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## REGULATORY PROCESS, REGULATORY REFORM, AND THE QUALITY OF REGULATORY IMPACT ANALYSIS

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by Jerry Ellig and Rosemarie Fike



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## **Abstract**

Numerous regulatory reform proposals would require federal agencies to conduct more thorough analysis of proposed regulations or expand the resources and influence of the Office of Information and Regulatory Affairs (OIRA), which currently reviews executive branch regulations. We employ data on variation in current administrative procedures to assess the likely effects of proposed regulatory process reforms on the quality and use of regulatory impact analysis (RIA). Many specific types of activity by agencies and OIRA are correlated with higher-quality analysis and greater use of analysis in decisions, and the effects are relatively large. Our results suggest that greater use of Advance Notices of Proposed Rulemakings for major regulations, formal hearings for important rules, articulation of retrospective review plans at the time regulations are issued, and expansion of OIRA's resources and role may improve the quality and use of RIAs.

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# **Regulatory Process, Regulatory Reform, and the Quality of Regulatory Impact Analysis**

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## **I. Introduction**

Regulatory impact analysis (RIA) has become a key element of the regulatory process in developed and developing nations alike. A thorough RIA identifies the potential market failure or other systemic problem a regulation is intended to solve, develops a variety of alternative solutions, and assesses the benefits and costs of those alternatives. Governments have outlined RIA requirements in official documents, such as Executive Order 12866 (Clinton 1993) and Office of Management and Budget Circular A-4 (2003) in the United States and the Impact Assessment Guidelines in the European Union (European Commission 2009). More recently, President Obama's Executive Order 13563 reaffirmed Executive Order 12866 and noted some additional values agencies could consider, such as fairness and human dignity (Obama 2011).

Yet all over the globe, evaluations of regulatory impact analysis have found that government agencies' actual practice often falls far short of the principles outlined in scholarly research and governments' own directives to their regulatory agencies. "Checklist" scoring systems reveal that many RIAs in the United States lack basic information, such as monetized benefits and meaningful alternatives (Hahn et al. 2000; Hahn and Dudley 2007; Fraas and Lutter 2011a; Shapiro and Morrall 2012). Similar analyses find that European Commission impact assessments have similar weaknesses (Renda 2006; Cecot et al. 2008; Hahn and Litan 2005). Case studies often find that RIAs have significant deficiencies and little effect on decisions (Harrington et al. 2009; Graham 2008; Morgenstern 1997; McGarity 1991; Fraas 1991). Some commentators have characterized individual RIAs as "litigation support documents" (Wagner 2009) or at least documents drafted to justify decisions already made for other reasons (Dudley 2011, 126; Keohane

2009). Interviews with agency economists indicate that this happens frequently (Williams 2008). A meta-analysis of 31 European Union and United Kingdom RIAs found that about half of them were used in a “perfunctory” fashion and only about 40 percent were used to enhance substantive understanding of the consequences of regulation (Dunlop et al. 2012, 33).

In the United States, deficiencies in the quality and use of regulatory analysis have led to calls for significant reforms of the regulatory process to motivate higher-quality analysis and promote its use in decisions (House Judiciary Committee 2011; President’s Jobs Council 2011; Harrington et al. 2009; Hahn and Sunstein 2002). Some proposed reforms would encourage or require agencies to undertake additional discrete actions. One would require that agencies publish an advance notice of proposed rulemaking (ANPRM) for all “major” regulations—typically regulations that have economic effects exceeding \$100 million annually. The ANPRM would analyze the nature and cause of the problem the regulation seeks to solve, identify a wide variety of alternative solutions, and offer preliminary estimates of the benefits and costs of each alternative. The President’s Jobs Council (2011, 43) recommended expanded use of ANPRMs without making them a requirement. The Regulatory Accountability Act, which passed the House in 2011 but failed to pass the Senate, would have required such ANPRMs for all major regulations (House Judiciary Committee 2011, 57).

The legislation would also have required trial-like, formal rulemaking hearings for “high impact” regulations—generally, those that imposed costs or other burdens exceeding \$1 billion annually—and would have required agencies to develop retrospective review plans for major regulations at the time the regulations were promulgated. This latter requirement also appeared in President Carter’s Executive Order 12044 on regulatory analysis (Carter 1978), but disappeared from subsequent executive orders.

Some reforms would augment the resources and role of the Office of Information and Regulatory Affairs (OIRA), the office within the Office of Management and Budget that reviews regulations and their accompanying RIAs for compliance with Executive Order 12866. Commentators have called for a doubling of OIRA's staff to restore it to its 1981 level, when it first started reviewing regulations (President's Jobs Council 2011, 45), and for subjecting regulations from independent regulatory commissions to RIA requirements and OIRA review (Hahn and Sunstein 2002, 1531–37; House Judiciary Committee 2011, 24–26; President's Jobs Council 2011, 45; Tozzi 2011, 68; Katzen 2011, 109; Fraas and Lutter 2011b). Shapiro and Morrall (forthcoming) calculate that expanding OIRA's staff is the lowest-cost way of improving RIAs. The Regulatory Accountability Act would have written many of the major regulatory analysis requirements in Executive Order 12866 into law (thus applying them to independent agencies) and would have required agencies to consult OIRA before issuing a proposed rule (House Judiciary Committee 2011).

In a sense, the reform proposals represent a continuation of a trend toward greater uniformity in administrative procedures that began with the Administrative Procedure Act (APA) of 1946. The APA instituted uniform procedures and established minimum standards for information gathering and disclosure across agencies (McCubbins et al. 1987, 256). The RIA requirements in executive orders further raised the standards by enunciating a series of substantive questions all executive branch regulatory agencies are supposed to address.<sup>1</sup> The proposed reforms would further standardize agency procedures for developing regulations and RIAs and apply these standards to independent agencies as well.

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<sup>1</sup> Unlike the APA, however, the executive orders on regulatory analysis are not judicially enforceable. Each one contains a sentence to that effect. See for example Carter (1978), sec. 7; Clinton (1993), sec. 10.

Recent regulatory history provides a rich database of experience that can be used to test the prospective impact of proposed reforms. Many of the proposed reforms are similar to actions that agencies sometimes undertake voluntarily or are actions that are currently required by law only for some regulations. OIRA already subjects some regulations to a lengthier or more thorough review than others (McLaughlin and Ellig 2011). If more extensive action by agencies and OIRA is correlated with higher-quality or more influential RIAs, it is more likely that “deepening and widening” such action will make agencies more accountable to elected leaders and the public.<sup>2</sup>

This paper combines newly gathered data on the variation in current regulatory processes with an extensive set of expert scores that evaluate the quality and use of regulatory impact analysis for proposed federal regulations to assess whether four proposed regulatory reforms would likely affect the quality of regulatory analysis and the extent to which agencies claim to use it in decisions. The four reforms are (1) expanded use of ANPRMs for major regulations, (2) public hearings for “high impact” regulations after they are proposed, (3) preparation of retrospective analysis plans at the time regulations are issued, and (4) expansion of OIRA’s influence and resources. None of our process variables are identical to the proposed regulatory reforms, but they are similar enough to be analogous, and the results are informative. Principal findings include the following:

- Several types of agency actions that expand pre-proposal information-gathering are associated with higher-quality RIAs and greater claimed use of analysis in decision-

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<sup>2</sup> This phrase comes from Hahn and Sunstein (2002), who call for “deeper and wider cost-benefit analysis.” They suggest some of the reforms mentioned in the text, and the phrase is consistent with the spirit of most of the reforms listed.

making. These include a prior notice of proposed rulemaking (NPRM) in the same regulatory proceeding, a public request for information by the agency, and consultation with state, tribal, or local governments.

- Two other pre-proposal actions—public meetings and advisory committees—do not appear to improve the quality and use of analysis and may even diminish them.
- An agency’s commitment to hear feedback on the regulation at a hearing or other public meeting in the future is associated with more extensive explanation of how the agency used the analysis in its decisions.
- A proposed rule that results from review or revision of a previous rule may be associated with lower-quality analysis than other rules. However, a legislative requirement for review is associated with higher-quality analysis.
- The quality and use of regulatory analysis is positively correlated with the length of OIRA review time. OIRA’s influence in the administration (measured by whether the administrator is a political appointee or acting administrator) is positively correlated with claimed use of regulatory analysis.

These results suggest that many types of activity by agencies and OIRA result in higher-quality regulatory analysis and greater use of analysis in decisions. In addition, our results suggest that regulatory reforms designed to expand agency activity and OIRA’s influence and resources could lead to noticeable improvement in the quality and use of regulatory analysis. Such improvement would aid policymakers and the public in monitoring and assessing the likely effects of proposed regulations.

## **II. Some Theoretical Considerations**

Elected leaders delegate significant decision-making authority to regulatory agencies. Delegation of decision-making to expert agencies makes accountability more difficult, due to the asymmetry of information between the agencies and the elected leaders whose directives they are supposed to implement.

From the perspective of elected policymakers, agencies may be under- or overzealous about adopting new regulations. Agency success is usually defined as success in creating regulations intended to achieve the agency's specific mission, such as workplace safety (OSHA) or clean water (EPA), rather than balancing pursuit of that mission with other worthy goals that require government and social resources. This perspective creates a degree of "tunnel vision" that discourages agencies from considering important tradeoffs between their specific mission and the broader public interest (DeMuth and Ginsburg 1986; Dudley 2011). On the other hand, issuing new regulations requires effort, which is costly (McCubbins et al. 1987, 247). Hence, bureaucratic inertia may lead to regulation that is less vigorous than elected leaders desire (Kagan 2001). Antiregulatory interests are also often well organized and well funded, and they may influence agencies to under-regulate (Bagley and Revesz 2006, 1282–304).

By adopting procedural requirements that compel agencies to publicize regulatory proposals in advance and disclose their likely consequences, Congress and the president mitigate information asymmetries and make it easier for affected constituencies to monitor and alert them about regulatory initiatives of concern (McCubbins et al. 1987). As Horn and Shepsle (1989) note, this can increase the value of the legislative "deal" generating the regulation if constituents can monitor the effects of proposed regulations at lower cost than elected leaders can.

Executive orders requiring agencies to conduct and publish regulatory impact analyses (RIAs) and clear regulations through the Office of Management and Budget (OMB) are examples of presidential initiatives that seek to reduce information asymmetries.<sup>3</sup> Posner (2001) argues that elected leaders should often find RIA requirements useful even when their goal is something other than economic efficiency, because the RIA is supposed to provide a structured and systematic way of identifying the regulation's likely consequences. As if to confirm Posner's hypothesis, seminal articles by DeMuth and Ginsburg (1986) and Kagan (2001) portray centralized regulatory review and RIAs as important tools for ensuring agency accountability under presidents Reagan and Clinton—the two US presidents who did the most to shape the current requirements and review process in the executive branch, despite their rather different attitudes toward regulation. President Reagan was the first president to subject agency regulations to OIRA review. President Clinton and his staff actively directed agencies to issue regulations, continued OIRA oversight, and took credit for regulatory successes.

As a first approximation, therefore, we expect that regulatory reforms aimed at increasing agencies' activity and OIRA's influence would lead to more thorough RIAs and increase the extent to which agencies claim to have used analysis to inform decisions. Several complicating factors, however, could lead to different predictions under specific circumstances.

### ***A. Agency Effort***

Many regulatory reform proposals would require agencies to take certain actions that are currently discretionary, or required by law only for some regulations. It is plausible to expect that

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<sup>3</sup> Dunlop et al. (2012) offer an explanation of this use of RIAs in the European context.

these reforms could improve the quality and use of regulatory analysis, but some of them may have the potential to generate perverse effects, for two reasons.

First, increased agency activity will not necessarily improve the quality of the RIA. Agencies can also devote analytical effort to increasing information asymmetries by making the RIA more complex but less informative. Commentators already note that some RIAs spend an inordinate amount of time on less important benefit or cost calculations while missing more substantial issues, such as significant alternatives (Keohane 2009; Wagner 2009). In addition, since agencies know OIRA will review their RIAs and regulations, they may attempt to game the system by preemptively using additional analysis to create the impression of quality review and blunt the effectiveness of OIRA review to improve the quality of the RIA.

Second, expanded procedural requirements could reduce the quality or use of RIAs by giving interest groups greater influence over the regulatory process. Public meetings or other forums that gather stakeholders together may facilitate collusion among stakeholders at the expense of the general public, even if the purpose of the meeting is merely information-gathering. To the extent that the agency is guided by agreement among stakeholders rather than the results of analysis, the RIA may be used less extensively. If analysts expect this to occur, they will likely put less effort into creating a high-quality analysis. Of course, greater responsiveness to stakeholders may be precisely the result elected leaders intend. In this case, the quality and use of the RIA may decline rather than increase. Even if stakeholders wield no inappropriate influence, public meetings or other extensive discussions may lead agencies to document the analysis or its effects less extensively in the NPRM or RIA, since major stakeholders already heard this discussion in meetings where many topics relevant to regulatory analysis were aired. We discuss these possibilities in our description of the explanatory variables below.

