] *See generally* E.J. Elton et al., *Survivor Bias and Mutual Fund Performance*, 9 REV. FIN. STUD. 1097 (1996).

[137] *See* Carr & Rosembuj, *supra* note 112, at 117 (explaining how the early World Bank programs assumed more risk than later private-sector participants); *About World Bank Carbon Finance Unit (CFU)*, *supra* note 121 (explaining the World Bank fund's role in jump-starting the carbon markets).

forestry projects, despite the fact that forestry projects currently account for only a small fraction of total offsets.[138]

2. *Toward a Better Understanding of Transaction Costs*

What would a better measure of transaction costs look like? First, "transaction costs" must be defined with reference to the task at hand.[139] This Article compares the efficiency of mechanism-based offsetting to the efficiency of an alternative model.[140] Transaction costs should therefore be defined to encompass the total share of offset investment that goes toward effectuating the transfer of funding from the final compliance buyer to the project itself. All such costs should be included, irrespective of the party that pays and of whether the costs are pecuniary or non-pecuniary.

Second, the categories of costs that fall within the scope of this definition should be guided by the structure of the carbon offsets market. A good definition of transaction costs would map to the offsetting process itself, allowing us to see who incurs which costs at what point in the process.

Third, transaction cost categories should reflect a preference for observable costs — like fees specified in contracts and price spreads between primary and secondary credits — over costs that are non-observably internal to a firm or transaction. For example, the existing transaction cost studies estimate project costs by surveying project consultants to determine how much time and money consultants expend on each task. However, elementary economic reasoning suggests that, at the margin, the fee charged by a consultant will embody: all of the costs that the consultant incurs in performing her work on behalf of the project as well as her payments for taxes; payments on loans used to finance its operation; and the return on its equity. Because the question of interest here is the total cost of using the CDM system (as opposed to the distribution of that cost among various tasks internal to the market participants), these fees should be the basis of the estimate.[141]

3. *Quantifying the Efficiency Problem*

Table 2 applies these principles to the available data (summarized above in Table 1). The most convincing data (based on reasons explained in the footnotes to the Table 2) are selected and used to compile an imprecise

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[138] AMBROSI ET AL., *supra* note 2, at 54 (explaining that although credits produced by forestry projects are increasing, they still account for a small fraction of total carbon offset credits); *see also* UNEP RISØ CENTRE, *supra* note 2.

[139] *See* KREY, *supra* note 128, at 30 (defining transaction costs as the "costs of running an economic system").

[140] Other tasks require different definitions of transaction costs. For example, a study aimed at estimating the level of transaction costs at which a project of a given size becomes unviable, *see, e.g.*, Chadwick, *supra* note 129, at 266, may appropriately apply a definition of transaction costs that encompasses only costs borne by the project's developers.

[141] Additionally, direct observation of the fee is both easier and more reliable than reliance on survey data.

but broadly representative estimate of the importance of transaction costs in the carbon-offsetting market.

TABLE 2: AN APPROACH TO CATEGORIZING THE COSTS OF USING THE CDM

Item	Explanation & Measurement Technique	Estimate
Project developer's search, preliminary, and negotiation costs	All costs incurred by the project that are not reflected in fees paid. Typically, this category will include the cost of finding and interacting with project partners. If the project developer does not partner with other firms, the category will include the cost of in-house development of expertise and market-making work. Costs in this category will not show up in an explicit price, and must be estimated from the operations of the project developer.	€ 40,000[142]
Consultant's fee	This fee may include (1) the consultant's costs of finding, negotiating with, and interacting with the project; (2) the costs of estimating emissions reductions and preparing other project documentation; (3) the cost of interacting with the DNA and DOE, if that responsibility is allocated to the consultant; (4) any fees that the consultant takes responsibility for paying on behalf of the project; and (5) the consultant's profits, taxes, and debt service payments. This cost is observable in the contract price paid by the project to its consultant.	€ 75,000[143]
Regulatory fees paid by project	If the consultant does not assume contractual responsibility for paying fees to the DNA, DOE, and EB under its contract with the project, those fees are recorded in this category. They are observable in official fee schedules.	€ 72,500[144]
Other regulatory funding	To the extent that the offset regulator (e.g., the EB) is funded not only by user fees but also by other government funds, that funding covers regulatory costs that are part of the cost of maintaining the offset system. These costs are observable in records of funding transfers to the regulator.	0
Spread between seller and buyer prices	Like the consultant's fee, this price spread reflects the cost of performing intermediation and aggregation functions, as well as the profits of the firms that undertake those functions. This cost is observable as either a fee or price spread.	€ 3.00 / tCO_2[145]

[142] *See* Michaelowa & Jotzo, *supra* note 122 (using lower bound of negotiation costs and assuming that project's search and negotiation costs are equal to buyer's search and negotiation costs).

[143] *See id.*

[144] *See id.* (providing validation costs, registration costs, and DNA approval costs).

[145] CAPOOR & AMBROSI, *supra* note 109, at 33.

Item	Explanation & Measurement Technique	Estimate
Transfer fees	Brokerage registry fees, transaction costs, and other fees charged by regulators and not assumed by the intermediary as part of the price spread.	0[146]
Buyer's search, preliminary, and negotiation costs	All costs incurred by the compliance buyer in using the mechanism that are not reflected in the offset purchase price. Like the project's costs, these costs do not show up in a price, and require an inquiry into the operations of the buyer.	€ 40,000[147]
Total assuming a carbon offset price of € 10/tCO_2, a project size of 51,500 tCO_2/yr,[148] and a useful life of 7 years.[149]		€ 3.64/tCO_2
Percent of total offset funding dissipated in transaction costs		36%

The final estimate continues to suffer from some of the problems discussed in subsection 1 but does unearth some significant costs that are not evident in estimates reported above. Far and away the most important single cost category is the spread between the price paid by intermediaries and the price paid by the final compliance buyer — i.e. the cost of passing credit through the carbon market's financial intermediation and aggregation infrastructure. An Annex I offset buyer who wants a guaranteed stream of offset credits pays ten euros for the credit, and the non-Annex I offset sellers receive only seven euros.

Why is this cost so high? There are at least three possibilities. The most likely explanation is that it represents the market-determined award for the intermediaries' assumption of the risk of project default or lower-than-expected credit generation. This risk is transferred to the intermediaries from both credit buyers and credit sellers. As described above, credit buyers often prefer to buy guaranteed credits that insulate them from the risk of non-delivery.[150] Credit sellers could make these guarantees by writing them into their long-term credit offtake contracts, but they tend to prefer more flexible contract terms that insulate them from liability for underperformance.[151] The intermediary-aggregators solve this problem by standing between the two parties and writing each the contract they desire; the price spread is their reward.

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[146] All such fees are assumed to be paid out of the World Bank estimate for the price spread.

[147] *See* Michaelowa & Jotzo, *supra* note 122, at 513 tbl.1 (providing the most conservative estimate for the sum of search and negotiation costs).

[148] Based on the median project size across all projects in the CDM pipeline based on the "first year $ktCO_2$" column in the April, 2012 "CDM Pipeline" spreadsheet available from UNEP Risø Centre, *supra* note 2.

[149] CDM projects can receive credit for a ten-year non-renewable term or for a seven-year term renewable two times for a total of twenty-one years. U.N. Framework Convention on Climate Change, *Guidelines for Completing the Project Design Document (CDM-PDD) and the Proposed New Baseline and Monitoring Methodologies (CDM-NM),* 17–18, U.N. Doc. No. EB 41 Report Annex 12 v.7, *available at* http://cdm.unfccc.int/Reference/Guidclarif/pdd/PDD_guid04.pdf. The future credit stream represented by this figure has not been discounted.

[150] *See supra* notes 109–118.

[151] *See supra* notes 109–118.

A second possible reason is that some integrated consulting-intermediary firms (e.g., Ecosecurities) may charge low consulting fees and subsidize their consulting operations with the fees and price spreads they receive by purchasing credits from the projects they work on.[152] If so, the three-euro price spread reported by the World Bank may cover some consulting fees and regulatory fees as well as intermediation costs. However, it is not clear that this cost shifting should affect the bottom line estimate of total transaction costs. And even if we ignore all transaction costs except for the price spread, we are still left with an estimate of thirty percent transaction costs — well above most of the estimates reported in the previous literature.

A third, and more sinister, possibility is that the price spread reflects market failure within the intermediation industry. In other words, the industry could be compensating itself at a rate that goes beyond the true social value of its risk-bearing and market-making, just as Wall Street's critics allege that the money earned by the U.S. financial sector exceeds the value it provides to other sectors of the economy. Even if this line of criticism is true, however, the spread is still a cost of using the system. Buyers and sellers pay the intermediaries whether their payments are well-spent, matching and risk management services, or ill-spent, lining the pockets of clever financial engineers.

It may seem that the cost of mitigating risk should not be included in an estimate of the cost of using the CDM system. After all, not all compliance buyers purchase guaranteed offsets — some may choose to buy relatively risky "primary" offset credits. Similarly, not all project developers are unwilling to bear approval and emissions reductions risks themselves. Some projects write emissions reductions purchase agreements with guarantee clauses,[153] and others do not sell their credits forward at all.[154] However, the risk that the project accepts is merely a non-pecuniary cost that should be quantified in the estimation of the total cost of using the CDM system. Those buyers and projects that choose to tolerate higher risk in exchange for a more attractive pecuniary price are hiding this cost, not eliminating it.

4. *The Implications of Transaction Costs for Offsetting*

The most obvious implication of high transaction costs is their potential to increase the cost of meeting the cap-and-trade system's cap. As Professor Robert N. Stavins demonstrates formally in *Transaction Costs and Tradeable Permits*, transaction costs both increase the price of offsetting and decrease the number of offsets demanded.[155] Both of these effects increase the cost of

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[152] *See supra* notes 120–121 (describing how some carbon market participants provide both consulting and intermediation services).

