The Costs and Benefits of Regulation: Review and Synthesis

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Hahn and Hird provide the first comprehensive analysis of the costs and benefits of federal economic and social regulation. They assess several alternative methods of measuring the effects of regulatory policies, noting the advantages and drawbacks of each. They find that previous estimates of the costs of economic regulation probably overstated the true costs by failing to distinguish between transfer payments and net changes in economic efficiency. Their study separates transfers from efficiency costs for each estimate and updates the figures for sixteen industries and seven areas of social regulation. Overall, they find that the efficiency cost due to economic regulation is large and that the benefit from social regulation is positive but small. Their study also finds a huge variation in estimates of the costs and benefits of particular regulatory policies, particularly in the transportation sector and in environmental protection. This variation indicates that most estimates may be merely "guesstimates." Nevertheless, Hahn and Hird argue that since the current political climate has increased the pressure on Congress to add regulatory burdens, the need to introduce such information into policy making has never been greater.

Introduction

The past two decades have witnessed both an unparalleled rise in new regulations as well as significant deregulatory reform. New agencies such as the Environmental Protection Agency, the National Highway Traffic Safety Administration, and the Occupational Safety and Health Administration emerged, while Congress either eliminated or sharply curtailed the activities of others, such as the Civil Aeronautics Board and the Interstate Commerce Commission.[1]

The impact of regulatory activity on the economy continues to be a hotly debated subject.[2] While few would deny that regulations have added substantially to the costs of doing business, the impact of regulation on the overall economy is more difficult to ascertain. The issue takes on even greater importance as U.S. firms find it increasingly difficult to compete in the global marketplace.[3] Yet, simultaneously, the public clamors for more regulation, particularly in the area of environmental protection.

Current fiscal pressures, in the wake of Gramm-Rudman-Hollings[4] and the budget "crisis," are likely to encourage Congress and the President increasingly to use social regulation as a tool for achieving political objectives. This political environment encourages legislators to substitute off-budget regulatory costs for on-budget expenditures that might exceed the deficit constraints legislation imposes.[5] For example, President Bush asked for $12 billion in additional direct expenditures for new initiatives[6] while implicitly asking for at least that much in increased compliance costs for his proposed reauthorization of the Clean Air Act[7] alone.[8] We project that this trend towards increased regulation will continue in the near future. Consequently, it is imperative to assess carefully the benefits and costs of these regulations in order to allow politicians and bureaucrats to make more informed decisions. Moreover, it is important to understand exactly what factors are included in different types of estimates of the costs and benefits of regulation.

Social scientists have attempted to measure the impacts of regulatory changes using a variety of estimation techniques. Most of the studies that

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1. *See* COUNCIL OF ECON. ADVISERS, ECONOMIC REPORT OF THE PRESIDENT, RETHINKING REGULA-TION 187 (1989).

2. *See* Hahn, *Regulation: Past, Present and Future*, 13 HARV. J.L. & PUB. POL'Y 167, 228 (1990).

3. *See generally* M. PORTER, THE COMPETITIVE ADVANTAGE OF NATIONS 507-41 (1990).

4. Balanced Budget and Emergency Deficit Control Act of 1985, Pub. L. No. 99-177, 99 Stat. 1038 (codified as amended at 2 U.S.C. §§ 602-922, 31 U.S.C. §§ 1104-1109, 42 U.S.C. § 911 (1988)).

5. Hahn, *Instrument Choice, Political Reform and Economic Welfare*, 67 PUB. CHOICE 243, 246 (1990).

6. G. Bush, Building a Better America 181 (Feb. 9, 1989) (release to Congress).

7. 42 U.S.C. §§ 7401-7642 (1988).

8. N.Y. Times, June 18, 1989, at C1, col. 6; Hahn, *The Politics and Religion of Clean Air*, REGULA-TION, Winter 1990, at 21, 24.

examine the impact of regulatory changes focus on either the costs imposed by one or two federal regulatory agencies[9] or the effects on a single industry.[10] Researchers have calculated very different estimates of regulatory costs. For example, estimates measuring the benefits of partial railroad deregulation vary by more than two orders of magnitude. Such wide-ranging estimates result from a variety of factors including a paucity of data as well as the difficulty in constructing a sound structural model.

In addition to studying specific regulatory changes, a few researchers have attempted to develop monetary estimates of the aggregate impact of regulation. Weidenbaum and DeFina suggest that the annual cost of regulation to the economy is in excess of $100 billion in 1988 dollars.[11] Litan and Nordhaus use a similar methodology to arrive at an estimate of annual cost between $67 and $177 billion.[12] Neither of these estimates reflects recent regulatory changes during the Carter and Reagan Administrations, such as the dramatic deregulation of trucking, railroads, natural gas, oil, and airlines. Moreover, neither attempts to address the benefits that accrue from federal regulation, particularly in the areas of health, safety, and environmental protection.

Our study attempts to fill this void. The analysis provides the first comprehensive estimates of the costs and benefits of federal regulation in the United States. Previous estimates of the costs of economic regulation probably overstate the true costs because they fail to distinguish between transfer payments and net changes in economic efficiency. Both quantities are important, but for different reasons. Transfer payments measure the amount a regulatory change redistributes from losers to winners, while changes in net surplus indicate the overall impact on the economy.

We also find a large variance in the cost estimates for particular regulatory policies, most notably in the transportation sector. This variation leads us to conclude that existing tools for estimating regulatory impacts are extremely imprecise, and that most estimates more properly are viewed as "guesstimates." The range of uncertainty is even larger for benefit estimates. These uncertainties notwithstanding, the need to introduce such information into policy making has never been greater because in the current political climate Congress and the President feel increased pressure to add regulatory burdens.[13]

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9. *See* Gray, *The Cost of Regulation: OSHA, EPA and the Productivity Slowdown*, 77 AM. ECON. REV. 998 (1987).

10. *See* R. CRANDALL, H. GRUENSPECHT, T. KEELER & L. LAVE, REGULATING THE AUTOMOBILE (1986) [hereinafter CRANDALL].

11. M. WEIDENBAUM & R. DEFINA, THE COST OF FEDERAL REGULATION OF ECONOMIC ACTIVITY (American Enterprise Institute Reprint No. 88, 1978) ($66.1 billion in 1976 dollars). All figures in the text are in 1988 dollars. The footnotes provide the original dollar amounts in the relevant year dollars.

12. R. LITAN & W. NORDHAUS, REFORMING FEDERAL REGULATION 23 (1983) ($34.7 to $90.6 billion in 1977 dollars).

13. Furthermore, Executive Orders 12,291 and 12,498 require agencies to provide cost and benefit estimates for all new and major federal regulations. Exec. Order No. 12,291, 3 C.F.R. § 127 (1990); Exec.

Our analysis builds on the microeconomic approach most studies of regulation use to quantify changes in economic efficiency. The primary contribution of this paper is to provide an up-to-date synthesis of the literature on regulatory costs and benefits along with estimates of the overall impact of federal regulation.

Part I of this Article reviews the extensive empirical literature measuring the impact of regulation and notes the strengths and weaknesses of different research strategies. Part II analyzes more recent studies, and provides revised estimates of the cost of regulatory compliance and of the economic benefits of social regulation. It also explores the limitations of the analysis in light of various uncertainties in the estimates. The Conclusion suggests some areas for future research. The Appendix contains summaries of the various studies used in compiling the numerical estimates. Unless noted otherwise, we have translated all figures in the text into 1988 dollars using the Consumer Price Index. We provide the original dollar figures in the footnotes.

I. Approaches to Estimating Regulatory Impacts

There are several ways to measure the impact of regulation. The first section outlines the general problems analysts confront in estimating regulatory impacts. The second section explores how one can derive such estimates by focusing on particular industries under the assumption that prices in other sectors remain unaffected. The third section reviews attempts to evaluate regulatory costs by examining the economy as a whole. The fourth section considers the role of political costs. The final section lays out the basic framework this Article uses.

A. *The Methodological Problem*

Perhaps the most difficult task in estimating the impact of a regulatory change is specifying what would have happened in the absence of that change. The researcher must engage in the delicate art of constructing a "counterfactual," which describes what might have happened if the change had not occurred. By comparing the effects of the counterfactual with those of the proposed activity, it is possible to estimate the differences in costs and benefits between the real and the hypothetical states of the world.

In hindsight, one can easily discern certain biases in the way researchers constructed their counterfactuals. For example, *ex ante* studies of deregulation frequently made two basic assumptions, which, in retrospect, turn out to be unreasonable. First, they assumed that the proposed deregulatory change would

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Order No. 12,498, 3 C.F.R. § 323 (1990).

result in an efficient industry structure much like the results of the textbook competitive equilibrium. Second, they failed to control adequately for changes in technology and service resulting from deregulation. The assumption that deregulation would produce an efficient outcome introduced an upward bias into *ex ante* estimates of the benefits of deregulation. In contrast, assumptions about technological change and service quality often introduced a downward bias. The airline deregulation that took place in the late 1970s illustrates both points. Post-deregulation changes in the structure of the industry led to the formation of some markets that were not efficient. Only one or two companies served some routes, allowing firms to exercise significant control over price in some cases.[14] Yet, almost no one expected the airline industry to adopt hub-and-spoke networks on such a large scale.[15]

Once the analyst has specified a counterfactual, various approaches are available to quantify the impact of regulations. These approaches differ in three key ways. First, they model linkages in the economy to different extents. Second, their estimation procedures differ. Finally, they differ in the effects they measure.

This Article emphasizes those approaches aimed at measuring losses or gains in economic efficiency. Economic studies of regulation measure changes in consumer and producer welfare due to regulatory policies.[16] There are two types of models one can use to address this problem. At one extreme are partial equilibrium models, which view each industry in isolation. At the other extreme are models that explicitly incorporate linkages within the economy. These include macroeconomic models and general equilibrium models.

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14. *See* Kahn, *I Would Do It Again*, REGULATION, No. 2, 1988, at 22, 25. There is a great deal of controversy over whether the airline merger policies of the Department of Transportation in the 1980s led to increases or decreases in efficiency. *Id.* at 25-26; Kahn, *Deregulation: Looking Backward and Looking Forward*, 7 YALE J. ON REG. 325, 341-43 (1990); S. MORRISON & C. WINSTON, THE ECONOMIC EFFECTS OF AIRLINE DEREGULATION 72-73 (1986).

15. *See* Kahn, *Airline Deregulation—A Mixed Bag, But a Clear Success Nevertheless*, 16 TRANSP. L.J. 229, 246-47 (1988).

16. Efficiency is a favorite measure of economists because theoretically it is possible to divide the gains from a more efficient policy in ways that make each citizen at least as well off as under the existing policy. This view has come under criticism from the "public choice" school of economics, which notes that resources spent in changing policies may not be recoverable. *See infra* notes 45 to 47 and accompanying text.

Other measures economists frequently use to examine the impact of regulations include changes in employment, industry-specific output, gross national product, and productivity. We emphasize that there is no "correct" measure. As policy analysts, we prefer to use efficiency because it has a firmer grounding in economic theory, but the reader should know of its limitations in practice. *See* Bromley, *The Ideology of Efficiency: Searching for a Theory of Policy Analysis*, 19 J. ENV. ECON. MGMT. 86 (1990). For an overview of various methods for addressing the impact of economic regulation, see Joskow & Rose, *The Effects of Economic Regulation*, in 2 HANDBOOK OF INDUSTRIAL ORGANIZATION 1449, 1453-64 (R. Schmalensee & R. Willig ed. 1989).

B. *Partial Equilibrium Models*

Economists have applied partial equilibrium models to two categories of regulatory problems—those pertaining to economic regulation and those involving social regulation.[17] Estimating the efficiency gains from airline deregulation is an example of the former. Estimating the reduction in health costs associated with removing lead from gasoline is an example of the latter.

1. *Evaluating the Costs of Economic Regulation*

The predominant approach for evaluating the effects of changes in economic regulation is to construct an econometric model based on the demand and supply characteristics of an industry before and after a regulatory change. Econometric studies typically evaluate output markets directly, or use production and cost functions to measure the impact of regulatory change. For example, Boyer estimates changes in rail rates due to deregulation by holding constant variables such as weight, percentage of less-than-full truckload traffic, and year of deregulation.[18] In another study, Morrison and Winston estimate the probability that a traveler would choose air travel as a function of travel cost, travel time, average time between scheduled departures, number of travelers, and so on, to determine the efficiency and distributive impacts of airline deregulation.[19] Econometric problems such as omitted variable bias, poor data, and limited observations are common to many of these studies. While such studies provide a formal statistical apparatus for testing hypotheses, their formulation typically is general, glossing over the precise nature of actual production functions.

2. *Approaches for Evaluating Social Regulation*

An array of approaches exists for estimating the effects of social regulation. These methods include expenditure studies, engineering analyses, mathematical programming techniques, econometric procedures, and surveys of individuals.

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17. Economic regulation typically refers to regulation of prices and/or quantities of goods in a specific industry. In contrast, social regulation typically affects several industries. For a discussion of this distinction, see Joskow & Noll, *Regulation in Theory and Practice: An Overview*, in STUDIES IN PUBLIC REGULATION 1 (G. Fromm ed. 1981) [hereinafter STUDIES]; COUNCIL OF ECON. ADVISORS, *supra* note 1, at 187.

18. Boyer, *The Costs of Price Regulation: Lessons from Railroad Deregulation*, 18 RAND J. ECON. 408 (1987).

19. S. MORRISON & C. WINSTON, *supra* note 14, at 11-52.

a. *Expenditure Studies*

Expenditure evaluations of the cost of regulation frequently rely on surveys of firms or businesses to determine costs of compliance. Examples include the exhaustive Business Roundtable study of regulatory costs[20] and the Survey of Current Business' periodic evaluations of pollution abatement costs.[21] While direct surveys produce easily quantified estimates of the regulatory costs, this estimation approach poses several problems. First, respondents may have biases. For example, a firm or corporation may inflate its estimated costs hoping that politicians will consider providing regulatory relief. More important, direct expenditure studies do not reveal that portion of costs that would have been borne in the absence of regulation because they do not specify an adequate counterfactual. For example, because of consumer demand, an automobile company may choose to install stronger bumpers on its cars even without a regulation requiring it to do so. Counting the added cost of such bumpers as a product of regulation overstates its impact. Finally, regulations can effectively eliminate products or shrink a firm's market. An expenditure analysis would not account for such costs.

b. *Engineering Approaches*

Analysts use engineering approaches to calculate the added cost of installing equipment directly, adjusting for quality changes. For example, the Bureau of Labor Statistics conducts studies of automobile emissions and safety standards by determining the cost of individual components added in response to various regulations in order to compile their Consumer Price Index series.[22] While engineers may be able to measure the costs, estimating the total effect on producing the remainder of the car is more problematic. Increasing a car's resilience to side impacts may increase the cost of producing a door, but may allow the manufacturer to reduce strength and cost in other parts of the car. As with other methodologies, the problem of the counterfactual arises: how would the car have been built in the absence of these regulations? Engineering studies cannot easily determine how a regulation will affect input substitutions.