## ***B. OIRA Influence and Resources***

Executive Order 12866 explicitly gives OIRA two distinct functions, which may sometimes conflict (Arbuckle 2011; Dudley 2011). OIRA has a dual role of ensuring that the regulations reflect the regulatory analysis principles enunciated in Executive Order 12866 and ensuring that they reflect the president's policy views. If OIRA primarily enforces the principles of Executive Order 12866, then we would expect greater effort on OIRA's part to improve the quality and use of RIAs. If OIRA primarily enforces the president's policy views on agencies, then OIRA's efforts may have no effect or even a negative effect on the quality and use of RIAs. In the latter case, OIRA review ensures that regulatory decisions reflect the president's policies regardless of what consequences the analysis reveals.

A 2003 Government Accountability Office report found numerous instances in which OIRA review affected the content of an agency's regulatory analysis or the agency's explanation of how the analysis was related to the regulation. Other research, however, has concluded that OIRA has had little systematic impact on the cost-effectiveness of regulations. Hahn (2000) finds that the introduction of OIRA was not correlated with improvement in the cost-effectiveness of regulations. Farrow (2006) finds that cost per life saved had a miniscule effect on the decision to reject a proposed regulation and that OIRA had no tendency to reduce the cost per life saved. These previous studies, however, presume that OIRA can only act to improve the efficiency of regulations. A more recent paper finds that the length of OIRA review is positively correlated with the amount of information in RIAs (Shapiro and Morrall forthcoming). We assess OIRA's effect on broader outcomes—the quality and use of RIAs—and employ different explanatory variables to measure OIRA's influence and effort. We thus provide a test that is more consistent with Posner's (2001) hypothesis that elected leaders utilize RIAs to curb information asymmetries.

### **III. Data and Variables of Interest**

#### ***A. Dependent Variables***

Our dependent variables measuring the quality and use of regulatory impact analysis are qualitative scores awarded by the Mercatus Center at George Mason University's Regulatory Report Card, which assesses the quality and use of RIAs for proposed, economically significant regulations.<sup>4</sup> Economically significant regulations are those that have costs or other economic effects exceeding \$100 million annually or that meet other criteria specified in section 3f1 of Executive Order 12866 (Clinton 1993), which governs regulatory analysis and review for executive branch agencies. For 2008–10, the years covered in this paper, the Regulatory Report Card consists of 10 criteria derived from requirements in Executive Order 12866, supplemented by two criteria on retrospective analysis that are not explicitly required by the executive order but are logically necessary if agencies are to conduct regular retrospective reviews of regulations, as required by section 5a of the executive order. Ellig and McLaughlin (2012) list the criteria and demonstrate how they mirror elements in the OMB's Regulatory Impact Analysis Checklist (OMB 2010).

To produce the Report Card scores, two trained evaluators assessed each criterion on a Likert (0–5) scale, where 0 indicates no relevant content and 5 indicates reasonably complete analysis with one or more best practices that other agencies might imitate. The scores do not indicate whether the evaluators agreed with the regulation or the analysis; they indicate how complete the analysis was and how well the agency explained its use of analysis. The 12 criteria are grouped into three categories: Openness, Analysis, and Use. To develop scores for each of the four Analysis criteria, the evaluators scored the RIA on a series of sub-questions, then

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<sup>4</sup> A complete set of Regulatory Report Card score data can be downloaded at [www.mercatus.org/reportcard](http://www.mercatus.org/reportcard).

averaged and rounded these scores to calculate the score for each Analysis criterion. As a result, the Regulatory Report Card database actually includes scores for 30 separate questions. Table 1 (page 48) lists these questions.

Readers concerned solely with the quality of RIAs would want to focus on the Openness and Analysis scores. As the list of questions in table 1 indicates, the Openness criteria assess the transparency of the analysis, but several of them also provide insight about the quality of the analysis. An RIA that scores high on Openness because it has clear documentation of source data, studies, and underlying theories, for example, is likely to have better analysis than an RIA that uses little data or shows scant evidence of research.

The first two Use criteria assess the extent to which the agency claimed in the RIA or NPRM to use the analysis in its decisions. The second two assess how well the agency made provisions in the RIA or NPRM for retrospective analysis of the regulation in the future. The developers of the Report Card acknowledge that these criteria assess only whether the agency claimed to use the analysis or appears prepared to evaluate the regulation in the future (Ellig and McLaughlin 2012). The actual influence of the RIA is unobservable without interviewing the key decision-makers who wrote each regulation. Both of these scores could also be vulnerable to “false positives,” since agencies may have incentives to claim they used the analysis even if they did not, or to promise to conduct retrospective review even if they do not follow through.<sup>5</sup> Therefore, the Use scores may be somewhat noisier indicators of actual agency behavior than the Openness or Analysis scores.

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<sup>5</sup> It is not clear whether this is a serious problem in reality. The Use category has a lower average score than the Openness or Analysis categories (see table 2), and the two retrospective analysis questions have the lowest scores of all the 12 criteria. (Ellig et al. 2012). Thus, there may be few false positives because there are relatively few high scores at all on the Use criteria; agencies rarely claim to have used the analysis extensively.

As a qualitative evaluation using Likert-scale scoring, the Report Card represents an approach midway between checklist scoring systems and detailed case studies of individual regulations. The evaluation method is explained more fully in Ellig and McLaughlin (2012). Interrater reliability tests indicate that the training method for evaluators produces consistent evaluations across multiple scorers (Ellig and McLaughlin 2012; Ellig et al. 2013). The Report Card is the most in-depth evaluation we know of that covers more than 100 proposed federal regulations.

We use the scores for 71 prescriptive regulations proposed in 2008–10, the same time period covered by Ellig, McLaughlin, and Morrall’s (2013) study that compares the quality and use of RIAs during the Bush and Obama administrations.<sup>6</sup> This lets us determine whether their results still hold after controlling for the regulatory process variables that are the primary focus of our analysis.

In keeping with the current debate about regulatory reform, we focus on prescriptive regulations for several reasons. First, prescriptive regulations fill the conventional role of regulations: they mandate or prohibit certain activities (Posner 2003). This makes them distinct from budget regulations, which implement federal spending programs or revenue collection measures. Second, empirical evidence shows that budget regulations tend to have much lower-quality analysis (Posner 2003; McLaughlin and Ellig 2011). By focusing on prescriptive regulations, we hope to identify the aspects of the regulatory process most conducive to higher-quality analysis. Finally, OIRA review of prescriptive regulations tends to focus on the major elements of regulatory impact analysis as articulated in Executive Order 12866; review of budget regulations focuses mostly on whether the regulations’ implications for the federal budget are

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<sup>6</sup> Ellig, McLaughlin, and Morrall’s (2013) study includes 72 prescriptive regulations and 39 budget regulations. We reclassified one regulation they labeled prescriptive—dealing with abandoned mine lands—as a budget regulation, because it specifies conditions attached to federal grants for the restoration of abandoned mine lands.

accurately estimated (McLaughlin and Ellig 2011). Since one of the pre-proposal process factors we examine is OIRA review, it seems logical to examine the type of regulation for which OIRA tries hardest to enforce the provisions of the executive order.

Table 2 (page 49) shows summary statistics for the dependent variables. The total score averages just 32.5 out of a maximum possible 60 points. The highest-scoring regulation received 48 out of a possible 60 points, equivalent to 80 percent. For Openness, Analysis, and Use, the maximum possible score was 20 points each; no regulation achieved the maximum in any category. For the retrospective review questions, the maximum possible score was 10 points, which one regulation achieved.

### ***B. Regulatory Process Variables***

A major contribution of this paper is a new dataset, which provides our primary explanatory variables of interest.<sup>7</sup> This dataset consists of observable indicators denoting the type of pre-proposal activity OIRA and the agencies devoted to the production, review, and use of RIAs for each proposed rule, plus several additional variables characterizing other aspects of the regulatory process. The authors and a graduate student research assistant read through the NPRMs, RIAs, and other supporting documents, searching for key words and concepts. The data were then coded as dummy variables to capture the types of actions accompanying each proposed regulation.<sup>8</sup> Below, we provide a brief description of each variable and the coding. When the definition or coding might not be obvious from the description, we also provide an example from the dataset. Table 3 (page 49) lists summary statistics for the regulatory process variables.

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<sup>7</sup> The dataset is available from the authors upon request.

<sup>8</sup> In a spreadsheet, we compiled an extensive record of exactly where in the text of the NPRM and supporting documents the information used in our coding can be found. Some of the variables required careful reading of the regulation and some subjective interpretation of what type of power the agency has.

*ANPRM.* An advance notice of proposed rulemaking usually includes some initial analysis, along with a tentative proposal and/or some options the agency is considering. ANPRMs also often request comment on specific questions the agency would like more information on. An ANPRM provides additional time for interested parties to participate in the rulemaking process, react to agency proposals, and furnish information. This dummy variable is coded as “1” if the agency published an advance notice of proposed rulemaking (abbreviated ANPRM or ANOPR depending on the agency) and “0” if no such document was published in the *Federal Register*. In our sample, 18 observations had an ANPRM or ANOPR. Since the publication of an ANPRM means the agency engaged in additional information-gathering and analysis before proposing the regulation, we would expect *ANPRM* to have a positive influence on the quality and use of regulatory analysis.

*Prior NPRM.* Agencies sometimes publish and seek comments on multiple versions of a proposed rule in the *Federal Register* before issuing a final rule. Each successive NPRM incorporates new information into the proposal and may also reflect additional changes the agency has made to the RIA. For example, formal comments submitted by concerned parties, who often have specialized knowledge about the potential impact of regulation, may be reflected in updated versions of the NPRM. Several of the regulations in our dataset were the most recent versions of rules that had been previously published in the *Federal Register*. This dummy variable is coded as “1” if the agency published an NPRM before the publication of the NPRM in the dataset. It is coded as “0” otherwise.

A 2008 rule proposed by the Office of the Comptroller of the Currency (OCC), “Standardized Risk-Based Capital Rules (Basel II),” offers a straightforward example (US Dept.

of the Treasury et al., 2008). On December 26, 2006, the OCC issued an NPRM which preceded the 2008 NPRM in our dataset. Thus the *Prior NPRM* variable is coded as “1” for this regulation. For some regulations (such as the Department of the Interior’s annual migratory-bird-hunting rules), the agency may have published NPRMs after the publication of the NPRM included in our dataset. The *Prior NPRM* variable would be “0” in such cases, because we only seek to assess the effect of an NPRM that precedes the one in the dataset.

A prior NPRM means the agency engaged in additional work and received more information from the public before proposing the current version of the rule. For nine of the proposed rules in our sample, the agencies issued prior NPRMs. We would generally expect *Prior NPRM* to have a positive effect on the quality of regulatory analysis.

*Request for Information.* This dummy variable reflects the agency’s attempt to obtain information from the public before drafting the proposed rule. If the agency issued a formal request for information, published a notice announcing the availability of framework documents, or published a notice of data availability (NODA) and requested comments from the public on these documents, this variable is coded as “1.” If the agency did not issue any formal requests for information from the public, this variable is coded as “0.” A request for information preceded 11 of the proposed rules.

We expect *Request for Information* to have a positive effect on the dependent variable, for two reasons. First and most obviously, it gives the agency access to more information. Second, a request for information may signal that the agency is less settled on a course of action and is more likely to be persuaded by the results of the RIA. This could lead to higher scores for use of analysis. It may also lead to higher scores for quality of analysis, since an agency that is

less settled on its course of action may have more interest in ensuring that a high-quality analysis is conducted. Conover and Ellig (2012), for example, suggest that the first round of regulations implementing the Affordable Care Act have low-quality RIAs precisely because most decisions were made before the RIA was completed, and so the Department of Health and Human Services had little reason to produce a high-quality analysis to inform decisions.

*Advisory Committee.* This variable captures the influence of advisory committees created as part of the US regulatory process. An entry is coded as “1” if the regulatory agency created, formed, initiated the creation of, and consulted with a committee on the particular regulation proposed in the NPRM. A committee formed for a negotiated rulemaking is also classified as an advisory committee.<sup>9</sup> If the NPRM utilizes the research or recommendations of a committee that the agency had no role in creating (such as a committee formed by the United Nations or a congressional committee), this variable is coded as “0.” Agencies utilized advisory committees for 33 of the proposed rules.

