



A COASEAN APPROACH TO COST-BENEFIT ANALYSIS

D. Bruce Johnsen
Antonin Scalia Law School,
George Mason University

**George Mason University Law & Economics
Research Paper Series**

18-45

This paper is available on the Social Science Research Network
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D. Bruce Johnsen*
Antonin Scalia Law School
George Mason University
3301 N. Fairfax Drive
Arlington, VA 22201
703-978-7601
djohnsen@gmu.edu

Draft 2

October 29, 2018

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* Professor of Law, Antonin Scalia Law School, George Mason University. B.A., M.A., and Ph.D. (Economics), University of Washington; J.D., Emory University School of Law. For helpful comments and

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Abstract

Government regulation is said to be justified when private markets fail to efficiently allocate resources owing to so-called “externalities.” Yet as Ronald Coase convincingly showed decades ago, the presence of externalities can be usefully attributed to the “costs of market transactions,” putting the entire notion of market failure on shaky ground. What kind of failure is it when the parties affected by an alleged externality decline to spend a dollar transacting to capture ninety-nine cents in benefits? Transaction costs are real social costs and, at least conceptually, must be factored in to any social calculus. This essay proposes a relatively simple Coasean approach to cost-benefit analysis where transaction costs are sufficiently low that competition can be expected to drive the parties *toward* efficient resource allocation. A rule is justified under this approach only if the regulator can show it is likely to reduce the relevant transaction costs. If so, the parties will adjust their private arrangements to reduce any inefficiencies out of self-interest. There is no need for the regulator to quantify total costs and benefits. This is information the parties—the men and women “on the spot”—are best able to identify on their own.

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“Whatever we may have in mind as our ideal world, it is clear that we have not yet discovered how to get to it from where we are.”¹

“What I think will be considered in the future to have been the important contribution of [*The Problem of Social Cost*] is the explicit introduction of transaction costs into economic analysis.”²

— R.H. Coase

I. Introduction

Economists have struggled for decades over how to do reliable cost-benefit analysis (CBA).³ During this time Reagan-, Clinton-, and Obama-era executive orders and federal case law have increasingly required executive agencies to address “material failures of private markets” by integrating CBA into the rule-making process, with the stated objective being to “maximize net benefits” to society.⁴ Federal statutes and case law have recently extended the CBA mandate to include independent agency rulemaking. Yet substantial controversy continues to swirl over the feasibility of CBA in a variety of settings and for a host of reasons, the most important among them being the difficulty of quantifying costs and

¹ R.H. Coase, *The Problem of Social Cost*, J. LAW & ECON. 1, 43 (1960). This is arguably the most influential article ever published in economics. William M. Landes and Sonia Lahr-Pastor, *Measuring Coase’s Influence*, 54 J. LAW & ECON. 383 (2011).

² Douglas W. Allen, *Transaction Costs*, ENCYCLOPEDIA OF LAW AND ECONOMICS (Volume One: The History and Methodology of Law and Economics, Bouckaert, Boudewijn and De Geest, Gerrit, eds.)(Cheltenham: Edward Elgar Press, 2000), 893-896. Also published on line at <http://allserv.rug.ac.be/gdegeest/0740art.htm>.

³ Wendy L. Gramm, *Regulatory Review Issues, October 1985-February 1988*, 63 ADMIN. L. REV. 27, 33 (2011).

⁴ Executive Order 12,866 states: “Each agency shall identify the problem that it intends to address (including, where applicable, the failures of private markets or public institutions that warrant new agency action) as well as assess the significance of that problem.” Executive Order No. 12,866, 58 FR 51735 (September, 1993).

benefits.⁵

The neoclassical model of market exchange provides the theoretical foundation for traditional CBA. It illustrates the welfare effects of trade embedded in market demand and supply assuming, among other things, that 1) people behave “as if”⁶ they are rational maximizers, 2) the affected parties face zero transaction costs, and 3) there are no externalities. In equilibrium, the model hypothesizes that market prices reflect *marginal* benefits and costs, and that the parties will capture all possible gains from trade in the form of consumer and producer surplus, net social benefits, or “social welfare.”

The neoclassical model’s main scientific function is to predict the direction of affected parties’ response to parametric shocks, a method known as comparative statics. If the tax on cigarettes increases, for example, will the price, quantity traded, and quality of tobacco increase or decrease? The model makes no predictions about the magnitude of these changes, only their direction.⁷ All that is theoretically necessary to make predictions in the basic model is that demand curves slope down and supply curves slope up, that some measurable parameter has changed, and that the change has ordinaly measurable effects.⁸ The neoclassical model has tremendous predictive power in this regard. It is testable, has been tested, and has gone largely unrefuted.⁹ Federal courts have found it sufficiently reliable to be admissible into evidence as the basis for economic expert testimony under the

⁵ See, generally, Matthew D. Adler and Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 Yale L. J. 165, 167 (1999); Abby McCloskey & Hester Peirce, *Holding Financial Regulators Accountable: The Case for Economic Analysis*, AM. ENTER. INST. 1 (2014); Eric A. Posner & E. Glen Weyl, *Cost-Benefit Analysis of Financial Regulations: A Response to Criticisms*, 124 YALE L.J.F. 246 (2015); Jonathan S. Masur and Eric A. Posner, *Unquantified Benefits and the Problem of Regulation under Uncertainty*, 102 Cornell L. Rev. 87 (2016); Jonathan S. Masur and Eric A. Posner, *Cost-benefit Analysis and the Judicial Role*, 85 U. Chi. L. Rev. 935(2018); Jeffrey N. Gordon, *The Empty Call for Benefit-Cost Analysis in Financial Regulation*, 43 J. LEGAL STUD. 351 (2014); John C. Coates IV, *Cost-Benefit Analysis of Financial Regulation*, 124 YALE L.J. 882 (2015); Cass R. Sunstein, *Financial Regulation and Cost-Benefit Analysis*, 124 YALE L.J.F. 263, 264-65 (2015);

⁶ Milton Friedman, *The Methodology of Positive Economics* (in *Essays in Positive Economics*, 1953).

⁷ In the language of mathematics, predictions focus on the sign of a partial derivative rather than its magnitude.

⁸ For an explanation of the distinction between ordinal and cardinal measurement in the CBA context, see Matthew D. Adler and Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 Yale L. J. 165, 191-92 (1999)

⁹ Ellig and Peirce (2014) argue that two important criteria for assessing the quality of an agency’s economic analysis are whether it clearly identifies a market failure and whether it outlines a testable theory capable of being refuted by observed facts.

Daubert standard, which establishes testability of the underlying theory as one important factor.¹⁰

In contrast to comparative statics, CBA attempts to cardinally measure—to quantify—the magnitude of changes in total consumer and producer surplus from the imposition of a proposed regulatory rule. This requires an estimate of consumers’ subjective willingness to pay for a good and producers’ subjective willingness to provide the good along the relevant range of demand and supply. These values are exceedingly difficult to measure, perhaps impossible. Various workarounds can be used, but ultimately no CBA could pass muster under the *Daubert* standard. How, for example, could someone who wants to challenge the accuracy of a CBA test it and refute it? There is no way to do so other than to criticize its methods and offer a contradictory CBA, which may be more convincing but will be equally untestable.

A critical question largely ignored in the CBA debate is why regulation is justified to begin with and how the answer to this question should influence the analysis. Going at least as far back as the writings of A.C. Pigou almost a century ago,¹¹ mainstream welfare economists have asserted that government regulation is justified when markets fail to efficiently allocate resources owing to so-called “externalities”—situations in which one party takes an action that imposes spillover costs or bestows spillover benefits on another party but fails to account for them in choosing his activity level.¹² As a result, in pursuing his self-interest he does too much or too little of the activity, leading to socially inefficient resource allocation and failure to maximize net benefits to society. The accepted policy implication is that government regulation correcting the market failure is necessary to improve resource allocation and increase net benefits.

¹⁰ *Daubert v. Merrell Dow Pharmaceuticals Inc.*, 509 U.S. 579 (1993). The factors that determine admissibility are: (1) whether the body of knowledge on which the testimony is based is testable and has been tested; (2) whether it has been subjected to peer review and publication; (3) whether it has a known or knowable error rate; (4) whether there are established standards controlling its operation; and (5) whether it is generally accepted as reliable within a relevant scientific community.

¹¹ A.C. Pigou, *The Economics of Welfare* (McMillan, 1920).

¹² The activity level might be the amount of trading a broker does for a client’s account over which he has trading discretion or the amount of research he does as a basis for recommending trades to a client who directs his own account.

In his path-breaking work *The Problem of Social Cost*, Nobel laureate Ronald Coase turned this belief on its head.¹³ He showed that any prospect of inefficient resource allocation creates an opportunity for market participants to benefit by internalizing the externality through private transactions. If transaction costs were zero, the parties would negotiate to maximize net benefits out of self-interest. A change in the regulatory rule would have no effect on resource allocation or the parties' joint welfare and government regulation would be unnecessary.¹⁴

Transaction costs are never zero, and in any event they increase with the number, size, and complexity of transactions, eventually overwhelming the benefits from negotiating further adjustments. Some "inefficiency" will persist in the form of hypothetical resource misallocation, by definition a state of affairs in which marginal social benefits fall short of marginal social costs or vice-versa. Potential net benefits are lost, but only because the transaction costs the parties must incur to capture them are even greater. Transactions costs are real costs to society and, at least conceptually, must be factored into the social calculus. In a given regulatory framework, the parties will negotiate what they privately perceive as efficient resource allocation with due consideration for the costs of transacting. The outcome is a local equilibrium in the sense that neither party has any incentive to negotiate further adjustments given the transaction costs they face, and the conclusion must be that net social benefits are maximized. EQUILIBIRUM

Coase's main point, often misunderstood, is that the costs of transacting can be operationalized to explain why the rule of liability—here, the regulatory rule—indeed matters for resource allocation. Rather than asking whether the overall benefits of a proposed rule will exceed the overall costs, in a Coasean framework the proper question is simply whether, at the margin, a proposed regulation will reduce the parties' costs of

¹³ See R.H. Coase, *The Problem of Social Cost*, J. LAW & ECON. 1, 43 (1960). This is arguably the most influential article ever published in economics. William M. Landes and Sonia Lahr-Pastor, *Measuring Coase's Influence*, 54 J. LAW & ECON. 383 (2011). See also R.H. Coase, *The Nature of the Firm*, 4 ECONOMICA 386 (1937), where he used the phrase "the costs of using the pricing mechanism" rather than "the costs of market transactions."

¹⁴ Although the parties' joint wealth would be at a maximum, the distribution of wealth between them is indeterminate.

transacting. If not, the regulation should be scrapped.¹⁵ If so, regulators should move forward confident that the man or woman “on the spot” can be counted on to perform their own CBA, or not, and make all efficient adjustments to the new rule based on their “knowledge of the particular circumstances of time and place.” This knowledge is fleeting, circumstantial, and inherently unavailable to outside observers because it requires them to identify a counterfactual, yet another reason quantified CBA of proposed regulation is so difficult.¹⁶

This is not to say private markets solve all problems or that government regulation is incapable of improving resource allocation. It simply says that in low-transaction-cost settings regulation is justified only if it reduces the parties’ costs of transacting. EQUILIBIRUM It is insufficient to identify so-called “problems” that need correcting without having credibly made this showing. Only then can it be properly characterized as a market failure calling for a corrective rule. Regulators should bear this fundamental point in mind when performing CBA of corrective rules in keeping with the executive order charge to base new rules on “the best reasonably obtainable scientific, technical, economic, and other information.”¹⁷

The Coasean approach, characterized here as transaction cost-benefit analysis (TCBA), avoids much of the measurement problem that plagues traditional CBA because it requires the regulator to assess only the direction of the effect of a proposed rule on the costs of transacting at the margin—comparative statics. There is plenty of excellent theoretical and empirical scholarship on the cost of transacting available to serve as a guidepost.

Transaction cost-benefit analysis stands to dramatically reduce the information burden regulators face to assess a rule’s likely effects on net social benefits. It can serve as both a substitute for and as a complement to traditional CBA. It is most likely to prove helpful where the parties face sufficiently low transaction costs that they can bargain directly or where competitive markets can be relied on to move them *toward* optimal resource

¹⁵ A reduction in transaction costs is a necessary but not a sufficient condition for regulation. A sufficient condition is that the discounted present value of reduced transaction costs exceeds the up-front cost of changing the regulation, perhaps including the cost to the regulator of performing the CBA). See Masur & Posner ? for a related discussion.

¹⁶ F.A. Hayek, *The Use of Knowledge in Society*, 35 *Am. Econ. Rev.* 519 (1945); James M. Buchanan, *Cost and Choice: An Inquiry in Economic Theory* (Chicago: Markham Publishing Co., 1969).

¹⁷ EO 12866, Section 1(b)(7).

allocation. Vertical relationships (such as those between manufacturers, retailers, and consumers), which always pose conflicts of interest, are a broad category on point. Even where transaction costs are extremely high, TCBA provides an insightful framework to guide traditional CBA.