[153] *See* CAPOOR & AMBROSI, *supra* note 109, at 34.

[154] MICHAELOWA & PUROHIT, *supra* note 12, at 4 (stating that Indian project developers typically take the additionality or barrier approach).

[155] *See* Robert N. Stavins, *Transaction Costs and Tradeable Permits*, 29 J. ENVTL. ECON. & MGMT. 133 (1995). Stavins's analysis focuses on allowances, not offsets, but his prelimi-

compliance with a given emissions target and decrease the flow of investment to offset providers. The price effect does so directly by making offsets more expensive to sell and purchase. The quantity effect does so indirectly by inspiring firms to substitute relatively expensive allowances or direct reductions for the offsets that they would use otherwise.

High transaction costs may also affect the distribution of projects. Specifically, transaction costs may partially explain the CDM's poor performance against its goal of incentivizing sustainable development.[156] Because the high fixed transaction costs make it harder for small projects to cover those costs while still yielding an attractive return, they tend to bias CDM investment toward large projects.[157] This bias may be why decentralized projects like rural cook stoves have been so uncommon, even though credits derived from such projects attract premium prices.[158]

D. Environmental Criticism of the CDM

What kinds of outcomes are "purchased" with the thirty-six percent of offset buyers' funding that goes toward offset certification and marketing? Unfortunately, there is considerable evidence that the environmental "quality" of the offsets transacted through the CDM is highly suspect. Environmental criticism of the CDM has focused primarily on two problems: the HFC-23 problem and the additionality problem.

1. *The HFC-23 Problem*

HFC-23 gas is a byproduct of the manufacture of HCFC-22, a refrigerant.[159] The CDM offset awards take into account the fact that a ton of HFC-23 has 11,700 times the global warming impact of a ton of CO_2, but fail to take into account that the cost of eliminating one ton of HFC-23 is not

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nary conclusions are generalizable to offsets. *See also* Juan-Pablo Montero, *Marketable Pollution Permits with Uncertainty and Transaction Costs,* 20 RESOURCE & ENERGY ECON. 27, 27 (1997); G. Cornelis van Kooten, Sabina Lee Shaikh, & Pavel Suchánek, *Mitigating Climate Change by Planting Trees: The Transaction Costs Trap* 78 LAND ECON. 559, 559 (2002) (concluding that transaction costs may "increase the costs of afforestation [offset] projects beyond what conventional economic analysis suggests").

[156] *See* McNish et al., *supra* note 12, at 5466–67; *see also* Chadwick, *supra* note 129, at 265–76 (noting that transaction costs made a cook stove project in Africa unattractive unless the CER price was over approximately fifteen euros).

[157] Chadwick, *supra* note 129, at 267.

[158] U.N. Framework Convention on Climate Change, Nov. 29–Dec. 10, 2010, *Annual Report of the Executive Board of the Clean Development Mechanism to the Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol*, 5, U.N. Doc. No. FCCC/KP/CMP/2010/10 (Nov. 3, 2010), *available at* http://unfccc.int/resource/docs/2010/cmp6/eng/10.pdf [hereinafter Executive Board's 2010 Annual Report] (listing "regional and subregional distribution" as a "challenge" for the CDM); CAPOOR & AMBROSI, *supra* note 114, at 44 (noting that projects considered especially "green" or with collateral social benefits attract premium prices).

[159] *See* Wara, *supra* note 1, at 1781–82.

11,700 times more than the cost of eliminating a ton of CO_2.[160] As a result, HFC-23 projects became the most sought-after products in the CDM marketplace, and their owners received windfall profits.[161] Critics pointed out that from the perspective of the international community, these windfalls were a waste of money: HFC-23 destruction that could have been achieved for about $31 million per year by directly paying HCFC-22 producers to install HFC-23 destruction equipment was contracted through the CDM at a cost of $800 million per year.[162]

2. *The Additionality Problem*

As the supply of HFC-23 projects was exhausted and CDM regulators made rules to limit the further expansion of the project class, criticism turned to the more intractable problem of estimating counterfactual baselines for the purpose of showing additionality. As discussed above, the CDM allows some projects to show additionality by citing "barriers" that the project faces, as opposed to actually demonstrating its financial marginality. However, a quantitative study showed that only twenty-nine percent of the small projects that use the barriers analysis go on to explain how the CDM helps address the barriers cited or why the barriers would have precluded the implementation of the project but for the CDM.[163] The other seventy-one percent merely allude to barriers without showing how those barriers make the project financially marginal. As a conceptual matter, it is difficult to see how this evidence allows regulators to separate additional from non-additional projects.

There are also concerns about the CDM's application of the investment analysis. Many projects that apply the investment analysis claim relatively small increases in the economic attractiveness of the project. A wind project in India successfully argued that it had demonstrated additionality with an increase in project internal rate of return from 7.36% without CDM funding to 7.87% with CDM funding.[164] In addition, applicants routinely ignore the additionality tools' requirement that they compare profitability estimates to a "hurdle" or "benchmark" rate.[165] Where they do make such a comparison, the hurdle rates vary widely, raising doubts about whether applicants are accurately indentifying a reasonable rate rather than setting the hurdle in a way that makes a project additional.[166]

This weak project-by-project additionality review has led to results that are absurd in the aggregate. Barbara Haya finds that thirty-five percent of all large hydro projects certified by the CDM as additional were completed

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[160] *Id.* at 1782–85.
[161] *Id.*
[162] Bradsher, *supra* note 13.
[163] SCHNEIDER, *supra* note 14, at 33.
[164] *Id.* at 35.
[165] *Id.* at 36.
[166] *Id.* ("Among the analysed projects, the required internal rate of return [stated by the project] of the project ranges from 4% to 22%.").

before registration with the CDM.[167] Ninety-six percent of all projects were expected to be completed within two years, meaning that the project's additionality arguments rely on what Haya refers to as the "Alice in Wonderland" assumption that the large dam investments would be abandoned unfinished but for the CDM.[168] Similarly, Wara and Victor note that substantially all new non-coal electricity generation capacity in China receives CDM funding.[169] This pattern implies that but for the CDM there would be no investment in natural gas or renewables, despite the Chinese government's stated policy of increasing such investment.

Not surprisingly, therefore, the authors who have attempted to quantify the total effect of these additionality decisions have concluded that a large fraction of CDM additionality determinations are likely erroneous. Based on a 2006 study of fifty-two Indian projects, Axel Michaelowa and Pallav Purohit estimated that few projects were making satisfactory arguments for additionality.[170] Based on a 2007 analysis of ninety-three projects, Lambert Schneider estimated that forty percent of projects are non-additional, though he notes that because of the smaller-than-average size of these projects, they account for only twenty percent of total emissions reductions claimed by the CDM.[171] Based on a 2005 sample of nineteen projects, Christopher Sutter and Juan Carlos Parreño give eleven out of sixteen analyzed projects a "C" rating for additionality, corresponding to a judgment that there was a "low probability" of being additional.[172]

Given that approximately 1.2 billion tCO_2 of emissions reductions are expected to be processed via the CDM between 2008 and 2012, a false positive rate of one in three would amount to 400 million non-additional tons of CO_2.[173] This amount is about three percent of 1990 emissions by the parties that agreed to Kyoto targets, meaning that even if Kyoto's cap-and-trade system nominally achieves its goal of cutting emissions to five percent below 1990 levels, it will actually have cut emissions to only two percent below Kyoto levels. If the U.S. system relies as heavily on offsets as EPA currently predicts, the additionality problem is likely to be even bigger.

Nor does there appear to be relief on the horizon. There is a fundamental trade-off between effective evaluation procedures and administrative efficiency, and to date the efficiency goals have been ascendant. For example, after the CDM denied ten Chinese windmill projects as non-additional in

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[167] HAYA, *supra* note 14, at 6.

[168] *Id.* at 3, 6.

[169] Wara & Victor, *supra* note 6, at 13–14.

[170] Michaelowa & Purohit, *supra* note 12, at 1.

[171] SCHNEIDER, *supra* note 14, at 9. The forty percent figure is for projects whose additionality is "unlikely or questionable." *Id.*

[172] Sutter & Parreño, *supra* note 12, at 84. There is also evidence that CDM participants themselves doubt the additionality of projects. In a recent survey, seventy-one percent of surveyed participants agreed that "many CDM projects would also be implemented without registration under the CDM." SCHNEIDER, *supra* note 14, at 9. Eighty-six percent agreed that "in many cases, carbon revenues are the icing on the cake, but are not decisive for the investment decision." *Id.*

[173] *See* AMBROSI ET AL., *supra* note 2, at 62–63.

2009, the International Emissions Trading Association lobbied for more transparency and relief from administrative bottlenecks.[174] At the December 2009 Copenhagen meeting, the parties to the Kyoto Protocol issued a document entitled "Further Guidance Relating to the Clean Development Mechanism."[175] The Guidance exhorted the EB to expand the availability of streamlined methodologies and improve the efficiency of its procedures, but did not include any specific agreements about addressing the additionality problem or improving environmental outcomes.[176] In fact, the Guidance instructed the EB to implement an appeals procedure for rejected projects, a development that may dissuade the EB from further tightening its additionality standards.[177] The 2010 Cancun meeting issued a statement that, "work is progressing on the development of a tool that will facilitate the more objective determination of additionality, the matter of which remains the single biggest cause of projects going under review and being rejected."[178] However, it is not clear that objectivity or transparency will actually improve additionality determinations, let alone that a new "tool" can achieve better environmental decisions without running afoul of the CDM's efficiency mandate.