*Advisory Committee* is coded as “1” regardless of whether the agency’s consultation with the committee was required by law. In 2008, for example, the Pipeline and Hazardous Materials Safety Administration proposed a rule establishing maximum operating pressures for gas transmission pipelines. The NPRM states that the administration must consider any comments received from the public and any comments and recommendations of the Technical Pipeline Safety Standards Committee (US Dept. of Transportation 2008, 13174). Thus, we have coded *Advisory Committee* as “1” for this regulation.

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<sup>9</sup> We considered using negotiated rulemaking as a separate explanatory variable, but there is only one negotiated rulemaking in the sample.

The NPRMs issued for other regulations mention consultations with advisory committees but provide no indication that the consultation is required. In 2009, the EPA proposed a regulation titled “Control of Emissions from New Marine Compression-Ignition Engines at or above 30 Liters per Cylinder.” The NPRM mentions that the agency consulted the Clean Air Scientific Advisory Committee of the EPA’s Science Advisory Board several times. Additionally, the NPRM references a peer review panel the agency held with the Science Advisory Board’s Health Effects Subcommittee (US EPA 2009a, 44503–10). The NPRM did not mention that the EPA was required to undertake these actions. We have recorded “1” as the entry for the *Advisory Committee* variable. The expected sign on *Advisory Committee* is ambiguous. Advisory committees could increase the quality of regulatory analysis if they serve as an additional source of information and expertise, but they may reduce the quality of analysis if they serve mainly as a forum for stakeholder negotiation rather than information-gathering.

*State Consultation.* This variable indicates whether the agency consulted any representatives from state or local governments when drafting the proposed rule. It captures whether the agency actively sought states’ input and engaged them in the rulemaking process. This dummy variable is coded as “1” if the NPRM explicitly mentions that the agency met with representatives of state and local governments or if the agency actively sought input from these parties. It is coded as “0” otherwise.

State consultation can occur in many different ways. Agencies can hold public meetings at which state representatives and relevant stakeholders are present. This was the case for the 2009 Greenhouse Gas Mandatory Reporting Rule. The NPRM mentions that during the rulemaking process, the EPA held meetings with state, local, and tribal environmental control

agencies and regional air-quality planning organizations (US EPA 2009b, 16457). Agencies can actively seek input from state and local stakeholders in other ways. In 2010, the EPA published the NPRM establishing standards for coal combustion residuals from commercial electric power producers. The EPA modeled the provisions in the proposed rule after the EPA's Guide for Industrial Waste Management, which represents a consensus view of best practices for industrial waste management based on involvement from EPA, state, and tribal representatives, and a focus group of industry and public interest organizations (US EPA 2010, 35208). Additionally, an agency can create an advisory committee that has state and local government representatives as members. For the annual establishment of its migratory bird hunting rules, the Department of the Interior relies on the recommendations of the Flyway Council system, which is a long-standing example of state and federal cooperative management. Representatives of many different states are members of this council (US Dept. of the Interior 2009, 41010).

Any action taken by the agency that actively incorporates the input of state representatives or local government stakeholders into the rulemaking process will result in a coding of "1" for the *State Consultation* variable. We do not consider the agency to have consulted with a state representative simply because the agency used state data or studies, states submitted comments in prior proceedings, particular states would be affected by the proposed regulation, or the agency was responding to a petition or lawsuit initiated by a state. Agencies consulted state and local stakeholders for 11 of the proposed rules.

State, tribal, and local governments are additional sources of information. They may offer perspectives the agency has not thought of. More importantly, they have access to local knowledge about costs, benefits, or other consequences of regulation that federal officials might

not even be aware of. For these reasons, we would expect this variable to have a positive impact on our dependent variables.

*Public Meeting.* This variable indicates whether the agency held a public event to receive comments from interested parties before publishing the proposed regulation. The *Public Meeting* dummy variable is coded as “1” if the agency held a public hearing or public meeting before publishing the NPRM, and as “0” otherwise. For 23 of the proposed rules, the agency held a public hearing or public meeting. Like a request for information, a pre-proposal public meeting allows the agency to gather more information, and it may also signify that the agency has not yet made up its mind and will find the results of the RIA valuable. To some extent, a public meeting may also substitute for analysis, if the agency makes decisions based on stakeholder positions, negotiations, or other considerations before conducting its own analysis. A public meeting might also lead to less thorough documentation of the analysis, if the agency views the meeting as a partial substitute for written communication with the public in the RIA and NPRM. Because these potential effects place opposing pressures on our dependent variable, we expect *Public Meeting* will likely have a positive sign, but we are less confident of this prediction than of some others.

*Future Public Meeting.* This dummy variable indicates whether the NPRM explicitly committed the agency to a public discussion forum in the future to receive feedback on the proposed rule. This dummy variable is coded as “1” if the NPRM mentions that a future public meeting will take place on a specific date. The variable is coded as “0” if no future meeting is mentioned, or if a future meeting is mentioned only tentatively—that is, the NPRM mentions that

a public meeting will be held upon request or mentions the possibility of a future meeting but does not mention a date for the meeting.

Of course, the information that an agency receives at a future public meeting cannot affect the quality and use of analysis for an NPRM that is published before the meeting. Nevertheless, we expect that a future public meeting could affect the Report Card score for several reasons. First, it may indicate that the agency is less settled on its approach, and so it may have conducted its RIA more carefully and paid closer attention to the results. Second, a future public meeting may augment the agency's incentive to conduct careful analysis and use it in decisions, because the agency will have to defend its proposed rule from challenges in a public forum. On the other hand, if an agency anticipates receiving relevant information and feedback during a future public meeting, it may delay some of its analysis until afterward, thus leading to a lower-quality RIA at the NPRM stage. Thus, the prevailing impact a future public meeting will have on the dependent variable is unclear.

*Revised Rule.* This variable indicates whether the proposed rule is an amendment to, or a revision of, a previous rule. Regulations that are amendments to or revisions of previous regulations are coded as "1," while NPRMs for new regulations are coded as "0." The predicted sign of this variable is ambiguous. On one hand, if the agency is revising a previous rule, then it can draw on a stock of existing expertise to conduct the RIA, which suggests the analysis should be of higher quality. On the other hand, agencies are often reluctant to invent new approaches when an existing approach has already been upheld in court (Williams 2008). This suggests the agency may be less interested in conducting a high-quality analysis that incorporates new ways of solving old problems; in other words, there is path dependence stemming from the initial regulatory action.

*Review Required.* This dummy variable is designed to capture whether the NPRM results from a legislative requirement to review a prior rule. (It does not indicate whether the agency is committing to review the rulemaking in the future.) If the NPRM was the result of a legislative requirement to review a previous rule, it is coded as “1.”

The legislative requirement need not be a requirement for genuine retrospective analysis of an existing rule’s benefits and costs; this kind of analysis is relatively rare (Lutter 2012). Rather, we check to see whether some type of legislative requirement motivated revision of the regulation. For example, the NPRMs for all the EPA’s national ambient air quality standards are coded as “1,” because the Clean Air Act requires the EPA to periodically review these standards. Similarly, most of the Department of Energy’s energy efficiency standards are coded as “1,” because many of them are revised standards required by law.

Only rules with a “1” entered for *Revised Rule* can have a “1” for *Review Required*. Thus, the two variables help us distinguish whether a revision of a rule undertaken on the agency’s own initiative has a different effect than a legislatively required revision.

*Acting OIRA Administrator.* This variable equals “1” if OIRA concluded its review of the regulation during the interregnum period at the beginning of the Obama administration when the OIRA administrator was an acting career civil servant rather than a Senate-confirmed presidential appointee. Ellig, McLaughlin, and Morrall (2013) hypothesize that this variable may be associated with lower scores, because OIRA has less influence over agencies when a presidential appointee is not the administrator. They find that it had a marginally significant, negative effect on use of analysis but no effect on the quality of analysis.

*OIRA Review Time.* To measure the extent of OIRA effort expended on each NPRM, we use the number of days OIRA spent reviewing the NPRM before its publication. Executive Order 12866 normally gives OIRA a 90-day period to conduct its review of an NPRM and notify the agency whether it can proceed with the regulation. Formally, the review period can be extended once by 30 days. In practice, some regulations have review times exceeding 120 days. These are most likely cases where OIRA has reviewed the regulation within the required time period and asked the agency for additional data or analysis (DeMuth and Ginsburg 1986, 1088). Long review periods may also reflect cases where OIRA and the agency have significant disagreements about the content of the regulation or the accompanying analysis. Additional time is required for the two parties to work out their disagreements. (US GAO 2003, 46)

Reginfo.gov, a federal regulatory portal, records the dates when OIRA review begins and concludes. For each regulation, we calculated the review time based on these dates. Review time can vary for reasons unrelated to the quality of the analysis—such as OIRA’s total workload, shifting priorities, a deliberate decision to speed up or slow down the adoption of new regulations generally, or informal OIRA review before the regulation is officially submitted (US GAO 2003, 46; McLaughlin and Ellig 2011, 194–95). To adjust for some of these factors that may vary from year to year, our *OIRA Review Time* variable is calculated as the regulation’s review time minus the mean review time for regulations reviewed in the same year. This is why the mean value for *OIRA Review Time* in table 3 is zero. Review time centered on the year’s mean is probably still a noisy measure of OIRA effort, but less noisy than raw review time.

We would normally expect OIRA review time to have a positive effect on the quality and use of RIAs (McLaughlin 2011; Shapiro and Morrall forthcoming). However, like many kinds of effort, review time may be subject to diminishing marginal returns. A very lengthy review might

even be associated with worse analysis or use of analysis. If review time is extended when OIRA and the agency have trouble agreeing, that could mean either that the analysis has significant quality problems or that political considerations are trumping the results of the analysis. The former implies a lower score for quality of analysis; the latter implies a lower score for use of analysis. We therefore include a second variable, *OIRA Review Time*<sup>2</sup>, to test for diminishing marginal returns and the possibility that very long review times may be associated with lower-quality analysis.<sup>10</sup>

### ***C. Control Variables***

Ellig, McLaughlin, and Morrall (2013) provide the most extensive published analysis of factors correlated with Report Card scores. To ensure that our results do not stem from the omission of important variables identified in prior research, our control variables include all their explanatory variables, plus some additional ones.

*Obama Administration.* This variable equals “1” if the regulation was reviewed by OIRA during the Obama administration, and “0” if it was reviewed during the Bush administration. It is intended to indicate whether there is any systematic difference in the quality and use of regulatory analysis in different presidential administrations. Posner’s (2001) positive theory, as well as actual experience under different administrations (DeMuth and Ginsburg 1986; Kagan 2001; Hahn and Sunstein 2002; Hahn and Dudley 2007), suggests that administrations are likely to have similar levels of interest in regulatory analysis regardless of their policy preferences.

This variable is not statistically significant in Ellig, McLaughlin, and Morrall (2013).

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<sup>10</sup> Because *OIRA Review Time* is centered on the year’s mean, the squares of review times below the year’s mean are entered as negative numbers.

*Midnight Regulation.* This variable equals “1” for Bush administration regulations that were proposed between Election Day 2008 and Inauguration Day 2009, and whose OIRA review concluded after June 1, 2008. The Bush administration set the June 1 deadline in an explicit attempt to limit these regulations. These regulations might be expected to have lower scores for three reasons: they were put together in a hurry, political considerations may have led the administration to place a lower priority on conducting high-quality analysis, and the surge of midnight regulations may overwhelm OIRA’s review capacity (Brito and de Rugy 2009; McLaughlin 2011). Ellig, McLaughlin, and Morrall (2013) find that this variable is correlated with lower scores for quality and use of analysis for prescriptive regulations.

*Midnight Leftover.* This variable equals “1” for Bush administration regulations whose OIRA review concluded after June 1, 2008, but were left for the Obama administration to propose. These regulations might have lower quality or use of analysis because they were supposed to be midnight regulations but didn’t quite get done in time, or because they were lower-priority regulations passed on to the next administration. Ellig, McLaughlin, and Morrall (2013) find that these regulations had lower scores for use of analysis.

*Regulation type variables.* Different types of regulations, such as economic, civil rights, security, environment, and safety regulations, may have different quality or use of analysis due to the existing “state of the art” of regulatory analysis in different fields, or because political considerations make high-quality analysis more or less likely to be conducted and used depending on the topic. We classify each regulation into one of these four categories. Ellig,

McLaughlin, and Morrall (2013) find that the type of regulation sometimes, but not always, had a statistically significant correlation with the quality or use of analysis.

A more granular control for type of regulation would employ dummy variables for each agency issuing the regulation. In one specification, we use agency dummies in place of regulation type dummies.