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20. ARTHUR ANDERSEN & CO., COST OF GOVERNMENT REGULATION STUDY FOR THE BUSINESS ROUNDTABLE (1979).

21. *See, e.g.*, Farber & Rutledge, *Pollution Abatement and Control Expenditures, 1982-85*, SURV. CURRENT BUS., May 1988, at 22.

22. CRANDALL, *supra* note 10, at 174.

c. *Mathematical Programming*

One approach for estimating the costs and benefits of environmental policy is to use linear or nonlinear programming techniques.[23] For example, the costs of various policies for pollution control frequently are based on detailed engineering studies. An analyst combines these cost estimates with estimates of the benefits from different policies to compare the net economic efficiency of policy alternatives. Such models are useful for gauging the impact of individual policies, such as requiring removal of lead from gasoline. Nevertheless, in general, economists have not used these methods to develop estimates of the total costs of environmental regulation, even though in principle they could.

d. *Econometric Estimates*

Econometric studies have measured both the costs and benefits of social regulation.

i. *Estimating Costs*

A study by Crandall is representative of an econometric study quantifying the cost of automobile regulation. Crandall estimates an *ex post* cost function including both current and lagged regulatory constraints. The study controls for automobile wheelbase, list prices, and dummy variables to account for data discrepancies and Detroit's market misfortunes since 1980.[24] Estimating the cost of social regulation is similar in nature to estimating the cost of economic regulation[25] in that economists specify a counterfactual and compare it with the current regulatory regime. Peltzman's study of the economic effects of the 1962 drug amendments[26] exemplifies econometric estimates of the demand side of regulatory changes.[27]

ii. *Estimating Benefits*

A host of methods complements cost estimation procedures by measuring the benefits associated with social regulation. Two ways to infer willingness

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23. *See generally* J. FRANKLIN, METHODS OF MATHEMATICAL ECONOMICS (1980). For applications to environmental problems, see R. HAHN, A PRIMER ON ENVIRONMENTAL POLICY DESIGN 6-18 (1989).

24. CRANDALL, *supra* note 10.

25. *See supra* notes 16-19 and accompanying text.

26. Drug (Kefauver-Harris) Amendments of 1962, Pub. L. No. 87-781, 76 Stat. 780 (codified at 21 U.S.C. §§ 321-381 (1988)).

27. Peltzman, *An Evaluation of Consumer Protection Legislation: The 1962 Drug Amendments,* 83 J. POL. ECON. 1049 (1973).

to pay include applying hedonic price or wage methods to studies of averting behavior, and studying the amount individuals actually pay for such quality changes.[28] Barriers neighborhoods construct to mitigate the effects of highway or airport noise illustrate the first method. One can assume that the benefits of the noise reduction are at least the cost of the expenditure to avoid a given quantity of noise, if marginal benefits equal marginal costs. Hedonic price or wage methods attempt to evaluate the marginal value of quality improvements in specific amenities. For instance, the value workers implicitly place on safety is assumed to be the wage premium those working in more hazardous, though otherwise identical, circumstances receive. Econometric analyses of the implicit wage (or price) premiums can reveal the amount workers are willing to pay for improved workplace safety and, in the aggregate, their willingness to pay to prevent an expected fatality.[29] Similarly, hedonic analysis of the price differentials for different housing site locations based on variations in air quality can reveal individuals' willingness to pay for cleaner air. Economists have applied the technique in a number of instances including the valuation of reducing crime, lowering highway or airport noise, cleaning up hazardous waste sites, and other location-specific amenities.

Hedonic estimation procedures, while useful, also have drawbacks. The basic problem with the approach is that it necessarily relies on very indirect methods of estimation, which under certain circumstances lead to identification problems.[30] Completely specifying the relevant demand and supply character-istics that determine where people choose to live is a daunting econometric task open to serious questions of omitted variable bias. Moreover, problems of multicollinearity frequently arise when estimating the value of improved visibility and health as benefits of cleaner air.[31] Further, in some circumstances, people may not have complete information about certain risks, such as those associated with particular jobs, hazardous waste sites, and air pollutants. Despite these problems, rapid advances in this relatively new

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28. Freeman, *Methods for Assessing the Benefits of Environmental Programs*, in 1 HANDBOOK OF NATURAL RESOURCE AND ENERGY ECONOMICS 223 (1985).

29. Most estimates of the implicit value of a statistical life lie in the range of $1.7 to $9.2 million, with the most likely value towards the bottom of the range. *See* Fisher, Chestnet & Violette, *The Value of Reducing Risks of Death: A Note on New Evidence*, 8 J. POL'Y ANAL. & MGMT. 88, 90 (1989) ($1.6 to $8.5 billion in 1986 dollars).

30. Identification problems occur in estimating a system of simultaneous equations where the data do not allow a distinction between two equations. In such a case, the data make the equations seem as if they were the same when, actually, their parameters are different. To avoid an identification problem, each equation of the system must have variables that distinguish it from the other equations. *See* Rosen, *Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition*, 82 J. POL. ECON. 34 (1974); Brown & Rosen, *On the Estimation of Structural Hedonic Price Models*, 50 ECONOMETRICA 765 (1982). Quigley provides one solution to these problems while maintaining the hedonic framework. *See* Quigley, *Nonlinear Budget Constraints and Consumer Demand: An Application to Public Programs for Residential Housing*, 12 J. URB. ECON. 177 (1982).

31. Multicollinearity means that one cannot separate the effects of two or more independent variables because they are highly correlated with one another.

technique promise improved empirical estimates of the benefits of commodities, such as clean air, that are not explicitly traded in the marketplace.

Other measures of the benefits of social regulation include travel cost estimates of the value of cleaner water for fishing, boating, and swimming, and estimates of the value of saving "statistical" lives by, for instance, requiring safer automobiles. The travel cost method treats the costs individuals incur in reaching recreation sites as surrogate prices. From these observed "prices," one generates site-specific demand curves, from which one calculates the resulting welfare changes.[32] The most widely accepted way of measuring the value of risk changes utilizes the hedonic method described above, since aggregation over enough individuals produces implicit values per statistical life prolonged.[33]

e. Surveys

An alternative method for valuing environmental and natural resources is to use survey data. "Contingent valuation" methods are survey techniques designed to elicit information about what individuals are willing to pay (or accept) for changes in the environment. For example, a respondent might be asked how much she would be willing to pay in increased electricity rates for a specified reduction in smog. Typically, the respondent would be shown a picture of the environmental resource before and after, so that the nature of the proposed change is clear.

A great deal of controversy has arisen over the application of contingent valuation methods to particular cases. Although analysts currently use them in a wide variety of cases involving damage to natural resources, these techniques have a variety of problems. Researchers disagree over the meaningfulness of the estimates, particularly when resources are not traded regularly in markets.[34] Economists continue to use such techniques because there is no obvious alternative for valuing resource damages in many situations.[35]

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32. *See* R. MITCHELL & R. CARSON, USING SURVEYS TO VALUE PUBLIC GOODS: THE CONTINGENT VALUATION METHOD 79-80 (1989) (discussion of travel-cost method).

33. For a recent estimate, see Moore & Viscusi, *Doubling the Estimated Value of Life: Results Using New Occupational Fatality Data,* 7 J. POL'Y ANAL. & MGMT. 476, 476 (1988).

34. Although contingent valuation is particularly useful when markets do not regularly trade the commodity to be valued (for example, wilderness areas), it suffers from the likely divergence between what people choose to tell the interviewer and how they would behave under actual, rather than hypothetical, conditions.

35. *See* R. MITCHELL & R. CARSON, *supra* note 32, at 1-2. *See generally* Carson & Navarro, *Fundamental Issues in Natural Resource Damage Assessment,* 28 NAT. RESOURCES J. 815 (1988) (interesting perspective on politics driving preference for specific contingent valuation techniques).

C. *Economy-Wide Modeling of the Impacts of Regulation*

Two general methods exist for evaluating the impacts of policy changes on the economy. One involves macroeconomic models and the other involves general equilibrium models.

Macroeconomic models typically combine a series of accounting relationships, such as the relationship between savings and investment, with historical relationships of performance in various sectors of the economy. While economists frequently use these models to make forecasts of output changes in various sectors, they generally do not use them to assess changes in economic efficiency.

In contrast, general equilibrium models are ideally suited to simulate and measure changes in economic efficiency. This method has become increasingly popular as a way of measuring the impact of policies and regulations on consumer and producer behavior. These models typically examine a response to a new policy, such as a change in regulation, under the assumption that markets are perfectly competitive. One can link the effects of a regulation to changes in output, employment, and in some cases welfare. One application of particular interest is the Hazilla and Kopp general equilibrium analysis of the costs of clean air and water regulations.[36] Those authors find a large disparity between the cost estimates reached using the expenditure approach outlined above and their general equilibrium analysis. More recently, Jorgenson and Wilcoxen have implemented a general equilibrium model that attempts to measure the long-run impact of environmental regulations on economic growth.[37]

Although general equilibrium models have several problems, including substantial data requirements, their results suggest that partial equilibrium approaches may fail to give an adequate picture of regulatory impacts in some cases. Simply stated, the methodological issue boils down to defining the conditions under which it is reasonable to assume away "second-order" effects.[38] These conditions vary across different industries and regulations. For example, Hazilla and Kopp find that second-order effects are pronounced in air and water regulation.[39] The impact of second-order effects has changed with time, however. They find that in 1975 social costs were lower than EPA's

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36. Hazilla & Kopp, *Social Cost of Environmental Quality Regulations: A General Equilibrium Analysis*, 98 J. POL. ECON. 853 (1990).

37. Jorgenson & Wilcoxen, *Environmental Regulation and U.S. Economic Growth*, 21 RAND J. ECON. 314 (1990).

38. Second-order effects consist of price, input, and output decisions that a partial equilibrium model typically omits. For example, if pollution raises the prices of consumption items, people may substitute leisure for consumption of goods and services. In addition, those industries that incur the highest pollution control costs would tend to experience decreases in employment, while industries with lower pollution control costs would expand their employment.

39. Hazilla & Kopp, *supra* note 36, at 870.

estimate of compliance costs, but subsequently increased above compliance costs in the 1980s.[40] They explain this result, in part, by asserting that pollution control regulation led people to substitute leisure for direct consumption, so that output decreased over time.[41] A similar study by Jorgenson and Wilcoxen is consistent with their conclusions. Jorgenson and Wilcoxen find that studies based on growth accounting are likely to underestimate the impact of environmental regulations on economic growth because they ignore the effect on investment.[42]

One of the principal arguments on behalf of general equilibrium models is that they enable the analyst to develop a more realistic representation of how the economy works. However, these models have their drawbacks, particularly in assessing regulatory impacts. One problem with the modeling efforts to date is that they rarely report sensitivities to input parameters.[43] A second problem with the models is that they assume the economy is perfectly competitive. Analysts could relax this assumption, but have not done so in actual policy applications. A third serious problem with environmental applications is that they do not take into account the benefits of environmental improvement. We conjecture that including benefits could have a dramatic effect on parameters such as economic growth and changes in welfare. A fourth problem with these models relates to validation. For example, how can one be sure such models are a valid representation of the economy? Validation is a problem inherent in modeling any counterfactual situation; it is exacerbated, however, when modeling becomes more complex. A final problem relates to the lack of transparency of the models. Because such complex models are difficult to understand, it is easy to imagine situations in which results are driven by errors in the data or in the construction of the model itself.

In short, the application of general equilibrium models to regulatory problems is still in its infancy. At this stage, most analysts seem content to note that the results obtained from these models often are different from those obtained using partial equilibrium approaches. Indeed, some suggest that general equilibrium results represent a more realistic simulation of the economic impacts of particular policies. We believe that both partial and general equilibrium models have important uses in policy applications and should be viewed as complements rather than substitutes. Unfortunately, both structural models have obvious deficiencies and there is no simple way of

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40. *Id.* at 865.
41. *Id.* at 866-867.
42. Jorgenson & Wilcoxen, *supra* note 37, at 338.
43. Some studies include sensitivity analysis, but because of the complexity of the models, it is not obvious that these sensitivities actually capture the limitations of the models to yield useful policy insights.

determining which set of models provides a better estimate of regulatory impacts.[44]

D. *Political Costs of Regulation and Deregulation*

While the preceding models can estimate the benefits of economic deregulation, they do not account for the political costs associated with establishing and maintaining different regulatory regimes. A theory of the conditions under which deregulation is likely to occur would be useful for estimating these costs. However, no theory is widely accepted at present.[45] Some theories treat the government as a "black box" that redistributes wealth to the highest or most effective bidder. McCormick has argued that in such situations, the gains from deregulation may be relatively small.[46] Other theories, based on the behavior of legislators within well-defined political institutions, question such simplistic views.[47]

Furthermore, it is difficult to include political costs when calculating the total cost of regulation or deregulation. In principle, these costs should equal the costs of shifting to and maintaining the new political equilibrium minus the costs of maintaining the old political equilibrium, appropriately discounted. Since one cannot observe these costs easily, it is not obvious whether this calculation would yield a positive or negative number. The relative magnitude of this number in comparison with the estimated gains from deregulation also is uncertain. For the purpose of estimating costs and benefits of regulation, we assume that these costs are negligible. That is, political deadweight costs are comparable under different regulatory regimes.