More fundamentally, some CDM critics doubt that any reform has the power to solve the additionality problem, irrespective of efficiency considerations. These critics point out that the problem with additionality is that it makes necessary something that is impossible — namely, observation of what emissions would be in a counterfactual world without the CDM incentive.[179]

III. Tracing Offsetting's Problems to Market Structure

Having completed the heavy lifting of describing the present day reality of the offsetting industry in Part II, this Article now turns to the task of introducing a methodology for understanding and evaluating that industry: the New Institutional Economics ("NIE"). NIE is a mainstream,[180] but not widely known, school of economic thought whose concern with transaction costs sharply distinguishes it from the market romantic perspective summarized in Part I. Application of NIE principles, this Part argues, suggests that

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[174] *See* David Fogarty, *Copenhagen Talks Must Mandate CDM Reform: IETA*, Reuters, Dec. 4, 2009, *available at* http://www.reuters.com/article/2009/12/04/us-carbon-copenhagen-reform-idUSTRE5B318J20091204.

[175] Copenhagen Guidance, *supra* note 100.

[176] *Id.* at 4.

[177] *Id.* at 8 ¶ 42; James Murray, *Copenhagen Green Lights Plan to Streamline CDM*, Bus. Green (Dec. 23, 2009), http://www.businessgreen.com/bg/news/1804422/copenhagen-green-lights-plan-streamline-cdm.

[178] Executive Board's 2010 Annual Report, *supra* note 158, at 7 ¶ 18.

[179] Bullock et al., *supra* note 14, at 5.

[180] NIE's most famous champion, Professor Oliver Williamson, won the Nobel Prize in 2009. Justin Lahart, *Nobel Looks Outside Markets*, Wall S. J., October 13, 2009, at A3, *available at* http://online.wsj.com/article/SB125534373296580027.html.

the problems with offsetting are endemic to policymakers' decision to incentivize investment with tradable property rights.

A. The New Institutional Economics

The formal study of why different methods of economization flourish in different contexts begins with Coase's *other* famous paper: *The Nature of the Firm*.[181] In this paper, Coase observed that the distinguishing mark of the firm is "the supersession of the price mechanism" by management.[182] Given Smith's insights about the special nature of market transactions, Coase wondered why firms were so prevalent.[183] Why do managers *plan* strategy, inventory, supply chain movements, and the like subject to *commands* from superiors? Would not individual merchants interacting in a free market outperform a managed firm?

Coase answered this question the same way he explained the need for government intervention in *The Problem of Social Cost*, by focusing on transaction costs. "The main reason why it is profitable to establish a firm," he said, "would seem to be that there is a cost of using the price mechanism."[184] To take just a few examples, there is the cost of finding a party to transact with, the cost of finding a fair price, the cost of formalizing the arrangement, the cost of enforcing the agreement, and so on. Where these costs trump the Smithian benefits of market organization, economic actors in the labor market will choose to avoid them by accepting work as employees rather than independent contractors, and firm organization will "supersede" market organization in the product market.

The NIE movement seeks to formalize and operationalize Coase's insights.[185] Contributions to the school have been diverse, and many funda-

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[181] Of course, Coase had many predecessors, one of whom was Adam Smith himself. *See* SMITH, *supra* note 19, at 19. Economic historians have also taken a great interest in the phenomenon of firms. ALFRED D. CHANDLER, THE VISIBLE HAND: THE MANAGERIAL REVOLUTION IN AMERICAN BUSINESS 11–12 (1977) (arguing that economic growth in the United States has been driven by the replacement of a market-dominated small-business economy by a management-dominated big-business economy); CRONON, *supra* note 57, at 104–10, 334–36 (describing the efficiencies that accompanied the replacement of small merchants trading on market price spreads with managed enterprises like Montgomery Ward). Paul Krugman has suggested that economists ignored these insights until recently because they had learned to mathematically model competition but had not yet learned to model the increasing returns to integration of economic activity within a firm. DAVID WARSCH, KNOWLEDGE AND THE WEALTH OF NATIONS 58–60 (2006).

[182] Ronald H. Coase, *The Nature of the Firm (1937)*, *in* THE NATURE OF THE FIRM: ORIGINS, EVOLUTION, AND DEVELOPMENT 18, 19–20 (Oliver E. Williamson & Sidney G. Winter eds., 1993). For a summary of more recent contributions to the theory of the firm, see Nicolai J. Foss, *The Theory of the Firm: An Introduction to Themes and Contributions*, *in* THE THEORY OF THE FIRM: CRITICAL PERSPECTIVES ON BUSINESS AND MANAGEMENT xv, xxx (Nicolai J. Foss ed., 2000).

[183] Coase, *supra* note 182, at 19–20.

[184] *Id.* at 21.

[185] OLIVER E. WILLIAMSON, THE ECONOMIC INSTITUTIONS OF CAPITALISM 16–18 (1985).

mental questions are still debated; however, it is possible to articulate several NIE concepts that are particularly relevant to this Article.

First, the NIE counsels attention to microstructure.[186] When classical economists look at an industry, they see a number of competing production functions — "black boxes" that take in inputs and produce outputs at varying levels of efficiency.[187] NIE economists are more curious about what happens inside the black boxes and about how contractual relationships link one black box to another. Because they take Coase's insight about transaction costs to heart, NIE economists recognize that much of the economization in our society is accomplished through the "visible hands" that architect efficient institutions and relationships, rather than by the discipline of the market's invisible hand.[188]

Second, the NIE has popularized the assumption of "incomplete" contracting.[189] Traditional perfect-competition economic models assume that rational actors will write contracts that can cover all possible future states of the world, leaving no risk un-allocated. NIE models make a more realistic assumption, positing that the ability to express rationality in the contracting realm is bounded by the cost of obtaining relevant information and the cost of negotiating and writing contracts.[190]

Third, the NIE has articulated the importance of adaptive decision-making.[191] A corollary of incomplete contracting is that any contractual arrangement will leave residual uncertainty about future events. Therefore, economic agents must often make adaptive decisions in response to unforeseen events in addition to the ex ante decisions. This task often — but not always — favors integration over market competition.[192] All else being equal, the value of adaptive decision-making will be greater where uncertainty is greater. It will also be greater when parties make partner- or location-specific investments that subject them to a "hold up game." For example, if a coal-fired power plant is built near a contractual partner's coal mine, both parties have transaction-specific investments that make the spot market an inadequate means of coordinating their activity.

Fourth, the NIE makes extensive use of the concept of the principal-agent problem.[193] The principal-agent problem is the formal name for the difficulty of motivating someone to work for another person. Under the stylized assumptions of neoclassical economics, one can usually ignore this problem. Information and transactions are free, so omniscient managers will effectively supervise their employees, and fire and replace them when they misbehave. But in an NIE world of incomplete contracting and substantial

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[186] *Id.* at 15–16.
[187] *Id.* at 18–19.
[188] *Id.* at 15–16.
[189] *See* Foss, *supra* note 182, at xxxviii–xxxix.
[190] *See id.* at xxxix–xl.
[191] *Id.* at xxxviii.
[192] *Id*.
[193] This concept is more widely employed than the other concepts discussed in this section and plays a large role in both NIE and non-NIE work. *Id.* at xxxvi.

transaction costs, it is impossible for the principal to perfectly evaluate the agent's work. Therefore, the agent will always be able to find a way to shirk work or to pursue her own interests rather than those of her principal. Adaptive decision-making and incomplete contracting are economies to integration, but the principal-agent problem cuts the opposite way — it is a diseconomy to integration.

Fifth, application of an NIE approach to the decision between a public bureaucracy and a privatized bureaucracy has led Professor Oliver Williamson to identify a value for "probity."[194] Williamson uses this word as a catchall for values like loyalty to principals, loyalty to consumers or constituents, and external transparency. Economic actors who value probity, he says, typically turn to organizational forms with some or all of the hallmarks of a public bureaucracy: formalized, rule-oriented management, a compensation and tenure system that rewards loyalty over hard work or creativity, and social conditioning that brings an agent's preferences in line with those of her organization.[195]

NIE assumes that the economies and diseconomies implied by these principles will be important to varying degrees in different industries and transactions.[196] It suggests that their relative importance in a given industry or transaction can predict the most efficient combination of firms, market transactions, and contractual relationships:

> As among market, hybrid, and hierarchy, the market mode supports autonomy by combining high-powered incentives with little administrative control and a legalistic dispute settling mechanism; hierarchy supports (internal) cooperation by combining low-powered incentives, extensive administrative control, and resolving most disputes within the firm . . . and hybrid contracting is located between the market and hierarchy in all three respects.[197]

In other words, where the disadvantages of weak incentives (i.e., the principal-agent problem) dominate the flexibility and dispute-resolution advantages of hierarchical control, the market mode of organization is preferred. Where hazards like unforeseen events or the need for cooperation make adaptive management critical, the firm mode of organization is preferred.[198] And where some level of hazard or cooperation is present, but participants still wish to use market incentives to discipline each other, the participants may craft a "hybrid" contractual arrangement.[199] A contractual arrangement does not raise the specter of the principal-agent problem, but it does allow for parties to behave opportunistically: once one party has made a relation-

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[194] Oliver E. Williamson, *Public and Private Bureaucracies: A Transaction Cost Economics Perspective*, 15 J.L. ECON. & ORG. 306, 322 (1999).
[195] *See id.* at 322–23.
[196] *See id.* at 312–13.
[197] *Id.* at 313.
[198] *Id.* at 313–14.
[199] *Id.*

ship-specific investment, the other party may be able to slack off on its own performance because it knows the other party cannot easily abandon the project (and because suing under the project is itself costly).[200]

Where the analysis above suggests that bureaucratic control will outperform market incentives, economic actors face another choice: a public bureaucracy or a private one. For Williamson, the institutional features of public bureaucracy — for example, civil service protections and the use of formal rules to govern bureaucratic work — make it like private bureaucracy, but more so.[201] Even more than private sector management, Williamson says, public management has the potential to organize activity rationally.[202] At the same time, public management threatens to weaken even more drastically the incentives to work efficiently.[203] Therefore, public management is likely to be preferred only where probity is in high demand, as Williamson concludes it clearly is, at the very least, for core governmental functions such as "foreign affairs transactions."[204]

The NIE framework challenges the Hayek-Efficient Market Hypothesis-Public Choice perspective referred to as market romanticism in Part I. The market romantic view tends to assume that markets (a term it tends to use loosely) are inherently more efficient than managed systems. NIE recognizes that actual spot markets are at best uncommon, and that much of the economization often carelessly attributed to market discipline is actually the product of contractual arrangements and managerial organization.[205] As one economist memorably put it, if a Martian unfamiliar with Earth's intellectual history were asked to describe our economic landscape, the Martian would describe the internal management activities of firms as the most prominent feature, noticing occasional competition only at the boundaries between firms.[206] NIE also suggests that the relative prevalence of management and hybrid arrangements is a good thing — indeed, in many circumstances, they outperform markets.[207]

The next three sections apply the NIE framework to the carbon market, using it to help judge the existing structure's performance on three dimensions: efficiency,[208] risk management, and environmental quality.