*Agency policy preferences.* Posner's model (2001, 1184–85) predicts that the greater the ideological distance between the president and the agency, the more likely the president is to require an agency to conduct regulatory impact analysis. He notes anecdotal accounts that OIRA enforces RIA requirements more vigorously based on the agency's ideology, suggesting that "a more systematic test would be feasible if ideological positions of agencies or agency heads could be measured." Clinton and Lewis (2008) use expert elicitation to develop numerical scores measuring agency policy preferences on a "conservative–liberal" spectrum. Ellig, McLaughlin, and Morrall (2013) interact these scores with a dummy variable for each presidential administration. Ellig et al. find results consistent with Posner's hypothesis: regulations from agencies with more "conservative" policy preferences tended to have lower Report Card scores during the Bush administration, and regulations from agencies with more "liberal" policy preferences tended to have lower scores during the Obama administration. We include these variables to control for this effect.

*Public Comments.* Regulations.gov tracks the number of public comments submitted on each proposed regulation. Shapiro and Morrall (2012) employ the number of comments as an indicator of a regulation's political salience; the more comments, the more likely it is that a

regulation is politically salient. They find that the more public comments there are on a regulation, the lower are its net benefits, suggesting that the federal government is less likely to try to maximize net benefits when significant political considerations get in the way. If this is true, we might also expect that regulations with more public comments would have lower scores for quality and use of regulatory analysis.

On the other hand, McCubbins, Noll, and Weingast (1987) posit that the requirements of the Administrative Procedure Act help ensure that the most politically controversial regulations generate the most complete information on the public record. It is conceivable that agencies would seek to conduct, and OIRA would require, more careful analysis for regulations that are more controversial, because these are precisely the regulations for which policymakers would most want to understand the likely effects.

#### **IV. Econometric Methods and Results**

Because the Report Card scores are qualitative evaluations, we estimate an ordered logit regression model to assess whether the scores are correlated with any of the regulatory process variables. Appendix 1 explains the underlying econometric theory and mathematical exposition of our models. Below, we discuss the results.

##### ***A. Total Score Regressions***

Table 4 (page 50) shows our initial regression results, using the total score as the dependent variable. Specification 1 includes only the regulatory process variables, without controlling for any other factors. The results suggest that five of the variables—*Prior NPRM*, *Request for Information*, *State Consultation*, *Future Public Meeting*, and *Review Required*—are positively

correlated with the quality and use of regulatory analysis. *Acting OIRA Administrator* is negative and statistically significant. None of the other process variables are significant in specification 1.

As we include additional variables in subsequent specifications, these results remain robust, and some additional regulatory process variables become significant. Specification 2 controls for additional factors discussed in Ellig, McLaughlin, and Morrall (2013). It also adds the number of public comments filed in the proceeding. When we add these variables, the coefficients on *Prior NPRM*, *Request for Information*, *State Consultation*, and *Future Public Meeting* become larger and more statistically significant than in specification 1.

*OIRA Review Time* also becomes positive and statistically significant, and *OIRA Review Time*<sup>2</sup> becomes negative and statistically significant; both results are consistent with our theory. Their coefficients indicate that any effect of OIRA review time would remain positive until 80 days beyond the mean review time for the year; only one regulation had a review time longer than this.<sup>11</sup>

Specifications 3 and 4 show that the results for both the regulatory process variables and the control variables are robust when we include other potential control variables. Specification 3 adds dummy variables for the agency issuing the regulation, instead of controlling for the type of regulation.<sup>12</sup> The variables that were statistically significant previously remain so in specification 3, except for *Midnight Leftover* and *Obama Agency*

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<sup>11</sup> To check the robustness of the results with respect to *OIRA Review Time*, we also estimated specification 2 omitting regulations with review times exceeding OIRA's 90-day deadline or the 90-day deadline plus a 30-day extension. We also omitted *OIRA Review Time*<sup>2</sup>, since this variable was included to test for differential effects of long reviews. The coefficient on *OIRA Review Time* was positive and significant at the 1 percent level. All other regulatory process variables retained the same signs and roughly the same statistical significance as specification 2 in table 4, except that *Review Required* became insignificant when regulations with review times longer than 90 days were omitted. Regression results are omitted for brevity but are available from the authors.

<sup>12</sup> Regulation type is dropped because regulation type and agency are highly, but not perfectly, collinear. For example, in 2009 the Coast Guard, part of the Department of Homeland Security, proposed a regulation affecting ballast water discharges from ships in coastal waters; this was an environmental regulation, not a security regulation.

*Preference*, which become insignificant. *Bush Agency Preference* remains negative and highly significant, which suggests that different administrations may treat the analysis of different agencies' regulations differently based on their policy priorities. *Public Meeting* becomes negative and significant at the 5 percent level.

Specification 4 considers the possibility that activity by the agency may be a substitute or complement to OIRA review time. The regulatory process variables that are statistically significant in prior specifications remain significant in specification 4. The interaction terms suggest that OIRA review might be a substitute for three of the regulatory process variables: *Prior NPRM*, *Future Public Meeting*, and *Review Required*. Since *OIRA Review Time* is measured as the deviation from each year's mean review time, the positive coefficients on *Prior NPRM*, *Future Public Meeting*, and *Review Required* indicate that these variables are positively correlated with the total score when *OIRA Review Time* is set at its mean value of zero. The coefficient on the interaction of *OIRA Review Time*  $\times$  *Advisory Committee* is also negative, but *Advisory Committee* by itself is statistically insignificant. Although use of an advisory committee does not improve the quality and use of analysis on its own, an advisory committee appears to cut the positive effect of OIRA review time by more than half. One possible explanation is that the agency's use of an advisory committee makes it harder for OIRA to challenge (and improve) the agency's analysis, because the agency can cite the advisory committee as authority to back up its approach.

In our regressions, most of the control variables from Ellig, McLaughlin, and Morrall (2013) have the same signs as they did for those authors, with greater statistical significance. Thus, our results largely augment and confirm theirs. Adding the newly created regulatory process variables, however, challenges two of their results. In their paper, the quality of

regulatory analysis does not change with the presidential administration or the presence of the acting OIRA administrator when review of the regulation was completed. In our estimations, the acting OIRA administrator variable is always associated with lower Report Card scores (usually significant at the 5 percent level), and the Obama administration is sometimes associated with lower Report Card scores (significant at the 5 percent level in two specifications).

These results do not necessarily indicate that the Obama administration made lower-quality or less use of regulatory analysis. In many cases, the Obama administration made more frequent use of the regulatory process measures that are statistically significant in our specifications. As the mean figures in table 5 (page 51) indicate, the Obama administration's regulations were more likely to have a prior NPRM, consult states, commit to a future public meeting, or stem from a review that was required by law. Regulations reviewed under the acting OIRA administrator are more likely to consult states, commit to a future public meeting, or stem from a review that is required by law. Ellig, McLaughlin, and Morrall (2013) do not control for these factors, so they find no difference in scores attributable to different administrations. Our results, combined with theirs, indicate that regulations proposed during the Obama administration or while OIRA had an acting administrator would have had lower scores, were it not for these differences in the regulatory process in the two administrations. Since agencies' choices about pre-proposal processes and post-proposal hearings can reflect administration policies, it may be appropriate to consider not just the *Obama Administration* and *Acting OIRA Administrator* variables, but also the other regulatory process variables, to assess the complete effect of a change in administrations.

## ***B. Quantitative Impact***

Many of the regulatory process variables have a statistically significant correlation with total scores for the quality and use of regulatory analysis and also with many scores for individual questions. But is this effect large or small? To answer this question, we calculate quantitative results using the coefficients in specification 2. As appendix 2 explains, specification 2 is less likely to suffer from bias due to multicollinearity than specifications 3 and 4, and so we use specification 2 for all subsequent analysis in this paper.

Interpretation of ordered logit coefficients is not as straightforward as interpretation of ordinary least squares coefficients. The score variable is ordinal rather than cardinal. The dependent variable in an ordered logit regression equation is the log of the ratio of the odds that the score will or will not have a designated value (Theil 1971, 634). The coefficients estimate how each explanatory variable affects this odds ratio.

We estimate how each regulatory process variable affects the probability that the total score exceeds the mean value of 32.5 and the 75th percentile value of 36. For each regulatory process variable, we use Stata's "prvalue" command to calculate the probability of the score variable taking each possible value. All other explanatory variables are set equal to their mean values. The difference in the predicted probabilities when the regulatory process variable of interest equals 0 or 1 tells us how the regulatory process variable affects the probability of the score taking each value. We sum the probabilities of each score exceeding the mean value (32.5) and the 75th percentile value (36) to produce the results reported in table 6 (page 52). We assess the effect of *OIRA Review Time* in a similar way. Since *OIRA Review Time* is expressed in days rather than as a dummy variable, we calculate the probability of each score when *OIRA Review Time* equals its mean of 0 days and its standard deviation of 42 days.

An example helps clarify how to interpret table 6. The results for *Prior NPRM* indicate that a regulation with a prior NPRM had a 92 percent chance of scoring above the mean value of 32.5. A regulation without a prior NPRM had a 46 percent chance of scoring above the mean. Therefore, the prior NPRM increased the odds of scoring above the mean by 46 percentage points—exactly doubling the odds that the regulation would score above the mean. A prior NPRM increased the odds of a regulation scoring above 36 (in the 75th percentile) from 13 percent to 67 percent.

In general, the table shows that whenever the regulatory process variables are statistically significant, they have a noticeable effect on the odds of a regulation's score exceeding the mean or ranking in the top 25 percent. Five different variables are associated with a more than 75 percent chance of the score exceeding the mean: *Prior NPRM*, *Request for Information*, *State Consultation*, *Future Public Meeting*, and *Review Required*. A one standard deviation (42-day) increase in OIRA review time is associated with a 77 percent chance of scoring above the mean. Even where the predicted odds are lower, the effects of some process variables are dramatic. For example, the score has a 3 percent chance of ranking in the top 25 percent when OIRA is headed by an acting administrator, but a 22 percent chance when the administrator is a political appointee. Similarly, *Prior NPRM*, *Request for Information*, *State Consultation*, *Future Public Meeting*, and *Review Required* more than triple the odds that a regulation will score in the top 25 percent. Thus, the effects of many of the regulatory process variables are not just statistically significant, but also large.

### ***C. Causality***

The large and statistically significant correlations we find are consistent with our theory, but they do not prove causation. There are other possible explanations for the observed correlations—

especially the correlation between *OIRA Review Time* and Report Card scores. A better analysis may simply take OIRA longer to review because it is more complex; thus, causation may run in the opposite direction. Or other factors might simultaneously cause higher-quality analysis and longer review times. More politically controversial regulations might get better analysis and more careful review. Regulations more (or less) central to an administration's policy priorities might receive both better analysis and more careful review. Statutory or judicial deadlines for issuing regulations could produce lower-quality analysis and cut review time short. These factors could also affect agency decisions about many of the other regulatory process variables, such as whether to use ANPRMs or multiple NPRMs.

A two-stage or simultaneous equations analysis might help sort out the causality issues, but these options are not available with ordered logit in Stata. Instead, we offer some insight by testing some alternative theories of causality. We identify explanatory variables that should be statistically significant if the alternative theories of causality are true, then check to see whether these variables are correlated with both the regulatory process variables and Report Card scores. If they are not correlated with both, then the alternative theories of causality are less likely to be correct, and our theory is more likely to be correct.

Table 7 (page 53) lists some alternative hypotheses explaining why Report Card scores might be correlated with OIRA review time or the regulatory process variables we have explored. It also identifies one or more independent variables that can be used to test each hypothesis in regressions predicting the length of OIRA review time or the agency regulatory process activities of interest. We use the number of public comments to see whether political salience of the regulation might affect agency activity or the length of OIRA review. Two variables measure the complexity of the regulation's topic: the total number of words in the

NPRM and RIA, and whether the RIA includes a Regulatory Flexibility Act analysis.<sup>13</sup> A Regulatory Flexibility Act analysis, required by law under certain circumstances, assesses whether the regulation disproportionately burdens small businesses and, if so, whether there are regulatory alternatives that might lessen this impact. We check to see whether review time or agency activities vary based on the regulation's relationship to each administration's policy priorities by including the agency policy preference variables interacted with administration dummy variables. We test for the effect of deadlines with dummy variables indicating whether the regulation was subject to a statutory or judicial deadline.

Finally, we test to see whether two shifts in administration policies are correlated with review time or agency activity. The first dummy variable indicates whether the regulation was a midnight regulation in the Bush administration. These may have been rushed through the review process, with less extensive analysis by agencies and a shorter OIRA review. The second indicates whether OIRA review of the regulation concluded after the Obama administration issued its Regulatory Impact Analysis Checklist in November 2010, which clarified that the new administration expected RIAs to address the same topics and follow the same principles laid out in prior administrations' executive orders on regulatory analysis.