Coase's fundamental insight about the nature of market failure and the relevance of transaction costs to understanding it has been largely absent from the recent scholarship on CBA of federal regulation. This essay seeks to fill the void. Part II briefly recounts the history of CBA in federal regulation and identifies the sources of federal agencies' requirement to perform CBA of proposed rules. It also reviews a selection of the recent scholarly literature addressing whether quantified CBA of proposed regulation is feasible. The consensus on this question appears to be that complete quantification is impossible but that regulators should nevertheless attempt to quantify costs and benefits of a proposed rule "as best [they] can" and describe potentially unquantifiable costs and benefits in qualitative terms. Though errors are inevitable, this puts the regulator on record and provides both a long-run basis for assessing success and a reference point for adaptive learning.

Part III briefly discusses the neoclassical model as the foundation for traditional CBA and illustrates the widely-accepted economic rationale for government regulation based on market to failure.¹⁸ Part IV takes a closer look at market failure. Early on, Frank Knight showed that Pigou and his followers mistook the absence of property rights for market failure. Where property rights are well defined and enforced, markets routinely resolve many Pigovian externalities long before they appear on the regulatory radar screen.

Part IV examines what is meant by "transaction costs," concluding that they consist of the costs of defining and enforcing *economic* property rights to valuable asset flows. It reviews some of the foundational scholarly literature on the economics of property rights. The underlying theory is testable and has been successfully and repeatedly tested. Where appropriate, this literature can serve as helpful guide for regulators when performing TCBA of proposed rules.

Part VI provides a summary and concluding remarks. It discusses the circumstances in which TCBA is likely to provide better answers than traditional CBA. AND

¹⁸ A.C. Pigou, *The Economics of Welfare* (McMillan, 1918).

II. Overview of Cost-Benefit Analysis of Federal Regulation

A. *Brief History*

It is difficult to pinpoint the origin of CBA in the U.S. According to one source, the Army Corp of Engineers began using it as early as 1902,¹⁹ but it gained considerable traction with the rise of the administrative state starting with the New Deal.²⁰ There is evidence the Army Corp of Engineers also used it informally to evaluate various dam projects on the Snake and Columbia Rivers during the early 1930s.²¹ More formal use of CBA apparently began during the Johnson administration, with modestly increasing importance and sophistication during the Nixon, Ford, and Carter administrations.²² In 1980, President Carter signed the Paperwork Reduction Act into law.²³ This statute created the Office of Information and Regulatory Affairs (OIRA) as part of the Office of Management and Budget (OMB) to “review and approve agency collections of information, including those related to regulations.”²⁴

B. *Executive Agency CBA*

Shortly after taking office, President Reagan put teeth into regulatory oversight with his Executive Order 12291 mandating that executive agencies perform cost-benefit analysis of proposed “major” rules.²⁵ Section 2 of the Order stated, in relevant part:

¹⁹ Theodore M. Porter, *TRUST IN NUMBERS: THE PURSUIT OF OBJECTIVITY IN SCIENCE AND PUBLIC LIFE* (1995), at 148-190.

²⁰ Henry G. Manne, *Economics and Financial Regulation*, 35 *Regulation* (2012), at 20-25.

²¹ Richard O. Zerbo, Jr. and Linda J. Graham, *The Role of Rights in Benefit Cost Methodology: The Example of Salmon and Hydroelectric Dams* 74 *WASH. L. REV.* 763, 766 (1999); Jim Tozzi, *OIRA’s Formative Years: The Historical Record of Centralized Regulatory Review Preceding OIRA’s Founding*, 63 *ADMIN. L. REV.* 37, 41-43 (2011).

²² See Jim Tozzi, *OIRA’s Formative Years: The Historical Record of Centralized Regulatory Review Preceding OIRA’s Founding*, 63 *ADMIN. L. REV.* 37 (2011).

²³ Pub. L. No. 96-511, 94 Stat. 2812 (1980) (codified as amended at 44 U.S.C. §§ 3501-3521 (2006)).

²⁴ Susan E. Dudley, *Observations on OIRA’s Thirtieth Birthday*, 63 *ADMIN. L. REV.* 113, 114 (2011). See also Wendy L. Gramm, 63 *ADMIN. L. REV.* 27, 28 (2011); Jim Tozzi, *OIRA’s Formative Years: The Historical Record of Centralized Regulatory Review Preceding OIRA’s Founding*, 63 *ADMIN. L. REV.* 37, 55 (2011).

²⁵ Executive Order No. 12291 (1)(d) reads as follows: “‘Agency’ means any authority of the United States that is an ‘agency’ under 44 U.S.C. 3502(1), excluding those agencies specified in 44 U.S.C. 3502(10).” The latter section refers to “independent agencies” and specifically lists the SEC among them.

- (a) Administrative decisions shall be based on adequate information concerning the need for and consequences of proposed government action;
- (b) Regulatory action shall not be undertaken unless the potential benefits to society for the regulation *outweigh* the potential costs to society;

- (e) Agencies shall set regulatory priorities with the aim of *maximizing the aggregate net benefits to society*, taking into account the condition of the particular industries affected by regulations, the condition of the national economy, and other regulatory actions contemplated for the future [emphasis added].

The Order made OIRA responsible for assessing regulations to ensure they plausibly maximize aggregate net benefits to society. It requires regulatory impact analysis (RIA) of major rules, and it also requires the Director of the OMB to “[m]onitor agency compliance with the requirements of this Order and to advise the President with respect to such compliance.”²⁶ Although OIRA’s early years were rocky,²⁷ it eventually became a powerful though surprisingly inconspicuous force on the federal regulatory landscape.²⁸

In 1993, President Clinton’s Executive Order 12866 replaced EO 12291. Section 1(a) softens the substantive cost-benefit provisions, stating that “agencies should select those approaches that *maximize net benefits* . . . unless a statute requires another regulatory approach.” It also adds assessment of “distributive impacts” and “equity” into the calculus. Section 1(b)(6) weakens the threshold for approval by requiring that benefits merely “justify”²⁹ costs rather than “outweigh” them.

Notably, the Order frames the call for regulation in the language of market failure. Its preamble provides the following seemingly sensible foundation for federal regulation: “the private sector and private markets are the best engine for economic growth. . . . Federal agencies should promulgate only such regulations as . . . are made necessary by compelling

²⁶ Exec. Order No. 12291, 46 FR 13193 (February 17, 1981).

²⁷ Gramm (2011), at 29-30;

²⁸ Donald R. Arbuckle, *Obscure but Powerful: Who are those Guys?*, 63 ADMIN. L. REV. 131, 132 (2011).

²⁹ EO 12866 Section 1(a)(6).

public need, such as *material failures of private markets* to protect . . . the well-being of the American people.”³⁰ Moreover, they should “base [their] decisions on the best reasonably obtainable scientific, technical, economic, and other information concerning the need for, and consequences of, the intended regulation.”³¹ Section 2(b) of the Order requires OMB to issue guidance on the proper conduct of CBA to affected agencies.³² Among them, OMB’s 2003 guidance advises that “[o]ppportunity cost’ is the appropriate concept for valuing . . . costs.”³³

Order 12866 remains in effect today, but in January 2011 President Obama reinforced it with Executive Order 13563, among other things requiring executive agencies to allow Internet submission of public comments, to provide for greater coordination with other agencies, to ensure scientific integrity, and to further provide for retrospective analysis of existing rules.³⁴ Although independent agencies are exempt from executive orders, Executive Order 13579 (2011) urges them to comply with EO 13563 to the extent permitted by law.³⁵ At the very least, these orders collectively outline best practices for all federal agency rulemaking.

Largely owing to OIRA review, executive agency CBA is widely considered to be of fairly high quality,³⁶ with much of the CBA done by the Environmental Protection Agency (EPA) being the archetype.³⁷ Independent agency CBA, which relies largely and only more recently on judicial review, lags behind but appears to be improving.³⁸

C. *Independent Agency CBA*

An early statutory mandate for independent agency CBA appears in the 1974 amendments to the Commodity Exchange Act of 1936 (CEA) authorizing creation of the

³⁰ Executive Order No. 12866, 58 FR 51735 (September, 1993) [emphasis added].

³¹ Executive Order No. 12866, 58 FR 51735 (September, 1993) [emphasis added].

³² EO12866 Section 2(b).

³³ OMB *Circular A-4 To the Heads of Executive Agencies and Establishment* (Sept. 17, 2003). Available at <https://www.federalregister.gov/documents/2003/10/09/03-25606/circular-a-4-regulatory-analysis> .

³⁴ Executive Order No. 13,563, 76 FR 3821 (January 18, 2011).

³⁵ Executive Order 13579, 76 Fed. Reg. 41587 (Jul. 14, 2011).

³⁶ Ellig & Peirce.

³⁷ Resvez.

³⁸ Ellig.

Commodity Futures Trading Commission (CFTC). Section 19(a) of the CEA states in relevant part:

- (1) IN GENERAL: Before promulgating a regulation under this chapter or issuing an order . . . the Commission shall consider the costs and benefits of the action of the Commission.
- (2) CONSIDERATIONS: The costs and benefits of the proposed Commission action shall be evaluated in light of—
 - (A) considerations of protection of market participants and the public;
 - (B) considerations of the efficiency, competitiveness, and financial integrity of futures markets;
 - (C) considerations of price discovery;
 - (D) considerations of sound risk management practices; and
 - (E) other public interest considerations.³⁹

The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (Dodd Frank) also specifically requires an independent agency to perform CBA. Title X of Dodd-Frank creates the Bureau of Consumer Financial Protection, and Section 1022 (b)(2)(A) gives it rulemaking authority provided that in so doing it considers “the potential benefits and costs to consumers and covered persons, including the *potential reduction of access* by consumers to consumer financial products or services resulting from such rule.”⁴⁰

In 1996 Congress passed the National Securities Market Improvement Act (NSMIA) adding the following language to the Securities Act of 1933 (SA),⁴¹ Securities Exchange Act of 1934 (SEA),⁴² and the Investment Company Act of 1940 (ICA)⁴³:

³⁹ Section 19(a)(1), Commodity Exchange Act, Pub. L. No. 74-675, 49 Stat. 1491(1936) (codified as amended at 7 U.S.C. §§ 1-27f).

⁴⁰ Pub. L. No. 111-203, § 929-Z, 124 Stat. 1376, 1871 (2010) (codified at 15 U.S.C. § 78o)

⁴¹ 15 U.S.C. § 77a (1933).

⁴² 15 U.S. Code § 78mm (1934).

⁴³ 15 U.S. Code § 80a-6 (1940).

(b) Consideration of Promotion of Efficiency, Competition, and Capital Formation—Whenever pursuant to this title the Commission is engaged in rulemaking and is required to consider or determine whether an action is *necessary or appropriate* in the public interest, the Commission shall also consider, in addition to the protection of investors, whether the action will *promote efficiency, competition, and capital formation*.⁴⁴

Beginning in 2005, three cases from the U.S. Court of Appeals for the D.C. Circuit found that this language requires the SEC to perform CBA of its proposed regulations, and in each case it found the SEC's CBA deficient and therefore "arbitrary and capricious" in violation of the Administrative Procedure Act (APA).⁴⁵

In *U.S. Chamber of Commerce v. SEC* (2005)⁴⁶ the Chamber sought review of the SEC's *Investment Company Governance Rule (Governance Rule)*, which would have conditioned various exemptions most mutual funds enjoy from provisions of the ICA on having boards with at least 75 percent outside directors and an independent chairman.⁴⁷ The Court found that the SEC had failed to adequately consider the costs of the conditions it proposed and hence their likely effect on efficiency, competition, and capital formation. Although an empirical study is unnecessary, a regulator must nevertheless do its best to assess costs. Uncertainty may limit what the Commission can do but does not excuse its statutory obligation to do what it can to apprise itself—and hence the public and the

⁴⁴ Pub. L. 104–290, 110 Stat 3416 (1996) Section 106 [emphasis added]. In addition, the SEA requires that "The Commission and the Secretary of the Treasury, in making rules and regulations pursuant to any provisions of this chapter, shall consider among other matters the impact any such rule or regulation would have on competition." 15 U.S.C. 78(w)(a)(2). MAKE THE POINT INFRA ABOUT LONG- VERSUS SHORT-RUN INVESTOR PROTECTION WITH REGARD TO UP-FRONT LOADS.

⁴⁵ *U.S. Chamber of Commerce v. SEC*, 412 F.3d 133 (2005), *American Equity Investment Life Insurance Company v. SEC*, 613 F.3d 166 (D.C. Cir. 2010), and *Business Roundtable v. SEC*, 647 F.3d 1144 (2011).

⁴⁶ 412 F.3d 133 (2005). The SEA, the ICA, and IAA all allow persons aggrieved by a final order of the Commission to obtain review of the order in the United States Court of Appeals for the circuit in which he resides or has his principal place of business or in the District of Columbia Circuit. SEA 15 U.S.C. § 78y(a); ICA Section 43(a), 15 U.S.C. § 78y(a), and IAA Section 13, 15 USC § 80b–13.

⁴⁷ The ICA mandates that mutual funds have at least 40 percent outside directors. By ICA Rule 12(b)-1, the SEC had already conditioned various exemptions a mutual fund having a majority of outside directors. 17 CFR Parts 239, 240, 270 and 274. Release Nos. 33-7754; 34-42007; IC-24082; File No. S7-23-99.