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[200] *See id.*

[201] *See id.* at 314, 336.

[202] *Id.* at 336.

[203] *See id.*

[204] *Id.* at 337–38, 340.

[205] *See* JOHN MCMILLAN, REINVENTING THE BAZAAR: A NATURAL HISTORY OF MARKETS 168 (2002).

[206] *Id.*

[207] *See* Williamson, *supra* note 194 at 313–15.

[208] Broadly defined, "efficiency" refers to the cost of achieving a given outcome. Here, the outcome achieved could of course encompass both a certain level of risk mitigation and a certain level of environmental quality. To more clearly distinguish the goal of risk mitigation from the goal of cost reduction, however, I use "efficiency" to refer to the average or expected cost of achieving a given environmental outcome, irrespective of the risk of variation in that cost. This can be thought of as the "nominal" cost of running the system.

B. Market Structure and Cost Inefficiency

The architects of the CDM built what they thought of as a market-based system for encouraging investment in clean infrastructure in countries that otherwise would not participate in the CDM.[209] Participants in this system are guided by market incentives. Carbon offset buyers must search out the cheapest carbon offsets, for if they do not, they will be less profitable than their savvier competitors. Similarly, project developers must work efficiently, for if they do not, buyers will purchase cheaper offsets elsewhere. Accordingly, money flows to the clean development projects that provide the most emissions reductions per euro of investment. The invisible hand of market prices guides the whole system, minimizing the principal-agent inefficiencies that might plague a system in which investments were made by a centralized public bureaucracy.

But by looking at the system's microstructure, it is possible to see that existence of positive transaction costs and incomplete contracting complicates the picture. Building, for example, a windmill is a task that already requires substantial planning and cooperation among different entities — the project developer has to secure a site, line up financing, obtain government approvals, hire an engineering firm, and so on. Carbon offsetting adds another series of transactions to the project developer's plate by requiring it to certify its project through the CDM. And even if these transactions are successful, the project developer still does not get money, but rather emissions permits, for which it has no use. Accordingly, the developer must find a way to get these credits to market. Doing so requires another series of costly transactions.

The system exacerbates these pecuniary transaction costs by requiring the project developer to accept risk.[210] Application of a baseline measurement methodology to the project can be more costly or less costly than expected. Regulators can reject the project. Even if regulators approve the application, problems with the underlying physical project might prevent it from ever receiving credits. The price of carbon might fall or rise. Under pressure from environmental critics, regulators could cease issuing credits to certain classes of questionable products. The international agreement that gives offsets their value could collapse. Any one of these events could leave a project developer facing much larger costs than expected or holding carbon offsets much less valuable than expected.

Together, these transaction costs and risks make it unattractive for a project developer to invest in a plan that will generate offsets, and unattractive for capped entities to plan to meet their compliance needs with offsets instead of allowances. If left unaddressed, these problems might be serious

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[209] *See supra* Part I.E.

[210] CAPOOR & AMBROSI, *supra* note 109, at 59; CAPOOR & AMBROSI, *supra* note 112, at 34; Carr & Rosenbuj, *supra* note 112, at 117-19.

enough to dissuade most would-be developers and buyers from participating in the carbon offset market.

To some extent, however, carbon market participants have succeeded in managing these transaction costs and risks by "superseding" the market with other economic arrangements,[211] just as the NIE predicts.[212] For example, participants structure offset sales through long-term forward contracts, rather than spot market transactions.[213] The relationship-specific investments of such cooperative arrangements allow participants to slacken somewhat their efficiency by making it likely that they will be able to complete the transaction even if they perform imperfectly.[214] But the participants are willing to pay this price to insulate themselves from the paralyzing risks a pure spot-market structure would require them to bear.[215]

Similarly, consultant-intermediaries like Ecosecurities supersede the need to transact with multiple entities by seeing a project through from initial project design all the way to aggregation into a pool of other projects.[216] Bringing these tasks under bureaucratic management may create principal-agent inefficiencies, but these diseconomies are presumably outweighed by the benefits of adaptive management.[217] For example, integration may allow the consultant-intermediary to economize on the acquisition of information about the project, and to thereby reduce the uncertainty that is inherent in making investments in a world of incomplete contracting.

In sum, therefore, the NIE helps to explain two things about the carbon market. The first is a small irony about its structure: carbon offsetting was organized around market logic, but given the transactions and risk involved, it is unlikely that carbon offsetting could be effectively organized as a pure spot market. The CDM architects succeeded in creating a system governed, in a broad sense, by the invisible hand of market prices, but the visible hand of firm-managed activities and long-term contractual arrangements are required to make the market run.

Second, the cost inefficiency described in Part II.C is closely related to the CDM architects' attempt to create a market-based system and the strategies carbon markets participants have devised to make that system work. The lion's share of the thirty-six percent of clean development funding that goes toward making the system run gets spent on the transactions required to transfer CERs and risk among parties.

The foregoing applies NIE principles positively, to describe why the carbon offset industry looks the way it does given the institutional parameters of the present-day system. NIE principles can also be applied normatively to explore whether, on the one hand, the present-day microeconomic

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[211] *See supra* Part II.B.
[212] *See supra* Part III.A.
[213] *See supra* Part II.B.
[214] *See* Williamson, *supra* note 194, at 314.
[215] *Id.*
[216] *See supra* Part II.B.
[217] Williamson, *supra* note 194, at 313–14.

structure is optimal, or whether, on the other hand, the institutional design of the CDM has led to an inefficient industrial structure. Is it worth paying what Coase called the "cost of using the price mechanism"[218] to obtain the benefits of the invisible hand? Or would it be better to pay the price of principal-agent inefficiencies to obtain the benefits of using the visible hand of rational management to decide in which projects to invest?

Even armed with insights from the NIE, answering this question theoretically is impossible, for the NIE ultimately bears out what is perhaps the most fundamental economic precept of all: there is no such thing as a free lunch. The choice of economic arrangement is ultimately a choice among imperfect solutions to the problem of economic organization, with each solution having its downsides. The free market can always be used to discipline the work of the various actors, but it comes at the price of high transaction costs. Alternatively, use of the institution of a firm or contract to economize on some transactions weakens incentives and confronts the principal-agent problem. An alternatively managed investment program, for example, might spend more than thirty-six percent of its funding on an inefficient workforce of investment managers. Accordingly, while it is erroneous to make the market romantic assumption that the present-day system is more efficient than the alternatives merely because it is "market"-based, it is equally erroneous to assume that a managed system would be more efficient.

The most this Article can achieve, therefore, is to flag the connection between the observed transaction costs and the market-inspired microeconomic shape of the present system, and to describe how an alternative system might work, in hopes of facilitating a side-by-side reckoning of the cost advantages and disadvantages. The latter task is addressed in Part IV.

C. Market Structure and Environmentally Unsound Offsets

As suggested in Part II, the main reason for the CDM's environmental inadequacies is probably the difficulties inherent to the measurement of counterfactual "business as usual" baselines, not transaction costs. However, there is reason to believe that high transaction costs and the market structure that has emerged to make property rights-based offsetting possible exacerbate this problem. And as for the efficiency and risk problems, the transactions-cost focused work of the NIE can help elucidate these features.

Specifically, what Williamson calls the "hazard of probity"[219] is dangerous in offset markets, much more so than it is in allowance markets. Government uses law to ensure that every allowance it issues is by definition environmentally sound; once allowances are on the market, there is no dan-

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[218] Coase, *supra* note 182, at 21.
[219] Williamson, *supra* note 194, at 322.

ger that they might represent a fraudulent reduction.[220] Carbon offset transactions are different. For one thing, government itself cannot directly ensure that the offsets are environmentally sound; it can only oversee the claims of project developers. Therefore, it is possible that an offset certified by regulators is later revealed to be fraudulent or based on flawed measurement methodologies. Furthermore, most offset transactions, unlike allowance transactions, deal in speculative or inchoate assets. Offsets are sold forward before they come into existence, some before project approval, and many others after project approval but before the yearly verification of actual emissions reductions and issuance of credit.[221]

In real markets, we typically do not worry about the quality and riskiness of goods that are bought and sold, because we believe that the buyer has an incentive not only to demand a low price but also to ensure the quality of the goods. Caveat emptor, we say. But again, offset markets are different. Neither the buyer, nor the seller, nor the consultants and intermediaries have an incentive to look out for the environmental "quality" of the carbon asset. The buyer wants only the right to emit CO_2; if the project developer can get the project past regulators, it is not in the buyer's interest to scrutinize the project.