Table 8 (page 54) shows regression results, using ordinary least squares to estimate the *OIRA Review Time* equation and using logit to estimate the equations for the other regulatory process variables. In the first regression, four of the variables are correlated with *OIRA Review Time*. The agency policy preference variables indicate that regulations from agencies with more conservative policy preferences received shorter review times during the Obama administration

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<sup>13</sup> We could not use word counts for the NPRM and RIA separately because agencies sometimes produce the RIA as a separate document, sometimes publish the RIA as a separate section of the NPRM, and sometimes intersperse RIA content at various places in the NPRM as part of the agency's justification for the regulation.

and longer review times during the Bush administration. Yet the regression results in table 4 suggest that agencies with more conservative policy preferences had higher Report Card scores during the Obama administration and lower scores during the Bush administration. This is precisely the opposite of the result we would expect to see if regulations closer to (or further from) an administration's policy priorities simultaneously receive better analysis by agencies and lengthier OIRA reviews.

Midnight regulations appear to receive longer review times—a finding inconsistent with the hypothesis that Bush administration policy toward midnight regulations explains the positive correlation of *OIRA Review Time* with Report Card scores, since *Midnight Regulation* is negatively correlated with the Report Card score in table 4's regressions. The results for *Judicial Deadline* indicate that judicial deadlines are associated with shorter review times, and the results for *Post-RIA Checklist* indicate that regulations reviewed after the checklist had longer review times. These last two results are the only ones that may be consistent with a theory that some factor not taken into account in our earlier regressions explains both the length of OIRA reviews and the Report Card score.

The logit regressions reveal that few explanatory variables are correlated with the regulatory process variables. *Public Comments* is never statistically significant. *Word Count* is positive and significant at the 10 percent level in two regressions and at the 5 percent level in one. The other variable indicating a more complex analysis, *Regulatory Flexibility Analysis*, is never significant. The agency policy preference variables are significant at the 5 percent level in one regression and at the 10 percent level in another, but in both cases they have the same sign. They suggest that agencies with more conservative policy preferences were more likely to have ANPRMs and less likely to issue a request for information during both administrations—another

set of findings inconsistent with the theory that the correlation between Report Card scores and visible agency actions can be traced to administration policy priorities that simultaneously affect both. *Statutory Deadline* is marginally significant in just two regressions, but the coefficient is positive, which indicates that statutory deadlines are associated with more extensive agency activity, not less. *Judicial Deadline* and *Post-RIA Checklist* are not significant in any of the regressions. *Midnight Regulation* is positive and marginally significant in just one.

Thus, there is some weak evidence that *Word Count*, *Judicial Deadline*, and *Post-RIA Checklist* might affect the length of OIRA review or some of the regulatory process variables in ways that are consistent with the alternative hypotheses in table 7. When we add these variables to specification 2 in table 4, however, none of them are significantly correlated with the Report Card score.<sup>14</sup> This result occurs regardless of whether we include or omit *OIRA Review Time* and the regulatory process variables that are correlated with these additional variables. Therefore, we ultimately find no statistical evidence supporting any of the alternative hypotheses.

#### ***D. Scores on Separate Categories of Criteria***

The complete Report Card dataset consists of numerical scores on 30 different questions for each regulation, grouped into three categories of criteria. Aggregating these into a total score may mask important relationships. Some variables of interest may have positive correlations with some components of the total score and negative correlations with others, thus appearing to have little or no correlation with the total score. Others may be correlated only with some criteria, but not strongly enough to show up as a correlation with the total score. To see whether the regulatory process variables affect all aspects of the analysis uniformly, we run separate

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<sup>14</sup> These regression results are omitted for brevity, but are available from the authors.

regressions using scores on the three categories of criteria as the dependent variable: Openness, Analysis, and Use. Because one of the proposed regulatory reforms would require agencies to formulate plans for retrospective analysis of regulations at the time they are issued, we also run a regression using the sum of the scores on the two Use questions that assess how well agencies currently make provisions for retrospective analysis. Table 9 (page 55) shows the results.

The first three regressions reveal that there are indeed some differences in results for different categories of criteria. *Request for Information* is the only regulatory process variable that is significant and positively correlated with Openness, Analysis, and Use. *Prior NPRM*, *Review Required*, and *OIRA Review Time* are significant and positively correlated with Analysis and Use, but not with Openness. *Future Public Meeting* is significant and positively correlated with Openness and Use, but not Analysis. *State Consultation* is significant and positively correlated only with Analysis. *ANPRM* becomes marginally significant and positively correlated with Use. *Acting OIRA Administrator* is significant and negatively correlated only with Use. *Public Meeting* is significant and negatively correlated with Openness, suggesting that analysis is less well documented or less readable when the agency has held a public meeting before the proposal.

These results qualify some of the conclusions a reader might draw from the Total Score regressions in table 4. Readers concerned mainly with the quality of analysis and accompanying documentation would want to focus on the regressions for Openness and Analysis, ignoring Use. Most of the regulatory process variables that are positively correlated with Total Score are also statistically significant and positively correlated with Openness, Analysis, or both. However, *Future Public Meeting* is only marginally significant for Openness, not significant for Analysis, and highly significant for Use. Similarly, *Acting OIRA Administrator* is not significantly correlated with Openness or Analysis, but highly significant for Use. Finally, *ANPRM* also

becomes marginally significant for Use. Thus, a commitment to a future meeting, a political appointee heading OIRA, and an ANPRM do not improve the quality of analysis, but they may encourage agencies to do a better job explaining how they used the analysis.

The final regression uses only the sum of the scores on the two retrospective analysis criteria as the dependent variable. These criteria assess the extent to which the agency laid the groundwork for retrospective analysis of the regulation by articulating goals and measures and identifying data it could use to assess the regulation's results. Only two of the regulatory process variables have a highly significant correlation with the retrospective analysis score: *State Consultation* and *Review Required*. The finding that agencies make greater provision for retrospective analysis when legislation requires review of the regulation may seem obvious. Restating this conversely provides greater insight: agencies appear less likely to make provision for retrospective analysis when the law does not require them to review their regulations.

### ***E. Scores on Individual Criteria***

To guard against the possibility that the results reported above are artifacts of the Report Card's averaging and weighting scheme, we also run regressions using the score on each of the 30 individual questions as the dependent variable. Running 30 regressions is likely to produce some statistically significant correlations merely by chance, so we interpret these results with caution. To conserve space, table 10 (page 56) summarizes all correlations for regulatory process variables that were significant at the 10 percent level or greater.

Three findings of interest emerge from table 10. First, there are very few anomalous correlations that contradict prior results in tables 4 and 9. Second, the variables significantly correlated with the total score are correlated with numerous individual criteria, lending more

confidence to the results reported above. Third, several variables that lack significant correlation with the total score, or with the scores of the three categories of criteria, are correlated with the scores of some individual criteria. These include *ANPRM* (positive) and *Advisory Committee* (negative). Several other variables that lack correlation with the scores of categories of criteria in table 9 are nevertheless correlated with the scores of some individual criteria within those categories in table 10; these include *Public Meeting*, *Future Public Meeting*, and *Acting OIRA Administrator*. Thus, these regulatory process variables may have somewhat more correlation with some aspects of regulatory analysis than tables 4 and 9 indicate.

## **V. Implications for Regulatory Reform**

Our results suggest that four types of regulatory process reforms may substantially improve the quality and use of RIAs: (1) expanded use of ANPRMs for major regulations, (2) public hearings for “high impact” regulations after they are proposed, (3) preparation of retrospective analysis plans at the time a regulation is issued, and (4) expansion of OIRA’s influence and resources.

### ***A. Expanded Use of ANPRMs for Major Regulations***

Expanded use of ANPRMs is expected to improve the quality and use of regulatory analysis for three different reasons. First, public comment on a preliminary analysis provides the agency with more information; it allows the agency to benefit from critiques, feedback, and other public input (President’s Jobs Council 2011, 43). Second, requiring an agency to produce a preliminary analysis of the problem and alternative solutions before it writes a proposed regulation helps counter the well-documented tendency of agencies to make regulatory decisions first and then task economists or other analysts with writing an analysis that supports decisions that have

already been made (Williams 2008; House Judiciary Committee 2011, 32–33). Third, public disclosure of a preliminary analysis alters incentives by “crowdsourcing” regulatory review, instead of leaving the review function solely to OIRA (Belzer 2009).

Although we present evidence that OIRA improves the quality and use of regulatory analysis, Report Card scores indicate that most RIAs fall short of the ideals enunciated in Executive Order 12866 (Ellig and McLaughlin 2012; Ellig et al. 2013). OIRA and the rule-writing agencies are both in the executive branch, and analysis is often secondary to politics (Arbuckle 2011). Involving parties outside the executive branch at an earlier stage could help reveal politically motivated flaws in the analysis or its use.

None of our pre-proposal process variables precisely mimic the preliminary analysis of the problem and alternative solutions recommended by the President’s Jobs Council and required in the Regulatory Accountability Act. Several, however, are analogous. The current practice that probably most resembles the type of ANPRM proposed by regulatory reformers is *Prior NPRM*. *Prior NPRM* has one of the largest and most statistically significant correlations with the quality and use of regulatory impact analysis. A few additional regulatory process variables are less directly analogous to the proposed mandatory ANPRM but nevertheless indicate some of the tradeoffs associated with agency efforts to gather more information via pre-proposal processes. We note that formal requests for information and consultation with states usually improve scores when they have a statistically significant effect. These are not the same as ANPRMs, but they are similar in one respect: they are formal procedures that allow the agency to collect more information before proposing a regulation.

Perhaps ironically, *ANPRM* is not statistically significant (except at the 10 percent level in the Use regression). There are two possible explanations—one substantive, one statistical. The

substantive explanation is that perhaps the ANPRMs for the regulations in our sample were not sufficiently thorough to measurably improve the quality of the regulatory analysis. A prior NPRM, on the other hand, would have included a more complete draft RIA; *Prior NPRM* is associated with higher-quality analysis. The statistical explanation is that *ANPRM* is to some extent correlated with several of the other process variables. Using *Total Score* as the dependent variable, *ANPRM* becomes significant at the 5 percent level if we omit *Future Public Meeting or Review Required*, and it is significant at the 10 percent level if we remove *Request for Information*, *Advisory Committee*, *Revised Rule*, or *OIRA Review Time*. (The statistical significance of these variables remains unchanged if we omit *ANPRM*.)<sup>15</sup>

Two other information-gathering processes are not associated with improved quality or use of analysis: public meetings and advisory committees. We suspect this occurs because public meetings can become a forum for deal-making among large stakeholders before any analysis is conducted. In addition, the negative interaction of *Advisory Committee* with *OIRA Review Time* suggests that advisory committees sometimes insulate analysis from improvement via the OIRA review process. Thus, not all pre-proposal information-gathering unambiguously improves RIAs.

### ***B. Public Hearings for “High Impact” Regulations after They Are Proposed***

None of the regulations in our sample were adopted through formal rulemaking, so none of them involved the kind of hearings specified in the Administrative Procedure Act. Twenty-one of the regulations, however, included an agency commitment to some kind of hearing or other public meeting to discuss the regulation after the NPRM. This commitment to a public meeting

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<sup>15</sup> These regression results are omitted for brevity, but are available from the authors.

in the future has a positive and statistically significant correlation with the total score and with the Openness score (with a 10 percent significance level) and the Use score (with a 1 percent significance level). Simply the possibility of having to defend the regulation and the accompanying analysis in public appears to motivate agencies to better explain how they used their analysis.

We emphasize, though, that not all public meetings improve the quality of analysis. Public meetings before the NPRM are associated with a lower Openness score. *Public Meeting*'s negative coefficient in the Openness regression is larger than the coefficient on *Future Public Meeting*, which suggests that the positive effects of a future meeting are not large enough to counteract the negative effects of a pre-proposal public meeting.

### ***C. Prepare Retrospective Analysis Plans for Regulations at the Time They Are Issued***

Despite repeated presidential exhortations in executive orders, agencies rarely engage in rigorous retrospective analysis to determine whether regulations accomplished their intended outcomes (Lutter 2012; US GAO 2007). Report Card data indicate that agencies rarely make provision for retrospective analysis when they issue regulations (Ellig et al. 2013, table 3). The regression in the last column of table 7 suggests that *Review Required* is correlated with higher scores on the retrospective analysis criteria. *Review Required* is also associated with higher-quality analysis. The legislative requirements for review we encountered were not requirements for full retrospective analysis. The fact that even the relatively weak requirements in some existing laws are correlated with better analysis of prospective regulations and better preparation for retrospective analysis gives us hope that an explicit requirement would have a stronger effect.