Congress—of the economic consequences of a proposed regulation before it chooses to adopt it.⁴⁸

In *American Equity v. SEC* (2010)⁴⁹ the petitioner, American Equity Investment Life Insurance Company, sought the D.C. Circuit Court’s review of SEC *Rule 151A* (2007) under the SEA,⁵⁰ finding that fixed index annuities are securities rather than an insurance contracts. As an issuer of securities, American Equity therefore would be subject to the Act’s registration and reporting requirements. The thrust of the SEC’s rationale for the *Rule* was that the absence of a clear rule identifying the regulatory status of fixed index annuities injected sufficient uncertainty into the market that efficiency, competition, and capital formation were undermined. In the Court’s opinion, however, it was not enough for the SEC simply to declare that *some* rule is necessary. It must first establish a pre-rule benchmark and then identify the relative merits of the proposed rule in comparison to the benchmark. It had not done so, and so the Court vacated the rule.

Most recently, in *Business Roundtable v. SEC* (2011)⁵¹ the D.C. Circuit Court vacated SEA Rule 14a-11, known as the *Proxy Access Rule* (2010).⁵² With modest limitations, the *Proxy Access Rule* would have require firms subject to the SEA, including investment companies, to add to their proxy materials the name of any person or persons nominated for a directors seat by a shareholder who has held at least 3% of the firm’s voting stock for a least three years. The effect of the rule would have been to allow qualified dissident shareholders partial control over the ballot to elect the company’s board of directors. The SEC reasoned that the rule could create “potential benefits of improved board and company performance and shareholder value [that] justify [its] potential costs”⁵³ and that any adverse effects on the board would derive generally from long established state law proxy rules and not from the *Rule’s* enhanced proxy access requirements.

The Court disagreed, vacating the *Rule*. In its words:

⁴⁸ Chamber, at 144.

⁴⁹ 613 F.3d 166 (D.C. Cir. 2010).

⁵⁰ Securities and Exchange Act (1934), Section 36(a), 15 U.S. Code § 78mm.

⁵¹ 647 F.3d 1144 (2011).

⁵² 75 Fed. Reg. 56,668 (2010)

⁵³ 75 Fed. Reg., at 56,761.

[The SEC] inconsistently and opportunistically framed the costs and benefits of the rule; failed adequately to quantify the certain costs or to explain why those costs could not be quantified; neglected to support its predictive judgments; contradicted itself; and failed to respond to substantial problems raised by commenters. For these and other reasons, its decision to apply the rule to investment companies was also arbitrary.⁵⁴

The Court faulted the SEC for declaring the costs of board distraction from enhanced proxy access to be merely an incident of traditional state law proxy rules. Citing to *Chamber of Commerce*, the Court reiterated: “As we have said before, this type of reasoning, which fails to view a cost *at the margin*, is illogical and, in an economic analysis, unacceptable.”⁵⁵

These D.C. Circuit Court decisions prompted a decided response. In 2012 the SEC published an internal guidance memorandum recognizing that it has a general “statutory obligation to determine as best it can the economic implications of [a proposed] rule,”⁵⁶ although not CBA per se. As a matter of good regulatory practice, however, it instructs SEC economists to “quantify expected benefits and costs to the extent feasible,” even where the available data is imperfect.⁵⁷ It also advises that staff economists be given a more prominent role in the rule-writing process, from inception through adoption.⁵⁸ Soon afterward the SEC dramatically increased the number of economists on its staff.⁵⁹

Recall the statement in EO 12866 that “agencies should select those approaches that maximize net benefits . . . *unless a statute requires another regulatory approach.*” In *National Association of Manufacturers v. SEC* (2014),⁶⁰ the Court addressed the adequacy of the SEC’s CBA of its *Conflict Minerals Rule*. Section 1502 of Dodd-Frank charged the SEC with issuing regulations requiring firms using “conflict minerals” in the Republic of the

⁵⁴ *Chamber*, at 1148-49.

⁵⁵ *Business Roundtable v. S.E.C.*, 647 F.3d 1144 (2011), at 1151 [emphasis added].

⁵⁶ *Current Guidance* at 3.

⁵⁷ *Current Guidance*, at 13.

⁵⁸ See Jerry Ellig & Hester Peirce, *SEC Regulatory Analysis: “A Long Way to Go and a Short Time to Get There,”* 8 BROOK. J. CORP. FIN. & COM. L. 361, 365–66 (2014); Bruce R. Kraus, *Economists in the Room at the SEC*, 124 YALE L.J.F. 280 (2015).

⁵⁹ See Joshua T. White, *The Evolving Role of Economic Analysis in SEC Rulemaking*, 50 GA. L. REV. 293, 308–09 (2015).

⁶⁰ 748 F.3d 359 (2014)(affirmed at 800 F.3d 518 (2015)).

Congo to investigate and disclose the origin of those minerals.⁶¹ In passing the statute, Congress specifically had determined that “[the rule’s] costs were necessary and appropriate in furthering the goals’ of peace and security in the Congo.”⁶² In response to the National Association’s challenge, the Court found that the SEC had “‘exhaustively analyzed the final rule’s costs.’ Because Congress intended the rule to achieve ‘compelling social benefits’ [the SEC] is not required ‘to measure the immeasurable’ and need not conduct a ‘rigorous, quantitative economic analysis’ unless the statute explicitly directs it to do so.”⁶³

Two federal cases recently found that general language in the EPA’s enabling legislation requires it to assess the costs and benefits of a proposed rule. Most important, in *Michigan v. EPA* (2015) the U.S. Supreme Court found that the EPA must consider both costs and benefits in regulating under the Clean Air Act’s “appropriate and necessary” standard,⁶⁴ and that its refusal to consider costs in coming to the decision to regulate power plants was an unreasonable interpretation of the Clean Air Act.⁶⁵

As the Court put it, “the phrase ‘appropriate and necessary’ requires at least some attention to cost. One would not say that it is even rational, never mind ‘appropriate,’ to impose billions of dollars in economic costs in return for a few dollars in health or environmental benefits. . . . No regulation is ‘appropriate’ if it does significantly more harm than good.”⁶⁶ A full-blown CBA is unwarranted at the preliminary stage, however. In the Court’s words: “We need not and do not hold that the law unambiguously required the Agency, when making this preliminary estimate, to conduct a formal cost-benefit analysis in which each advantage and disadvantage is assigned a monetary value.”⁶⁷

More recently, the D.C. Circuit Court relied on *Michigan v. EPA* to invalidate the MetLife corporation’s designation by the Financial Stability Oversight Council (FSOC) as a systemically important financial institution (SIFI) in *MetLife, Inc., v. FSOC* (2016).⁶⁸ Under Dodd-Frank, the FSOC may designate a “nonbank financial company” for enhanced

⁶¹ See 15 U.S.C. § 78m(p)(1)(A).

⁶² 748 F.3d 359, 369-70 (2014).

⁶³ 748 F.3d 359, 369 (2014)(citations omitted).

⁶⁴ 42 U. S. C. §7412 (n)(1)(A).

⁶⁵ Slip opinion at 15.

⁶⁶ *Michigan v. E.P.A.* 135 S.Ct. 2699, 2707 (2015).

⁶⁷ Slip opinion at 14.

⁶⁸ Case No. 16-5188 (D.C. Cir. 2017).

supervision by the Federal Reserve System’s Board of Governors if it determines that “material financial distress” at the company “could pose a threat to the financial stability of the United States.”⁶⁹ The Court rejected the FSOC’s determination that it is not required to consider the costs to the company in its risk calculus, finding that it must identify a causal connection between the risk of financial distress and the prospect of significant damage to the U.S. economy. Costs to the company are part of this determination. Otherwise the FSOC has no way of knowing whether the designation does significantly more harm than good, and it is therefore “arbitrary and capricious” under the APA.⁷⁰

D. *The Scholarly Literature*

Federal statutes and case law requiring independent agencies to perform CBA of proposed rules focus largely on financial regulators such as the SEC and CFTC, and much of the recent scholarship assailing or defending judicially reviewable CBA therefore focuses on financial regulation. Largely absent from this literature, however, is any critical discussion of the nature of the specific market failure driving the regulation or how it might feed into the underlying economic analysis.⁷¹

Coates (2015) provides an exhaustive review of the feasibility of *quantified* CBA in financial regulation.⁷² This includes his attempt to perform reliable CBA in six subject areas, which he reports to have been impossible.⁷³ He identifies any number of insurmountable

⁶⁹ 12 U.S.C. § 5323(a)(1).

⁷⁰ Slip opinion at 13.

⁷¹ Ellig and Peirce (2014) are a notable exception. *See supra* note 9. One study argues that transaction costs should be included as one component of costs in traditional CBA. Frank A.G. den Butter, Marc de Graaf, and André Nijsen, *The Transaction Costs Perspective on Costs And Benefits of Government Regulation: Extending The Standard Cost Model* (Tinbergen Institute Discussion Paper, 2009). Another argues for the importance of considering institutional transaction costs when conducting cost benefit analysis on environmental regulations. Dale B. Thompson, *Beyond Benefit-Cost Analysis: Institutional Transaction Costs and Regulation of Water Quality*, 39 NAT. RESOURCES J. 3 (1999). Neither of them take the approach offered here.

⁷² See for example Coates n. 126.

⁷³ The six subject areas are 1) Section 404 of the Sarbanes-Oxley Act requiring the SEC’s rules creating the Public Company Accounting Oversight Board (PCAOB) and to impose on public companies new mandatory disclosures under Section 404 of the Sarbanes-Oxley Act of 2002; 2) the SEC’s proposed 2004 *Investment Company Governance Rule*, addressed by the Court in *Chamber I*; heightened bank capital requirements mandated by the Basel Committee on Banking Supervision following the 2008 mortgage crisis; the Volcker Rule under the Dodd-Frank Act prohibiting U.S. banks from engaging in “proprietary trading” for their own accounts; the SEC’s proposed 2013 rule on cross-boarder swaps; and the U.K.’s Financial Services Authority’s 2011 mortgage market reforms.

difficulties and rejects claims by those who argue that quantified CBA as done in the environmental setting can provide a workable model for use in financial regulation. He asserts that economic analysis of environmental regulation involves an assessment of relatively simple physical interaction.⁷⁴ Economic analysis of financial markets is different because the market lies at the heart of the entire economy, involves various human elements that cannot be quantified, and is subject to various “non-stationary relationships” that exhibit “long-term structural changes”⁷⁵ As he puts it, unless “evidence is developed to illuminate when [CBA of financial regulation] passes its own test, courts and secondary agencies (that is, agencies other than those charged with rulemaking responsibility) should have no role in second-guessing the choice of when to conduct [it], or the details . . . when it is used.”⁷⁶ Until CBA of financial regulation develops further, any attempt at quantification is merely a “guesstimate.” In the meantime, he argues it should be used strictly as a conceptual framework to guide informed decisions ultimately based on unreviewable “expert judgment.”⁷⁷

Writing in response, Posner and Weyl (2015) argue that financial markets are ideally suited to quantified CBA because they “generate vast amounts of data [that is] monetary in nature.”⁷⁸ Accordingly, quantified CBA is much more suited to assessing financial market regulation than environmental health safety regulation. They argue that most of Coates’ criticisms of quantified CBA of financial regulation are really criticisms of any and all CBA. In their view, any uncertainty with quantified CBA is an argument in favor of further academic research rather than rejection of CBA altogether.

More recently, Masur and Posner (2018) recognize that in any given setting the regulator may be unable to quantify costs and benefits with precision owing to uncertainty, in which case it should use its most informed judgment. To move forward with a rule based on judgment regarding difficult-to-quantify costs and benefits it should publish its best estimate of costs and benefits and report its methodology as a basis for retrospective evaluation. This

⁷⁴ Coates at 1001, n. 1.

⁷⁵ Coates at 888. See also Jeffrey N. Gordon, *The Empty Call for Benefit-Cost Analysis in Financial Regulation*, 43 J. LEGAL STUD. 351 (2014).

⁷⁶ Coates at 888.

⁷⁷ Coates at 903.

⁷⁸ Eric A. Posner & E. Glen Weyl, *Cost-Benefit Analysis of Financial Regulations: A Response to Criticisms*, 124 YALE L.J.F. 246 (2015).

process essentially provides for iterative learning over time.⁷⁹

Sunstein (2015) recognizes that financial regulators are plagued by the Hayekian knowledge problem; the information necessary to formulate rational regulations is dispersed across many members of society. In some cases “Knightian uncertainty” will make it impossible for them to perform reliable CBA. He nonetheless concludes that “[t]here is no reason to think . . . it is always or usually impossible for financial regulators to conduct cost benefit analysis,” pointing out that “Executive Order 13,563, . . . directs executive agencies ‘to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible’.”⁸⁰

Revesz (2017) takes a somewhat different approach.⁸¹ Rather than focusing on whether, or to what extent, quantified CBA of financial regulation is feasible, he emphasizes the need for institutional reforms necessary to ensure financial regulators are able to perform CBA of sufficient quality to survive judicial scrutiny. These reforms are all the more pressing, he argues, owing to the Supreme Court’s decisions in *Michigan v. EPA*, which relied on the “appropriate and necessary” language of the Clean Air Act to find the EPA’s failure to consider costs in regulating power plant emissions unreasonable. Similar language appears in the SEC’s enabling legislation—in its case “necessary or appropriate in the public interest”—and Dodd-Frank uses it eighty times, in many cases for provisions directed to the SEC or CFTC.⁸²

Revesz points out that the quality of CBA done by executive agencies is quite high owing to OIRA review. The EPA, which has built significant economic expertise in area, is apparently the acknowledged forerunner.⁸³ He recommends institutional reforms that will help bring the quality of financial regulators’ CBA up to EPA standards, either by subjecting them to review by the FSOC or, preferably, to OIRA. But in his formulation this should not preclude judicial review.⁸⁴ Rather, it would subject CBA of financial regulation to two levels

⁷⁹ Jonathan S. Masur and Eric A. Posner, *Cost Benefit Analysis and the Judicial Role*, 85 U. CHI. L. REV. 935, 945.