Therefore, the structural characteristics of the carbon offsets market force regulators to accept all of the responsibility for maintaining the offsets' integrity. In allowance trading, the public sector can restrict itself to a "night watchman" role: it need only prosecute fraud, take care that powerful players do not manipulate the market, and help resolve contractual disputes. Indeed, the opportunity for the state is precisely what Coase's market romantic readers found so intriguing about the idea of allowance trading in the first place. But in offsetting the public sector must do more. At a minimum, it must specify the methodologies by which emissions reductions are to be measured, set rules for the demonstration of additionality, and ultimately make a yes or no decision on each project.

Given the importance of the public sector role, two aspects of the CDM are surprising. First, because the "probity" of offset regulators is all that stands between the integrity of the cap-and-trade system and the certification of massive quantities of bogus emissions reductions, Williamson's framework would tend to suggest a public bureaucracy, yet the CDM decided to "outsource" much of the regulation process to DOEs.[222] The largely private-sector DOEs — not the CDM EB itself — have primary responsibility for the examination of projects' emissions reductions claims.[223] Upon a positive recommendation by a DOE, EB approval is automatic by default; only if the EB "requests review" can it override a DOE's decision.[224] Even more strik-

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[220] *See*, *e.g.*, Kyoto Protocol, *supra* note 6, at art. 3 §§ 6–13 (setting out the basic parameters of emissions trading under the Kyoto Protocol).

[221] U.N. DEVELOPMENT PROGRAM, *supra* note 115.

[222] *See generally* HAMILTON ET AL., *supra* note 92.

[223] *Id.*

[224] *Id.*; *see also* CAPOOR & AMBROSI, *supra* note 158, at 46.

ingly, the DOEs are not paid by the EB for their regulatory services, but by the projects whose applications they review.[225] In a competitive market where several DOEs are competing for market share, the entities have a clear interest in giving deference to project claims and thereby acquiring a reputation for being "easy" regulators.

Second, the CDM's decision to limit regulators' role to passive review of documents created by project developers, as opposed to more active participation in the certification process, is questionable. For one thing, regulator's project-by-project perspective can lead to results that are reasonable on the individual level but nonsensical in the aggregate. As Wara and Victor point out, it is plausible that any given Chinese non-coal power plant is additional, but it is not plausible that *every* new non-coal power plant is.[226] Yet the CDM has awarded funding to virtually all new non-coal capacity in China.[227]

A related problem with the public sector's current role is that it is difficult for funding to find its way to "programmatic" activity such as changes to major environmental laws or efforts to speed the diffusion of clean technologies like cook stoves in rural areas. In many cases, such transactions would be most effectively achieved by direct negotiation with foreign governments. But given the CDM's structure, no public sector body is competent to conduct these negotiations itself. It must instead promulgate a rule authorizing private funders to fund a given activity, and then review the results of each proposed "programmatic" investment — a process that leads to serious concerns about the additionality of the proposed programs. It should not be surprising, therefore, that the rollout of "programmatic CDM" has been much delayed.[228]

Similarly, the passive regulatory model also limits regulators' ability to respond to unexpected outcomes of system design flaws. The HFC-23 projects are a case in point. There was a pervasive sense among offset market observers that credit buyers had paid too much for HFC-23-derived credits, and should have maximized emissions reductions by diverting some of their funds to other project classes.[229] But the developers had complied with CDM rules, and the sale portion of the transaction was beyond the reach of regulators, so the passive EB had no choice but approve the transactions.

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[225] LAMBERT SCHNEIDER & LENNART MOHR, INST. FOR APPLIED ECOLOGY, A RATING OF DESIGNATED OPERATIONAL ENTITIES (DOEs) ACCREDITED UNDER THE CLEAN DEVELOPMENT MECHANISM (CDM) 6 (2009), *available at* http://www.oeko.de/oekodoc/902/2009-020-en.pdf.

[226] Wara & Victor, *supra* note 6, at 13–14.

[227] *Id.*

[228] *Editorial*, CDM INVESTMENT NEWSL. (BEA Int'l. & Climate Bus. Network), Feb. 2007, at 2–3, *available at* http://www.climatebusiness.net/newsletter_17.pdf (complaining of delay in development of programmatic CDM); *see also* CAPOOR & AMBROSI 2009, *supra* note 158, at 48 (noting that as of 2009 work still remained on development of programmatic CDM).

[229] *See, e.g.*, Bradsher, *supra* note 13; Wara, *supra* note 1, at 1788.

D. Market Structure and Catastrophic Risk, with an Extended Analogy to the 2008 Collapse of the U.S. Securitized Mortgage Lending Market

The structure of the current carbon market also may be a suboptimal on another dimension: risk. The similarities between the structure of the emerging carbon market and that of the mortgage lending market that collapsed in 2007 are striking. This section fleshes out this analogy and argues that the similarities between the two structures should lead us to wonder whether the thirty-six percent of offset funds that goes to carbon market transactions is adequately protecting investors and project developers from the risk of market manipulation, speculative excesses, and other shocks.[230]

Decades ago, the U.S. home lending system was dominated by local banks. The banks made loans secured by a lien on the home, and bore the risk that the homeowner would default. They therefore supervised their loans assiduously, refusing to extend credit to would-be homebuyers that they considered too risky, closely watching economic climate trends, and tracking the value of the homes that were the security on their loans. Then the U.S. government and the financial sector innovated.[231] The mortgage markets learned to take a stream of future payments on a traditional mortgage, bundle them into a trust along with a number of other mortgage payment streams, and issue a security (a species of property right) backed by the trust.[232] This risk-pooling and securitization process allowed the financial sector to offer fixed income securities that supplemented the supply of bonds, which were becoming scarce in relation to demand, both because of rising savings from the newly wealthy in some areas of the developing world and because the U.S. government was running a budget surplus and was therefore no longer a net borrower.[233] These new mortgage-backed securities allowed an unprecedented amount of money to flow from worldwide investors into U.S. housing markets.[234]

The replacement of the old contract-based mortgage lending regime with the new securitized, tradable property-based regime relied on the as-

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[230] CHAN, *supra* note 14, is a pioneering effort to think through the nature of these risks.

[231] Viral V. Archaya & Matthew Richardson, *How Securitization Concentrated Risk in the Financial Sector*, *in* WHAT CAUSED THE FINANCIAL CRISIS 183–88 (Jeffrey Friedman ed., 2011) (explaining some pernicious consequences of securitization); Christopher L. Foote & Paul S. Willen, *The Subprime Mortgage Crisis*, in THE NEW PALGRAVE DICTIONARY OF ECONOMICS ONLINE EDITION (2011), *available at* http://www.dictionaryofeconomics.com/article?id=pde2011_S000547. For a tongue-in-cheek but thought-provoking theory of the financial crisis, see Calvin Trillin's suggestion that all of the problems can be traced to the fact that "smart guys had started working on Wall Street," thereby creating a highly profitable innovations that ended up being too clever by half. Calvin Trillin, Op-Ed., *Wall Street Smarts*, N.Y. TIMES, Oct. 13, 2009, *available at* http://www.nytimes.com/2009/10/14/opinion/14trillin.html.

[232] Archaya & Richardson, *supra* note 221 at 183–88; Foote & Willen, *supra* note 221.

[233] Ira Glass et al., WBEZ Chicago, *This American Life: The Giant Pool of Money* (May 9, 2008), transcript *available at* http://www.thisamericanlife.org/radio-archives/episode/355/transcript.

[234] *See* Steven Gjerstad & Vernon L. Smith, *Monetary Policy, Credit Extension, Housing Bubbles*, *in* WHAT CAUSED THE FINANCIAL CRISIS, *supra* note 231, at 107, 120 fig.3.3.

sumption that the invisible hand would efficiently guide the decisions of the industry's participants and prevent capital from flowing to risky buyers.[235] After all, the securities were traded on a free market, and their value was ultimately linked to the risk of default, so the market could be expected to place a low value on risky securities and thereby give mortgage originators an interest in ensuring that their own issues were sound. Unfortunately, this assumption ignored the microstructural changes in the mortgage market.[236] The tidal wave of new loanable funds available from the fixed-income markets enticed mortgage originators to lower their lending standards. The originators invented "unverified income, verified asset" loans, then "no income, verified asset" loans, and, finally, the now-infamous "NINJA" loan — "no income, no job, no assets."[237] The originators themselves may have been aware of the increased risk of the newest loans, but since they passed all of the mortgages up the chain to the Wall Street firms, they did not bear this risk themselves, and could afford to ignore it. The intermediaries that did the pooling, securitizing, tranching, and re-tranching did not care either, because they, too, passed the loans on after taking their cut. The prestigious investment firms that held many of the securities on their balance sheets (and later failed because of it) should have cared, but they did not. The principal-agent problem may be part of the explanation: the firms' management was playing with other people's money, not their own.[238] Thus they shared in the short-term upside of the firm's investment but were not fully exposed to the downside risk (the worst that could happen to them was to get fired). As a result, these agents may have had an incentive to take bets that were higher-returning but riskier than the principals wanted. The buck stops with the principals who owned the investment banks or owned mortgage-backed securities directly, and they themselves (or the rating agencies they hire) might perhaps have been expected to take on some minimal role in monitoring risk. But the fantastical complexity and abstractness of the whole firm-contract-market complex made it impossible for them — or anyone — to accurately understand this risk.[239]

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[235] Joseph E. Stiglitz, *The Anatomy of a Murder: Who Killed America's Economy?*, *in* WHAT CAUSED THE FINANCIAL CRISIS, *supra* note 231, at 139, 143–44.