#### ***D. Expand OIRA's Resources and Influence***

Our regression results offer two pieces of evidence that more extensive OIRA review could improve the quality and use of regulatory impact analysis. First, OIRA review time is positively correlated with the quality and use of regulatory analysis—consistent with Shapiro and Morrall's (forthcoming) finding that RIAs undergoing longer OIRA review contain more information. Second, scores on the Use criteria are lower when OIRA is headed by an acting administrator rather than a presidential appointee—which means scores are higher when an administrator appointed by the president gives the office more clout in its negotiations with agencies.

Given these results, we think that giving OIRA more resources to undertake regulatory review would likely lead to better regulatory analysis and greater use of the analysis in decisions. This conclusion is warranted as long as one accepts that OIRA review time is a reasonable proxy for the extensiveness of OIRA review. Increasing OIRA's regulatory review staff would surely increase the number of "person-days" OIRA could devote to review, which would permit more thorough review even if review times fall due to the increase in staff. Indeed, Shapiro and Morrall (forthcoming) conclude that increasing OIRA's staff would improve RIAs at lower social cost than merely extending OIRA review time.

We suspect that extending OIRA review to independent agencies' regulations would also improve the quality and use of analysis for those regulations. This inference might seem unwarranted, since the sample does not include any regulations from independent agencies. If our source for the score data had included independent agency regulations, we could offer a more definitive test of whether independent agencies with no OIRA review produce better or worse analysis than executive branch agencies. Our results suggest, however, that OIRA review of executive branch agencies' regulations is associated with greater quality and use of analysis.

Unless independent agencies already conduct excellent economic analysis of their regulations, or their regulations are of such different character that OIRA could offer no useful insights, there is little reason to think OIRA review would not be helpful.

We are aware of no evidence that independent agencies customarily conduct excellent economic analysis. Even the independent agency that arguably has the strongest legislative requirements for benefit-cost analysis of regulations—the Securities and Exchange Commission—has lost multiple court cases due to inadequate economic analysis.<sup>16</sup> Scholars at Resources for the Future have found that other independent agencies rarely present information about the benefits and costs of their regulations (Fraas and Lutter 2011b).

There is also little evidence that independent agency regulations are so different in substance from executive branch regulations that OIRA's insights could not be helpful. Independent agencies such as the Federal Communications Commission, the Securities and Exchange Commission, the Consumer Financial Protection Bureau, and the Consumer Product Safety Commission deal with economic, financial, and safety issues amenable to the same type of economic analysis employed in RIAs for executive branch regulations in our sample. The balance of evidence currently available, therefore, suggests that OIRA's expertise—and OIRA's ability to return regulations with inadequate analysis to agencies—would likely help independent agencies produce better economic analysis of their regulations. Directly comparing the quality of analysis for regulations from independent and executive branch agencies would offer a more definitive test; that is a topic ripe for further research.

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<sup>16</sup> *Business Roundtable and Chamber of Commerce v. SEC*, 647 F.3d 1144 (D.C. Cir. 2011); *American Equity Inv. Life Ins. Co. v. SEC*, 572 F.3d 923 (D.C. Cir. 2009); *Chamber of Commerce v. SEC*, 443 F.3d 890 (D.C. Cir. 2006); *Chamber of Commerce v. SEC*, 412 F.3d 133 (D.C. Cir. 2005).

## **VI. Conclusion**

Pre-proposal activity by OIRA and by agencies is often positively correlated with the quality and use of regulatory impact analysis. Other aspects of the regulatory process, such as a legislative requirement that the agency revisit the regulation, or the agency's commitment to hold a future public meeting on the proposed regulation, also seem to have a positive effect. Our results give cause for optimism about the likely effects of several regulatory process reforms currently under discussion at the federal level in the United States.

Nevertheless, this paper does not purport to be a complete benefit-cost analysis of any of these regulatory reform proposals. A complete benefit-cost analysis would need to consider two additional questions. First, would improving the quality or use of analysis lead to regulations with greater net benefits? Second, would the increase in net benefits outweigh any costs associated with delays introduced by new procedural requirements? These questions are beyond the scope of this paper, but we have taken the crucial first step toward such a benefit-cost analysis by identifying features of the regulatory process that are associated with greater quality and use of regulatory impact analysis.

Our findings have implications beyond the contemporary regulatory reform debate. For readers curious about the effects of the current regulatory process, our analysis suggests that the agencies' and OIRA's current hard work is not futile. Many types of activity are positively correlated with the quality and use of regulatory impact analysis. Moreover, the signs and significance of our control variables are largely consistent with what theory and the findings of previously published research suggest. Indeed, our addition of the pre-proposal process variables often increases the size and statistical significance of the variables employed in prior research.

Most broadly, this paper demonstrates how data from qualitative evaluations of RIAs can be used to generate substantial information about the effects of administrative processes.

Although we certainly do not believe we have exhausted the possible applications of the Report Card dataset, we advance the creators' vision of using the data to assess whether "the quality of analysis varies systematically with institutional factors" (Ellig and McLaughlin 2012, 869).

**Table 1. Report Card Questions**

<b>Openness</b>	
1.	Accessibility: How easily were the RIA, the proposed rule, and any supplementary materials found online?
2.	Data Documentation: How verifiable are the data used in the analysis?
3.	Theory Documentation: How verifiable are the models and assumptions used in the analysis?
4.	Readability: Was the Regulatory Impact Analysis comprehensible to an informed layperson?
<b>Analysis</b>	
5.	Outcomes
a.	How well does the RIA identify ultimate outcomes that affect citizens' quality of life?
b.	How well does the RIA identify how these outcomes are to be measured?
c.	Does the RIA provide a coherent and testable theory showing how the regulation will produce the desired outcomes?
d.	Does the analysis present credible empirical support for the theory?
e.	Does the analysis adequately assess uncertainty about the outcomes?
6.	Systemic Problem
a.	Does the analysis identify a market failure or other systemic problem?
b.	Does the analysis outline a coherent and testable theory that explains why the problem (associated with the outcome above) is systemic rather than anecdotal?
c.	Does the analysis present credible empirical support for the theory?
d.	Does the analysis adequately assess uncertainty about the existence and size of the problem?
7.	Alternatives
a.	Does the analysis enumerate other alternatives to address the problem?
b.	Is the range of alternatives considered narrow or broad?
c.	Does the analysis evaluate how alternative approaches would affect the amount of the outcome achieved?
d.	Does the analysis adequately address the baseline—what the state of the world is likely to be in the absence of further federal action?
8.	Costs and Benefits
a.	Does the analysis identify and quantify incremental costs of all alternatives considered?
b.	Does the analysis identify all expenditures likely to arise as a result of the regulation?
c.	Does the analysis identify how the regulation would likely affect the prices of goods and services?
d.	Does the analysis examine costs that stem from changes in human behavior as consumers and producers respond to the regulation?
e.	Does the analysis adequately address uncertainty about costs?
f.	Does the analysis identify the approach that maximizes net benefits?
g.	Does the analysis identify the cost-effectiveness of each alternative considered?
h.	Does the analysis identify all parties who would bear costs and assess the incidence of costs?
i.	Does the analysis identify all parties who would receive benefits and assess the incidence of benefits?
<b>Use</b>	
9.	Any Use Claimed: Does the proposed rule or the RIA present evidence that the agency used the Regulatory Impact Analysis?
10.	Net Benefits: Did the agency maximize net benefits or explain why it chose another option?
11.	Goals & Measures: Does the proposed rule establish measures and goals that can be used to track the regulation's results in the future?
12.	Retrospective Data: Did the agency indicate what data it will use to assess the regulation's performance in the future and establish provisions for doing so?

Source: Jerry Ellig and Patrick A. McLaughlin. "The Quality and Use of Regulatory Analysis in 2008." *Risk Analysis* 32 (2012): 869–71.

**Table 2. Summary Statistics, Dependent Variables**

	N	Mean	SD	Min	Max
Total	71	32.5	6.5	14	48
Openness	71	12.9	2.5	6	18
Analysis	71	11.3	3.1	2	18
Use	71	8.3	3.2	2	15
Use (retrospective)*	71	3.1	1.8	0	10

\*Sum of scores on questions 11 and 12.

**Table 3. Summary Statistics, Regulatory Process Variables**

	N	Mean	SD	Min	Max	Frequency
ANPRM	71	0.25	0.44	0	1	18
Prior NPRM	71	0.13	0.34	0	1	9
Request for Information	71	0.15	0.36	0	1	11
Advisory Committee	71	0.46	0.50	0	1	33
State Consultation	71	0.15	0.36	0	1	11
Public Meeting	71	0.32	0.47	0	1	23
Future Public Meeting	71	0.30	0.46	0	1	21
Revised Rule	71	0.85	0.36	0	1	60
Review Required	71	0.35	0.48	0	1	25
Acting OIRA Administrator	71	0.14	0.35	0	1	10
OIRA Review Time*	71	0.00*	42.30	-71	126	NA

\**OIRA Review Time* is measured as deviation from mean review time in each year.

**Table 4. Total Score Regressions (N = 71)**

	(1)	(2)	(3)	(4)
ANPRM	0.84 (1.34)	0.71 (1.03)	0.52 (0.60)	0.44 (0.53)
Prior NPRM	1.70 (1.93)*	2.58 (2.73)***	3.41 (3.35)***	3.01 (2.88)***
Request for Information	1.71 (2.46)**	2.63 (3.03)***	4.33 (3.64)***	4.26 (4.03)***
Advisory Committee	0.23 (0.43)	-0.33 (0.51)	-0.22 (0.29)	-0.62 (0.86)
State Consultation	1.42 (2.22)**	1.73 (2.19)**	1.90 (2.16)**	1.90 (2.20)**
Public Meeting	-0.78 (1.46)	-0.65 (1.12)	-1.93 (2.44)**	-0.09 (0.13)
Future Public Meeting	1.26 (1.98)**	1.86 (2.44)**	1.90 (2.16)**	3.00 (3.14)***
Revised Rule	-1.01 (1.31)	-1.45 (1.79)*	-0.87 (0.96)	-1.75 (1.89)*
Review Required	1.77 (2.80)***	1.55 (2.07)**	1.70 (2.14)**	1.84 (2.21)**
Acting OIRA Administrator	-1.97 (2.51)**	-2.08 (2.12)**	-1.75 (1.78)*	-2.64 (2.56)**
OIRA Review Time	0.004 (0.29)	0.04 (2.53)**	0.04 (1.90)*	0.10 (2.60)***
OIRA Review Time <sup>2</sup>	-0.0001 (0.70)	-0.0005 (2.30)**	-0.0005 (2.08)**	-0.0008 (1.91)*
Obama Administration		-1.93 (2.22)**	-1.58 (1.48)	-2.10 (2.23)**
Midnight Regulation		-4.26 (3.66)***	-3.30 (2.01)**	-6.69 (4.86)***
Midnight Leftover		-3.20 (3.22)***	-2.07 (1.48)	-2.74 (2.58)***
Civil Rights		-2.16 (1.61)		-0.65 (0.35)
Security		1.61 (1.05)		3.67 (2.16)**
Environment		2.16 (2.33)**		3.63 (3.28)***
Safety		0.05 (0.06)		0.32 (0.35)
Obama Administration × Agency Preference		1.58 (3.51)***	1.31 (1.02)	2.29 (4.37)***
Bush Administration × Agency Preference		-1.97 (3.77)***	-4.48 (4.00)***	-2.57 (4.12)***
Public Comments		0.0001 (2.28)**	0.0001 (2.28)**	0.0002 (2.94)***
Department of Transportation			1.09 (0.80)	
Environmental Protection Agency			-0.84 (0.36)	
Department of Labor			-5.06 (1.93)*	
Department of Homeland Security			5.28 (2.64)***	
Department of Justice			0.82 (0.34)	
Department of the Interior			2.37 (1.43)	
Department of Energy			5.24 (2.59)***	
Department of Health & Human Services			-2.42 (0.85)	
Department of Agriculture			2.90 (1.55)	
General Services Administration			1.65 (0.76)	
Joint EPA-DOT			8.46 (3.09)***	
OIRA Review Time × ANPRM				-0.002 (0.09)
OIRA Review Time × Prior NPRM				-0.002 (4.11)***
OIRA Review Time × Request for Information				0.006 (0.24)
OIRA Review Time × Advisory Committee				-0.07 (3.50)***
OIRA Review Time × State Consultation				-0.002 (0.10)
OIRA Review Time × Public Meeting				0.03 (1.57)
OIRA Review Time × Future Public Meeting				-0.05 (2.41)**
OIRA Review Time × Revised Rule				0.03 (1.37)
OIRA Review Time × Review Required				-0.44 (1.84)*
Pseudo-R <sup>2</sup>	.04	.16	.21	.23

Notes: Absolute values of Z-statistics in parentheses. Statistical significance: \*10 percent, \*\*5 percent, \*\*\*1 percent.