⁸⁰ Cass R. Sunstein, *Financial Regulation and Cost-Benefit Analysis*, 124 YALE L.J.F. 263, 264-65 (2015).

⁸¹ Richard L. Revesz, *Cost-Benefit Analysis and the Structure of the Administrative State: The Case of Financial Services Regulation*, 34 YALE J. ON REG. 545 (2017).

⁸² Revesz at 548.

⁸³ Revesz at 545, 549-52

⁸⁴ Revesz at 549.

of review, one administrative and one judicial. Following first-stage administrative review, he believes federal courts would be more inclined to defer to the agency but that judicial review is nonetheless appropriate.

Although insightful as far as it goes, none of this scholarship discusses or even cites Coase, mentions market failure as the ostensible justification for regulation, or examines how the market failure framework might inform CBA. Mannix (2017) provides a notable exception. He argues that regulators suffer from an agency problem. They are charged with identifying and correcting market failure, but they may have a tendency to over-regulate because they neither bear the full costs of their actions nor capture the full benefits. That is, their behavior is subject to distorting externalities. The CBA requirement serves as an effective check on the agency problem, ensuring they act as “faithful agents of the public interest.”⁸⁵

Of relevance here, Mannix notes that the Obama administration opened the door to incorporating behavioral economics into regulatory CBA. As he describes it, since then “regulatory agencies have increasingly used consumer irrationality to justify regulatory interventions even where there is no apparent market failure. They attribute economic benefits amounting to many billions of dollars to regulatory actions that give consumers nothing new and simply deprive them of their preferred choices.”⁸⁶ If regulators are to be trusted as stewards of the public interest, they must be willing to accept those being regulated as sovereign in their preferences. He quotes Guyer & Viscusi (2013) on this point, whose statement also supports the Coasean approach:

How can it be that consumers are leaving billions of potential economic gains on the table? . . . Moreover, how can it also be the case that firms seeking to earn profits are likewise ignoring highly attractive opportunities to save money? . . . Rather than accept the implications that consumers and firms are acting so starkly against their economic interest, a more plausible explanation is that there is something incorrect in the assumptions being made in the regulatory [CBA].⁸⁷

⁸⁵ Mannix, at 164.

⁸⁶ Mannix at 164.

⁸⁷ Mannix at 164-65.

In the following statement, Mannix recognizes the fundamental premise of TCBA: “improvements [in efficiency] would be accomplished by the market instead of the government if the market were better able to overcome transaction costs.” It takes only one more step in reasoning to recognize that requiring regulators to demonstrate a reduction in transaction costs before imposing a new rule provides the economically correct constraint on regulatory overreach. Equally important, by leaving the regulated free to respond as they choose to a properly justified rule, TCBA accords them sovereignty over their preferences. Although seemingly normative, this point accentuates the informational advantage of TCBA, which recognizes that the parties being regulated are better equipped to assess the costs and benefits of various possible responses than are regulators.

Another point worth mentioning is that the debate over the feasibility of quantified CBA focuses attention largely on macro-level regulation, such as banking reserve requirements, measures to control systemic risk, cross-border swaps market, etc. Yet much of what the SEC regulates occurs on the micro level, often involving garden-variety vertical arrangements familiar in the antitrust arena.⁸⁸ The transaction costs the parties would face to privately address putative market failures in economy-wide settings might make private ordering solutions completely ineffectual (although participants’ ingenuity in this regard is often surprising). But transaction costs in the issuer-brokerage-investor, issuer-investment bank-investor, exchange-investment-company-investor, and other vertical relationships in financial services are fairly low. Indeed, in each case it is easy enough to show that reducing transaction costs is the primary reason such relationships are structured as they are. In these and other settings, transaction costs may hinder the parties from maximizing net benefits, but they are surely low enough that any regulation reducing the relevant costs of transacting will lead the parties to adjust their relations to increase net benefits.

III. Overview of Traditional Cost-Benefit Analysis

A. *Assessing Welfare in the Basic Neoclassical Model*

⁸⁸ See D. Bruce Johnsen, *A Transaction Cost Assessment of SEC Regulation Best Interest*, forthcoming in the COLUMBIA BUSINESS LAW REVIEW.

In 1896 Vilfredo Pareto proposed *pareto optimality* as the ideal basis for making welfare trade-offs for social policy. A given allocation of resources is pareto optimal if there is no reallocation that would improve one person's welfare without reducing another's. In a world of zero transaction costs, voluntary market exchange would lead to pareto optimality and regulation would be unnecessary. Despite the contractarian appeal of relying exclusively on voluntary exchange to allocate resources, pareto optimality is an unworkable standard for justifying regulation. There can be no doubt regulation is warranted in some settings in which relying purely on voluntary exchange is impossible, and there will always be winners and losers. The cost of finding the losers, divining their losses, and compensating them to assure that they would be no worse off is simply unworkable.

The Kaldor-Hicks rule emerged in roughly 1939 as an alternative to pareto optimality and has since become the default rule for assessing net benefits to society in the context of CBA. A given re-allocation of resources is Kaldor-Hicks efficient if the winners could, in principle, fully compensate the losers and still improve their own welfare. It has come to be known as the "potential compensation test."⁸⁹

The neoclassical model provides the theoretical foundation for traditional CBA. It illustrates the welfare effects of trade embedded in market demand and supply assuming, among other things, that individuals and firms are rational maximizers, that no buyer or seller has market power, that all decision makers bear the full costs of their decisions and capture the full benefits, that all parties have full information, and that the interacting parties face zero transaction costs. In equilibrium, the model hypothesizes that market prices will reflect *marginal* benefits and costs, and that the parties will capture all potential gains from trade in the form of consumer and producer surplus, or social welfare. With costless transacting, the allocation of resources is said to be socially optimal, or "first best."

These assumptions provide a foundation for explaining how individuals and firms make decisions and are not an attempt to accurately characterize reality. The main concern is that the assumptions lead to testable predictions consistent with real-world observation. Whether or not people make cognitively rational decisions is irrelevant. The important

⁸⁹ Richard O. Zerbe, Jr., and Allen S. Bella, *A Primer for Benefit-Cost Analysis* (Edward Elgar, 2006).

question is whether they behave “as if” they are cognitively rational, fully informed, etc.⁹⁰ Transaction cost economics has shown many times that behavior seemingly consistent with the Neoclassical Model can be easily explained by relaxing its assumptions to accommodate the costs of transacting, just as Coase predicted.

Figure 1 shows the unit rate of output for a traded good, Q , on the horizontal axis and the price in dollars per unit, P , on the vertical axis. Line D shows consumer demand for the good, which is synonymous with aggregate marginal valuation ($\sum MV_i$) across i consumers for each possible rate of output. The demand curve slopes downward to the right to reflect diminishing marginal valuation. Line S shows aggregate supply of the good across j producers, roughly reflecting their aggregate marginal cost ($\sum MC_j$) for each possible quantity, with these costs equal to the value of productive inputs if deployed elsewhere. The supply curve slopes up to the right, reflecting increasing marginal cost.

In a well-functioning competitive market with no transaction costs the equilibrium price is P^* and output is Q^* . Consumers make total expenditures equal to rectangle $P^* \times Q^*$. For the marginal unit of the good, consumer valuation is exactly equal to price, and consumers are indifferent to whether they buy this unit or not, so it generates no surplus—“net benefits”—at margin. Moving backward along the demand curve, consumers’ valuation of the good increasingly exceeds the price they pay. For Q^* units per period rather than zero, their total valuation is represented by the large trapezoid under the demand curve between zero units and Q^* units. Subtracting their total expenditures, $P^* \times Q^*$, the remaining upper dotted triangle is known as consumer surplus, one component of net social benefits.

A similar story can be told for producers. For Q^* units they are indifferent to whether or not they supply the marginal unit because $P^* = MC$ for that unit. As a result of supplying Q^* units rather than zero, they earn total revenues of $P^* \times Q^*$, exactly what consumers spend. Their cost of supplying Q^* units is the trapezoid beneath MC from zero to Q^* . The difference, represented by the lower cross-hatched triangle, is known as producer surplus, the other component of net social benefits.

⁹⁰ Milton Friedman, *The Methodology of Positive Economics* (in *Essays in Positive Economics*, 1953). In a competitive market, firms that happen to zig when they should zag will be eliminated from the system. Those remaining will appear to have chosen correctly even if their managers lacked the wherewithal to make an intelligent choice. Armen E. Alchian, *Uncertainty, Evolution, and Economic Theory*, 211 J.P.E. 58 (1950).

Together, consumer and producer surplus constitute the gains from trade, total social welfare, or, what Executive Order 12291 refers to as the “net benefits to society” from having Q^* units rather than none at all. The resulting allocation of resources is said to be Pareto optimal because no reallocation can improve social welfare. Hypothetically, if output is forced below Q^* , consumers sacrifice more value than producers save. If output is forced above Q^* , producers lose more value than consumers gain.

The neoclassical model is a remarkably powerful tool for predicting the direction of the marginal effects from an outside shock, comparative statics.⁹¹ Obvious examples include the imposition of a new tax or a restriction on trade that shifts either the demand or supply curve and causes predictable changes in prices, rates of output, and other indicia of the parties’ behavior. More generally, the model can be used to explain how and why observed patterns of behavior vary across time or differ cross-sectionally when the constraints market participants face change at the margin. The model is testable, has been repeatedly tested, and has survived testing largely intact.

The neoclassical model’s reliability falls off as we move beyond marginal analysis. Quantifying net social benefits, or even just the marginal effect on net social benefits from a given shock, is far less reliable. Economists *hypothesize* that the area under a demand curve up to any arbitrary rate of output reflects total consumer valuation, but getting enough data to reliably estimate a real-world demand curve is problematic. Not only is the real world a noisy place, but most of the variation we observe is in a narrow neighborhood around the equilibrium price and quantity. Among other things, accurate quantification requires the researcher to estimate how much people would pay for the first few units of a good whose normal consumption might be in the millions. The thorny scientific question is what evidence could possibly refute any specific measure of social welfare or, by implication, any cost-benefit analysis?

The same can be said on the producer side. The supply curve roughly reflects marginal costs aggregated across all producers, but (as EO 12866 recognizes) the economic definition of cost is opportunity cost—the value of the next best opportunity forgone.

⁹¹ Eugene Silberberg and Wing Suen, *THE STRUCTURE OF ECONOMICS: A MATHEMATICAL ANALYSIS* (McGraw-Hill/Irwin, 3rd ed., 2000).

Opportunity costs are seldom observable in an objective way. They have only a loose relationship to out-of-pocket expenses, do not appear as such on balance sheets or income statements, and in any event reflect the value of actions not taken and are therefore unobservable. Indeed, economists generally do not assert that market participants, themselves, know the opportunity cost of their decisions, only that they behave as if they know. Assessing opportunity cost at the margin is also troublesome because it represents the increase in total cost owing to a one-unit increase in output holding all else equal, a normally unobservable counter-factual. What most laymen have in mind when they think of cost is average cost—total cost divided by total output—which is much easier to observe and measure but in many settings is an inappropriate basis for predicting the choices people make or the relevant costs for CBA.

This is not to say quantification is hopeless. Over the years econometricians have made tremendous progress developing empirical methods to help see through noise in the data and to disentangle the various factors that influence market outcomes. Far more complete data is now available.⁹² With the advent of scanners that record millions of retail transactions evidencing huge variations in prices and quantities, economists have begun to make headway estimating demand and consumer surplus, possibly bringing quantified CBA within reach in specific settings. One early study estimates the demand for a new breakfast cereal, putting the annual addition to consumer surplus from a single new product in the range of \$66 to \$78 billion.⁹³ Another estimates the demand for Uber rides, with total benefits to U.S. consumers also in the billions of dollars.⁹⁴ In some settings, an appropriate CBA requires a valuation of life. Empirical estimates of the value of a statistical human life (VSL) are widely used.

These are situations in which the researcher picks the subject matter based on knowledge that sufficient data is available for analysis, rather than because of the pressing

⁹² See Henry G. Manne, *Economics and Financial Regulation*, Regulation, Vol. 35 No. 2 (Summer 2012).

⁹³ Jerry A. Hausman, *Valuation of New Goods under Perfect and Imperfect Competition*. At 228, 234. (“The correct economic approach to the evaluation of new goods has been known for over fifty years, since Hicks’s pioneering contribution. However, it has not been implemented by government statistical agencies, perhaps because of its complications and data requirements. Data are now available.” At 234-35). In *The Economics of New Goods* (Timothy F. Bresnahan and Robert J. Gordon, eds., University of Chicago Press, 1996).

⁹⁴ Peter Cohen, Robert Hahn, Jonathan HALL, Steven Levit, Robert Metcalfe, *Using Big Data to Estimate Consumer Surplus: The Case of Uber*, NBER Working Paper No. 22627, Sept. 2016.

need to do CBA of proposed regulation in a specific setting. In most financial settings calling for CBA of corrective rules, the necessary data is unlikely to exist and collecting it may be too costly or time consuming to be feasible.