[236] *See* Foote & Willen, *supra* note 231.

[237] Jeffrey Friedman, *Capitalism and the Crisis: Bankers, Bonuses, Ideology, and Ignorance*, *in* WHAT CAUSED THE FINANCIAL CRISIS, *supra* note 231, at 1, 17.

[238] *See* Foote & Willen, *supra* note 231. At least one journalist has suggested that the principal-agent problem explains why the traditional agent-run investment banks failed during the crisis, while most of the unregulated but principal-controlled hedge funds — whose activities were widely believed to be more risky than those of the banks before the crisis — did not. Chris Dillow, *Why Aren't Hedge Funds Failing As Fast As Banks?,* THE TIMES, Sept. 17, 2008, *available at* http://www.timesonline.co.uk/tol/comment/columnists/guest_contributors/article4768564.ece.

[239] Of course, the microeconomic structure of the mortgage market was not solely responsible for the 2008 collapse. Other much-discussed possible culprits include: loose macroeconomic policy; overreliance on Credit Default Swaps' ability to mitigate risk; overreliance on mathematical projection from past housing data; and lack of government regulation and oversight of the financial industry. Friedman, *supra* note 237, at 14–15; Richard A. Posner, *Afterword: The Causes of the Financial Crisis, in* WHAT CAUSED THE FINANCIAL CRISIS,

To render these events in the language of the NIE, we can say that a contract-based mortgage-lending regime was superseded by a market for tradable property rights (i.e., mortgage-backed securities) in which integrated firms (investment banks) were the leading participants. The gatekeepers of the old, boring system were bankers who decided, often on the basis of local knowledge, how attractive a credit risk each homeowner was. The gatekeepers of the new, sexy system were New York- and London-based financiers whose decisions to buy and sell abstract pools of income streams were supposed to propagate down through the mortgage value chain, sending Smithian price signals down to the local banks and would-be homeowners. The old system was inefficient in the sense that it did not provide a mechanism by which, for example, Emirati bond investors could take a financial stake in the housing markets of the exurban United States. In this way it "artificially" limited the supply of funds and made it more expensive than theoretically necessary for American borrowers to finance the purchase of homes. The new system "solved" this inefficiency problem — but only at the cost of accepting catastrophic systemic risks from which the old system was systemically protected. When taxpayers picked up the tab for the bad loans and suffered through the second-worst recession in U.S. history, it was the new system that looked inefficient.

The carbon offset industry took shape during the same period as the securitized mortgage industry,[240] and the two industries share a number of important characteristics. The architects of the offset market have invented a clever system that allows the distribution of funding through market trading of property rights rather than through direct, contractual relationships. The advantage of this system is that it creates price signals that encourage funding to automatically flow to the projects that give the most emissions reductions bang for the buck. Its disadvantage is its complexity. Like mortgage originators, carbon project developers end up selling forward a future stream of income (though this income is denominated in terms of tCO_2 rather than currency).[241] In some cases, this stream is securitized in the same way as the mortgages; in others it is aggregated by the similar process of using firms that hold a pool of such streams on their balance sheet and then write tradable derivative contracts.[242] From the discussion of the additionality problem in Part II, it is clear that there is reason to believe the money spent on these carbon projects is being targeted to "risky" projects — projects claiming emissions reductions that may later turn out to be non-additional. As in the mortgage market, neither the project owner that originates the asset nor the intermediaries that trade it have an incentive to look out for this risk, be-

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supra note 231, at 279; Peter J. Wallison, *Credit-Default Swaps and the Crisis*, *in* WHAT CAUSED THE FINANCIAL CRISIS, *supra* note 231, at 238, 244–46.

[240] Foote & Willen, *supra* note 231 (tracing the boom of the subprime mortgage securitization industry to the 2000s); *see also* CAPOOR & AMBROSI, *supra* note 109, at 1 (showing the carbon market emerging in the mid-2000s).

[241] CAPOOR & AMBROSI, *supra* note 112, at 34.

[242] CAPOOR AND AMBROSI, *supra* note 109, at 64–65.

cause they intend only to pass the security up the chain. Both the aggregation firms and the capped firms are run by agents who may ignore catastrophic risks, and these agents operate under the same smokescreen of market complexity as the mortgage-buying agents did.[243] Carbon rating agencies have emerged to quantify risk, but there is little reason to believe that these agencies will perform better than Standard & Poor's and Moody's did during the financial crisis.

With the example of the financial crisis in mind, Michelle Chan has identified several risks implicit in the structure of carbon markets.[244] First, a speculative bubble may drive up the price of carbon.[245] When the bubble "pops," speculators and companies that made investments based on the artificially high price will be hung out to dry. Second, the complexity of the system makes it possible that unscrupulous participants will manipulate it.[246] What if concentration in the intermediation/aggregation industry allows firms to charge super-competitive prices? In other words, what if the thirty percent of all offset investment that goes to intermediaries is simply pocketed by those intermediaries, rather than going toward aggregation strategies that manage risk? Third, the carbon market's use of financial derivatives to re-allocate risk can be problematic.[247] To the extent that such risk-shifting ends up hiding risk or postponing it to an ultimate day of reckoning, the innovations are counterproductive, and may end up generating or exacerbating price shocks.

IV. A "PUBLIC OPTION" FOR CARBON OFFSETTING: THE FUND ALTERNATIVE

Parts I, II, and III have traced the doubts about the CDM's efficiency and the environmental quality of its allocation of funds to its structure as a system of tradable property rights. This Part attempts to re-envision offsetting along simpler lines. Specifically, it argues for modeling offsetting after a publicly managed investment fund similar to the Global Environment Facility, the Montreal Protocol's multilateral fund, and the earliest proposals

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[243] In fact, the problem may be exacerbated by the fact that in the carbon markets, unlike in mortgage markets, the principals may not even care about the quality of their investments. In the carbon markets, the biggest risk is not default by the project developers, though that risk does exist, but rather the risk that the projects are selling non-additional offsets. From the standpoint of society, this risk is real: if credits are non-additional, the emissions-reductions goals of the cap-and-trade system will be undermined. But from the standpoint of capped firms, the risk is external: as long as they hold a government-recognized compliance asset, they have done their duty, and it seems unlikely that government will choose to revoke certifications that it has already issued. Moreover, even if the government does revoke the certifications for offset projects later revealed to be non-additional, it may be important that many of the end buyers of those offsets are public utilities that may be able to pass on the cost of higher than expected cap-and-trade compliance costs to consumers.

[244] CHAN, *supra* note 14, at 2–9.

[245] *Id.* at 4.

[246] *Id.* at 5–7.

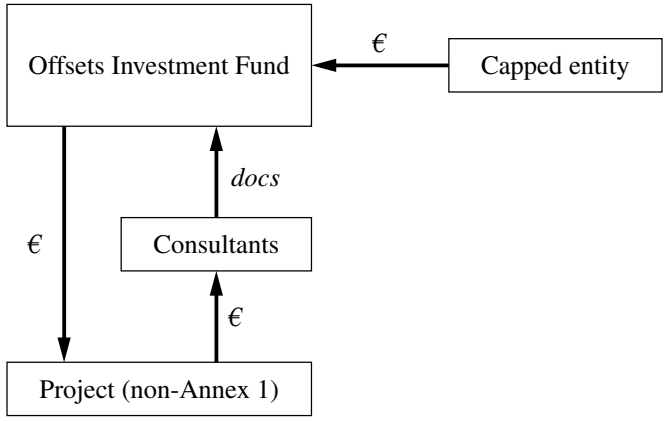
[247] *See id.* at 8–9.

for the CDM itself.[248] Such a fund would achieve emissions reductions through direct investment in clean development projects. It would issue offsets backed by these emissions reductions to fund contributors. In this way, projects would receive funds, and investors would receive offsets, but the offsets would need to be traded only within the cap-and-trade system, as allowances are. This structure, this Part argues, has the potential to (A) perform like the CDM does today while (B) reducing cost, (C) reducing risk, and (D) improving the environmental quality of emissions-reductions investment decisions.

A. How Fund-Based Offsetting Could Do the Same Thing as Mechanism-Based Offsetting

At the core of a fund-based offsetting system would be an investment fund run by a national government or the international public sector. The fund would collect money by auctioning or selling offsets to capped entities within the cap-and-trade system. On a yearly basis, the fund's managers would disburse these monies directly to suitable projects in the form of grants, low-interest loans, loan guarantees, or equity. Existing offset mechanisms make marginal clean development projects viable by inventing an abstract commodity, awarding the commodity to projects, and creating a market for the credits, thereby enabling the projects to generate a supplemental stream of offset income that allows them to attract loans. In contrast, an offsetting fund would reach the same result by simply investing in the project.

FIGURE 2: FUND-BASED OFFSETTING



[248] Other articles have also recommended replacing the CDM with a fund. *See* Ian Fein et al., *Submission of Calitopia*, *in* THE COPENHAGEN PROTOCOL ON CLIMATE CHANGE – AN INTERNATIONAL NEGOTIATION COMPETITION 299–322 (Laura Nielson ed., 2009); Ian Fein et al., *supra* note 12; Wara, *supra* note 1, at 1801–03; Wara & Victor, *supra* note 6, at 18, 21–22.

The fund's investment would be supplemental to funding the project receives from other investors. In fact, in its role as grantor or junior lender, the fund's subsidy would increase the return and decrease the riskiness of other investors' contributions, meaning that fund-based offsetting could use relatively small amounts of capital to leverage much larger investment decisions; just as offset income does today.