**Table 5. Regulatory Process Variables by Administration**

Bush	N	Mean	SD	Min	Max	Obama	N	Mean	SD	Min	Max	Acting OIRA (Obama)	N	Mean	SD	Min	Max
ANPRM	29	0.28	0.45	0	1	ANPRM	42	0.24	0.43	0	1	ANPRM	10	0.40	0.5	0	1
Prior NPRM	29	0.10	0.31	0	1	Prior NPRM	42	0.14	0.35	0	1	Prior NPRM	10	0.00	0.0	0	0
Request for Info.	29	0.24	0.44	0	1	Request for Info.	42	0.10	0.30	0	1	Request for Info.	10	0.10	0.3	0	1
Advisory Comm.	29	0.55	0.51	0	1	Advisory Comm.	42	0.40	0.50	0	1	Advisory Comm.	10	0.60	0.5	0	1
State Consultation	29	0.10	0.31	0	1	State Consultation	42	0.19	0.40	0	1	State Consultation	10	0.30	0.5	0	1
Public Meeting	29	0.38	0.49	0	1	Public Meeting	42	0.29	0.46	0	1	Public Meeting	10	0.10	0.3	0	1
Future Public Mtg.	29	0.10	0.31	0	1	Future Public Mtg.	42	0.43	0.50	0	1	Future Public Mtg.	10	0.70	0.5	0	1
Revised Rule	29	0.93	0.26	0	1	Revised Rule	42	0.79	0.42	0	1	Revised Rule	10	0.80	0.4	0	1
Review Required	29	0.31	0.47	0	1	Review Required	42	0.38	0.49	0	1	Review Required	10	0.60	0.5	0	1
OIRA Review Time	29	0.00	45	-69	82	OIRA Review Time	42	0.00	41	-71	126	OIRA Review Time	10	9	34	-37	52

**Table 6. Potential Effect of Regulatory Process Variables on Probability of Score Exceeding Mean or 75th Percentile**

<b>ANPRM</b>	<b>1</b>	<b>0</b>	<b>Difference</b>
Pr (Score > 32.5)	0.68	0.51	0.17
Pr (Score > 36)	0.27	0.15	0.12
<b>Prior NPRM</b>	<b>1</b>	<b>0</b>	<b>Difference</b>
Pr (Score > 32.5)	0.92	0.48	0.45***
Pr (Score > 36)	0.67	0.13	0.54***
<b>Request for Information</b>	<b>1</b>	<b>0</b>	<b>Difference</b>
Pr (Score > 32.5)	0.92	0.46	0.46***
Pr (Score > 36)	0.67	0.13	0.54***
<b>Advisory Committee</b>	<b>1</b>	<b>0</b>	<b>Difference</b>
Pr (Score > 32.5)	0.51	0.60	-0.08
Pr (Score > 36)	0.15	0.20	-0.05
<b>State Consultation</b>	<b>1</b>	<b>0</b>	<b>Difference</b>
Pr (Score > 32.5)	0.84	0.49	0.35**
Pr (Score > 36)	0.48	0.14	0.34**
<b>Public Meeting</b>	<b>1</b>	<b>0</b>	<b>Difference</b>
Pr (Score > 32.5)	0.45	0.61	-0.16
Pr (Score > 36)	0.12	0.21	-0.09
<b>Future Public Meeting</b>	<b>1</b>	<b>0</b>	<b>Difference</b>
Pr (Score > 32.5)	0.82	0.42	0.40**
Pr (Score > 36)	0.44	0.11	0.33**
<b>Revised Rule</b>	<b>1</b>	<b>0</b>	<b>Difference</b>
Pr (Score > 32.5)	0.50	0.81	-0.31*
Pr (Score > 36)	0.15	0.42	-0.28*
<b>Review Required</b>	<b>1</b>	<b>0</b>	<b>Difference</b>
Pr (Score > 32.5)	0.78	0.42	0.35**
Pr (Score > 36)	0.37	0.11	0.26**
<b>Acting OIRA Administrator</b>	<b>1</b>	<b>0</b>	<b>Difference</b>
Pr (Score > 32.5)	0.17	0.63	-0.45**
Pr (Score > 36)	0.03	0.22	-0.19**
<b>OIRA Review Time</b>	<b>42+</b>	<b>0</b>	<b>Difference</b>
Pr (Score > 32.5)	0.77	0.57	0.20**
Pr (Score > 36)	0.36	0.19	0.18**

Note: Calculated with all other variables set at mean values. Mean score is 32.5; 75th percentile score is 36. Statistical significance of regression coefficient: \*10 percent, \*\*5 percent, \*\*\*1 percent. +One standard deviation = 42 days.

**Table 7. Alternative Hypotheses Explaining Correlation of Regulatory Report Card Scores with OIRA Review Time or Agency Activities**

<b>Factors that may simultaneously lead to better analysis and lengthier OIRA review or more extensive agency activity</b>	<b>Regression variable(s)</b>
Political salience of the regulation	<i>Public Comments</i>
Complexity of the regulation's topic	Combined word count for NPRM and RIA RIA includes Regulatory Flexibility Act analysis
Relationship of the regulation to the administration's policy priorities	<i>Obama Administration × Agency Preference</i> <i>Bush Administration × Agency Preference</i>
Deadlines	<i>Statutory Deadline</i> <i>Judicial Deadline</i>
Shifts in administration policy	<i>Midnight Regulation</i> Regulation reviewed after Obama administration RIA checklist

**Table 8. Predictors of OIRA Review Time and Other Regulatory Process Variables**

	OIRA Review Time	ANPRM	Prior NPRM	Request for Information	Public Meeting
Public Comments	0.001 (0.97)	-0.00004(0.47)	-0.00001 (0.68)	<-0.00001 (0.02)	0.00003 (0.32)
Word Count (NPRM + RIA)	0.00003 (0.67)	<0.00001(1.66)*	<0.00001 (0.29)	<-0.00001 (0.60)	<0.0001 (2.25)**
Regulatory Flexibility Analysis	11.70 (1.13)	0.74 (0.97)	0.56 (0.58)	0.14 (0.15)	1.00 (1.35)
Obama Administration × Agency Preference	-15.6 (2.24)**	1.16 (2.08)**	-0.65 (1.03)	-1.10 (1.82)*	0.35 (0.68)
Bush Administration × Agency Preference	21.2(2.49)**	1.27 (1.96)*	2.31 (1.69)*	-1.19 (1.86)*	0.64 (1.17)
Statutory Deadline	-15.9 (1.22)	0.01 (0.01)	-1.13 (0.85)	-1.30 (1.07)	1.42 (1.68)*
Judicial Deadline	-34.4 (2.89)**	1.01 (1.15)	-1.33 (1.12)	-0.05 (0.04)	-0.38 (0.44)
Midnight Regulation	38.6 (2.31)**	1.02 (0.92)	1.96 (1.13)		0.15 (0.13)
Post-RIA Checklist	-14.2 (1.40)	-2.47 (2.39)	1.17	.16	.22
Adj. or pseudo-R <sup>2</sup>	.22	.18	.17	.53	.68
N	71	71	64	53	68
	Future Public Mtg.	Advisory Comm.	State Consult.	Revised Rule	Review Required
Public Comments	-0.00003 (0.42)	0.0001 (1.03)	<0.00001 (0.01)	0.00001 (0.10)	0.00007 (0.98)
Word Count (NPRM + RIA)	<0.00001 (1.72)*	<-0.00001(0.04)	<0.00001 (0.96)	<-0.00001(1.17)	<0.00001 (0.35)
Regulatory Flexibility Analysis	1.11 (1.43)	-0.85 (1.44)	-1.00 (1.34)	-0.05 (0.06)	-0.63 (1.05)
Obama Administration × Agency Preference	-0.56 (1.19)	0.21 (0.54)	0.007 (0.01)	0.21 (0.35)	0.51 (1.19)
Bush Administration × Agency Preference	0.16 (0.28)	-0.98 (1.79)*	-0.24 (0.34)	-1.27 (1.21)	0.41 (0.74)
Statutory Deadline	-0.10 (0.12)	-0.08 (0.10)	-0.94 (0.72)	-1.54 (1.51)	1.54 (1.91)*
Judicial Deadline	1.08 (1.55)	0.12 (0.18)	0.49 (0.57)	-1.35 (1.39)	0.97 (1.36)
Midnight Regulation	1.69 (1.66)*	-1.46 (1.34)		-0.84 (0.60)	-1.15 (0.64)
Post-RIA Checklist	0.69 (0.47)	-1.11 (0.87)			-1.15 (1.05)
Adj. or pseudo-R <sup>2</sup>	.15	.09	.07	.16	.11
N	71	71	61	68	71

Notes: Some logit regressions have fewer than 71 observations because Stata dropped certain dummy variables and observations if the dependent variable always equaled zero when the dummy variables equaled 1. Absolute values of T- or Z-statistics in parentheses. Statistical significance: \*10 percent, \*\*5 percent, \*\*\*1 percent.

**Table 9. Regressions Using Categories of Criteria (N = 71)**

	Dependent Variable			
	Openness	Analysis	Use	Use (retrospective)+
ANPRM	0.24 (0.33)	0.37 (0.51)	1.22 (1.64)*	0.47 (0.60)
Prior NPRM	1.13 (1.31)	2.02 (2.15)**	2.32 (2.34)**	1.46 (1.54)
Request for Information	1.84 (2.01)**	1.37 (1.61)*	2.32 (2.65)***	0.38 (0.43)
Advisory Committee	-0.49 (0.78)	-0.37 (0.54)	0.94 (1.34)	0.76 (1.12)
State Consultation	0.18 (0.23)	2.15 (2.60)***	1.19 (1.48)	2.59 (3.11)***
Public Meeting	-2.17 (3.48)***	-0.32 (0.51)	0.44 (0.73)	0.66 (1.05)
Future Public Meeting	1.26 (1.74)*	0.46 (0.61)	2.51 (3.29)***	1.25 (1.75)*
Revised Rule	0.12 (0.15)	-1.52 (1.88)*	-2.39 (2.69)***	-1.37 (1.57)
Review Required	-1.31 (1.81)*	1.96 (2.60)***	3.16 (3.85)***	2.67 (3.30)***
Acting OIRA Admin.	-1.06 (1.33)	-1.28 (1.30)	-2.88 (3.13)***	-0.22 (0.25)
OIRA Review Time	0.01 (0.71)	0.04 (2.26)**	0.04 (2.41)**	0.03 (1.90)*
OIRA Review Time <sup>2</sup>	<-0.0001 (0.03)	-0.0005 (2.17)**	-0.0006 (2.59)***	-0.0006 (2.30)**
Obama Administration	-1.44 (1.76)*	-1.25 (1.47)	-1.32 (1.37)	-1.89 (2.12)**
Midnight Regulation	-4.28 (3.56)***	-2.24 (2.07)**	-1.19 (1.03)	-1.13 (1.08)
Midnight Leftover	-2.95 (2.99)***	-1.54 (1.68)*	-0.55 (0.53)	-1.05 (1.00)
Civil Rights	3.09 (2.54)***	-3.10 (2.19)**	-3.98 (2.74)***	-4.03 (2.79)***
Security	1.45 (0.81)	1.38 (0.89)	1.58 (0.71)	0.22 (0.06)
Environment	4.01 (3.92)***	1.61 (1.78)*	-0.57 (0.58)	-1.51 (1.46)
Safety	1.32 (1.60)	-0.08 (0.10)	-0.13 (0.16)	-0.58 (0.68)
Obama Admin. × Agency Pref.	0.26 (0.60)	0.47 (1.15)	1.86 (4.15)***	0.64 (1.53)
Bush Admin. × Agency Pref.	-2.28 (4.03)***	-1.44 (2.77)***	-0.72 (0.15)	-0.44 (0.87)
Public Comments	0.00005 (0.88)	.00007 (1.28)	0.0002 (2.95)**	0.0001 (2.04)**
Pseudo-R <sup>2</sup>	.19	.13	.24	.19

Notes: Absolute values of Z-statistics in parentheses. Statistical significance: \*10 percent, \*\*5 percent, \*\*\*1 percent. +Uses sum of scores for questions 11 and 12.