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44. A serious problem with these simulations is that they have no external source of validation. Whether more complex models better reflect behavior in the "real world" is debatable, and depends on the particular problem and the models used. *See generally* M. MORGAN & M. HENRION, UNCERTAINTY: A GUIDE TO DEALING WITH UNCERTAINTY IN QUANTITATIVE RISK AND POLICY ANALYSIS (1990).

45. *See, e.g.,* Peltzman, *The Economic Theory of Regulation after a Decade of Deregulation,* in BROOKINGS PAPERS ON ECONOMIC ACTIVITY: MICROECONOMICS 1 (1989) [hereinafter BROOKINGS PAPERS]; Becker, *A Theory of Competition Among Pressure Groups for Political Influence,* 97 Q.J. ECON. 371 (1983). *See generally* Hahn, *supra* note 2.

46. McCormick, Shughart & Tollison, *The Disinterest in Deregulation,* 74 AM. ECON. REV. 1075 (1984). For a critique arguing that regulated firms do not necessarily minimize costs, see Frantz & Naughton, *A Note on the Disinterest in Deregulation,* 1 J. REGULATORY ECON. 175 (1989).

47. *See* Noll, *The Economic Theory of Regulation after a Decade of Deregulation: Comment,* in BROOKINGS PAPERS, *supra* note 45, at 48; McCubbins, Noll & Weingast, *Structure and Process, Politics and Policy: Administrative Arrangements and the Political Control of Agencies,* 75 VA. L. REV. 431 (1989).

E. *Selecting an Estimation Approach*

The preceding discussion of estimation procedures suggests that there is no dearth of tools for estimating regulatory impacts.[48] In general, the appropriate tool will vary with the objective. In this Article, the objective is to estimate the aggregate costs and benefits associated with selected regulatory policies. In principle, a macroeconomic model or general equilibrium model that attempts to sort out the influences of specific policies suffices. In practice, modeling problems and data gaps impede the application of such models. The best approach seems to be to cull the best estimates from the literature on the microeconomic impacts of regulation. Accordingly, this Article generally builds on the partial equilibrium framework.[49]

II. Towards a More Refined Estimate of Regulatory Costs and Benefits

Several studies have attempted to quantify the total costs of regulation. Weidenbaum and DeFina, and Litan and Nordhaus add together the regulatory cost estimates derived from numerous sources to produce an aggregate cost of regulation.[50] A problem arising in both of these studies is the definition of social cost, which varies due to different definitions used in the original empirical studies themselves. The primary difficulty lies in distinguishing between economic costs (deadweight losses) and transfers.[51] Both studies include in their estimates a mixture of costs and transfers, though Litan and

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48. Moreover, this discussion has been limited to those tools that focus directly on changes in economic efficiency. A related line of research attempts to examine how changes in regulation will affect productivity. Productivity studies chart the difference between observed productivity changes over time and those that would have occurred in the absence of one or more federal regulations. Denison estimates that less than 16% of the 1973-75 productivity slowdown was due to regulation. E. DENISON, ACCOUNTING FOR SLOWER ECONOMIC GROWTH: THE UNITED STATES IN THE 1970'S, at 3-4, 128-31 (1979). Other studies reach similar conclusions, arguing that regulation had a relatively small impact on declining productivity. *E.g.*, Portney, *The Macroeconomic Impacts of Federal Environmental Regulation*, in ENVIRONMENTAL REGULATION AND THE U.S. ECONOMY 25 (H. Peskin ed. 1981). An exception is Gray, *The Cost of Regulation: OSHA, EPA, and the Productivity Slowdown*, 77 AM. ECON. REV. 998 (1987), which finds that OSHA and EPA regulations alone accounted for over 30% of the productivity slowdown in the 1970s. *Id.* at 998.

   Productivity studies suffer from a number of problems, such as their reliance on expenditure data and an inability to specify the determinants of macroeconomic performance over time. Kopp & Smith, *Productivity Measurement and Environmental Regulation: An Engineering-Econometric Analysis*, in PRODUCTIVITY MEASUREMENT IN REGULATED INDUSTRIES 249, 257 (1981). Kopp and Smith further argue that by failing to model correctly the subtle input substitution process involved in meeting regulations, estimates such as Denison's, which rely on one or two specific factors, are biased downward (though the magnitude of the bias is unknown). *Id.* at 250-51.

   49. As general equilibrium models become more refined and provide more in-depth analyses of actual policies, it may be feasible to combine the outputs of these models with those of partial equilibrium models in order to measure overall regulatory costs.

   50. M. WEIDENBAUM & R. DEFINA, *supra* note 11; R. LITAN & W. NORDHAUS, *supra* note 12.

   51. Efficiency costs are real economic losses that one group suffers, yet another group cannot reclaim as benefits. Transfer payments are a redistribution of benefits from one group to another that has no impact on total economic output.

Nordhaus claim that their total reflects "deadweight or efficiency costs."[52] For example, in reporting estimates of the cost of trucking regulation, they mix substantial transfer payments with welfare costs.[53] Weidenbaum and DeFina do acknowledge that their costs include both transfers and efficiency costs; nevertheless, the proper interpretation of their estimate is unclear.[54] While we have relied on the source material used for these studies, we have improved upon them by separating, where possible, the efficiency losses from transfers. We provide two estimates of regulatory costs, one identifying changes in economic efficiency and the other including the more politically relevant transfer payments.

Another problem with previous compilations of regulatory costs is that they do not consider benefits that may be associated with regulatory policies. While most traditional economic regulations do not yield net economic benefits (only transfers and costs), most social regulations do yield benefits. Adding the costs of social and economic regulation without including benefits produces an inaccurate picture of the overall impact of regulation. The true magnitude of the net regulatory burden never emerges. While estimating the benefits of environmental, health, and safety regulation is not straightforward, it is not informative to exclude them from a discussion of regulatory costs and benefits. In sum, economic regulation, properly measured, represents a net cost to society; social regulation may represent either a net cost or a net benefit.

A. *Methodology*

Estimating the costs and benefits of regulation requires a working definition of regulation itself. Scholars have grappled with this problem for some time with only limited success, and we do not intend to resolve the debate here.[55] Instead, we focus on the impacts of policies that previous studies have tended to group under the category of administrative regulation—more specifically, federal regulation. In addition, we choose to focus on economic rather than administrative budgetary costs, largely because we view the latter as only tangentially related to regulation's total impact on the economy.[56]

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52. R. LITAN & W. NORDHAUS, *supra* note 12, at 189.

53. *Id.* at 186. If the authors had included the recipients of the transfers as beneficiaries of regulation, this mixture would not have posed a problem. In both studies, however, the authors ignore the benefits of regulation.

54. M. WEIDENBAUM & R. DEFINA, *supra* note 11, at 8.

55. *See* R. NOLL, WHAT IS REGULATION? (California Institute of Technology Social Science Working Paper No. 324, 1980); Stigler, *Regulation in Theory and Practice: An Overview: Comment*, in STUDIES, *supra* note 17, at 73.

56. An agency's budget reveals little about its effect on the economy. Indeed, the relatively small budgets of some regulatory agencies belie their large impact on the economy.

Our list of federal regulatory activities builds on the work of Litan and Nordhaus, and of Weidenbaum and DeFina.[57] As with these two studies, we find that some analyses separate costs and transfers, while others include only one or the other. We also add four other areas of regulation that seem appropriate and that include significant economic impacts: trade barriers, agricultural price supports, postal rates, and telecommunications.

In order to construct estimates of each type of cost, where necessary we approximate transfers (or efficiency costs) based on available estimates of the ratio of transfers to deadweight costs for other regulations. This procedure, while admittedly crude, is a reasonable approach given the data limitations. For the regulations this study examines, the ratio of transfers to efficiency costs ranges from 2:1 to 12:1. We estimate that the ratio is three dollars of transfers for every dollar of efficiency costs.[58]

Table 1 presents estimates both of the costs of economic regulation, defined as efficiency losses, and of the transfers resulting from economic regulation.[59] The efficiency losses are measured relative to a first-best outcome within a given sector. In some cases, such an outcome may not be attainable even in theory because the structure of an industry does not allow a sustainable, efficient equilibrium to emerge.[60] The first-best benchmark tends to overstate the actual costs of economic regulation. The degree of overestimation is "small," however, since appropriate policies could capture most of the efficiency gains. Moreover, *ex ante* studies of regulatory change frequently do not estimate adequately the impact of regulation on technological innovation. We suspect that this bias leads to a significant understatement of the benefits from more efficient policies in a number of areas, such as telecommunications and shipping, where improved regulation may lead to rapid technological advances.

Our "bottom line" estimate of the net costs of economic regulation is roughly $46 billion, as the total in Table 1 shows. Annual transfer payments, which we estimate to be between $172.1 and $209.5 billion, are much higher. These figures differ considerably from previous regulatory cost estimates. Weidenbaum and DeFina estimate costs at $137.0 billion,[61] while Litan and

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57. R. LITAN & W. NORDHAUS, *supra* note 12; M. WEIDENBAUM & R. DEFINA, *supra* note 11.

58. Sensitivity analyses using other ratio estimates between 2:1 and 5:1 produced little overall variation in regulatory costs (less than $1 billion in efficiency costs). Most studies estimate efficiency costs rather than transfers. Since efficiency costs are "known" for most studies employed here, in general we use the ratios solely to estimate transfers. The small differences in the costs arise when we know only transfers and derive efficiency costs instead. The ratio of 3:1 reflects the general tendency of all industries for which both transfers and efficiency costs are known, and, if anything, may err on the conservative side.

59. The Appendix provides a more detailed specification of the derivation of the figures in Table 1. *See infra* notes 109-211 and accompanying text.

60. Panzar & Willig, *Free Entry and the Sustainability of Natural Monopoly,* 8 BELL J. ECON. 1, 1-2 (1977).

61. M. WEIDENBAUM & R. DEFINA, *supra* note 11, at 3 ($66.1 billion in 1976 dollars).

Nordhaus's estimate ranges between $67.7 and $176.9 billion for the costs of economic regulation alone.[62] Our estimates diverge for several reasons. First, both Weidenbaum and DeFina, and Litan and Nordhaus estimate the cost of regulation at its height in the late 1970s, while our analysis follows significant deregulatory measures. Second, our analysis attempts to separate efficiency costs from transfers more carefully. Finally, our analysis incorporates several additional and significant regulations that the others chose to exclude, such as agricultural price supports, trade barriers, postal rate regulation, and telecommunications regulation. Indeed, when we omit these regulations from our list, the efficiency costs of the remaining regulations fall to between $7.2 and $8.5 billion.

B. *Difficulties and Omissions in Assessing Economic Regulation*

Table 1 does not indicate the significant efficiency gains since 1977, which resulted primarily from the deregulation of the transportation and energy sectors. The principal industries deregulated in the late 1970s (airlines, trucking, railroads, oil, and natural gas) accounted for one-half the efficiency cost of economic regulation in 1977, or about roughly $36 billion, according to our calculations.[63] With many of the inefficient regulations dismantled, the airline market experienced efficiency gains of $15.6 billion, trucking between $1.5 and $5.0 billion, rail $2.8 billion, natural gas about $5.0 billion, and oil from $5.7 to $11.5 billion.[64] Adding Crandall's estimate of about $3.0 billion saved by the limited telecommunications deregulation in 1982[65] produces total annual deregulatory savings of between $33.6 and $42.9 billion. Although further efficiency gains in these sectors are still possible (especially for air, rail, natural gas, and telecommunications), deregulators have made significant strides to reduce the overall impact of economic regulation on the economy.

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62. R. LITAN & W. NORDHAUS, *supra* note 12, at 23 ($34.7 to $90.6 billion in 1977 dollars). Our figures use Litan and Nordhaus's, and Weidenbaum and DeFina's estimated costs of both economic and social regulation. However, because we conclude below that the benefits of the social regulations examined are roughly equivalent to the costs, the $46 billion figure represents the total net cost of the regulations our study assesses. This Article directly parallels earlier studies.

63. According to Litan and Nordhaus, the figure was 78% of total economic regulation in 1977. R. LITAN & W. NORDHAUS, *supra* note 12, at 23. Our inclusion of other significant regulations, such as trade barriers and agricultural price supports that are not part of Litan and Nordhaus's analysis, explains most of this discrepancy.

64. The Appendix provides sources for each of these estimates. *See infra* notes 126-33, 157-69, 187-202, and accompanying text.

65. Telephone interview with Robert Crandall, Senior Economist, Brookings Institution (Dec. 10, 1990) [hereinafter Interview with Crandall]. Crandall estimates that the gains from repricing interstate and local services range from $0.7 to $1.9 billion for 1988. An upper bound on productivity gains resulting from greater interstate competition is $3.5 billion for 1988. Overall efficiency gains are in the neighborhood of $3.0 billion.

Table 1

Annual Costs of Economic Regulation in 1988
(in Billions of 1988 Dollars)

Regulated Sector	Efficiency Costs	Transfers	Sources[b]
International Trade	17.3	85.6-110.6	Hufbauer (1986)
Telecommunications	< 14.1	< 42.3[a]	Wenders (1987)
Agricultural Price Supports	6.7	18.4	Gardner (1987)
Airline	3.8	7.7	Morrison & Winston (1986, 1989)
Rail	2.3	6.8[a]	Winston (1985)
Postal Rates	na	4-12	President's Commission on Privatization (1988)
Milk Marketing Orders/Price Supports	0.4-0.9	0.9-3.5	Ippolito & Masson; Buxton & Hammond (*reported in* MacAvoy (1977))
Natural Gas[c]	0.2-0.4	5.0	Loury (1983)
Barge	0.2-0.3	0.6-0.9[a]	Litan & Nordhaus (1983)
Davis-Bacon Act	0.2[a]	0.5	Thiebolt (1975) (updated)
Credit	0.05-0.5	0.15-1.6[a]	Litan & Nordhaus (1983)
Ocean	0.05-0.08	0.15-0.22[a]	Jantscher (1975)
Trucking	0[d]	0	
Oil Price Controls	0	0	
Cable TV	0	0	
Total	$45.3-46.5	$172.1-209.5	

na Not available.

[a] Figures estimated using 3:1 ratio of transfers to efficiency costs. *See supra* note 56 and accompanying text.

[b] Indicates primary source of estimate; the Appendix contains details. *See infra* notes 109-211 and accompanying text.

[c] Cost of natural gas regulation expected to approach zero as all price controls are lifted.