On the other side of the offset transaction, the fund would be able to issue offsets corresponding to the amount of emissions reductions it stimulates with its investments. As under the current CDM, these offsets would be tradable property rights with a compliance value equivalent to that of emissions allowances. But unlike in the current system, the offsets could be issued by the public sector authority in charge of the cap-and-trade system, making it unnecessary for intermediaries to transfer the emissions rights from the project to the compliance buyer. This system would work because the fund, like single-payer health insurance, would operate as one enormous risk pool. Because all offset projects would already be pooled into the fund, there would be little incentive to pay private sector aggregators to help compliance buyers manage risk.

The main question in the design of a fund-based offset system is how to distribute offsets generated by the fund to its investors. Table 3 summarizes the characteristics of three distribution options. Under the first option, the fund could collect contributions from offset investors in exchange for shares. The fund would use the money to invest in projects, measure its results, and pay out offsets in proportion to each investor's contribution to the fund. The advantage of this system is environmental integrity. Offsets continue to be backed by measured emissions reductions; if the fund achieves fewer emissions reductions than expected in a given year, the number of offsets it awards decreases. The system's disadvantage is that a compliance buyer will not know ex ante how many offsets it will receive per dollar of investment. This uncertainty will make it costly for the buyer to plan its compliance strategy and expose the cap-and-trade system as a whole to price spikes in years where the fund's performance is low. As under the current system, intermediaries might step in to absorb the risk by standing between the fund and the compliance buyers; however, if they do, many of the inefficient features of the current system will be replicated in the fund system. In fact, intermediaries may charge even more to accept the risk under the fund system, as they will be less able to affect the performance of the government-controlled fund than the performance of the projects they invest in under the mechanism system.

The second option would allow the fund to either auction or sell offsets before it makes the investments that back the offsets. The advantage of this system is that it offers compliance buyers a riskless offset that can be easily purchased at a government window, eliminating the need for costly interme-

diation and risk moderation.[249] The primary disadvantage of the system would be a lack of environmental integrity. Each offset will no longer be backed by one tCO_2 of emissions reductions, because the fund might not succeed in achieving the requisite quantity of emissions reductions. If it does not, the cap-and-trade system's cap will creep upward as firms meet their reductions obligations with devalued offsets. While this objection is well-founded theoretically, it may already be occurring in the current system. As described in Part I, it is unlikely that every CDM offset is currently backed by a ton of real emissions reductions. According to its critics, the CDM's ton-for-ton offset accounting is more of a charade that provides a false sense of accuracy rather than an actual means of ensuring environmental integrity.[250] If so, what an ex ante sale model gives up might only be the impression of environmental integrity, not environmental integrity itself. Recognizing the necessarily probabilistic nature of offsetting might make offsetting safer in the long run by insulating it from sensationalistic "exposures" of its failure to back up its claims to environmental integrity.[251]

A third option is the ex post sale or auction of offsets. Like the "shares" model and the current model, this model would issue offsets only after actually achieving emissions reductions. This model would avoid the primary problem with the shares model by allowing the fund to sell or auction already-achieved, riskless offsets. The main sticking point for this "hybrid" system is that it would not be financed by the contributions of offset buyer/investors, and so it would require an investment by the public sector or third parties. In essence, the public sector or the fund's private owners would take on the risk that the quantity and price risk associated with the fund's activities will diverge from those expected. Additionally, the third option would face a practical hurdle: it would need to get a head start on the cap-and-trade system as a whole. After that, the fund would each year sell or auction "last year's" offsets.

The three options also differ in their ability to generate the "supply response" that is a feature of the present-day system. Under mechanism-based offsetting, inside-the-system price spikes inspire compliance buyers ("led by an invisible hand")[252] to increase their investment in offsets. These spikes increase the number of offsets available and reduce some of the upward pressure on prices. A shares or fixed-price ex ante fund-based offsetting system would likely accomplish essentially the same thing. When prices climb, capped firms would contribute more to the fund or purchase a

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[249] This system would be especially attractive to compliance buyers if offsets were sold rather than auctioned. The fixed price would operate as a "safety valve" for the whole system, turning the cap-and-trade system into a hybrid price/quantity instrument and reassuring capped entities that their cost of compliance would not rise above a certain level.

[250] *See* AMBROSI ET AL., *supra* note 2, at 62–63; SCHNEIDER, *supra* note 14, at 9; Sutter & Parreño, *supra* note 12, at 84.

[251] *See, e.g.*, Vidal, *supra* note 13 (discussing a study that found lack of environmental integrity in offset funds).

[252] SMITH, *supra* note 19, at 485.

larger number of offsets. As a result, the fund would use the additional money it collects to increase its investments, resulting in more offsets during the next period.

A supply response would also occur under an ex ante sale, ex ante auction, or ex post auction system, though perhaps to a lesser extent. In response to a demand spike, compliance buyers would purchase the same number of offsets, but they would do so at a higher price. As a result, the fund would collect additional money that it would use to increase its emissions reductions. More emissions reductions would allow it to "back" more offset sales in the next year, easing the supply crunch. An ex post fixed price system, on the other hand, would not drive any supply response at all. High demand without a variable price would result in a shortage of offsets without increasing the revenue collected by the fund, meaning that the market would not "clear" and offsets would have to be rationed.

Of course, it is not entirely clear that a supply response is desirable in all cases. In both the current system and any conceivable fund-based system, there would be a significant time lag between increased offset investment and offset delivery. Currently, it takes approximately two years from initiation of an offset project to delivery of the first credits.[253] Therefore, assuming the bounded rationality of offset buyers means that they do not effectively predict the future, then demand spikes may end up causing only volatility, not an effective supply response. High demand in one period might lead to a supply glut in the next period. If so, the systems with relatively low supply responses might be preferable — they would allow the government to rationalize and moderate the inefficient "market" response to demand spikes.

What is the bottom line of this multi-dimensional comparison of the options for distributing offsets? None of the three options is clearly preferred; choosing between them requires assumptions about the relative value of environmental integrity, supply response, and price moderation. However, the analysis supports an assertion that a clean development fund could be designed to provide offset investors with a compliance option that is comparable to that offered by the present-day offsetting system.

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[253] McNish et al., *supra* note 12, at 5467.

TABLE 3: CHARACTERISTICS OF ALTERNATIVE DESIGN OPTIONS FOR OFFSET ISSUANCE BY THE FUND

Characteristic	Current System	Shares Approach	Ex Post Offset Sale/Auction	Ex Ante Offset Sale/Auction
Environmental Integrity	Arguably good. Credits are issued only after emissions reductions are achieved. On the other hand, the additionality problem may mean that ton-for-ton accounting may give merely the appearance of environmental integrity, not actual environmental integrity.			Arguably bad. The fund may not end up achieving enough emissions reductions to back each tCO_2 of offset credit it sold with a tCO_2 of emissions reductions.
Risk Pooling	Bad. Capped entities will have to bear the risk of a variable per-dollar offset yield, or pay intermediaries to bear the risk by standing between capped entities and the fund.		Good. Capped entities can purchase offset credit at a non-variable price directly from the government window.	
Supply Response	Arguably good. High inside-the-system compliance costs automatically stimulate increased investment in offset projects. But, as a practical matter, long lag times may prevent the effectiveness of the supply response.		Arguably good if credits are auctioned; arguably bad if credits are sold. If credits are auctioned, high inside-the-system prices cause the fund to collect more money per credit, allowing it to achieve more emissions reductions the following year and thereby moderating the cost of compliance. Again, however, lag times may prevent the effectiveness of the response. If credits are sold at a fixed price, high inside-the-system costs will cause the fund to run out of credits. Fund managers can increase offset investment in order to attempt to re-balance, but there is no automatic supply response.	Arguably good. Whether credits are sold or auctioned, high inside-the-system compliance costs will result in an increase in offset funding that will moderate price in the next period. Again, lag times may make this theoretical supply response ineffective in practice.
Volatility	The supply response effect may tend to cause unnecessary price volatility as temporary demand spikes in one period lead to supply gluts and price collapses in the next period.		If credits are auctioned, volatility may be a problem. If credits are sold at fixed prices, high demand in one period will not cause a supply response, making the system naturally resistant to volatility.	Volatility may be a problem, irrespective of whether credits are auctioned or sold at fixed prices.

B. Why an Offset Fund Might Be More Efficient than a Mechanism

While the last section argued that fund-based offsetting could conceivably serve as a substitute for mechanism-based offsetting, the following sections describe why it might be a *better* system. The argument tracks the

criticisms leveled at the current system: this section argues that the fund would improve efficiency; the next two sections argue that it would improve risk management and environmental quality, respectively.

Implementing a fund-based approach would supersede the hybrid market-contract-firm system under which offsets currently are generated with a more integrated, management-heavy system. The costs and benefits of this switch can be understood in the NIE vocabulary introduced above. For example, under the fund system there would no longer be any need for the project to sell credits to capped firms or intermediaries through complex, structured transactions.[254] The fund would have to transact a loan or equity investment with the project itself, but there is reason to believe this transaction would be cheaper than the CER offtake transaction required by the CDM. Specifically, the fund would economize on information acquisition. Where consultants, regulators, and intermediaries need to acquire information about a proposed project under the current system in order to set its value through negotiation, in the managed system only the fund and possibly the project's consultant will need to acquire such information. The fund can use what it learns throughout its multiple interactions with a project to estimate efficiently the riskiness and attractiveness of the investment. In the words of Coase, superseding a market-price determined outcome with a managed outcome can "save a lot of trouble."[255]

But the switch to management would not be an unmitigated blessing: the NIE predicts that the fund system's weakening of the market incentives that currently are supposed to discipline carbon market participants has the potential to exacerbate the effects of the principal-agent problem. The usual concerns with bureaucracy, especially government bureaucracy, will apply. Moreover, one of the advantages of the mechanism concept is the way that it uses investors' self-interest to ensure that funds flow to the projects that achieve the most mitigation per dollar. The fund structure contains no such competitive discipline. In other words, there is nothing to stop fund managers from making bad decisions, whether those bad decisions are the result of willful political cronyism or a mere inability to compare all investments as effectively as a decentralized market process.