B. Market Failure as a Basis for Corrective Rules

The neoclassical model states that people acting in their own self-interest will efficiently allocate resources as long as they bear the full costs or capture the full benefits of their actions. When some costs or benefits fall on third parties—so-called externalities—the decision maker’s resource allocation decisions could exceed or fall short of optimality, and if so the market is said to fail. Every undergraduate economics major learns that government regulation is justified when the market fails owing to externalities.

Figure 2 illustrates the accepted mechanics of how externalities lead to market failure. Panel A shows a negative externality, while Panel B shows a positive externality, and in either case the activity in question may involve a nontraded good such as driving on public roads. Line MPB in Panel A reflects the marginal private benefits to a decision maker from engaging in some socially productive activity, such as driving to work. Because he captures all benefits, there are no external benefits that spill over on others; thus, marginal private benefit is identical to marginal social benefit ($MPB \equiv MSB$). On the other side of the equation, his private costs are given by MPC. Being self-interested, he will engage in A^0 units of the activity, where $MPB = MPC$. According to standard welfare analysis, at A^0 he does too much of the activity, neglecting to consider the marginal external costs, EC, that spill over on others in the form of traffic congestion. From society’s standpoint optimality occurs at A^* , where marginal social benefits just equal marginal social costs; $MSB = MSC \equiv MPC + EC$. Social welfare falls short of the optimum by the dotted triangle, a deadweight loss reflecting resources use whose social value falls short of their social cost, more generally referred to as forgone gains from trade.

The mechanics of positive externalities, shown in Panel B, follow much the same reasoning. Here, the decision maker equates his marginal private benefits with his marginal private costs and ignores any external benefits that spill onto others because he is unable to

charge a price for them. He ends up doing too little of the activity; that is, A^0 falls short of A^* . The shaded triangle shows the associated loss in social welfare. A relevant example comes from the principal-agent setting. The agent is charged with taking action to increase the principal's wealth, but although the agent bears the full costs of such actions he normally receives only a small fraction of the associated benefits. He therefore stops short of the activity level that maximizes the benefits to the principal. For example, a retail securities broker might exert too little effort identifying profitable trades for his client's benefit or under-search for price improvement on trades the client orders.

A simple solution to too much or too little activity is government mandates, such as limiting to A^* the number of travelers allowed to enter the roadway. A common example is HOV restrictions requiring a minimum number of vehicle occupants on specific roads at peak travel times. Speed limits, in essence, are another. Examples of mandates to solve positive externalities include required vaccinations and minimum schooling requirements. Mandates can be cumbersome because they require the regulator to gather information to identify A^* and leave little discretion to market participants about how to make efficient adjustments in response.

Corrective taxes are an alternative to quantity mandates. By forcing travelers to bear the full social cost of their travel decisions, for example, a road tax is said to correct the market failure and restore socially optimal resource allocation while leaving people free to choose how much and when to travel. They naturally choose activity level A^* rather than A^0 . Gasoline and cigarette taxes are arguable examples of corrective taxation. Where feasible, corrective taxes impose a smaller information burden on the regulator than government mandates because they allow market participants to make economizing adjustments as long as they are willing to pay the tax.

Two additional responses are available to address market failure are available. One is for the government to do nothing and the other is for it to require one party to compensate the other by establishing or changing the rule of liability. These possibilities are discussed below.

IV. A Closer Look at Market Failure

A. *From Pigou to Knight to Coase*

Writing just a few years after Pigou published his two-roads example, Frank Knight rejected the claim that market failure necessarily justifies government regulation.⁹⁵ In response to Pigou's example, Knight showed that the optimal tax Pigou endorsed to correct the market failure would be exactly the same as the profit-maximizing toll a private road owner would charge.⁹⁶ From this he concluded it was not market failure that caused overuse of the fast road but Pigou's unstated assumption that the road was unowned—in the public domain—and therefore subject to open access and the attendant resource misallocation.⁹⁷ The only reason Pigou had found an inefficiency is because he assumed away private property.

Knight also made the important point that the social function of private property consists of the incentive it provides owners to use their property efficiently, in this case by gathering the information necessary to identify the profit-maximizing toll.⁹⁸ The owner loses profits if he sets a toll leading to inefficient resource allocation. It is entirely plausible in many cases that regulators lack the wherewithal or incentive to identify the optimal tax or toll even if they know congestion when they see it.

Nearly 35 years later, Coase famously introduced the “costs of market transactions” into the market failure debate.⁹⁹ This helped operationalize Knight's insight about property rights because transaction costs are capable of leading to testable theory. Coase used the example of a rancher's cattle straying and trampling the neighboring farmer's crops, a garden-variety negative externality that the common law regularly addressed under the law of nuisance. Assuming zero transaction costs, he showed that the rule of liability would have

⁹⁵ Frank Knight, *Some Fallacies in the Interpretation of Social Cost*, 38 Q. J. ECON 582 (1924).

⁹⁶ For a brief history of roadway ownership and administration, see Douglas W. Allen, *The Institutional Revolution* (University of Chicago Press, Chicago and London: 2012), at 179-84.

⁹⁷ This is not to say that open access is always inefficient. See Dean Lueck, *The Rule of First Possession and the Design of the Law*, 38 THE J. LAW & ECON. 393 (1995); D. Bruce Johnsen, *Myths about Mutual Fund Advisory Fees: Economic Insights on Jones v. Harris*, 35 J. CORP. LAW 561 (2010); Michel A. Habib and D. Bruce Johnsen, *The Quality Assuring Role of Mutual Fund Advisory Fees*, 1 INTL. REV. OF LAW & ECON. 46 (2016).

⁹⁸ Although Knight's analysis focused on Pigou's call for corrective taxation, it applies equally to quantity mandates.

⁹⁹ The Problem of Social Cost was the culmination of several of Coase's earlier works. R.H. Coase, *The Nature of the Firm*, 4 ECONOMICA 386 (1937); and R.H. Coase, *The Federal Communications Commission*, 2 J. LAW & ECON. 1 (1959).

no effect on the number of cattle (resource allocation) the rancher raises or the extent of crop damage. Whether ranchers have to pay for damage to farmers' crops or farmers have to pay ranchers to reduce their herd size, efficient resource allocation will prevail.

This irrelevance result has since come to be known as the Coase Theorem, although Coase never touted his analysis as “the Coase Theorem” and nor did he endorse the relevance of zero transaction costs to the real world.¹⁰⁰ Nonetheless, countless scholarly articles have attempted to refute the Coase Theorem. Some claim to have done so theoretically by showing that if bargaining is costly the rule of liability can affect resource allocation even where the costs of market exchange are zero.¹⁰¹ This result follows only by excluding bargaining costs from the costs of market transactions. As Doug Allen (2006) observes, those who labored to refute the Coase Theorem “won the argument, but . . . missed the point and helped to side line transaction cost economics as far as the mainstream profession was concerned.”¹⁰²

A core group of economists began integrating the cost of transacting into the neoclassical model to explain the workings of the economic system, especially the contours of economic organization, as Coase had predicted.¹⁰³ In recognition of this point, Allen (1992) offers the Coase Theorem Part II: “When transaction costs are positive, property rights are allocated to maximize the gains from trade net of the transaction costs.”¹⁰⁴

In a Coasean framework, it begs the question to label one party the victim and the other the wrongdoer, or to say that one party injures or imposes costs on another. Two parties simply want to use a scarce resource in mutually incompatible ways, an inevitable condition in a world of scarcity. The traveler who enters the fast road no more imposes costs on other travelers than they impose costs on him and one on another. The rancher whose cattle stray is no more economically responsible—the cause—for injury to the farmer from

¹⁰⁰ The Coase Theorem is virtually identical to the Modigliani and Miller Irrelevance Theorem (under given assumptions, a firm's capital structure—how it is financed—will have no effect on firm value). Franco Modigliani and Merton Miller, *The Cost of Capital, Corporation Finance and the Theory of Investment*, 48 AM. ECON. REV. 261 (1958). For such theorems, the explanatory power comes from relaxing the underlying assumptions.

¹⁰¹ See especially, Robert D. Cooter, *The Cost of Coase*, 11 J. LEG. STUD. 1 (1982).

¹⁰² Douglas W. Allen, *Theoretical Difficulties with Transaction Cost Measurement*, 2 Division of Labor and Transaction Costs 1 (2006), at 6.

¹⁰³ Douglas W. Allen, *What Are Transaction Costs?* 14 RES. L. & ECON. 1 (1991), at 716.

¹⁰⁴ Allen (1992), at 6.

increasing his herd size than the farmer is responsible for planting crops where the cattle are likely to stray. In Coase's words, "it is true that there would be no crop damage without the cattle. It is equally true that there would be no crop damage without the crops."¹⁰⁵ Injury, or damage, is a reciprocal problem and, operationally, the costs of transacting determines who ends up with what rights.

More generally, transaction costs guide understanding of the structure of property rights—whether the focus is the rule of liability, the choice of contract terms or business form, the prevailing business customs, the pattern of social norms, or any other evolved mechanism to determine who holds rights to which value flows. Inefficient resource allocation leaves money on the table and creates an opportunity for market participants to cooperate to capture gains from trade. It can persist only where the costs of transacting exceed the value of forgone gains from trade. Transaction costs are real costs and, as always, it pays people to spend a dollar only if doing so generates more than a dollar in gains.

Transaction cost economics identifies costs that the frictionless Neoclassical Model assumes away. As a result, it can better predict the likely effects of government regulation. Regulation constrains transacting parties' choices, driving them to a new equilibrium. The relevant policy question is whether the new equilibrium is an improvement over the old, which depends on how the regulation affects the costs of transacting. In the real world, it makes little sense to claim government can correct market failure unless it has a clear comparative advantage in reducing transaction costs. As Coase lamented,

[a] better approach would seem to be to start our analysis with a situation approximating that which actually exists, to examine the effects of a proposed policy change and to attempt to decide whether the new situation would be, in total, better or worse than the original one. In this way, conclusions for policy would have some relevance to the actual situation.¹⁰⁶

Trying to divine what the world would look like if transaction costs were zero is little help for setting policy. The operational goal of transaction cost economics is to understand how

¹⁰⁵ Coase (1960), at 13.

¹⁰⁶ Coase (1960), at 43.

differences in, or shocks to, the costs of transacting influence interacting parties' equilibrium behavior, including prices, various other terms of exchange, and the evolved structure of property rights.

B. What are Transaction Costs?

For the concept of transaction costs to be useful in social science, they must be defined specifically enough that any theory relying on them is capable of being refuted. "A theory potentially consistent with everything explains nothing."¹⁰⁷ And regardless of the merit of transaction costs as an analytical tool for the social sciences, for the purposes of this essay the concept must be specific enough to assist regulators called on to perform TCBA of proposed rules.

An intuitive definition of transaction costs is that they consist of all costs absent from a one-man ("Robinson Crusoe") economy.¹⁰⁸ That is, they encompass the costs of all human interaction of any economic substance. For most purposes this definition is overly broad, among other reasons because it would subsume transportation costs, which better qualify as garden-variety production costs common to frictionless models.

A second possible definition of transaction costs is that they consist of the costs of transferring legal ownership or, as Coase stated by way of example in *The Problem of Social Costs*, the costs of market transactions.¹⁰⁹ While adequate for some purposes, this definition is too narrow for many others, in part because it excludes the costs of transactions in which no transfer of legal ownership occurs, such as those occurring within firms and other organizations.

A third definition is that transaction costs consist of the costs of establishing and maintaining *economic* property rights.¹¹⁰ This definition accommodates a world in which ownership is never complete, always leaving some value in the public domain and subject to competitive capture. Because Pigou's road lies in the public domain, its travelers establish *de facto* ownership over their place on the road by occupying it first. A competitive race to

¹⁰⁷ Steven N.S. Cheung, *A Theory of Price Control*, 17 J. LAW & ECON. 53 (1974), at 54.

¹⁰⁸ Allen (1999), at 906.

¹⁰⁹ Allen (2006), at 6.

¹¹⁰ Allen (2006), at 5.

first possession results in crowding and congestion—overuse—which dissipates some of the road’s potential value.¹¹¹

Even where a private road owner holds legal title, however, for practical purposes some of its value inevitably remains in the public domain because the costs of perfect exclusion are too high. Toll-paying travelers have the ability to capture this value, at a cost, and face a competitive race to do so against other travelers, and ultimately the road owner. They might agree to constrain their behavior, but unless the road owner installs a perfect and very costly system of cameras, helicopters, radar detectors, etc., to measure travelers’ actual behavior, any given traveler can extract more value from using the road than is jointly efficient.

The parties would probably agree that travelers have the right to stop on the roadside to fix a flat tire, but what about to take a nap or watch wildlife, both of which are likely to slow other travelers and reduce the toll they are willing to pay? What about speeding, which may benefit the speeder but increases the prospect of injury to others and also reduces their willingness to pay? What about vehicle weight limits to save wear-and-tear on the road? If the toll is assessed based on weight, any trucker knows to fill his fuel tanks after getting a weight certificate rather than before. This type of maximizing behavior is reciprocal. Despite advertising safe passage, the road owner might neglect to erect warning signs and other markers, to ward off highwaymen, or to keep cattle and large wildlife from straying onto the road? All of these possibilities and more feed into the equilibrium toll and other terms of travel, which the owner can vary by time of day, weather conditions, size or weight of vehicle, traveler loyalty, etc., so as to mitigate dissipation, but subject to the costs of transacting.