[d] If estimate is zero, federal regulation is assumed to be negligible.

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Table 1 does not quantify the costs in some important economic sectors where regulatory costs could be significant, most notably electric utilities and banking, because estimates of the costs in these areas are not readily available. In the case of electric utilities more widespread application of marginal cost pricing and greater competition in the market for producing power could yield significant gains.[66] In addition, promoting easier access to transmission facilities along with greater flexibility in pricing would provide further gains. The Federal Energy Regulatory Commission and Congress are considering a series of regulatory changes that would encourage greater competition in the market for producing power, which could yield significant gains for consumers and industry.[67]

Two problems arise in estimating these gains. The first involves obtaining reliable estimates of demand behavior. Estimates of how consumers and industry will change their purchases as a result of significant changes in prices generally are very crude. A second problem stems from the difficulty in specifying how a change in a particular policy would affect the market for supplying electricity. In virtually all cases, the implementation of the policy is critical. For example, regulators requiring utilities to pay too high a price for power generated from other sources could induce inefficiencies. Similarly, if regulators provide the wrong price signals for conservation, consumers and industry might over- or under-conserve electricity.[68]

Economists estimating the costs and benefits of banking regulation also encounter formidable problems, the most important of which is identifying a reasonable benchmark with which to compare the current system. Unfortunately, such a counterfactual does not exist.

The government has several opportunities to enhance the efficiency of the banking industry by allowing for economies of scope (for example, in underwriting securities) and by implementing more responsible regulation that provides consumers and businesses with greater incentives to monitor the health of financial institutions.[69] If implemented successfully, the legislative package addressing the savings and loan financial problems[70] could save a significant amount of money.[71]

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66. COUNCIL OF ECON. ADVISERS, *supra* note 1, at 207-11.

67. *Id.* at 209.

68. *See* Cicchetti & Hogan, *Including Unbundled Demand-side Options in Electric Utility Bidding Programs*, PUB. UTIL. FORT., June 8, 1989, at 9.

69. Hahn, *supra* note 2, at 186-95.

70. Financial Institutions Reform, Recovery, and Enforcement Act of 1989, Pub. L. No. 101-73, 103 Stat. 183 (1989).

71. *See, e.g.*, Benston & Kaufman, *Understanding the Savings-and-Loan Debacle*, 99 PUB. INTEREST 79 (1990).

C. *Estimates of the Costs and Benefits of Social Regulation*

Unlike economic regulation, where the benefits are thought to be negligible in most cases,[72] social regulation has the potential to confer significant benefits. Because social regulation can address specific "market failures," it may provide net benefits to society. While potentially beneficial, such regulation also has costs. Furthermore, the extent to which net benefits accrue will depend on how the government actually implements programs designed to address specific social problems, such as pollution, AIDS, or crime.

Table 2 shows that the cost estimate for social regulation lies within the range of the regulatory benefit estimates.[73] We estimate social regulatory costs to lie between $78.0 and $107.1 billion, while benefits span an even larger range from $41.9 to $181.5 billion per year. Because of the uncertainty of the estimates, the net effect of social regulation may be between negative $65.2 billion (net cost) and $103.5 billion (net benefit). Our "best guess" is that the costs and benefits of social regulations included in this study are roughly comparable.[74]

Adding the social and economic regulatory net costs yields an overall estimate of the quantitative effects of regulation of between a net cost of $111.7 billion and a net benefit of $58.2 billion. Since our "best guess" is that the net benefits of social regulation are less than $2 billion, the net costs of all regulations are the costs of economic regulation, minus the net benefits of social regulation. We estimate the annual net costs of all regulations to be roughly $44 billion, less than one percent of the Gross National Product.

One important aspect of environmental regulation that could easily dwarf the estimates contained in Table 2 relates to the disposal of hazardous wastes. The Congressional Budget Office estimates that in 1983, industrial expenditures for complying with the Resource Conservation and Recovery Act of 1976[75] standards (by disposing of hazardous waste) totaled $7.1 billion.[76] Cleaning up abandoned waste sites under EPA's Superfund[77] program will entail con-

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72. Two possible exceptions arise in the area of natural monopoly and antitrust, both of which can, in theory, lead to efficiency gains under particular circumstances.

73. The Appendix provides a more detailed specification of the derivation of the figures in Table 2. *See infra* notes 212-65 and accompanying text.

74. We derive our "best guess" using Freeman's "best guess" for environmental benefits of $58.4 billion. Freeman, *Water Pollution Policy*, in PUBLIC POLICIES FOR ENVIRONMENTAL PROTECTION 97, 123 (P. Portney ed. 1990) [hereinafter PUBLIC POLICIES]; Portney, *Air Pollution Policy*, in *id.* at 28, 57 ($51.3 billion in 1984 dollars). Adding this amount to the midpoint of the highway safety benefits, and comparing with the midpoint of the cost figures, produces a small net benefit of $1.4 billion. Although several of the cost estimates are upper bounds, we conclude that net benefits of social regulation are positive but small.

75. 42 U.S.C. §§ 6901-6986 (1988).

76. CONGRESSIONAL BUDGET OFF., HAZARDOUS WASTE MANAGEMENT (1985), *reported in* Dower, *Hazardous Wastes*, in PUBLIC POLICIES, *supra* note 74, at 178 ($6 billion in 1983 dollars).

77. Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9601 (1989).

siderable additional costs. For example, the Office of Technology Assessment estimates that the undiscounted costs associated with cleaning up and removing hazardous wastes could reach $500 billion.[78] This amount represents a very crude estimate of costs over the next few decades. We do not include estimates of the costs and benefits of such policies in part because most of these costs will be borne in the future, and the benefits are highly uncertain.[79]

Although the benefits of social regulation may equal or exceed its costs, the potential exists for far greater efficiency improvements since it is unlikely that marginal benefits equal marginal costs. For example, introducing marketable air pollution permits could yield significant improvements in air quality while reducing overall control costs.[80] Other areas for potential efficiency gains include drug, pesticide, and occupational safety regulation.

D. *Uncertainties in Regulatory Costs and Benefits*

Current applied benefits estimation is as much an art as a science due to imperfect methodology and insufficient data. Assessing what people are willing to pay for cleaner air or water, or increased safety, is difficult because typically one must use indirect techniques to infer such information.[81] In most cases, benefit estimates of social regulations probably are best viewed as "guesstimates."

In general, cost estimates are likely to be more precise because one can characterize production technologies more easily than changes in demand. For example, one would expect the range of uncertainty around cost estimates to

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78. OFF. OF TECHNOLOGY ASSESSMENT, COMING CLEAN: SUPERFUND PROBLEMS CAN BE SOLVED 194 (1989).

79. We are fairly certain that the costs of many of these regulations will be very high. The benefits are less clear, but often appear to be relatively small when measured in terms of cost per cancer case avoided. For example, an analysis of a proposal to broaden the scope of hazardous waste regulation by regulating more chemicals suggested a cost per cancer case avoided of at least $16 to $67 million. ECON. ANAL. STAFF, OFF. OF SOLID WASTE, U.S. ENVTL. PROTECTION AGENCY, TOXICITY CHARACTERISTIC REGULATORY IMPACT ANALYSIS, FINAL REPORT ES-10, ES-15 (1990) (we compute the range by dividing annual compliance cost by annual number of cancer risk reductions). An analysis of a draft regulation for municipal solid waste landfills noted that the cost per cancer avoided ranged from $0.3 to $2.7 billion per cancer case avoided. ECON. ANAL. STAFF, OFF. OF SOLID WASTE, U.S. ENVTL. PROTECTION AGENCY, DRAFT REGULATORY IMPACT ANALYSIS OF PROPOSED REVISIONS TO SUBTITLE D CRITERIA FOR MUNICIPAL SOLID WASTE LANDFILLS 29 (1988). These numbers are more than an order of magnitude higher than most estimates of the implied valuation of a statistical life based on individuals' actual risk tradeoff decisions. For discussion, see *supra* note 29. The EPA's best estimate of the risks from hazardous waste is that they are relatively low in comparison with other environmental risks, but the uncertainties around the risk estimates are large. *See generally* OFF. OF POL'Y ANAL. & OFF. OF POL'Y, PLAN., & EVALUATION, U.S. ENVTL. PROTECTION AGENCY, UNFINISHED BUSINESS: A COMPARATIVE ASSESSMENT OF ENVIRONMENTAL PROBLEMS: OVERVIEW REPORT (1987).

80. Hahn & Noll, *Designing a Market for Tradeable Permits*, in REFORM OF ECONOMIC REGULATION 119, 121 (W. Magat ed. 1982).

81. Moreover, often there is a gulf between how the public ranks various risks and how experts see these risks. *See* SCI. ADVISORY BD., U.S. ENVTL. PROTECTION AGENCY, REDUCING RISK: SETTING PRIORITIES AND STRATEGIES FOR ENVIRONMENTAL PROTECTION 12 (1990).

be narrower than the range of uncertainty around the benefits associated with reducing acid rain. There is greater certainty in estimating pollution abatement costs, such as the cost of switching to cleaner fuels and the cost of scrubbers, than in estimating the monetary value of changes in morbidity, mortality, ecological systems, and visibility, because utility gains are more difficult to monetize than capital and operating costs. In the case of air pollution, not only is the evidence linking pollutants to health disorders limited, but the value individuals place on improved health is difficult to measure as well.

Nevertheless, significant uncertainties affect most cost estimates. These uncertainties arise in predicting how government will implement specific policies and how industry will respond. The different analyses of transportation deregulation provide an example. In the cases of trucks, airlines, and railroads, the *ex ante* analyses of projected savings from deregulation tended to be significantly lower than those estimates completed after the implementation of reforms. The differences, which in some cases reach orders of magnitude, cast serious doubt on our ability to assess changes in regulatory costs resulting from major deregulatory initiatives. As we noted earlier, incorrect specifications of changes in technology and service explain part of the downward bias in these *ex ante* estimates.

Studies of the benefits associated with trucking deregulation provide estimates that vary by an order of magnitude. Research examining the trucking industry in the period prior to deregulation yields estimates of efficiency costs in the range of $1.5 to $4.9 billion, resulting from pricing above marginal cost. Joskow and Rose update Moore's 1975 estimate and find regulatory costs (including transfers) to be $4.9 billion.[82] Moore's 1978 estimate places the total costs (including transfers) at around $8.2 billion.[83] After the subsequent partial deregulation of trucking, however, at least one study reached very different conclusions as to the extent of efficiency costs prior to deregulation. Using "logistics costs" estimates (such as personnel and distribution costs) from Delaney, Owen attributes cost reductions on the order of $40.5 to $65.5 billion to trucking deregulation.[84]

Delaney's (and therefore Owen's) estimates may be suspect for several reasons, however. First, Delaney uses highly aggregated data to obtain his estimates, which prohibits a more detailed understanding of input substitutions.[85] Second, as Barnekov notes, some of the reduction in processing costs is related less to rail deregulation than to improved management techniques,

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82. Joskow & Rose, *supra* note 16, at 1481 ($4.5 billion in 1986 dollars).

83. Moore, *The Beneficiaries of Trucking Regulation*, 21 J.L. & ECON. 327, 342 (1978) ($2.5 to $3.3 billion in 1972 dollars).

84. D. OWEN, DEREGULATION IN THE TRUCKING INDUSTRY 1 (Federal Trade Commission, 1988) ($39 to $63 billion in 1987 dollars).

85. Delaney, *Managerial and Financial Challenges Facing Transport Leaders*, 40 TRANSP. Q. 29 (1986).

Table 2

Annual Costs and Benefits of Social Regulation in 1988
(in Billions of 1988 Dollars)

Regulated Sector	Costs	Benefits	Sources[b]
Environment	55.4-77.6	16.5-135.8 (58.4)[a]	Hazilla & Kopp (1990); Freeman (1990); Portney (1990)
Highway Safety	6.4-9.0	25.4-45.7	Crandall (1986)
Occupational Safety and Health (OSHA)	8.5-9.0	negligible	Crandall (1988); Denison (1979); Viscusi (1983)
Nuclear Power	5.3-7.6	na	DOE policy study (1979) (*reported in* Litan & Nordhaus (1983))
Drugs	< 1.5-3.0	na	Peltzman (1973)
Equal Employment Opportunity (EEO)	0.9	na	Weidenbaum & DeFina (1978); Litan & Nordhaus (1983)
Consumer Product Safety	> .034	na	U.S. Federal Budget, FY 1990 (administrative costs only)
Total	**$78.0-107.1**	**$41.9-181.5**	

na Not available.

[a] Point estimate is in parentheses. *See supra* note 74 and accompanying text.

[b] Indicates primary source of estimate; the Appendix contains details. *See infra* notes 212-65 and accompanying text.

communication, and data processing.[86] Third, there is no model against which to judge the accuracy of Delaney's calculations. Finally, partial equilibrium analyses that attempt to measure the impact of trucking deregulation should reveal a significant portion of the "logistics cost" estimates. That Delaney's numbers are an order of magnitude larger than the microeconomic studies suggests either that Delaney is in error or the partial equilibrium estimates are seriously flawed.

Estimates of the economic impact of airline deregulation also span a wide range. We estimate the annual efficiency costs for the period prior to deregulation to be $0.7 to $2.9 billion.[87] Since deregulation in 1978, at least two studies have estimated that the benefits of deregulation were far greater than previously estimated regulatory costs. Morrison and Winston, using a logit travel demand model, find that the benefits of airline deregulation were $15.6 billion, without any significant losses to specific groups.[88] They add that their calculations most likely understate overall benefits.[89] Caves estimates that productivity gains in the airline industry after deregulation lowered airline unit costs by 10%, saving over $4.8 billion in 1983 alone.[90] This finding is consistent with the Morrison and Winston estimate.

While airlines are now free to enter particular markets and set fares on particular flights, the government still manages the air traffic control system and has a dramatic impact on the management of airports. Several authors have argued that restructuring the "supply-side" of air transport could result in substantial efficiency gains.[91] Morrison and Winston estimate efficiency gains of over $11 billion from pricing airport slots efficiently and expanding the number (supply) of airports.[92]

Estimates of the impact of railroad regulation differ by over two orders of magnitude. Prior to partial deregulation, Winston estimated the annual welfare loss to be approximately $6.8 billion.[93] Since partial deregulation, two studies have attempted to estimate the resulting benefits. Using a statistical analysis

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86. Barnekov, *Trucking, U.S. Industrial Outlook*, 52 TRANSP. SERVICES 4, 6 (1989).