To a certain extent, this concern might be addressed with management structures internal to the fund. Specifically, allocation of funds through a reverse auction process could rationalize the award process.[256] For example, each quarter, project developers could offer emissions reductions to the fund at a price of their choosing. Imagine that a wind project in China may offer 100,000 tCO_2e of emissions reductions in exchange for a € 1 million grant and a solar project in Bolivia offers the same quantity of emissions reduc-

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[254] Intermediaries may continue to broker credit transactions between the government and capped firms if the participants find this service useful; however, as it will likely be relatively easy for capped firms to buy credits directly at the government credit window, these transactions are likely to be cheaper and less complex to structure.

[255] Coase*, supra* note 29, at 17.

[256] Ian Fein et al., *supra* note 12, at II.C; Wara & Victor, *supra* note 6, at 22.

tions in exchange for an € 800,000 grant. The fund managers would rank the two projects (along with all other projects submitted) according to the cost per tCO_2e of their estimated emissions reductions. As a result, the Bolivian project, with a cost of $8 per tCO_2e, would be ranked ahead of the Chinese project, which offers reductions at $10 per tCO_2e. The fund would award funding to projects in the order of their cost per tCO_2e rank until its funds are exhausted. In this way, it would ensure that funds that continue to flow to the projects that get the most "bang for their buck."

In the end, whether the economies to the fund's managed approach (namely, lower contracting costs and information acquisition costs) and the approach's ability to control principal-agent problems with internal management structures (the reverse auction) outweigh the diseconomies that come with the supersession of market discipline and the price mechanism is an empirical question, and one that is unfortunately beyond the scope of this Article. Nevertheless, NIE-based reasoning is enough to suggest that a fund-based system could have certain efficiency advantages that justify further exploration.

C. How the Fund Could Improve Environmental Decision-making

Part III traced some of the concerns about the environmental soundness of offsetting to the failure of the system design to do justice to the value of probity. It argued that the CDM outsources too much regulation and cabins the role of regulation into an inappropriately small part of the process. A fund model would address this line of criticism by re-casting the CDM's passive regulators as active fund managers, a change that would have at least three advantages.

First, active managers would have the ability to compare projects side by side, scrutinizing the claims of project developers. Indeed, project developers would compete for funding, and fund managers would have the luxury of choosing only the projects that are most environmentally sound, rather than approving all projects that purport to meet the CDM's substantive criteria.[257]

Second, fund managers would benefit from a holistic perspective. For example, in making their yearly funding decisions, they could more easily take note of the fact that a large percentage of Chinese power plants claim additionality, and re-calibrate their funding decisions accordingly. In responding to these observations the active fund managers would be better able to take advantage of programmatic approaches than passive regulators, because such programmatic activities fit more naturally in the flexible, managed fund model than they ever have in the mechanism model. For example,

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[257] OFFSET QUALITY INITIATIVE, ENSURING OFFSET QUALITY 7 (2008), *available at* http://www.offsetqualityinitiative.org/pdfs/OQI_Ensuring_Offset_Quality_7_08.pdf ("[I]ndividualized expert judgment is often required to ensure that reasonable and accurate estimations of a project's reductions are properly credited.").

the fund managers could incentivize the Chinese power plant sector by contracting with the Chinese government to set technology standards or to limit the expansion of coal in certain regions.

Finally, fund managers would be better able to correct design flaws on the fly. A fund, for example, would not have overcompensated the HFC-23 developers. Instead, managers negotiating a funding contract would have used relatively small grants to incentivize those projects' emissions reductions, giving them more funds to devote to other emissions reductions.

These advantages, of course, are unlikely to eliminate the environmental concerns with the CDM entirely. The thorniest offsetting problem is the difficulty of determining what emissions would have been in the counterfactual world in which the CDM did not exist. This problem is endemic to the idea of offsetting, and cannot be eliminated by institutional reform. Nevertheless, the arguments for active management presented here should at least give us reason to hope that a fund-based reform could reduce the degree to which the counterfactuality problem is exacerbated by an institutional design that limits the ability of the public sector to guard the integrity of the system.

D. How a Fund-Based Architecture Might Better Manage Risk

A fund-based architecture might better manage risk in two ways. The first advantage is the same advantage that a nationalized or single-payer health insurance system has over a non-universal health insurance system; by pooling the risk that an individual project will fail into a single fund that holds a number of different projects of various types, the fund would reduce the variability of total credit production.[258]

Second, allocating what risk remains to the public sector may reduce the need for expensive risk-shifting strategies. The need for risk-shifting strategies in the present-day system can be thought to result from the fact that the system naturally places regulatory and carbon price risk on two parties that have little interest in bearing those risks: regulated developed-country firms and developing-country project developers. Because those participants are not in the business of speculating on the carbon market, they naturally want to offload the risk onto a party that is, a task that involves transactions, costs, and, quite possibly, the danger of manipulation and other market failures. The fund system, by contrast, locates the risk on the party that can bear it best: the public sector entity charged with both deciding where to direct offset funding and with maintaining the integrity of the sys-

[258] Of course, depending on system design, there still might be a role for carbon speculators that hold credits with the intent to release them in the event of a price spike or banks that allow firms to borrow credits to make it through a short-term period of high demand and tight supply. Such credit banking might be particularly important in offset system that auctioned last year's credits, because it could replace the traditional supply response function of offsetting. However, banking is likely to be a feature of allowance trading regardless, so it is not so much a replacement for offset aggregation as a distinct transaction cost that exists irrespective of decisions about offset market design.

tem. Because the risk already sits on the shoulders of the entity ultimately charged with bearing it, there is no need for offset buyers and project developers to incur the search and intermediation costs associated with transferring it, or for aggregators to develop sophisticated hedging strategies.

CONCLUSION

This Article has argued that the task of channeling funding from capped entities toward worthy un-capped emissions reducing projects requires robust public sector involvement. Replacing the Rube Goldberg-esque tradable property rights system under which offsetting is presently conducted with a publicly managed system could yield superior efficiency, better management of catastrophic risk, and more confidence-inspiring environmental outcomes.

In the last two years, this perspective has gained some traction in the international climate change community. In the months preceding the UNFCCC's 2009 Copenhagen meetings, Mexican President Felipe Calderon proposed a new "green fund" for climate change-related investment in the developing world. He argued that "[t]he current carbon credits . . . are not an efficient mechanism . . . [because the carbon market] has to match an industry that wants to pollute with another that has projects to compensate or reduce gas emissions."[259] The idea became one of the few concrete commitments to emerge from the Copenhagen meetings.[260] Developed nations are supposed to commit money to the new, U.N.-managed fund.[261] Details about the destination of funds are still unclear, but it appears likely that it will finance both adaptation to climate change (which has to date been neglected under the Kyoto framework) as well as programmatic mitigation activities (e.g., efficiency standards for light bulbs) which are not a good fit for the CDM.[262] While no one has yet suggested the wholesale replacement of the CDM with such a fund, one commentator predicted that the fund "should serve to simplify the intricate network of funding mechanisms and bilateral agreements that currently provide low carbon and climate adaptation investment for developing countries."[263]

Despite this recent success, however, further fund-based reform, whether in the international system or in a planned U.S. system, faces at least two significant political hurdles. First, the political power of current carbon markets participants may make it difficult to jettison the mechanism concept. The International Emissions Trading Association, a lobbying or-

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[259] Mark Stevenson, *Mexico: 'Green Fund' Better than Carbon Credits*, THE GUARDIAN, June 22, 2009, http://www.guardian.co.uk/world/feedarticle/8571817.

[260] *See* AMBROSI ET AL., *supra* note 2, at 16.

[261] *Id.*

[262] *Id.;* James Murray, *Cancun Green Fund to Dominate Global Climate Finance*, BUS. GREEN (Dec. 13, 2010), http://www.businessgreen.com/bg/news/1931989/cancun-green-fund-dominate-global-climate-finance.

[263] Murray, *supra* note 262.

ganization supported by intermediaries and other carbon market participants, is an influential voice in the international debate. Similarly, investment banks and other financial-sector firms have a strong capacity to influence decisions on Capitol Hill. Second, debate over the management of the fund is likely to be extremely controversial. Within the United States, many will object to government-directed investment. At the international level, the question of who will manage the fund will likely provoke tension between the developed world — which will argue that the investors must control the fund — and developing world — which will argue that fund management must reflect its development priorities.[264]

In a more general sense, however, the biggest difficulty that the ideas presented in this Article face may be ideological rather than practical: a deep-seated appreciation for market-based policy instruments. The climate in which decisions about the design of carbon-offsetting systems are made is more international and more technocratic than the U.S. political climate in which any expansion of the public sector's role in health insurance is derided as "socialized medicine." But technocratic policymakers can love markets just as thoroughly as Tea Party protestors, if for different reasons. A second-order aim of this Article has been to illustrate one example of how fidelity to the market romantic vision combined with lack of attention to how real markets work can lead to bad policymaking. We value markets' power to spontaneously coordinate economic activity so highly that we have expended a lot of money, creative thought, and (ironically non-spontaneous) effort on a misguided quest to make markets work in a context to which they were never suited. Attention to the motivations and activities of actual participants in the offsetting industry — the kind of attention that Adam Smith paid to his butcher, baker, and brewer, and Hayek to his government planners — counsels a larger role for the public sector.

[264] Such a dispute played out during the Cancun negotiations over the details of the Green Fund, with the developed nations arguing for management by the World Bank and the developing nations arguing for a U.N.-managed fund. *Id.*