Who ends up with what rights in practice depends on the parties’ opportunities to capture value lying in the public domain, which depends predictably on the costs of transacting. Equilibrium occurs where the marginal cost of transacting equals the marginal “external cost” or “external benefit,” depending on the situation. For any level of activity beyond A^0 in Figure 2, the gains from reducing the level of activity exceed the transaction

¹¹¹ Absent an owner, it is conceivable those who want to use the road can get together and negotiate efficient restrictions on use, but the cost of such collective action—a transaction cost—are likely to be prohibitive in many settings. Private ownership can therefore be seen as a transaction-cost-reducing stand-in for collective action.

costs, consistent with market equilibrium. The length of line segments AB and CD in Figure 2 illustrate this point. If the cost of transacting at A^0 in Panel A of Figure 2 were less than the value reflected in line segment AB, the parties would find it in their interest to move to a lower and more socially efficient level of activity. At the margin, the marginal private cost (MPC) of the activity is equal to the marginal social cost (MSC) at A^0 , and the outcome is socially efficient. The parties are in equilibrium in the sense that neither is interested in adjusting given the transaction costs they would incur to do so.

This framework provides a theoretical basis for understanding the structure of economic property rights, as well as the effect any external intrusion such as government regulation is likely to have on the parties' decisions. It also makes clear that any regulation that reduces transaction costs will move the interacting parties toward A^* . A reduction in transaction costs is therefore the idealized goal of regulation aimed at correcting market failure. A parallel story can be for Panel B and positive externalities.

Allen defines economic property rights as the ability, whether legally protected or not, to exercise a choice over an economic good.¹¹² They are *defacto* in nature rather than *de jure*. This definition raises three questions. First, what maximand is appropriate for hypothesizing about the right-holder's motivation in exercising his choice? Second, what is meant by an economic good? Third, what is meant by a right?

Scholars who focus on the economics of property rights have had success hypothesizing that people maximize expected wealth. As a maximand, wealth has two favorable attributes helpful for understanding the structure of economic property rights. Wealth is a stock concept representing future value flows discounted to the present at the appropriate interest rate. Wealth maximization implies that people will invest to enhance their wealth to the extent, and only to the extent, that their expectations about capturing the investment returns are likely to be met, that is, to the extent economic property rights are secure. Wealth maximization recognizes that any theory of property rights must account for multiple periods. In addition, value, and hence wealth, is potentially measurable in the real world through revealed preference. Revealed preference is defined as the actor's willingness

¹¹² Allen (1999), at 898; Allen (2006), at 3.

to give up some valued good to get another good. It is often observable at the margin in the competitive struggle to establish or maintain economic property rights.¹¹³

Following Demsetz (1968), a “right” is forward-looking and reflects the ability of the holder to form accurate expectations about capturing the value of an economic good.¹¹⁴ The more definite the right the more a wealth maximizing right-holder will invest to increase its net present value. Any number of mechanisms effectively increase the certainty of rights. Law with its sanctions is one of them. Others include reputational sanctions, sanctions for violating custom or social norms, the threat of violence and other forms of self-help, etc. Each of these, in relevant situations, carries its own transaction costs, which has implications for the structure of economic property rights.

The standard definition of an economic “good” is that it consists of anything for which more is preferred to less, which is inherently subjective. But what is the “thing”? It is not necessarily a tangible object. Any tangible object, Blackacre for example, will generate value on multiple dimensions, each of which might be treated as a separate intangible thing owned, in law or in fact, by a separate party.¹¹⁵ Partition of the surface and mineral estates in land, various servitudes on the surface estate, leases, usufructs, etc., are obvious examples.

Economic property rights consist of the ability to exercise choice over one or more intangible assets,¹¹⁶ often but not invariably embodied in an identifiable thing in the following sense. Rights do not simply give the holder the ability to capture value, they give the holder the ability to *expect* to capture value, potentially as a stream that flows out over time on some dimension of a legally ownable good. Rights to the yearly harvest of apples from an orchard, rights to the orchard’s yearly flow of nectar for honey, and rights to collect branches periodically pruned from the trees for use as firewood are obvious examples. Rights over these value flows can be unbundled and packaged into separate intangible assets, with their capitalized value, or wealth, equaling the value of the net flows discounted to

¹¹³ See D. Bruce Johnsen, *Wealth is Value*, 15 JOURNAL OF LEGAL STUDIES 263 (1986); David Friedman, *Law’s Order* (Princeton University Press, 2000), at 19, 22.

¹¹⁴ Harold Demsetz, *Toward a Theory of Property Rights*, 57 A.E.R. 347, 347 (1967.)

¹¹⁵ Henry Smith, *Property as the Law of Things*, 125 HARV. L. REV. 1691 (2012).

¹¹⁶ Even in law, intellectual property rights are intangible and generally have no association with any tangible thing.

present value.¹¹⁷

To the extent the structure of rights is clear and reliable, the parties often find it worthwhile to cooperate to increase their joint wealth by making specialized investments in their respective assets. Specialized investment to protect an asset from capture by others is one source of value creation. Another, conditional on the first, is specialized investment to increase the productivity of the asset.

Economic property rights motivate specialists to make informed investments in the assets over which they exercise choice. Ordinarily, an asset owner cannot simply hire a specialist as a consultant to provide the necessary expertise because the costs of assessing the specialist's contribution to the asset's value in a noisy world are too high. As the world unfolds, asset values often depart from what was expected at the moment of investment. This can occur because of random noise, which the specialist cannot control, or because he exercised poor judgment or simply shirked—call it “entrepreneurial moral hazard.” Knowing little about the specialist's expertise, a non-specialist owner lacks the wherewithal to effectively assess whether random noise or moral hazard caused a bad outcome. Where the costs of transacting allow, requiring the specialist to make the investment and to own the results by bearing the asset's residual value averts moral hazard and increases the gains from trade.¹¹⁸ Assigning responsibility in this way is an important function of economic (and legal) property rights.

Secured lending provides insight into one among many possible examples of how intangible assets can be unbundled from a tangible thing. Imagine construction of a commercial building to be used as an office tower by an office-tower (OT) specialist. Unknown to the specialist, should the bad state come to pass the best alternative use of the office tower is converted into a hotel. Public reports confirm that office-tower-to-hotel conversions have occurred in significant numbers at times during the past.¹¹⁹ Office towers

¹¹⁷ “Property organizes this world into lumpy packages of legal relations—legal things—by setting boundaries around useful attributes that tend to be strong complements. The law of property in effect encapsulates these lumpy packages, or modules, semitransparently from other modules and the outside world generally.” Henry Smith, *Property as the Law of Things*, 125 HARV. L. REV. 1691 (2012), at 1693,

¹¹⁸ Armen A. Alchian and Harold Demsetz, *Production, Information Costs and Economic Organization*, 62 A.E.R. 777 (1972); Yoram Barzel, *Economic Analysis of Property Rights* (Cambridge University Press, 1989).

¹¹⁹ Drew Ward, *Old Offices Get New Lease on Life as Hotels*, August 21, 1996, B1; Laura Kusisto, *Commercial Property: Desks Swapped for Beds—As Demand for Rooms Increases, Office Buildings are Converted to Hotels*, Wall Street Journal, March 26, 2012, A22; Kosaku Narioka, *Land-Squeezed Developers Convert Office*

with rectangular floor plans make better conversions than those with square floor plans because they ensure each room has a window without leaving dead space in the center of the building. For given square footage, however, the construction costs of rectangular floors plans are higher because of their greater wall perimeter per square foot of floor space.

In contemplating the investment, an OT specialist is likely to wonder what he can do with the building if the bad state occurs. If he finances a portion of construction cost with secured debt he is likely to find he can borrow more to finance a tower with a rectangular floor plan than one with a square floor plan. This is because the lender is a specialist at knowing what can be done with the building in the bad state and how much it will fetch when redeployed should the OT specialist go into default. The lender bonds his valuation of the building's redeployment value by lending this amount minus anticipated transaction costs and taking a security interest in the tower. If he is right he profits, and if he is wrong he suffers losses. Embodied in the tangible thing—the building—are two intangible assets, an office tower and a hotel, each owned by the appropriate specialist.¹²⁰

The OT specialist need not know any of this information. He makes his decision about the best configuration of the building for use as an office tower after trading off alternative construction costs and loan terms. He then defaults if the revenue the building generates in the future falls short of his mortgage payments, which is the jointly efficient thing to do. The OT specialist bears the residual from his accuracy in predicting the payoff to the building as an office tower, and the lender bears the residual from his accuracy in predicting the building's redeployment value. Default is a feature, not a bug.

Hiring a consultant to provide the information imbedded in the lender's valuation and actually carrying out the conversion would require the OT specialist to incur inordinate transaction costs, for example by spending resources bargaining ex post in the event redeployment becomes necessary. Secured debt reduces the transaction costs of discovering this information and arranging for redeployment by efficiently allocating ownership—

Buildings Into Hotels, WALL STREET JOURNAL, May 2, 2017 Available at: <https://www.wsj.com/articles/land-squeezed-developers-convert-office-buildings-into-hotels-1493736404> .

¹²⁰ A skeptic might point out that secured lenders, such as banks, have no apparent specialized expertise. The response is that they serve as intermediaries between different specialists. It is clear from some industries, however, that lenders do have specialized expertise, as in the case of aircraft leasing-lending. See Michel A. Habib and D. Bruce Johnsen, *The Financing and Redeployment of Specific Assets*, 59 JOURNAL OF FINANCE 693 (1999).

residual claims—across states of the world in a way that is nearly self-executing.¹²¹

C. *Externalities Everywhere and Nowhere*

In a literal sense, “externalities” are everywhere, but private ordering internalizes most of them before they are ever recognized. Imagine Mr. A enjoys eating eggs, which he produces and consumes up to the point where his MPB equals his MPC. Now imagine Ms. B also likes eggs but has none, and that there is no trade between them. According to Pigou’s definition, Ms. B’s unmet valuation qualifies as a positive externality. Ms. B’s valuation must be included in the MSB, and Mr. A does not account for this in his production and consumption decisions. The conclusion must be that Mr. A produces too few eggs and keeps too many for himself because the net benefit he gets from the marginal egg is zero, while Ms. B values a single egg far more than zero. Should the government intervene by compelling Mr. A to share his eggs with Ms. B? Tax Mr. A? Possibly, but with clear property rights the problem is routinely solved through market transactions, which continue until joint costs and benefits are equalized inclusive of transaction costs.

It is difficult to see an externality in these situations because transaction costs are low enough to allow the parties to negotiate a better outcome, and they routinely do. If the goal is to understand or explain the terms of trade observed in the real world as a function of the costs of transacting, it is literally accurate in the Pigouvian sense to say that *trade internalizes the externality resulting from the absence of trade*. Any claim of a real-world externalities should be met with a healthy skepticism and a willingness to drill down to identify the costs of transacting and their equilibrium conditions. It may be that corrective government regulation is appropriate, but, at least where the parties deal directly, the case should first be made that the government has a comparative advantage over the parties in reducing the relevant transaction costs and the regulation will in fact reduce these costs.

There are countless examples of externalities being internalized in private markets, and this occurs even where the transacting parties are anonymous to one another.¹²² Cars

¹²¹ D. Bruce Johnsen, *The Quasi-Rent Structure of Corporate Enterprise: A Transaction Cost Theory*, 44 EMORY LAW JOURNAL 1277 (1995); Michel A. Habib and D. Bruce Johnsen, *The Financing and Redeployment of Specific Assets*, 59 JOURNAL OF FINANCE 693 (1999); Michel A. Habib and D. Bruce Johnsen, *The Private Placement of Debt and Outside Equity as an Information Revelation Mechanism*, 13 REVIEW OF FINANCIAL STUDIES 1017 (2000).

now come equipped with sensors and warning mechanisms that help spatially-challenged drivers park, which reduces the delay other drivers experience. Grocery stores supply shoppers with carts having seats to keep young children from wandering and unloading shelves for entertainment, allowing other shoppers to save valuable time and the store owner to increase prices incrementally without losing sales. Coffee shops now have smart-phone apps to make pre-ordering and payment simple and quick, thereby reducing customer waiting times. The list of externalities routinely internalized to the advantage of interacting parties is endless but goes largely unnoticed.

Steve Cheung (1969) may have been the first to develop “a theory of contract choice”¹²³ to show how private parties in the real world successfully avoid market failures of the kind Pigou hypothesized.¹²⁴ Prior to Cheung’s insightful work, development economists considered share contracting in agriculture inefficient because the tenant received only a fraction of the crop but bore the entire cost of variable inputs, a classic positive externality. The inference was that he would undersupply effort. Fixed rent contracts were generally considered more efficient because the tenant who makes decisions about working the land bears one hundred percent of the consequences of any inefficiency. Cheung pointed out that private landowners can choose between fixed rent and cropshare contracts, and that in equilibrium they often chose cropshare. Development economists characterized landlords who did so as irrational. Yet Cheung convincingly shows that non-price terms of the cropshare contract mitigate the undersupply problem by more carefully clarifying who has what rights and responsibilities. He systematically explains the choice between fixed rent and share contracts based on variations in transaction costs and crop risk. Depending on circumstances, cropshare contracts can be either more or less efficient than fixed rent contracts. He empirically tests his transaction-cost-versus-risk-aversion hypothesis and fails to reject it.