87. These cost estimates assume that previous estimates, which count both efficiency costs and transfers, total between $2.7 and $11.7 billion (between $1.4 and $6.0 billion in 1977 dollars). *See* R. LITAN & W. NORDHAUS, *supra* note 12, at 23. The efficiency cost estimate of $0.7-2.9 billion employs the previous assumption of three dollars of transfers for every dollar of efficiency costs.

88. S. MORRISON & C. WINSTON, *supra* note 14, at 51 ($8 billion in 1977 dollars).

89. *Id.* at 52.

90. Caves, Christensen, Tretheway & Windle, *An Assessment of the Efficiency Effects of U.S. Airline Deregulation via an International Comparison*, in PUBLIC REGULATION: NEW PERSPECTIVES ON INSTITUTIONS AND POLICIES 285, 286 (E. Bailey ed. 1987) [hereinafter PUBLIC REGULATION] ($4.0 billion in 1983 dollars).

91. Hahn & Kroszner, *The Mismanagement of Air Transport: A Supply-Side Analysis*, 95 PUB. INTEREST 100 (1989).

92. Morrison & Winston, *Enhancing the Performance of the Deregulated Air Transportation System*, in BROOKINGS PAPERS, *supra* note 45, at 61, 93.

93. Winston, *Conceptual Developments in the Economics of Transportation: An Interpretive Survey*, 23 J. ECON. LIT. 57, 84 (1985) ($2.5 billion in 1977 dollars).

of the effects of deregulation on the average revenue per ton-mile for railroads, Boyer finds that the annual cost of regulating railroads was only $102 million, far below previous estimates.[94] However, Barnekov and Kleit question the specification of Boyer's model.[95] Implementing their new model using Boyer's data, Barnekov and Kleit find that deregulation has resulted in efficiency gains of between $9.7 and $16.9 billion annually.[96]

A number of possible explanations arise for the differences between *ex ante* and *ex post* regulatory cost estimates. In some cases, such as airline deregulation, it is difficult to control for changes in product quality or technology. Moreover, specification of demand often is problematic, particularly when there are numerous substitution possibilities and innovation is difficult to predict.

In estimating the costs of social regulation, a key issue relates to how a particular program will be implemented. For example, consider the case of the acid rain regulations in the new Clean Air Act Amendments,[97] which allow for the formation of a market in emission permits to reduce sulfur oxide emissions by ten million tons. If this program is successfully implemented, it could save as much as $13 billion over traditional command-and-control regulation, which requires power plants to use particular pollution control technologies, such as scrubbing.[98] Unfortunately, it is difficult to know how the program will be implemented, and whether these efficiency gains will indeed be realized.

The results of these analyses suggest not only that the methods used to measure the impact of regulation and deregulation may be suspect, but that our ability to predict the costs and benefits of specific regulatory changes is limited as well. The cost and benefit estimates required for all new major federal regulations[99] probably are best viewed as order of magnitude approximations of the actual impact of regulation on the economy.

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94. Boyer, *supra* note 18, at 415 ($93 million in 1985 dollars).
95. C. BARNEKOV & A. KLEIT, THE COSTS OF RAILROAD REGULATION: A FURTHER ANALYSIS 1-5 (Federal Trade Commission Working Paper No. 164, 1988).
96. *Id.* at 1 (between $9.0 and $15.0 billion in 1986 dollars). There are a number of problems both in specifying the structural model and in obtaining data adequate to estimate the economic impacts of regulation. Problems in structural models include accounting for variations in product quality before and after deregulation, specifying the time period over which deregulation occurred, and ensuring that "explanatory" variables are not themselves endogenous to the process of deregulation. *Id.* at 3-4.
97. Clean Air Act Amendments of 1990, Pub. L. No. 101-549, 104 Stat. 2399 (1991).
98. Hahn, *Last Gasp for Bush Clean Air Reforms*, Wall St. J., Nov. 7, 1989, at A30, col. 3.
99. Exec. Order No. 12,291, 3 C.F.R. § 127 (1990); Exec. Order No. 12,498, 3 C.F.R. § 323 (1990).

Conclusion

In a $5 trillion plus economy, potential regulatory gains of $44 billion may seem like small change. In fact, the number is misleading for three reasons. First, it fails to capture the adverse impacts that many forms of government regulation have on innovation. Such regulation has the potential to be most onerous in areas where technology is changing rapidly, such as telecommunications and pollution control. Second, the number does not capture the trend towards increased use of social regulation, which we believe could place a significant drag on the economy in the years to come. Third, since marginal costs exceed marginal benefits for many social regulations, significant savings are available here as well. A more realistic assessment of the costs of regulation would require explicit consideration of these omissions.

Three tasks are critical to developing sound regulatory policy. The first, discussed above, is evaluating the costs and benefits of proposed regulatory changes. As George Stigler noted in his more optimistic days, there is a need to articulate carefully the impact of regulatory policies so that decision makers will choose more wisely.[100] Of course, as an older and wiser Stigler observed, there are limitations to the impact of such analysis.[101] Politicians will not necessarily embrace a program on efficiency grounds since they, like others, may be driven by narrower pursuits—such as survival within the political arena.[102] Nonetheless, the information based upon which politicians make regulatory decisions is extremely limited. We believe that improving and disseminating better information is likely to induce decision-makers to scrutinize the costs and benefits of regulation more carefully. We hope that this increased care will lead to more efficient decisions.[103]

The second task critical to the development of sound regulatory policy is designing institutions that promote more effective regulation. Over the last fifteen years, the Executive Branch has begun to experiment with a variety of oversight institutions, such as the Regulatory Analysis Review Group in the Carter Administration, and the Office of Information and Regulatory Affairs within the Office of Management and Budget.[104] Economists have conducted

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100. Stigler, *The Economist and the State*, 55 AM. ECON. REV. 1 (1965).

101. Stigler, *Economists and Public Policy*, REGULATION, May - June 1982, at 13.

102. Several scholars have highlighted the importance of political and economic forces in understanding regulatory policies and the limitations of regulatory reform efforts. For an early, insightful treatment, see R. NOLL, REFORMING REGULATION: AN EVALUATION OF THE ASH COUNCIL PROPOSALS (Studies in the Regulation of Economic Activity, 1971).

103. For a formal analysis of the impact of cost-benefit analysis on project funding decisions at the Army Corps of Engineers, see J. Hird, The Use and Quality of Cost-Benefit Analysis in the Federal Government, ch. 4 (Dec. 1988) (Ph.D. dissertation) (available in Main Library, U. Calif. at Berkeley); Hird, *The Political Economy of Pork: Project Selection at the U.S. Army Corps of Engineers*, 85 AM. POL. SCI. REV. (forthcoming June 1991).

104. For a review of Presidential initiatives to control regulatory spending, see G. EADS & M. FIX, RELIEF OR REFORM? REAGAN'S REGULATORY DILEMMA (1984).

surprisingly little research on the impact of these institutions, in part because their impact is difficult to measure.[105] More research is necessary to evaluate whether and how these institutions actually affect regulatory policy. At this point, it is unclear exactly what kind of arrangement within the Executive Branch would be most likely to promote regulations that are more economically efficient.

The third task critical to the development of sound regulatory policy is the actual design of specific policies. Social scientists and lawyers have an important role to play not only in evaluating policies, but also in designing them. Ideas matter—particularly ideas that address the concerns of powerful interest groups while enhancing efficiency. In order to increase the likelihood that policy-makers seriously consider these ideas, academicians and policy entrepreneurs must become more engaged in the details of implementing these ideas, as they did with airline deregulation and with the implementation of markets in emissions rights for controlling acid rain.

Economists have tended to focus their research on assessing the impact of "large" regulatory changes, such as the movement towards deregulation in the transportation industry. To complement these efforts, it is necessary to assess more carefully the thousands of individual regulations, both large and small, that collectively probably impose significant costs and may confer significant benefits as well. These regulations would include state initiatives, such as California's Proposition 65,[106] as well as federal initiatives ranging from OSHA regulations on recordkeeping requirements in the construction industry[107] to proposed EPA regulations governing the recycling of municipal waste.[108] The costs of these types of initiatives, taken together, may be of the same order of magnitude as the costs of major regulatory policies.

Given the importance of regulation in the U.S. economy, it is surprising how little attention is given to its aggregate impact. The absence of scholarly interest undoubtedly stems partly from the immensity of the task and the dearth of tools that are available. Nevertheless, its continued importance indicates that a better understanding of regulation and regulatory institutions is crucial to improving the decision-making process. This Article represents a modest step towards that end.

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105. *See* Hahn, *supra* note 2, at 221-27.

106. Safe Drinking Water and Toxic Enforcement Act of 1986, CAL. HEALTH & SAFETY CODE §§ 25,249.5—.13 (West 1984 & Supp. 1990). *See* Viscusi, *Predicting the Effects of Food Cancer Risk Warnings on Consumers*, 43 FOOD & DRUG COSMETIC L.J. 283 (1988).

107. 29 C.F.R. §§ 1926.550(b)(2), 1926.552(c)(15), 1926.903(e) (1990). For background, see 52 Fed. Reg. 36,378 (1987).

108. 16 C.F.R. § 1700.14(a)(7) (1990).

Appendix: Description of Industry Regulatory Analyses

This Appendix provides a review of the studies used to derive the estimates in the body of the Article. The first Part of the Appendix examines studies that estimate the costs of economic regulation; the second Part reviews studies that estimate both the costs and benefits of social regulation.

A1. The Costs of Economic Regulation

International Trade Barriers

Hufbauer estimates the economic effects of trade restraints by using partial equilibrium static analysis to determine both welfare costs and transfers for thirty-one industries.[109] The study finds that trade restraints cost consumers $110.6 billion annually,[110] net producers $85.6 billion per year,[111] benefit foreigners $12.1 billion,[112] and yield tariff revenues of $10.5 billion.[113] Efficiency costs for the thirty-one industries total $17.3 billion.[114] Total transfer payments are $85.6 to $110.6 billion, over five times the efficiency costs.[115]

Telecommunications

Griffin estimates a welfare loss of $2.4 to $3.3 billion per year due to subsidizing local telephone service from long-distance service.[116] Wenders estimates the annual welfare loss in U.S. toll markets at $13.1 billion, split about evenly between interstate and intrastate service.[117] Wenders assumes that marginal-cost pricing is attainable and analyzes the difference between marginal-cost prices and existing prices. In addition, citing the results of another study, Wenders calculates that uneconomic pricing in local usage markets imposes a welfare loss of $839 million annually because the subscriber is charged a flat access fee, with usage sold at zero marginal cost.[118] Further, Wenders calculates welfare losses in access markets of nearly $123 million per

109. G. HUFBAUER, D. BERLINER & K. ELLIOT, TRADE PROTECTION IN THE UNITED STATES: 31 CASE STUDIES (1986).
110. *Id.* at 15 ($100.6 billion in 1985 dollars).
111. *Id.* ($77.9 billion in 1985 dollars).
112. *Id.* ($11.0 billion in 1985 dollars).
113. *Id.* ($9.6 billion in 1985 dollars).
114. *Id.* ($15.8 billion in 1985 dollars).
115. *Id.* ($77.9 to $93.7 billion in 1985 dollars).
116. Griffin, *The Welfare Implications of Externalities and Price Elasticities for Telecommunications Pricing*, 64 REV. ECON. & STATISTICS 59 (1982), *reported in* J. WENDERS, THE ECONOMICS OF TELECOMMUNICATONS: THEORY AND POLICY 83 (1987) ($1.1 to $1.5 billion in 1975 dollars).
117. J. WENDERS, *supra* note 116, at 85 ($10.7 billion in 1982 dollars).
118. *Id.* at 86 ($685 million in 1982 dollars).

year.[119] Using Wenders' results, we estimate the total annual welfare cost of inefficient telephone pricing to be nearly $14.1 billion.

Crandall correctly points out that Wenders' estimate is an upper bound for two reasons.[120] First, Wenders assumes that marginal cost pricing is attainable in every market in the absence of regulatory controls. Second, marginal-cost pricing in both the access and long-distance markets is unlikely to result in full cost recovery. Crandall estimates the gains from repricing interstate and local services to range from $0.7 to $1.4 billion dollars for 1988. A subscriber line charge reflecting annual costs would yield efficiency gains between $1.0 and $3.1 billion for 1988.[121]

Agricultural Price Supports

The estimates of the economic effects of agricultural price supports draw on the work of Gardner.[122] Using partial equilibrium estimates of supply and demand elasticities for a number of crops, Gardner calculates welfare costs as well as transfer payments. His results show that consumers lose $5.1 billion while taxpayers forfeit another $18.5 billion.[123] Producers gain $17.2 billion, resulting in a net economic cost of $6.3 billion annually.[124] Adding the $417 million annual budget of the Agricultural Stabilization and Conservation Service (an agency Gardner claims would not be necessary without agricultural price supports)[125] produces a total welfare cost of $6.7 billion per year. Total transfer payments approximate $18.4 billion, nearly three times the welfare loss.