**Table 10. Statistically Significant Correlations for Individual Criteria**

Criterion	ANPRM	Prior NPRM	Request for Info.	Public Mtg.	Future Public Mtg.	Advisory Comm.	State Consultation	Revised Rule	Review Required	Acting OIRA	Review Time	Review Time <sup>2</sup>
1			++								--	++
2												
3			+++			---		-			+	--
4	++			---			++		--			
5a			-		++					-		
5b		+	+		++		+		+++	--		
5c		++	++	---	--		+		++		+	-
5d			+++	-	+++			-				-
5e			+++		+++				++			
6a												
6b												
6c	-		+						++			
6d											++	-
7a							+			--		
7b	++						+					
7c		++	+		--		+++	---	+++			
7d		++		---			+++	--	++			
8a						--						
8b									--			
8c					+						+	
8d												
8e										-		
8f		++	+++					--	+			
8g		++				---	+++	---	+++	---		
8h	+		++									
8i							+		++			
9	+									---		
10		++	++		+			--	++	--		
11							++		+			
12		++			+++	+	+++		+++		++	--

Note: Statistical significance: ++ or --- stands for 1 percent, + or -- stands for 5 percent, + or - stands for 10 percent.

## Appendix 1. Empirical Model

The goal of this empirical exercise is to determine which regulatory actions are associated with a higher-quality regulatory analysis and better use of that analysis in the proposed rule. Maddala (1983) and Greene (2003) develop the econometric theory we use in this study, the ordered logit model. In an ideal situation, we would estimate the following latent model:

$$y_i^* = \beta_0 + \beta_1 x_{i,1} + \beta_2 x_{i,2} + \dots + \beta_{28} x_{i,28} + \varepsilon_i. \quad (\text{EQ 1})$$

The variable  $y_i^*$  is the perfect measure for capturing the true quality and use of regulatory analysis. The subscript,  $i$ , denotes a particular observation in our sample of 71 regulations. The numerical subscript indexes the 28 different independent variables utilized in this study and their corresponding coefficients. In reality,  $y_i^*$  is unobservable, but we are able to observe a proxy for this value: expert subjective assessments of the quality and use of regulatory analysis for each individual rule.

The expert assessment does not provide  $y_i^*$ , but rather a censoring of  $y_i^*$  into different categories based on subjective thresholds. The observed value,  $y_i$ , depends on whether the quality and use of regulatory analysis crosses above these subjective threshold marks. These threshold points correspond with the various possible scores a regulation can receive on the Regulatory Report Card. Using the Report Card data, we estimate the following model:

$$y_i = \beta_0 + \beta_1 x_{i,1} + \beta_2 x_{i,2} + \dots + \beta_{28} x_{i,28} + \varepsilon_i. \quad (\text{EQ 2})$$

These scores are ordinal. Theoretically, there are 61 possible values for the dependent variable. The possible values for  $y_i$  range from no or very poor regulatory analysis quality and use (0) to very thorough regulatory analysis quality and use (60). Thus,

$$\begin{aligned}
 y_i &= 0 && \text{if } y_i^* \leq 0, \\
 y_i &= 1 && \text{if } 0 < y_i^* \leq \mu_1, \\
 y_i &= 2 && \text{if } \mu_1 < y_i^* \leq \mu_2, \\
 &\vdots && \vdots \\
 y_i &= 60 && \text{if } \mu_{59} \leq y_i^*.
 \end{aligned}$$

In the actual dataset, the Report Card scores for 2008–10 range from 14 to 48.

The various  $\mu$ s are unknown parameters estimated by the corresponding  $\beta_i$ . Essentially, the  $\mu$ s are the subjective threshold the expert evaluators have in mind when determining the regulation’s Report Card score. That is, if the expert assesses a particular regulation and determines that the true value of  $y_i^*$  falls between thresholds  $\mu_{40}$  and  $\mu_{41}$ , that regulation would receive a score of 41. The specific score a regulation receives depends on measurable factors, our independent variables denoted by the  $x_{j,i}$ .

While the Report Card score is likely to be highly correlated with the underlying, unobservable measure of the true quality and use of regulatory analysis, our proxy stems from subjective evaluation, which may introduce additional measurement error.<sup>17</sup>

One of the major assumptions of the ordered logit model is that the cumulative distribution function for this error term,  $\varepsilon_i$ , is a logistic function. That is,

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<sup>17</sup> Another assumption we make is that the expert assessment is made in a similar way across all regulations; that is, the error component is similar for all regulations. Ellig and McLaughlin (2012) and Ellig, McLaughlin, and Morrall (2012) report the results of inter-rater reliability analysis that demonstrates that the rating system produces consistent results across evaluators.

$$f(\varepsilon_i) = \frac{\exp(\varepsilon_i)}{[1 + \exp(\varepsilon_i)]^2}.$$

Thus, the probabilities associated with the observed outcomes can be written as

$$Prob[y_i = j | \mathbf{x}_i] = Prob[\varepsilon_i \leq \mu_j - \mathbf{x}_i' \boldsymbol{\beta}] - Prob[\mu_{j-1} - \mathbf{x}_i' \boldsymbol{\beta}], \quad j = \frac{0}{60}, \frac{1}{60}, \dots, \frac{60}{60}. \quad (\text{EQ 3})$$

The alternative assumption that the error term follows a standard normal distribution function would lead us to estimate ordered probit. The results of these two estimations are typically similar, but ordered logit coefficients can be given a straightforward quantitative interpretation. The dependent variable in an ordered logit regression equation is the log of the ratio of the odds that the score will or will not have a designated value. The coefficients estimate how each explanatory variable affects this odds ratio.

This paper contains several different variants of the ordered logit model, only differing with respect to which subset of the possible  $\mathbf{x}_i$  terms are included. Equation 4, below, depicts the individual components of vector  $\mathbf{x}_i$ , which are described in depth in the data section.

$$x_{i,j} = \left\{ \begin{array}{l}
x_{i,1} = \text{ANPRM} \\
x_{i,2} = \text{Prior NPRM} \\
x_{i,3} = \text{Request for Information} \\
x_{i,4} = \text{Advisory Committee} \\
x_{i,5} = \text{State Consultation} \\
x_{i,6} = \text{Public Meeting} \\
x_{i,7} = \text{Future Public Meeting} \\
x_{i,8} = \text{Revised Rule} \\
x_{i,9} = \text{Review Required} \\
x_{i,10} = \text{Acting OIRA Administrator} \\
x_{i,11} = \text{OIRA Review Time} \\
x_{i,12} = \text{OIRA Review Time}^2 \\
x_{i,13} = \text{Obama Administration} \\
x_{i,14} = \text{Midnight Regulation} \\
x_{i,15} = \text{Midnight Leftover} \\
x_{i,16} = \text{Civil Rights} \\
x_{i,17} = \text{Security} \\
x_{i,18} = \text{Environment} \\
x_{i,19} = \text{Safety} \\
x_{i,20} = \text{Obama Administration} \times \text{Agency Preferences} \\
x_{i,21} = \text{Bush Administration} \times \text{Agency Preferences} \\
x_{i,22} = \text{Public Comments} \\
x_{i,23} = \text{DOT} \\
x_{i,24} = \text{EPA} \\
x_{i,25} = \text{DOL} \\
x_{i,26} = \text{DHS} \\
x_{i,27} = \text{DOJ} \\
x_{i,28} = \text{DOI} \\
x_{i,29} = \text{DOE} \\
x_{i,30} = \text{HHS} \\
x_{i,31} = \text{USDA} \\
x_{i,32} = \text{GSA} \\
x_{i,33} = \text{EPADOT} \\
x_{i,34} = \text{OIRA Review Time} \times \text{ANPRM} \\
x_{i,35} = \text{OIRA Review Time} \times \text{Prior ANPRM} \\
x_{i,36} = \text{OIRA Review Time} \times \text{Request for Information} \\
x_{i,37} = \text{OIRA Review Time} \times \text{Advisory Committee} \\
x_{i,38} = \text{OIRA Review Time} \times \text{State Consultation} \\
x_{i,39} = \text{OIRA Review Time} \times \text{Public Meeting} \\
x_{i,40} = \text{OIRA Review Time} \times \text{Future Public Meeting} \\
x_{i,41} = \text{OIRA Review Time} \times \text{Revised Rule} \\
x_{i,42} = \text{OIRA Review Time} \times \text{Review Required}
\end{array} \right\} \forall i = 1, \dots, 71. \text{ (EQ 4)}$$

Equation 2 (EQ 2) depicts the model we estimate in all regressions in this study. We estimate four specifications of our model for which the dependent variable,  $y_i$ , is the composite Report Card score. Specification 1, our most basic estimation, includes only the pre-proposal process variables without controlling for any other factors. The independent variables included are  $x_{i,1}, \dots, x_{i,12}$ . Specification 2 builds on specification 1 by adding several control variables—whether the NPRM committed the agency to holding a hearing or other public meeting in the future to receive comments on the regulation, whether the proposed regulation is a revision of an existing rule, whether the revision was required by law, and the number of comments filed in the proceeding (found in Ellig et al. 2012), as well as dummy variables for the type of regulation. The set of independent variables included in this estimation is  $x_{i,1}, \dots, x_{i,22}$ .

Our third specification is nearly identical to specification 2, but we substitute the dummy variables for regulation type for dummy variables controlling for the agency issuing the NPRM (including a dummy variable for the one NPRM jointly issued by the EPA and DOT). The set of independent variables included in this estimation is  $x_{i,1}, \dots, x_{i,15}; x_{i,20}, \dots, x_{i,33}$ .

Finally, specification 4 builds directly on specification 2 by including our set of interaction terms. This is done to determine whether and to what extent specific agency pre-proposal procedures are complements or substitutes for OIRA review efforts. The set of independent variables,  $x_{i,1}, \dots, x_{i,22}; x_{i,34}, \dots, x_{i,42}$  is included in this final specification.

As a robustness check, we re-estimate the same regression model (depicted in equation 2) utilizing the individual components of the composite Report Card score as each of our dependent variables,  $y_i$ . This is done in order to see whether the regulatory process variables affect all aspects of the analysis uniformly. Specifically, we re-estimate the regressions for specification 3

and specification 4 using the three categories of criteria (Openness, Analysis, and Use) and scores for each of the 30 evaluation questions as the dependent variable.

## Appendix 2. Multicollinearity Considerations

Some of the regulatory process variables we consider might not be independent of each other. For example, for especially important or controversial regulations, agencies might take several of the pre-proposal process steps we consider, and OIRA's review time might be especially long. Since we plan to derive quantitative estimates of each process variable's effect and use the results of our analysis to assess policy proposals, it is especially important to ensure that multicollinearity does not bias the results.

Table A-1 shows the results of several different methods to assess multicollinearity in our independent variables for each specification. The simplest method is to examine correlation coefficients between the variables; a popular rule of thumb suggests that multicollinearity may be significant if a correlation coefficient exceeds 0.8 or 0.9 (Farrar and Glauber 1967). None of the correlation coefficients exceeds 0.58, except the correlation coefficient between *OIRA Review Time* and *OIRA Review Time*<sup>2</sup> (which is of course obvious and unavoidable). Most are well below 0.3.

Another statistic indicating multicollinearity is the variance inflation factor (VIF). A "high" VIF indicates significant multicollinearity, but there is little agreement on what level counts as high (Belsley et al. 1980, 93). Table 6 shows that the mean VIF is below 3 for specifications 1 and 2. VIFs for most variables range between 1 and 3 in these specifications. However, the mean VIF approximately doubles as we move from specification 2 to specifications 3 and 4. In specification 3, this occurs mainly due to correlation between several of the agency dummy variables and the variable that interacts agency policy preferences with the *Obama Administration* dummy variable. (The variable that interacts agency policy preferences with a *Bush Administration* dummy variable also has a relatively high VIF of 7.88.) In

specification 4, multicollinearity increases largely (and predictably) due to the introduction of the variables that interact *OIRA Review Time* with the other regulatory process variables.

Another statistic indicating multicollinearity is the condition index. Belsley, Kuh, and Welsch (1980, 153) suggest that a condition number exceeding 15 or 30 could indicate significant multicollinearity. As Table A-1 shows, the condition number increases substantially as we move from specification 2 to specifications 3 and 4.

Taken together, the evidence suggests that multicollinearity is unlikely to be a significant problem in specification 2, but may be a problem in specifications 3 and 4.

**Table A-1. Multicollinearity Statistics**

	Specification			
	(1)	(2)	(3)	(4)
Maximum correlation coefficient (excluding review time variables)	0.34	0.45	0.58	0.52
Mean VIF	2.79	2.94	5.73	6.20
VIFs exceeding 10	None	2	5	3
OIRA Review Time		10.52	13.04	46.19
OIRA Review Time <sup>2</sup>		11.10	13.43	32.16
Obama Adm. × Agency Preference			15.26	
EPA			22.49	
DOL			20.64	
OIRA Review Time × Revised Rule				17.76
Condition Number	10.42	15.53	25.86	23.76

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