A large amount of early scholarly work on transaction costs shows that the alleged externalities used to support calls for government regulation were often imaginary. In 1973 Cheung responded to J.E. Meade’s 1952 description of insoluble market failure between

¹²² See Steven N.S. Cheung, *The Myth of Social Cost* (Institute of Economic Affairs, London: 1978).

¹²³ John McManus, *The Theory of Share Tenancy by Steven N.S. Cheung*, 3 CAN. J. OF ECON. 349 (1970).

¹²⁴ Steven N.S. Cheung, *A Theory of Share Tenancy* (Chicago, 1969).

beekeepers and apple orchardists.¹²⁵ According to Meade, because of the parties' inability to transact and price the pollination services beekeepers provide orchardists, or the nectar the orchardists provide beekeepers, the parties will devote too few resources to growing apples and raising bees. As did Pigou, Meade concluded that the problem of "unpaid factors" could be addressed only by government imposed taxes or subsidies.

Cheung's analysis of the beekeeping industry buried these claims. While thumbing through the yellow pages of the local telephone directory one day, he came across ads offering beekeeping services. He began collecting data on the regional industry, and in talking with beekeepers and orchardists soon found they routinely negotiate over pollination services and nectar collection. What is more, the terms of their agreements systematically vary across different crops consistent with the hypothesis of joint wealth maximization constrained by the cost of transacting.

Apple trees, it turns out, require beekeeper services for pollination in the early spring but yield very little nectar for honey. Alfalfa grown for hay requires no pollination services but yields ample nectar for honey. Although his hand-assembled database is limited, Cheung finds strong empirical evidence that apple orchardists pay beekeepers to place their hives nearby in the spring and beekeepers pay alfalfa growers for the right to place their hives near alfalfa fields later in late summer. The other agreed terms and customary practices are remarkably consistent with constrained wealth maximization.¹²⁶

Economists working in the Pigouvian tradition have also used lighthouses as evidence of market failure and the need for corrective government regulation. Lighthouse keepers, the story goes, are unable to charge ship captains for their warning services on dark and stormy nights. Because of the unpaid factor, there will be too few lighthouses and a system of government subsidies is in order. Notable economists including John Stuart Mill, Pigou, Henry Sidgwick, and even Nobel laureate Paul Samuelson all subscribed to this story of market failure.

¹²⁵ Steven N.S. Cheung, *The Fable of the Bees: An Economic Investigation*, 16 J. LAW & ECON. 11 (1973). Cheung notes that "[Pigou deleted] the example of two roads . . . from later editions of *The Economics of Welfare*, presumably in an attempt to avoid the criticism by F. H. Knight," Cheung (1973), at 11.

¹²⁶ Cheung reports that the parties' rarely resort to written contracts, but when they do it is primarily to serve as evidence for beekeepers to secure bank financing. Apparently, it pays the parties to incur the transaction costs of formalizing their agreements to reduce the transaction costs beekeepers face in negotiating bank financing. Cheung (1973), at 29.

On investigating, Coase (1974) found that the British lighthouse system had relied for centuries on private parties to finance, build, and operate lighthouses.¹²⁷ Rather than government taxes and subsidies, private lighthouse owners routinely levied fees on ships large and small, domestic and foreign, commercial and otherwise. Fees varied according to economic circumstances. Collecting them was often a simple matter of visiting ship captains in nearby ports to request payment. Concurrently, Trinity House, an ancient quasi-public organization descended from a medieval seaman's guild, also financed and owned lighthouses and administered fee collection for centuries based on Crown patents. Trinity House eventually came under government oversight by the Ministry of Trade and consolidated its control over privately owned-lighthouse, but the system of self-funding continued at least up to the time of Coase's work.

Worth noting is the entrepreneurial role private lighthouse firms played. Clearly these firms succeeded in building lighthouses in the most precarious circumstances of the sea's destructive forces. Trinity House often contracted for their construction services in one way or another. In many cases, it appears the private firm that built a lighthouse in a precarious location retained ownership and collected fees until such time that the lighthouse's survival became reasonably certain, at which time ownership often devolved one way or another to Trinity House. The private builder therefore bore the residual from the lighthouse's structural integrity over its early years. Once that was proven, Trinity House assumed ownership bore the residual from efficient administration and fee collection.

The cooperative adjustments market participants make for mutual gain are relentless and often subtle, even where the parties are anonymous to one another. Consider taxes. The standard neoclassical analysis of tax incidence makes several interesting points regarding the likely effect on price, output, the distribution of tax burden, lost gains from trade owing to resource misallocation, etc., but the point of interest here is that producers and consumers have a common interest in cooperating to reduce the tax burden in terms of both total tax payments and lost gains from trade.

¹²⁷ R.H. Coase, *The Lighthouse in Economics*, 17 J. LAW & ECON. 357 (1974). See also Douglas W. Allen, *The Institutional Revolution* (University of Chicago Press, Chicago and London: 2012), at 172-79.

Barzel (1976) extends the neoclassical model of taxation and demonstrates the ingenuity transacting parties often summon when it comes to cooperative wealth capture.¹²⁸ In the U.S., the late 1950s and 1960s saw a substantial increase in state cigarette taxes, which were often levied as a fixed dollar amount (say 11¢) per pack on price in the neighborhood of 30¢ pack, with the tax rate varying substantially across states. Yet packs of cigarettes are not fundamentally what consumers value. Instead they want something more akin to “smoking pleasure.” Not all packs are alike when it comes to smoking pleasure, either at a given moment in time or through time. In response to higher taxes, producers and consumers adjusted by moving from eighty-eight millimeter to one-hundred millimeter cigarettes, regular- to king-sized, lower- to higher-quality tobacco, and in-store to vending machine purchases (which include valuable convenience with every pack). This allowed them to transact more smoking pleasure in every pack and per dollar of tax paid. The tax per pack was fixed, but not the size of packs or the tax per unit of smoking pleasure.

Unit sales of larger packs were no doubt less than what otherwise would have occurred, and per pack prices adjusted upward, surprisingly in many states by more than the amount of the tax.¹²⁹ This is theoretically impossible under standard neoclassical analysis, which assumes the characteristics of the good remain fixed. The reduction in the number of packs traded reduced total tax payments by more than enough to compensate for the added costs producers incurred providing consumers with larger packs of higher quality tobacco. Prior to the tax, the new larger packs would have been sub-optimal. Rather than direct bargaining, competition drove these adjustments.

The tax laws, although superficially clear, were incomplete and subject to joint wealth-increasing adjustments by self-interested market participants. By failing to carefully define what constituted a “pack” of cigarettes, state tax laws failed to clearly define the government’s legal rights to collect the taxes. This left value in the public domain and subject to capture by producers and consumers, who reclaimed economic property rights to

¹²⁸ Yoram Barzel, *An Alternative Approach to the Analysis of Taxation*, 84 J. POL. ECON. 1177 (1976).

¹²⁹ Yoram Barzel, *An Alternative Approach to the Analysis of Taxation*, 84 J. POL. ECON. 1177 (1976).

some portion of their lost gains from trade through cooperative adjustments in the characteristics of the taxed good.¹³⁰

Umbeck's (1977) examination of the famous California gold rush of 1848 extends Cheung's theory of contract choice.¹³¹ He shows that when gold was first discovered miners' initial reaction was to form into groups to work gold bearing land under sharing contracts. He specifies the trade-offs between transaction costs and risk between sharing and land allotment contracts and shows that, as population in the gold fields rose, the miners systematically abandoned high transaction cost sharing contracts in favor of low transaction cost land allotment contracts.

A large amount of scholarship has since been done empirically testing transaction cost economics. A major theoretical development came with Allen and Lueck (1993).¹³² They reject a trade-off between risk aversion and transaction costs as a basis for contract choice in favor of a trade-off between alternative transaction costs. As they explain it, "[the] difficulty with [risk-based] models is that they have been short on testable hypotheses because they rely on measurement of risk preferences or proxies for them."¹³³

Their analysis of over 1600 cropshare contracts in the American midwest includes the traditional moral hazard and incomplete-contracts problems, but adds the transaction costs of allocating both the responsibility for inputs and the divisions of outputs—economic property rights—between the farmer and the landowner. Uncertainty resulting from weather, pests, and other exogenous events remains important. Rather than entering the model through risk

¹³⁰ Similar adjustments have occurred in other goods subject to a per unit tax. The 1960s witnessed large increases in the per gallon gasoline tax, following Pigou, to correct the negative pollution externality motorists "imposed" on those who wanted to breath fresh air. The market adjusted by moving to higher-lead gasoline to boost octane content and per gallon mileage, thereby reducing the number of gallons transacted and total tax payments. Although fewer gallons of gasoline were traded, each gallon contained more lead, gasoline's primary pollutant. The net effect may have been an increase in lead emissions. Yoram Barzel, *An Alternative Approach to the Analysis of Taxation*, 84 J. POL. ECON. 1177, 1195 (1976).

Unlike a per unit tax, with a percentage, or *ad velorem*, tax on the purchase price consumers and producers have a common interest in unbundling valuable attributes of the ex ante economic good and to transact them separately free of the tax. *Id.*

¹³¹ John Umbeck, *A Theory of Contract Choice and the California Gold Rush*, 20 J. LAW & ECON. 421 (1977).

¹³² Douglas W. Allen and Dean Lueck, *Transaction Costs and the Design of Cropshare Contracts*, 24 RAND J. ECON. 78 (1993).

¹³³ Douglas W. Allen and Dean Lueck, *Transaction Costs and the Design of Cropshare Contracts*, 24 RAND J. ECON. 78 (1993), at 79.

aversion,¹³⁴ however, it enters on the transaction cost side by raising prospects the farmer might attempt to capture value by undersupplying effort, overusing noncontractible soil attributes such as moisture content, underreporting crop output, and over-reporting costly shared inputs such as seed, fertilizer, herbicides and pesticides, power for irrigation, crop drying costs, etc.¹³⁵

The authors hypothesize that cropshare contracts have the benefit of reducing the farmer's incentive to deplete the capital value of the soil. They predict that the parties will choose cropshare contracts over cash rent contracts when the potential for soil exploitation is high and the measurement costs of dividing the crop are small. Their empirical results fail to reject their transaction cost theory and otherwise overwhelmingly support it.

VI. Summary and Concluding Remarks

“BEST AVAILABLE SCIENTIFIC, . . .”

This essay argues that traditional CBA imposes a heavy informational burden on regulators seeking to justify proposed rules. A grand accounting for net social benefits is not what the neoclassical model was designed to do. Given this, it is unsurprising that controversy has arisen over the feasibility of quantified CBA. Depending on the setting, CBA may nevertheless provide insights into the advisability of regulation. TCBA stands as a viable substitute where traditional CBA falls short and as a viable complement in any event. It forces regulators to start with fundamentals by identifying the market failure alleged to justify regulation. It then requires them to identify the transaction costs that prevent the parties from resolving the market failure through private ordering and to show that the proposed regulation is likely to reduce the relevant transaction costs. In many settings, using the neoclassical model to identify the direction of the likely effect of a regulation on the costs of

¹³⁴ For other work that relies purely on transaction costs rather than risk aversion, see Sanford J. Grossman and Oliver D Hart, *The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration*, 94 J. POL. ECON. 691 (1986); Keith B. Leffler and Randal R. Rucker, *Transaction Costs and the Organization of Production: Timber Contracts*, 99 J. POL. ECON. 1060 (1991); Bengt Holmström and Paul R. Milgrom, *Multitask Principal-Agent Analyses: Incentive Contracts, Asset Ownership and Job Design*, 7 J. LAW, ECON. & ORG. 24 (1991).

¹³⁵ Douglas W. Allen and Dean Lueck, *Transaction Costs and the Design of Cropshare Contracts*, 24 RAND J. ECON. 78 (1993), at 79.

transacting imposes a far lower information burden on the regulator than traditional CBA. It is also in keeping with the underlying purpose of the neoclassical model, which is to generate comparative statics predictions capable of being tested and refuted by facts. Unless the regulator can make a plausible case that the regulation is likely to reduce these transaction costs, TCBA holds that there is no real market failure or economic justification for regulation.

TCBA is likely to prove most helpful where transaction costs modest. This can be presumed where the parties deal directly or where competitive markets can be expected to move them toward jointly beneficial outcomes. Examples include the many vertical relationships now subject to regulation. These include but are not limited to the following: 1) issuers of corporate stock, the brokers who trade their securities, and brokerage clients regulated by the SEC; 2) securities exchanges, their members, and the holders of corporate securities also regulated by the SEC; 3) commodities brokers and their clients regulated by the CFTC; 4) merchants, credit card-issuing banks, and cardholders regulated by the CFPB; 5) defined benefit pension plans and their members regulated by the DOL, 6) employers and employees in the context of workplace safety also regulated by the DOL; 7) product market manufacturers, retailers, and consumers in the antitrust context regulated by the FTC, etc.