Airline

Congress enacted significant changes in 1978 when it deregulated commercial air carriers. Deregulation resulted in generally lower fares and higher service quality as measured by frequency of service. Morrison and Winston estimate that deregulation yielded efficiency gains on the order of $15.6 billion.[126]

These *ex post* estimates are significantly higher than previous *ex ante* estimates of the efficiency costs of airline regulation. Litan and Nordhaus,

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119. *Id.* at 87 ($100 million in 1982 dollars).
120. Interview with Crandall, *supra* note 65.
121. *Id.*
122. B. GARDNER, PROTECTION OF U.S. AGRICULTURE: WHY, HOW, AND WHO LOSES? (Univ. of Maryland Dept. of Agricultural & Resource Economics Working Paper No. 87-15, 1987).
123. *Id.* at 55 ($4.8 billion and $17.7 billion in 1987 dollars).
124. *Id.* ($16.5 billion and $6.0 billion in 1987 dollars).
125. *Id.* at 56 ($400 million in 1987 dollars).
126. S. MORRISON & C. WINSTON, *supra* note 14, at 51 ($8.0 billion in 1977 dollars).

using the results of an earlier study,[127] estimate costs of between $2.7 and $11.7 billion for airline regulation.[128] However, these costs represent the difference between full-cost fares and the lowest feasible aggregate costs. Consequently, one must regard a large portion of this estimate as transfers to firms and labor, not as efficiency costs. Posner, whose study provides unusually high *ex ante* estimates of static deadweight or efficiency costs of various government regulations, estimates the annual social cost of airline regulation at between 19% and 20% of industry revenues, or $5.7 billion in 1978.[129]

Despite large savings from airline deregulation, significant inefficiencies remain. Morrison and Winston estimate that inefficient pricing of existing airport slots now imposes efficiency costs of $3.8 billion.[130] They also calculate that making investment in airports more efficient would add another $7.2 billion in gains.[131] In addition, deregulating international airline markets could yield significant efficiency gains.[132]

Morrison and Winston's combined calculations show that the cost of airline regulation (not including airport investment inefficiencies) was $19.4 billion in 1977,[133] significantly higher than contemporary estimates.

Rail

A number of studies have estimated the effects of regulating railroads. Winston reports a consensus of a $2.0 billion annual cost of surface rate regulation,[134] and roughly $4.9 billion for excess capacity costs.[135]

Applying the estimated ratio of transfers to efficiency costs of 3:1[136] to rail regulation produces a transfer payment estimate of roughly $20.6 billion. Moore estimates that as a result of the Staggers Rail Act of 1980,[137] approximately two-thirds of the rail market has been deregulated.[138] ICC regulation still remains, however, for areas where railroads exercise "market domi-

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127. G. DOUGLAS & J. MILLER, ECONOMIC REGULATION OF DOMESTIC AIR TRANSPORT: THEORY AND POLICY (1974).

128. R. LITAN & W. NORDHAUS, *supra* note 12, at 23 (between $1.4 and $6.0 billion in 1977 dollars).

129. Posner, *The Social Costs of Monopoly and Regulation*, 83 J. POL. ECON. 807, 818 (1975) ($3.2 billion in 1978 dollars).

130. Morrison & Winston, *supra* note 92, at 93.

131. *Id.* We do not attribute inefficient investment in airports to federal regulation.

132. COUNCIL OF ECON. ADVISERS, *supra* note 1, at 207.

133. Morrison & Winston, *supra* note 92, at 93.

134. Winston, *supra* note 93, at 83 ($1.0 billion in 1977 dollars).

135. *Id.* at 84 ($2.5 billion in 1977 dollars).

136. *See supra* note 58 and accompanying text.

137. Pub. L. No. 96-448, 94 Stat. 1895 (codified as amended in scattered sections of 11, 45, 49 U.S.C. (1983)).

138. Moore, *Rail and Trucking Deregulation*, in REGULATORY REFORM: WHAT ACTUALLY HAPPENED? 14, 22 (1986).

nance."[139] The estimates imply present annual efficiency costs of roughly $2.3 billion, with transfers of $6.8 billion.

An *ex post* analysis by Barnekov and Kleit shows that rail deregulation produced annual efficiency benefits of between $9.7 and $16.2 billion.[140] This figure differs sharply from Boyer's estimates. Boyer finds the upper bound of benefits to be only $102 million.[141] Since this dispute has not yet been resolved, we choose to use the consensus estimates of regulatory rail costs that Winston reports.[142] The efficiency benefits of the partial rail deregulation are approximately $4.6 billion, with transfers of $13.8 billion.

Postal Rates

While definitive estimates are not available, the President's Privatization Report indicates that eliminating the monopoly over postal service provision would provide annual cost savings on the order of between $4 and $12 billion.[143] These calculations are based on the wage premium purportedly granted to postal employees relative to counterparts working for private employers.[144] However, a large portion of the wage differences arises because the U.S. Postal Service pays women and nonwhite employees wages similar to those of white men, whereas gender and race correlate with wage differences in the private sector.[145]

Another study estimates that ending the postal monopoly could save the United States over $10 billion annually, while citing an FTC estimate that efficiency bonuses would save $1.5 billion a year.[146] Utt estimates that the public could save as much as $5 billion by contracting out.[147] These estimates are loosely constructed, however, and do not necessarily represent efficiency gains to the economy as a whole. Nevertheless, the 1982 relaxation of the Private Express Statutes[148] allowed considerable innovation in the postal delivery market. New firms such as Federal Express, as well as existing carriers such as the United Parcel Service, rushed to fill the expanding and

139. *Id.*
140. C. BARNEKOV & A. KLEIT, *supra* note 95, at 1 (between $9.0 and $15.0 billion in 1986 dollars).
141. Boyer, *supra* note 18, at 415 ($93 million in 1985 dollars).
142. Winston, *supra* note 93, at 84.
143. PRESIDENT'S COMMISSION ON PRIVATIZATION, PRIVATIZATION: TOWARD MORE EFFECTIVE GOVERNMENT 113 (1988).
144. Asher & Popkin, *The Effect of Gender and Race Differentials on Public-Private Wage Comparisons: A Study of Postal Workers*, 38 INDUS. & LAB. REL. REV. 16 (1984); Perloff & Wachter, *Wage Comparability in the U.S. Postal Service*, 38 INDUS. & LAB. REL. REV. 26 (1984).
145. Asher & Popkin, *supra* note 144, at 16.
146. J. BOVARD, THE SLOW DEATH OF THE U.S. POSTAL SERVICE 16 (Cato Institute Policy Analysis No. 102, 1988).
147. R. UTT, HOW TO MOVE THE POSTAL SERVICE TRULY OFF BUDGET 6 (Heritage Foundation Backgrounder No. 716, 1989).
148. 18 U.S.C. § 1725 (1988).

lucrative overnight mail service.[149] To our knowledge, however, there are no estimates of the efficiency gains accruing to the economy from such deregulatory initiatives.

Milk Marketing Orders and Price Supports

The annual cost of regulating milk markets has been reported to be as high as $2.1 billion,[150] although much of that figure includes transfer payments. Ippolito and Masson assess total efficiency costs of milk regulation at $333 to $653 million[151] and transfer payments at between $666 and $1,332 million annually.[152] Kwoka estimates a total efficiency cost of $615 million[153] with transfers of over $2,454 million.[154]

An additional study quantifies the costs and transfers involved in milk price supports. Buxton and Hammond estimate a deadweight loss of between $31 and $227 million if the products are redistributed back to consumers, and $220 to $1,073 million if the milk products are destroyed.[155] They estimate transfer payments between $336 and $2,040 million.[156]

. In sum, the total efficiency loss is roughly one-third of transfer payments in milk regulation and price supports. For both programs, the deadweight loss ranges from $0.4 to $0.9 billion, while transfer payments total between $0.9 and $3.5 billion.

Natural Gas

Several studies have estimated the cost of natural gas price controls, most of which Congress finished removing in 1981.[157] Using an econometric model, MacAvoy and Pindyck predicted that natural gas price deregulation

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149. PRESIDENT'S COMMISSION ON PRIVATIZATION, *supra* note 143, at 101.

150. M. WEIDENBAUM & R. DEFINA, *supra* note 11, at 11 ($1 billion in 1976 dollars).

151. R. Ippolito & R. Masson, The Social Costs of Federal Regulation of Milk (Jan. 1976) (unpublished manuscript), *reported in* FEDERAL MILK MARKETING ORDERS AND PRICE SUPPORTS 111 (P. MacAvoy ed. 1977) [hereinafter MILK MARKETING] ($125 to $245 million in 1973 dollars).

152. *Id.* (between $250 and $500 million in 1973 dollars).

153. J. Kwoka, Pricing under Federal Milk Marketing Regulation: Theory, Objectives, and Impact 25 (1975) (unpublished manuscript), *reported in* MILK MARKETING, *supra* note 151, at 111 ($202 million in 1970 dollars).

154. *Id.* ($805 million in 1970 dollars).

155. Buxton & Hammond, *Social Cost of Alternative Dairy Price Support Levels*, 56 AM. J. AGRIC. ECON. 286 (1974), *reported in* MILK MARKETING, *supra* note 151, at 109 (between $13 and $95 million, and $92 to $447 million in 1974 dollars).

156. *Id.* at 109 (between $140 and $850 million in 1974 dollars).

157. 15 U.S.C. § 1331 (1988). *See* Loury, *Efficiency and Equity Impacts of Deregulation,* in PUBLIC EXPENDITURE AND POLICY ANALYSIS 301, 323 (1983).

would produce efficiency gains of $6.0 billion in 1978 and $13.9 billion in 1980.[158]

Using partial equilibrium analysis, Loury estimates the efficiency cost of natural gas controls at $3.7 billion per year in the short run.[159] He estimates the efficiency gains of natural gas price decontrol at $6.8 billion per year over the long run.[160] Loury adds that these estimates are lower bounds of efficiency gains since regulated gas is not allocated based on price.[161] Using Loury's figures, we calculate that potential annual transfer payments were $83.8 billion, again far higher than efficiency costs.

Jorgenson and Slesnick use general equilibrium analysis to estimate the effects of changes in the Natural Gas Policy Act of 1978.[162] Continued controls under the Act lead to a projected average annual efficiency loss of $1.2 billion between 1983 and 2000.[163] They estimate that immediate decontrol would lead to an average efficiency gain of $3.8 billion over the same period.[164]

The Natural Gas Policy Act of 1978 deregulated the natural gas industry, although the Act's effects were less comprehensive than those after the deregulation of the oil industry. Regulation still exists for interstate markets in "old gas" from Prudhoe Bay in Alaska, from some offshore areas, and from stripper wells.[165] However, the bulk of the market is deregulated in terms of price and allocation, and the "new gas" portion of the market is growing over time as the "old gas" fields are depleted.[166] In addition, President Bush recently signed the Natural Gas Wellhead Decontrol Act of 1989,[167] which will fully deregulate the natural gas market.[168]

According to recent ICC estimates, roughly 40% of the natural gas market is subject to price regulation; at present, however, regulation is binding on only 6%.[169] Therefore, we estimate that the efficiency cost of natural gas

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158. P. MACAVOY & R. PINDYCK, PRICE CONTROLS AND THE NATURAL GAS SHORTAGE 54 (1975), *reported in* Brauetigam & Hubbard, *Natural Gas: The Regulatory Transition*, in REGULATORY REFORM: WHAT ACTUALLY HAPPENED?, *supra* note 138, at 149 ($2.5 billion and $5.8 billion in 1974 dollars).

159. Loury, *supra* note 157, at 307 ($2.9 billion in 1981 dollars).

160. *Id.* ($5.2 billion in 1981 dollars).

161. *Id.* at 305 (inferred from Loury's graph).

162. 15 U.S.C. §§ 3301-3432 (1988). *See* Jorgenson & Slesnick, *General Equilibrium Analysis of Price Regulation*, in PUBLIC REGULATION, *supra* note 90, at 153.

163. Jorgenson & Slesnick, *supra* note 162, at 184 ($407 million in 1972 dollars).

164. *Id.* ($1.3 billion in 1972 dollars).

165. 15 U.S.C. §§ 3312(e), 3313(d), 3314-3315, 3318-3319, 3331(d) (1988); 18 C.F.R. §§ 2.56b, 271.801—.807 (1990). *See* Brauetigam & Hubbard, *supra* note 158, at 164.

166. Kalt & Leone, *Regional Effects of Energy Price Decontrol: The Roles of Interregional Trade, Stockholding, and Microeconomic Incidence*, 17 RAND J. ECON. 201, 202 (1986).

167. 15 U.S.C. §§ 3301-3432 (1989).

168. Schneider, *Bush Signs Bill Ending Gas Controls*, N.Y. Times, July 27, 1989, at D1, col. 6.

169. Letter from Dr. H.A. Merklein, Administrator of the Energy Information Administration, to Representative Philip R. Sharp, Chairman of the House Subcommittee on Energy and Power (Apr. 3, 1989).

regulation at present is only 6% of that estimated by Loury prior to deregulation, or $0.2 to $0.4 billion, with transfers totalling $5.0 billion. If natural gas market prices rise in the future, those figures could escalate rapidly in the absence of complete decontrol. We estimate the efficiency benefits of natural gas deregulation at $5.0 billion, with transfers of over $79.0 billion.

Credit, Ocean, and Barge

These three estimates of regulatory costs represent updates of estimates that Litan and Nordhaus provide. Citing a General Accounting Office study, Litan and Nordhaus estimate credit regulation efficiency costs to be between $0.2 and $2.1 billion in 1977.[170] According to Jantsher, ocean shipping regulation (cabotage laws) cost between $0.2 and $0.3 billion annually.[171] Barge regulation estimates, which Litan and Nordhaus provide without documentation, range from $0.8 to $1.2 billion.[172] We applied the ratio of three dollars of transfers to one dollar of efficiency costs[173] to each of these sets of numbers to derive the efficiency cost and transfer payment estimates indicated in Table 1.

Davis-Bacon Act

The Davis-Bacon Act[174] requires that the federal government award contracts that pay workers "prevailing wages" and benefits in order to protect local laborers from the less costly national labor market.[175] A study by former Congressman John Anderson based on Gould's econometric model indicates that average wages are 6.5% higher under the Act than if it were repealed.[176] According to Weidenbaum and DeFina, this differential amounts to a cost of $1.2 billion.[177] Thieblot calculates the difference between the lowest initial bids with the Act and similar re-bids when the Act was suspended momentarily.[178] He finds that without the Act, bids were 0.63% lower.[179]

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170. R. LITAN & W. NORDHAUS, *supra* note 12, at 23 (between $0.1 and $1.1 billion in 1977 dollars).
171. G. JANTSCHER, BREAD UPON THE WATERS: FEDERAL AID TO THE MARITIME INDUSTRIES 52 (1975), *reported in* R. LITAN & W. NORDHAUS, *supra* note 12 (between $0.1 and $0.15 billion in 1977 dollars).
172. R. LITAN & W. NORDHAUS, *supra* note 12, at 23 ($0.4 to $0.6 billion in 1977 dollars).
173. *See supra* note 58 and accompanying text.
174. 40 U.S.C. §§ 276(a)-276(a)(5) (1988).
175. *See* J. GOULD & G. BITTLINGMAYER, THE ECONOMICS OF THE DAVIS-BACON ACT: AN ANALYSIS OF PREVAILING WAGE LAWS 1-4 (American Enterprise Institute Study No. 278, 1980).
176. *Reported in* M. WEIDENBAUM & R. DEFINA, *supra* note 11, at 18. *See* J. GOULD & G. BITTLINGMAYER, *supra* note 175, at 69-74.
177. M. WEIDENBAUM & R. DEFINA, *supra* note 11, at 18 ($0.6 billion in 1976 dollars).
178. A. THIEBLOT, THE DAVIS-BACON ACT (Industrial Research Unit, The Wharton School, University of Pennsylvania, Labor Relations & Public Policy Series Report No. 10, 1975).
179. *Id.*

Weidenbaum and DeFina calculate that the government could save $0.6 billion per year if Congress repealed the Act.[180]

However, these estimates include transfer payments to workers and firms awarded federal construction contracts, and do not reflect welfare losses alone.[181] A study detailing the efficiency costs should include the Act's effect of inducing inefficient capital-labor ratios and the effect of preventing national firms from realizing full economies of scale for private projects. In lieu of such a study, using the previously discussed ratio of 3:1 for transfers to efficiency costs,[182] we estimate the efficiency loss to be $0.2 billion with transfers totaling $0.5 billion.

Bus

Deregulating buses through the Bus Regulatory Reform Act of 1982[183] appears to have had only modest impacts on efficiency and service. It did not, as many expected, dramatically decrease the bus service to rural localities.[184] Oster and Zorn argue that at most bus deregulation accelerated the trend away from servicing small communities that predated the 1982 Act.[185] However, the benefits of deregulation were relatively minor as well. Meyer and Oster state that "bus costs in 1980 [pre-deregulation] were very low under a wide array of market circumstances, even without further rationalization."[186] They do not, however, provide any estimates of the national savings from bus deregulation.

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180. M. WEIDENBAUM & R. DEFINA, *supra* note 11, at 17 ($0.2 billion in 1976 dollars). The estimate in 1988 dollars is based on total outlays for major capital investment of $100.2 billion in 1988. *See* U.S. OFF. OF MGMT. & BUDGET, HISTORICAL TABLES, BUDGET OF THE UNITED STATES GOVERNMENT, FISCAL YEAR 1990, at 158 (1989). Weidenbaum and DeFina calculate their figures based on government spending on construction of $38.0 billion dollars in 1976 (in 1976 dollars). *See supra* note 11, at 17.

181. M. WEIDENBAUM & R. DEFINA, *supra* note 11, at 17, acknowledge this point, but still include the figure as an estimate of the cost of regulation.

182. *See supra* note 58 and accompanying text.

183. Pub. L. No. 97-261, 96 Stat. 1102 (codified in scattered sections of 15, 26, 39 U.S.C. (1988)).

184. Oster and Zorn note that although many companies overreacted to deregulation by cutting routes, services to rural communities increased after 1983 in Florida, for example, where state deregulation preceded federal deregulation by two years. Oster & Zorn, *Impacts of Regulatory Reform on Intercity Bus Service in the United States*, 25 TRANSP. J. 33, 33 (1986). This reversal underscores the importance of tracing out the long-term consequences of deregulation rather than focusing on short-term changes. Indeed, Oster and Zorn conclude: "If the experiences of both the airline industry and the Florida bus industry prove to be a good indication of the longer-run response to a relaxation of regulatory restrictions, then the trends found in a study covering only three years of post-deregulation activity might overstate the expected future losses." *Id.* at 41.

185. *Id.* at 33.

186. J. MEYER & C. OSTER, DEREGULATION AND THE FUTURE OF INTERCITY PASSENGER TRAVEL 175 (1987).

Trucking

Considerable confusion appears to exist in the literature on the costs of trucking regulation. The confusion lies in separating transfers from efficiency costs. Felton finds that the "social cost," excluding transfers, of trucking regulation is $11.0 billion.[187] Moore estimates that the cost of inefficient use of private and common carrier trucking ranges from $5.1 to $9.9 billion,[188] and that the annual cost of traffic carried by trucks that could more cheaply be carried by rail is another $0.7 to $9.9 billion.[189] Moore's total costs of trucking regulation are therefore between $5.8 and $19.8 billion.[190] Felton's estimate falls within these bounds.

These estimates of cost, while important in assessing political impacts, include substantial transfers to industry and labor. At the time, Moore concluded that "there is no convincing economic rationale for the trucking firms sharing monopoly gains with labor."[191] However, subsequent research points to "substantial declines in union wages as a consequence of reduced regulatory rents," especially for the Teamsters.[192] Other research shows that regulation created monopoly profits for owners of trucking firms.[193] In a subsequent article, Moore notes that rents may have been substantial.[194] He concludes that, "three-quarters or more of the cost to shippers and ultimately to consumers of trucking regulation take the form of income transfers to labor and capital involved in trucking."[195] His research indicates that total income transfers in 1972 amounted to between $7.1 and $9.3 billion.[196] Trucking deregulation provided evidence that much of the "social costs" earlier studies measured actually were transfers to owners and labor.

We try to separate the welfare costs from transfers in estimating the effects of trucking regulation. Using Moore's estimate that "three-quarters or more" of previously-estimated costs actually are transfers, we estimate that total efficiency costs in the late 1970s were $1.5 to $4.9 billion with transfers of $4.3 to $14.9 billion. However, due to deregulation in the late 1970s, today's costs are considerably smaller. Although some federal trucking regulation

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187. Felton, *The Costs and Benefits of Motor Truck Regulation*, Q. REV. ECON. & BUS., Summer 1978, at 7, 14 ($5.3 billion in 1976 dollars).

188. Moore, *Deregulating Surface Freight Transportation*, in PROMOTING COMPETITION IN REGULATED MARKETS 55, 71 (A. Phillips ed. 1975) ($1.5 to $2.9 billion in 1968 dollars).

189. *Id.* at 71 ($0.2 to $2.9 billion in 1968 dollars).

190. *Id.* (between $1.7 and $5.8 billion in 1968 dollars).

191. *Id.* at 61.

192. Rose, *Labor Rent Sharing and Regulation: Evidence from the Trucking Industry*, 95 J. POL. ECON. 1146, 1175 (1987).

193. Rose, *The Incidence of Regulatory Rents in the Motor Carrier Industry*, 16 RAND J. ECON. 299, 299 (1985).

194. Moore, *The Beneficiaries of Trucking Regulation*, 21 J.L. & ECON. 327, 342 (1978).

195. *Id.*

196. *Id.* at 342 (between $2.5 and $3.3 billion in 1972 dollars).

exists, open entry and variable rate schedules combine to make the current climate virtually competitive.[197] No recent studies are available that estimate the current cost of regulating trucking. We assume for purposes of this analysis that the present trucking regulatory costs are negligible, implying that the efficiency gains from trucking deregulation are between $1.5 and $4.9 billion.

Oil Price Controls

Arrow and Kalt estimate that the cost of oil price controls lies between $3.1 and $6.6 billion.[198] Kalt estimates that the sum of efficiency losses for consumers and producers is $1.4 to $7.2 billion per year, plus another $1.4 billion in private and public sector administrative costs.[199] He finds that the windfall profits tax costs an extra $2.9 billion, for a total welfare loss of $5.7 to $11.5 billion per year.[200] Kalt also estimates that annual transfer payments total between $70.3 and $122.0 billion,[201] over ten times the welfare losses.

President Carter's program of gradual decontrol of oil prices and allocations, beginning in 1979, ended with the Reagan Administration's complete decontrol in 1981.[202] Although some federal regulations pertaining to the oil industry remain (for example, environmental regulations concerning Alaskan drilling and tankers), no available studies measure their effects. As a result, for this study we have assumed the present cost of federal price and allocation regulations to be negligible. Therefore, we estimate the benefits of oil deregulation to be between $5.7 and $11.5 billion, with transfers between $70.3 and $122.0 billion.

Cable Television

The Comanor and Mitchell study provides an estimate of the welfare costs of FCC regulation of cable television.[203] Litan and Nordhaus report that Comanor and Mitchell calculate an annual deadweight loss of between $3.9 and $7.8 billion.[204] However, Comanor and Mitchell's figures represent "the

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197. OFF. OF TRANSP. ANAL., INTERSTATE COMMERCE COMM'N, HIGHLIGHTS OF ACTIVITY IN THE PROPERTY MOTOR CARRIER INDUSTRY (Staff Report No. 11, Aug. 1987).

198. K. ARROW & J. KALT, PETROLEUM PRICE REGULATION: SHOULD WE DECONTROL? 26-27 (1979), reported in R. LITAN & W. NORDHAUS, supra note 12, at 23 ($1.6 to $3.4 billion in 1977 dollars).

199. J. KALT, THE ECONOMICS AND POLITICS OF OIL PRICE REGULATION 233-34 (1981) ($1.0 to $5.0 billion, and $1.0 billion in 1980 dollars).

200. Id. at 233-34 ($2.0 billion and $4.0 to $8.0 billion in 1980 dollars).

201. Id. (between $49.0 and $85.0 billion in 1980 dollars).

202. Hubbard & Weiner, Petroleum Regulation and Public Policy, in REGULATORY REFORM: WHAT ACTUALLY HAPPENED?, supra note 138, at 105, 114-15.

203. Comanor & Mitchell, The Costs of Planning: The FCC and Cable Television, 15 J.L. & ECON. 177 (1972), reported in R. LITAN & W. NORDHAUS, supra note 12, at 23 ("Broadcast and Cable TV," Table 2.6).

204. R. LITAN & W. NORDHAUS, supra note 12, at 23 (between $2.0 and $4.0 billion in 1977 dollars).

capitalized value of the prospective welfare loss" [emphasis added], which they state "may easily lie between $1 billion and $2 billion at the current [1972] price level."[205] The annualized value of this efficiency loss, using Comanor and Mitchell's assumptions of a 15-year lifetime discounted at 10% per year,[206] ranges between $370 and $740 million.[207] Further, using rough estimates Comanor and Mitchell provide in Figure 1,[208] we calculate that transfer payments involved in cable television regulation far exceed efficiency costs, and could range from $1.7 to $3.4 billion.[209] These costs have diminished considerably after passage of the Cable Communications Policy Act of 1984.[210] We assume here that federal regulation imposes zero costs.[211]

A2. The Costs and Benefits of Social Regulation

Environment (Costs)

Numerous studies attempt to evaluate the costs and benefits of environmental regulation. Some address parts of environmental legislation (for example, the Clean Air Act[212]) while others try to evaluate the combined costs.

The U.S. Council on Environmental Quality (CEQ) prepared one of the first estimates.[213] Using pollution control expenditure statistics gathered from several federal agencies, predominantly EPA, the CEQ estimates that air pollution control costs were $30.1 billion in 1978, with water pollution adding another $18.5 billion.[214] Comparable projections for 1987 were $67.9 billion and $37.0 billion for air and water respectively.[215] According to the CEQ, all environmental regulations imposed added expenditures of $48.8 billion in 1978 and an estimated $116.1 in 1987.[216] Annual capital costs were about

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205. Comanor & Mitchell, *supra* note 203, at 205.

206. *Id.* at 202, 205.

207. Between $131 and $262 million in 1972 dollars.

208. Comanor & Mitchell, *supra* note 203, at 199.

209. *Id.* ($0.6 to $1.2 billion in 1972 dollars, using a transfer to efficiency cost ratio of 4.7:1 generated from their estimates).

210. Pub. L. No. 98-549, 98 Stat. 2779 (codified in scattered sections of 15, 18, 47, 50 U.S.C. (1988)).

211. For an overview of the current status of cable regulation, see Krech & NTIA Staff, *Cable Television*, in U.S. DEP'T OF COMMERCE, NTIA TELECOM 2000: CHARTING THE COURSE FOR A NEW CENTURY 539, 546-50 (NTIA Special Publication No. 88-21, 1988).

212. 42 U.S.C. §§ 7401-7642 (1988).

213. U.S. COUNCIL ON ENVTL. QUALITY, ENVIRONMENTAL QUALITY—1979: THE TENTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY (1979).

214. *Id.* ($16.6 billion and $10.2 billion in 1978 dollars).

215. *Id.* ($37.4 billion and $20.4 billion in 1978 dollars).

216. *Id.* ($26.9 billion and $64.0 billion in 1978 dollars).

one-half the totals while operation and maintenance costs comprised the remainder.[217]

Denison uses changes in productivity measures to estimate the total cost of environmental regulation at $21.1 billion in 1975.[218] This figure is roughly three times his estimate (in nominal dollars) for pollution abatement costs just three years earlier.[219]

The Commerce Department's Bureau of Economic Analysis (BEA) conducts survey analyses of the private costs businesses expend in order to meet existing pollution regulations. The body of this Article discusses the problems with the survey method approach.[220] The most recent survey finds that private expenditures on pollution control and abatement totalled $84.0 billion in 1986.[221] Air pollution costs were $35.9 billion, water pollution $32.9, and solid waste and other costs comprised the balance, or $15.2 billion.

In its periodic evaluations required by Congress, EPA has conducted studies assessing the costs of clean air and water regulation. Building on the BEA's relatively simple direct approaches, EPA finds that the total annual private cost of the Clean Air and Clean Water Acts was $55.4 billion in 1981.[222]

Freeman, updating 1980 CEQ figures, estimates that water pollution costs in 1985 lie between $28.5 and $34.2 billion.[223] Hazilla and Kopp apply general equilibrium analysis to the costs of federal clean air and water regulations and find significantly higher costs of $77.6 billion[224] compared with an EPA estimate of $61.6 billion.[225] They attribute the difference, which escalates rapidly, to the expansion over time of the intertemporal impacts major regulations have on microeconomic decisions, and to the ability of general equilibrium analysis to uncover effects in related industries that partial analysis ignores.[226] Jorgenson and Wilcoxen estimate that environmental regulation reduces the level of gross national product by 2.59%.[227]

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217. *Id.* at 666-67.

218. E. DENISON, *supra* note 48, at 71 ($9.5 billion in 1975 dollars).

219. *Id.* ($3.2 billion in 1975 dollars).

220. *See supra* notes 34-35 and accompanying text.