The world becomes more troublesome where transaction costs are high. Examples could include the problem of systemic risk in financial markets, addressing public health and safety with vaccines to protect against infectious diseases, protecting endangered species that do not respect sovereign boundaries, providing for clean air in the global commons, etc. Determining the direction of the effect of proposed regulations on the costs of transacting in these settings may be extremely difficult, but it is certainly no more difficult than the grand accounting for costs and benefits that traditional CBA would require. At the very least TCBA explicitly recognizes the proper overall framework essential for the proper conduct of CBA. Posner and Weyl (2015) correctly argue that requiring regulators to perform CBA according to established protocol would be beneficial even where costs and benefits are impossible to reliably quantify because it puts the regulator on record and provides a basis for ex post iterative learning. It is appropriate that TCBA inform this long-run process of knowledge accumulation.

Transaction costs may appear extremely high, seemingly prohibitive, in some settings, as with intergenerational exchange. How do future generations make their willingness to pay felt in the present? In certain settings the solution is deceptively simple. Simply create some form of legal property rights to avert the inefficient competitive race in which the parties will otherwise engage to establish economic property rights. Allowing private parties to own wildlife stocks has proven to be a powerful mechanism for preservation in some cases. The shift from prohibiting trade in alligator hides to allowing trade in certified farm-raised alligator hides probably helped save the species.¹³⁶ With trade in and profit from alligator hides impossible, habitat destruction due to development led to an alarming decline in numbers during the 1960s. The shift to allowing trade in certified farm-raised alligator hides put profit into preservation. Alligator populations rebounded.¹³⁷ All that was needed was a reliable certification process for legitimate private ownership.

Ted Turner is known for owning and stewarding an expanding population of bison on his large, heavily-fenced landholdings in the Rocky Mountain West.¹³⁸ Even Jane Fonda his former wife has been quoted as saying that “if you want to save the American bison you have to put profit in it.”¹³⁹ With private ownership, future generations’ willingness to pay for bison meat, or just for the opportunity to view them in their natural setting, is transmitted through the price mechanism to the current generation by private ownership. No one has ever expressed fear, for example, that chickens will go extinct and leave future generations wanting. Their owners have too much to gain by transferring chicken stocks to the next generation for profit.

Reports have surfaced recently that honeybee colonies are threatened owing to disease, and that they are dying out at an alarming rate.¹⁴⁰ The results, we are told, could be

¹³⁶ See <http://www.wlf.louisiana.gov/general-alligator-information>. See also Robert A. Thomas, *Hunting Alligators*, PERC REPORTS, Volume 17, Fall 1999.

¹³⁷ See <http://www.wlf.louisiana.gov/general-alligator-information>. See also Robert A. Thomas, *Hunting Alligators*, PERC REPORTS, Volume 17, Fall 1999. Available at <https://www.perc.org/1999/09/01/hunting-alligators/>.

¹³⁸ Deena Shanker, *Bison Returned from the Brink Just in Time for Climate Change*, BLOOMBERG, July 31, 2017 Available at: <https://www.bloomberg.com/news/features/2017-07-31/bison-returned-from-the-brink-just-in-time-for-climate-change>.

¹³⁹

¹⁴⁰ Sean Rossman, *A Third of the Nation's Honeybee Colonies Died Last Year*, USA TODAY, May 26 2017. Available at: <https://www.usatoday.com/story/news/nation-now/2017/05/26/third-nations-honeybee-colonies->

disastrous because honeybees are essential for pollination and possibly even for mankind's very existence.¹⁴¹ More sober reports reveal that private owners—beekeepers—are introducing new colonies at the replacement rate.¹⁴² Honeybees, for the time being, are safe

In each of these examples, private property reduces the transactions costs the affected parties must bear to make their valuations felt. Where private ownership is too costly to be feasible, intermediate solutions have proven viable so that legal property rights properly channel the competitive race for economic property rights and thereby reduce the costs of transacting. Throughout the world various fisheries were once in shambles, with dangerously low and declining stocks owing to open access resource rights.¹⁴³ Under open access, ownership of individual fish occurs only when they are reduced to the fisher's possession—the law of capture. No fisher has the incentive to reduce fishing effort to maintain or enhance the stocks necessary for regeneration. The race for economic property rights dissipated the value of the resource.

Traditional gear and entry restrictions have proven incapable of stemming the decline. The advent of individual transferable quotas (ITQs) changed all that. With an ITQ system, the regulator sets the total allowable catch for the season and each ITQ holder has a right to harvest his allotted share. With the total allowable catch fixed, the share becomes a specific number of fish. There is no need for the ITQ holder to inefficiently race to catch fish before others do. Being transferable, inefficient (high cost) fishers are free to sell their ITQs voluntarily to those who are more efficient and therefore willing to pay an attractive price. The seller receives compensation for relinquishing his quota, harvesting costs fall, and both

[died-last-year-why-you-should-care/348418001/](https://www.bloomber.com/news/articles/2018-05-23/bee-death-increase-may-be-tied-to-climate-change-survey-says). See also Alan Bjerga, *Honeybees May Be Dying in Larger Numbers Due to Climate Change*, BLOOMBERG, May 24, 2018. Available at: <https://www.bloomber.com/news/articles/2018-05-23/bee-death-increase-may-be-tied-to-climate-change-survey-says>.

¹⁴¹ One third of food eaten by humans is directly or indirectly pollinated by honeybees who "pollinate about \$15 billion worth of U.S. crops each year" including the entirety of the U.S. almond industry. Sean Rossman, A Third of the Nation's Honeybee Colonies Died Last Year, USA TODAY, May 26 2017 Available at: <https://www.usatoday.com/story/news/nation-now/2017/05/26/third-nations-honeybee-colonies-died-last-year-why-you-should-care/348418001/>.

¹⁴² Shawn Regan, How Capitalism Saved the Bees, PERC REPORTS, Volume 36, Winter2017. Available at <https://www.perc.org/2017/07/20/how-capitalism-saved-the-bees/>.

¹⁴³ See, for example, the North Sea herring stock's collapse in the 20th century due to overfishing or the Campeche shrimp fishery's decline due to open access conditions and overfishing. Mark Dickey-Collas et al., *Lessons Learned From the Stock Collapse and Recovery of North Sea Herring: a Review*, 67 ICES J. OF MARINE SCIENCE 9 (2010). Edward B. Barbier and Ivar E. Strand, *Valuing Mangrove-Fishery Linkages: A Case Study of Campeche, Mexico*, No. 53.1997, Fondazione Eni Enrico Mattei (FEEM), Milano.

parties capture gains from trade. What is more, under an ITQ system quota holders have an incentive to invest to enhance the underlying stocks.¹⁴⁴ The evidence is clear that fish stocks across throughout the world have prospered under ITQs.¹⁴⁵ Compared to gear and entry regulations under open access, ITQs reduce the transaction costs affected parties face to make their valuations felt and to capture the value flows over which they hold clear legal and economic rights.

Following EO 12,866, the presumption should be that “the private sector and private markets are the best engine for economic growth” and should be regulated only when the case can be made that suffer from “a material failure.” Observed patterns of interaction that persist in the market can be presumed to reflect the best efforts of the parties to capture gains from trade, constrained as they inevitably are by the costs of transacting. Sensible regulation must be premised on understanding why, and under what current circumstances, observed market practices reflect an equilibrium determined in part by the costs of transacting and how government regulation might make things better. TCBA promises to provide an effective and economically correct constraint in the emergent trend to constrain the administrative state.

¹⁴⁴ See Terry L. Anderson and Donald R. Leal, *FREE MARKET ENVIRONMENTALISM* (2001) at 107-122.

¹⁴⁵ Christopher Costello and Robert Deacon, *The Efficiency Gains from Fully Delineating Rights in an ITQ Fishery*, 22 *MARINE RESOURCE ECONOMICS* 347 (2007).

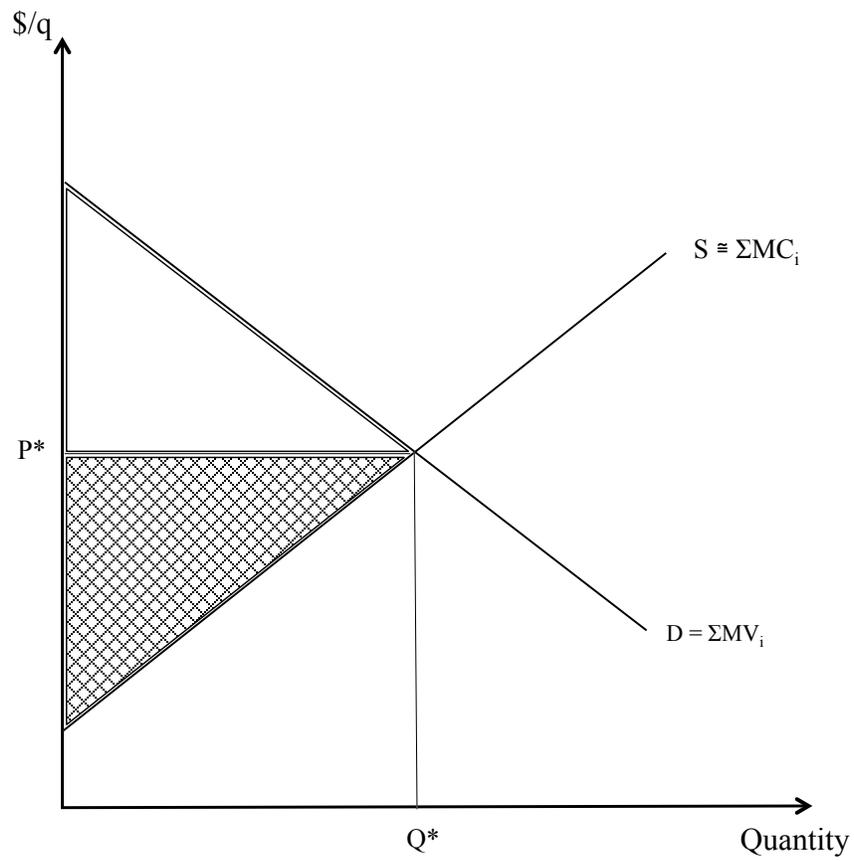


Figure 1
Social Welfare

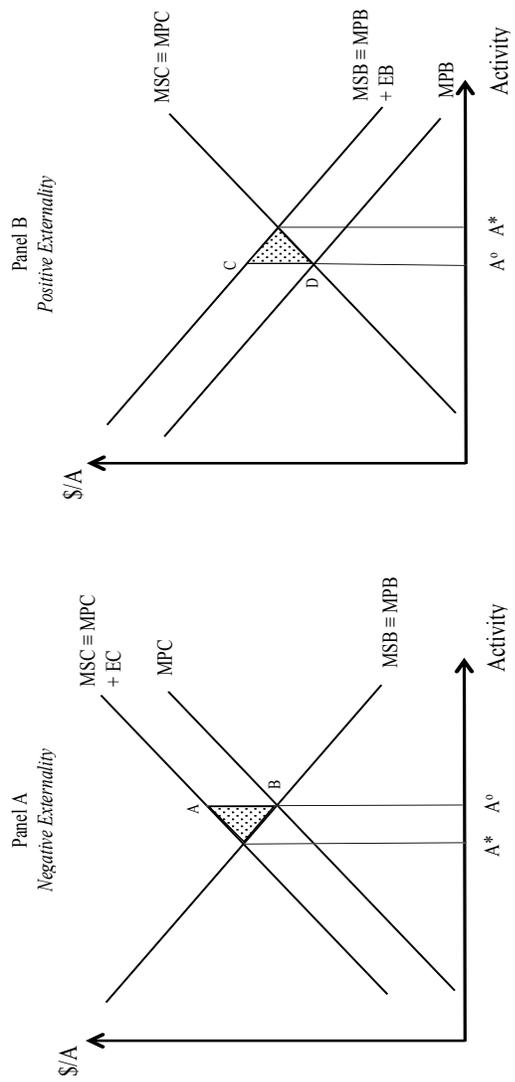


Figure 2
Externalities

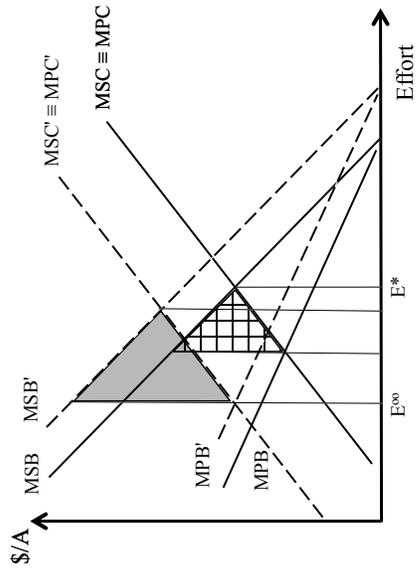


Figure 4
The Quantity Effect

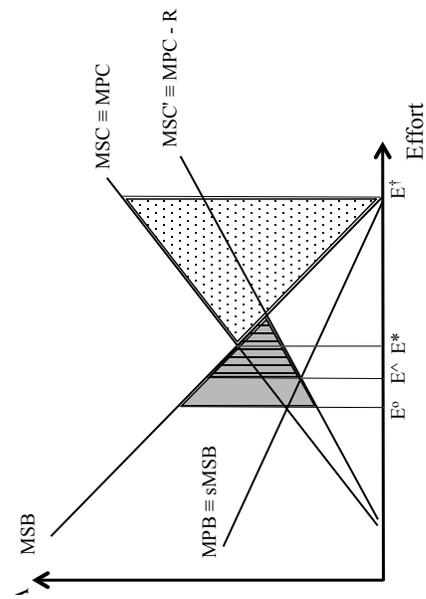


Figure 3
The Agency Problem