221. Farber & Rutledge, *supra* note 21, at 28 ($77.8 billion in 1986 dollars).

222. OFF. OF POL'Y ANAL., U.S. ENVTL. PROTECTION AGENCY, COST OF CLEAN AIR AND WATER: REPORT TO CONGRESS (1984), *reported in* Hazilla & Kopp, *supra* note 36, at 858 ($42.5 billion in 1981 dollars).

223. Freeman, *supra* note 74, at 126 (between $25.2 and $30.8 billion in 1984 dollars).

224. Hazilla & Kopp, *supra* note 36, at 865 ($70.6 billion in 1985 dollars).

225. *Id.* ($56.0 billion in 1985 dollars).

226. *Id.* at 855.

227. Jorgenson & Wilcoxen, *supra* note 37, at 315. Jorgenson and Wilcoxen do not consider the possible benefits from environmental investment that could increase output. These benefits could be substantial, but are highly uncertain. *See infra* notes 228-33 and accompanying text.

Environment (Benefits)

Portney, who adapted the work of Freeman, estimates the benefits of air pollution regulation at between $10.0 and $104.3 billion per year, with a "best guess" of $42.5 billion.[228] Three-fourths of the benefits he estimates are health-related, and are sensitive to the "value-of-life" (VOL) numbers he chooses. However, Freeman probably understates the value of clean air benefits because he estimates a negligible improvement in auto emissions during the years he studies, 1970 to 1978, even though vehicle-miles driven increased significantly over this period.[229] Because of the increase in effective compliance over the last ten years, the benefits of reducing auto emissions may be considerable. The benefit figures in Table 2 then represent a lower bound.[230] Freeman estimates that in 1985 water pollution regulations added benefits of between $6.5 and $31.5 billion with $15.9 billion most likely.[231] The estimates in Table 2 reflect these estimates for the benefits of cleaner air and water, with a point estimate of $58.4 billion.

Lave and Seskin, modifying results from other studies, report annual health benefits (mortality and morbidity) from air pollution regulations alone totalling $42.9 billion.[232] Their estimate is conservative because it does not include less soiling, reduced damage to agriculture, improved visibility, and other benefits of cleaner air.[233]

Highway Safety

Using both engineering and econometric approaches (from which he obtains relatively similar estimates), Crandall estimates the cost of automobile safety regulations at between $9.1 and $13.4 billion including the bumper standard, and between $6.4 and $9.0 billion without the standard.[234] The ranges reflect differences in the safety coefficient and in assumptions about the manufacturing learning curve in producing automobiles at least cost.

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228. Portney, *supra* note 74, at 57 (between $8.8 and $91.6 billion in 1984 dollars (converted by Portney from 1978 dollars)).
229. *Id.* at 58.
230. Freeman, *supra* note 74, at 123.
231. *Id.* (between $5.7 and $27.7 billion, with $14.0 billion most likely in 1984 dollars (converted by Freeman from 1978 dollars)).
232. L. LAVE & E. SESKIN, AIR POLLUTION AND HUMAN HEALTH 225 (1977) ($16.1 billion in 1973 dollars).
233. *Id.* at 226.
234. CRANDALL, *supra* note 10, at 77 (between $7.0 and $10.3 billion, and between $4.9 and $6.9 billion in 1981 dollars).

As with most estimates of the benefits of regulation, significant disagreement exists over the benefits of automobile safety regulation.[235] Peltzman argues that because of mandated safety regulations, people drive more recklessly.[236] He finds that while safety regulations result in some reduction in loss of auto occupants' lives, such offsetting behavior led to an equal or greater increase in the number of pedestrian deaths and nonfatal accidents.[237] As a result, Peltzman's contention is that automobile safety regulation not only has failed to save lives, but may even have caused additional deaths due to its influence on driver behavior.

Surely, the imposition of NHTSA regulations alone cannot explain the reduction in the rate of traffic fatalities; other beneficial effects on safety include such factors as improved road surfaces and lighting, the imposition of the fifty-five miles-per-hour speed limit, stricter drunk-driving laws, and other influences that have coincided with added NHTSA regulations.[238] Moreover, the argument supposes that in the absence of regulation, automobile companies would not make such safety improvements voluntarily. While we are reluctant to overemphasize their willingness to try to sell safety equipment, consumer demand today probably would induce automobile companies to install such safety features as passenger restraints (seat belts) and rearview mirrors, at a minimum.

Peltzman's argument has come under attack from a number of angles. Graham and Garber show that Peltzman's results are highly sensitive to plausible changes in specification.[239] Behavioralists contend that driving is such a complex endeavor that individuals use simple rules or heuristics in order to decide upon their actions.[240] If the behavioralists are correct, imposing additional safety features may change individual driving behavior very little. One hypothesis is that because the probability of a crash is so low, drivers treat the chance as if it were zero, implicitly ignoring the possibility of serious injury. A second hypothesis is that while drivers are sensitive to changes in accident frequency, perhaps because they have such little experience, they act as if they are insensitive to crash severity.[241] However, this second hypothe-

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235. *Compare* NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., U.S. DEP'T OF TRANSP., HIGHWAY SAFETY 1985, at 1 (1988) ("[T]he safety picture has improved significantly since the passage of the basic legislation in 1966") *with* Peltzman, *The Effects of Automobile Safety Regulation*, 83 J. POL. ECON. 677 (1975).

236. Peltzman, *supra* note 235, at 677.

237. *Id.*

238. INSURANCE INSTITUTE FOR HIGHWAY SAFETY, STATUS REPORT, Sept. 9, 1986, at 2.

239. Graham & Garber, *Evaluating the Effects of Automobile Safety Regulation*, 3 J. POL'Y ANAL. & MGMT. 206 (1984).

240. *See, e.g.*, Tversky & Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, 185 SCIENCE 1124 (1974).

241. Graham & Gardner, *supra* note 239, at 209.

sis would not preclude Peltzman's offsetting effects in the case of collision avoidance regulations such as windshield wipers and lighting/reflecting devices.

The debate has made both extreme positions untenable. Automobile regulations neither have prevented every highway death over the past 25 years, nor have they been completely ineffective (or even life-threatening). Using both time-series and cross-sectional evidence, Crandall estimates that a large improvement in highway safety is attributable to regulations.[242] The study estimates the benefits of regulation at between $7.6 and $45.7 billion, depending on the optimism of the assumptions and whether one values lives saved at $0.4 or $1.3 million.[243] A $1.3 million "value of life" yields a range of automobile regulatory benefits between $25.4 and $45.7 billion.[244] Even the lower end of the benefit estimate ($25.4 billion) exceeds the most expensive cost estimate ($13.4 billion).[245]

Occupational Safety and Health

Using productivity changes, Denison estimates mining safety regulatory costs at $4.9 billion, and total employee safety and health regulations at $9.0 billion.[246] Crandall, implementing a capital expenditures approach, reports that the total cost of occupational health and safety regulations in 1985 was $8.5 billion.[247] Given the difference in their methodologies, Denison and Crandall arrive at remarkably similar cost estimates.

Though a number of studies have estimated the costs and benefits of individual OSHA regulations, few have tried to calculate the combined benefits of all occupational health and safety regulation. One economist, who has had considerable experience studying OSHA regulations, concludes that the effects of worker safety regulations have been negligible.[248] Viscusi states, "The industry data I analyzed suggests that OSHA inspections or penalties have had no significant effect on worker injuries and illnesses."[249] Lave, after reviewing the results from a number of studies on OSHA, also concludes that "OSHA had little or no effect on accident rates, even in targeted industries where its resources were focused."[250] In the absence of credible studies showing posi-

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242. CRANDALL, *supra* note 10, at 74.
243. *Id.* at 77 ($0.3 to $1.0 million in 1981 dollars).
244. *Id.* ($19.5 to $35.1 billion in 1981 dollars).
245. *Id.* ($10.3 billion in 1981 dollars).
246. E. DENISON, *supra* note 48, at 72 ($2.2 billion and $4.1 billion in 1975 dollars).
247. Crandall, *What Ever Happened to Deregulation?*, in ASSESSING THE REAGAN YEARS 271, 286 (D. Boaz ed. 1988) ($6.9 billion in 1982 dollars).
248. W. VISCUSI, RISK BY CHOICE: REGULATING HEALTH AND SAFETY IN THE WORKPLACE 35 (1983).
249. *Id.* at 33-34.
250. L. LAVE, THE STRATEGY OF SOCIAL REGULATION: DECISION FRAMEWORKS FOR POLICY 102 (1981).

tive benefits of OSHA regulations, we conclude that the net costs total roughly $8.5 billion per year.

This figure, however, probably represents an upper bound. Although Viscusi may be correct in ascribing no benefits to OSHA regulation, the costs ascribed to OSHA's regulations may overstate the actual costs. Firms may have instituted many of the safety features now found in the workplace for other reasons, such as labor market pressures. Viscusi himself states that OSHA "regulations have not been particularly effective in altering firms' incentives to invest in safety."[251] While OSHA regulations may have resulted in few workplace benefits, they also may not be the primary or even most significant factor responsible for increased costs.

Nuclear Power

Citing a DOE policy study, Litan and Nordhaus state that nuclear power regulations impose annual efficiency losses of $5.3 to $7.6 billion.[252]

Drug Approval

Peltzman's 1973 study was the first to try to quantify the economic effects of the 1962 Drug Amendments.[253] His analysis measures (1) the market demand curve for the uninformed consumer who, through a physician's advice, trial and error, or some other method learns that the drug is ineffective, and (2) the informed consumer demand curve, which shifts inward (the informed consumer is willing to pay less for a given quantity of the drug than the uninformed consumer). After measuring this demand shift and computing the welfare effects, Peltzman finds that the net effect of the amendments was equivalent to a tax on 5% to 10% of annual drug purchases.[254] With consumers spending nearly $30 billion per year on legal drugs,[255] the social cost (deadweight loss) would amount to between $1.5 and $3.0 billion per year.

McGuire sharply criticizes the Peltzman study for ignoring the impact on the opposite type of consumer: one who is overly skeptical and only reluctantly tries new drugs (perhaps because of past experience).[256] One may describe these consumers' buying patterns using demand curves that shift out as the

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251. Viscusi, *Consumer Behavior and the Safety Effects of Product Safety Regulation*, 28 J. L. & ECON. 527, 527-28 (1985).

252. R. LITAN & W. NORDHAUS, *supra* note 12, at 22 ($2.7 to $3.9 billion in 1977 dollars).

253. S. Peltzman, *An Evaluation of Consumer Protection Legislation: The 1962 Drug Amendments*, 81 J. POL. ECON. 1049 (1973).

254. *Id.* at 1090.

255. STATISTICAL ABSTRACT OF THE UNITED STATES 412 (1988).

256. McGuire, Nelson, & Spavins, *An Evaluation of Consumer Protection Legislation: The 1962 Drug Amendments: A Comment*, 83 J. POL. ECON. 655 (1975).

overly skeptical consumer learns more about a given drug. McGuire claims that since Peltzman measures market responses to drugs, he ignores the independent benefits accruing to both types of consumers from added information.[257] In other words, Peltzman measures an aggregate demand curve when one ought to model both responses separately. Unfortunately, McGuire does not present new estimates of the effects of drug regulation using their improved framework.

Since Peltzman's study of over fifteen years ago, drug regulation has undergone considerable change. Delay times for FDA approval dropped considerably in the 1980s.[258] In addition, the FDA recently instituted deregulatory measures to speed the procedures by which companies submit new drug applications,[259] although it is too early to assess their effects. To our knowledge, however, no subsequent estimates of the cost of drug regulation exist. In light of these changes, Peltzman's estimate is best interpreted as an upper bound on net social costs.

Equal Employment Opportunity

The Equal Employment Opportunity Commission (EEOC) requires that employers maintain records of hiring and firing decisions, and in some cases conduct affirmative action programs.[260] Record-keeping and program implementation can demand valuable employee time and impose significant legal costs. Weidenbaum and DeFina estimate that such costs total roughly $0.9 billion.[261] We include this estimate in our total social regulatory cost, though the benefits of EEOC actions easily may exceed compliance costs. However, the benefits are extremely difficult to quantify.

Consumer Product Safety

To our knowledge, there have been no definitive estimates of the cumulative costs imposed by the Consumer Product Safety Commission (CPSC) on industry and consumers (for example, by banning the sale of allegedly hazardous toys such as lawn darts). Weidenbaum and DeFina note that the CPSC's administrative cost was $42 million in 1976, but add that compliance costs were not available.[262] Since the 1988 budget outlays for the CPSC were

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257. *Id.* at 657.
258. FOOD & DRUG ADMIN., PUB. HEALTH SERV., DEP'T OF HEALTH & HUMAN SERV., NEW DRUG EVALUATION: STATISTICAL REPORT 34 (1987).
259. *FDA Acts to Speed Approval of Drugs*, N.Y. Times, Feb. 21, 1989, at C3, col. 6.
260. 29 C.F.R. §§ 1602.1—.55, 1608.1—.12 (1990).
261. M. WEIDENBAUM & R. DEFINA, *supra* note 11, at 4 ($0.4 billion in 1976 dollars).
262. M. WEIDENBAUM & R. DEFINA, *supra* note 11, at 3.

roughly $34 million,[263] we use that estimate as the cost of CPSC regulation, recognizing that it is a lower bound and that compliance costs probably make the total costs much higher.

One study examines the CPSC's potential benefits, or its impact on safety. Using an econometric analysis of the CPSC's effects as well as case studies, Viscusi finds "no evidence of any significant beneficial impacts [of CPSC regulation] on product safety."[264] The results of a study by Rubin confirm Viscusi's findings.[265] Indeed, the most frequent injuries are those over which the CPSC has little influence (falling down stairs and sports injuries). Compared with the magnitude of regulatory costs and benefits in other arenas, those measured for the CPSC are insignificant. The relatively small magnitude of these costs, however, does not reflect the costs the CPSC imposes on producers, lenders, and shareholders due to litigation and bankruptcy.

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263. BUDGET OF THE UNITED STATES GOVERNMENT, FISCAL YEAR 1990, at 9-161 (1990).
264. Viscusi, *supra* note 251, at 529.
265. Rubin, Dennis & Jarrell, *Risky Products, Risky Stocks*, REGULATION, Jan.- Feb. 1988, at 35, 38.