Is Regulatory Rule-Making State-Contingent? Evidence from U.S. Aviation Safety

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Abstract

How does regulatory rule-making respond to industry conditions and economic fluctuations? This paper takes advantage of a unique feature of the legal framework for U.S. aviation safety to identify counterfactual regulations. The National Transportation Safety Board issues safety recommendations based on accident investigations without regard to cost, whereas the Federal Aviation Administration is a regulatory agency that must decide on their implementation based on cost-benefit considerations. The main result is that regulatory activity appears pro-cyclical: A one-standard deviation increase in the air transport industry growth rate increases the adoption odds of safety recommendations issued the following year by a factor of 1.14-1.24. While pro-cyclicality could be consistent with both private and public interest theories of regulation, both recommendation-specific and overall air crash fatalities also increase adoption, consistent with cost-benefit considerations. The paper concludes with suggestive evidence on the generalizability of the main result from regulatory reviews.

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1 Introduction

What determines the supply of regulations? Beginning with competing theories (Stigler, 1971; Posner, 1974; Peltzman; 1976, Becker, 1983), a rich literature has explored this question, ranging from studies explaining overall levels of regulation (e.g., Aghion, Algan, Cahuc, and Shleifer, 2010; Mulligan and Shleifer, 2005; Glaeser and Shleifer, 2003) to analyses of regulatory agency behavior (e.g., Leaver, 2009; Moore, Maclin, and Kershner, 2001; Ando, 1999; Olson, 1995, 1997, 2000; Cropper, Evans, Berardi, Ducla-Soares, and Portney, 1992; Thomas, 1988; Magat, Krupnick, and Harrington, 1986; Weingast and Moran, 1983). This paper seeks to add to the literature by studying the response of regulatory activity to industry conditons and economic fluctuations. Recently, a growing academic and policy interest has emerged in such adjustments (e.g., Taylor, 2012), with some studies finding large potential welfare benefits (Heutel, 2012). However, the extent to which regulatory activity can or does already respond to economic conditions remains an open empirical question.[1] A fundamental challenge in identifying the effects of shocks on regulatory decisions is the construction of an appropriate counterfactual. For example, Kahn (2007) finds that both the types of bills introduced in Congress and their adoption probabilities respond to environmental shocks. In studying the effects of economic conditions on legislators, Lopez and Ramirez (2008) similarly emphasize the need to adjust vote ideology scores to changes in the policy space.[2]

This paper provides new evidence on this question in an empirical setting of academic and policy interest by taking advantage of a unique feature of the regulatory framework for U.S. aviation: the distinct roles of the National Transportation Safety Board (NTSB) and the Federal Aviation Administration (FAA). The NTSB issues safety recommendations based on accident investigations and without regard to their potential costs (Holanda, 2009). In contrast, the FAA is a regulatory agency deciding whether to implement recommendations based on cost-benefit

[1]For theoretical work, see, e.g., Barseghyan, Battaglini, and Coate (2013).

[2]Following Groseclose, Levitt, and Snyder (1999). Alternatively, Lopez and Ramirez (2004) and Lyon and Yin (2010) study the effects of fluctuations on pre-defined outcomes (political polarization and renewable portfolio standards, respectively).

considerations. NTSB recommendations thus constitute a *flow of potential new rules* which should not respond (directly) to economic fluctuations.[3] I thus evaluate the determinants of FAA responses to NTSB recommendations.

The central finding is that regulatory activity appears to be pro-cyclical. A one-standard deviation increase in the real air transport industry growth rate (8.3%) in year $t-1$ increases the odds that a given safety recommendation issued in year t will be adopted by a factor of 1.14-1.24, and increases the overall share of recommendations that will be adopted by $2-3$ percentage points. This effect corresponds to 20-30% of the standard deviation in the recommendation implementation rate. While pro-cyclicality could be consistent with both private and public interest theories of regulation, I further find that recommendations based on deadlier accidents are (marginally) more likely to be adopted, in line with cost-benefit considerations. Interestingly, *aggregate* major U.S. air crash fatalities also appear to significantly increase adoption. Finally, I fail to detect a significant association between the political party of the U.S. President and the recommendation adoption rate.

To the best of my knowledge, these results provide new evidence both on the state-contingency of regulatory activity, and on the economic determinants of FAA behavior, which have not been previously econometrically quantified. This paper thus also relates to the broader literature on incentives for aviation safety (e.g., Borenstein and Zimmerman, 1988; Mitchell and Maloney, 1989; Rose, 1990, 1992; Bosch, Eckard, and Singal, 1998; Helland and Tabarrok, 2012), and to the related policy debate. In particular, FAA decisions on NTSB recommendations have been questioned by, e.g., the Government Accountability Office (1996), and since 2010 the FAA has been required to report to Congress annually on this topic.

The paper concludes by providing suggestive evidence on the generalizability of the main result. As a broader measure of the government's proclivity to support the issuance of new regulations, I study the rate at which the Office of Information and Regulatory Affairs (OIRA) designates proposed new rules as "economically significant." Rules in this category must undergo

[3] Section 4 addresses endogeneity concerns (e.g., due to airline profitability affecting accidents (Rose, 1990)) as well as reverse causality.

a more detailed review, including formal cost-benefit analysis, before they can be issued. I find that new rules are significantly more likely to be subject to additional OIRA scrutiny during economic downturns. While these results are only suggestive due to the identification problem outlined above, they are consistent with pro-cyclicality of regulatory activity at a broader level.

This paper proceeds as follows. Section 2 describes the institutional background. Section 3 discusses the data. Section 4 presents the analysis and results. Section 5 concludes.

2 Background

The National Transportation Safety Board (NTSB) is an independent federal agency set up to investigate every civil aviation accident in the U.S. Although initially in the Department of Transportation, in 1974 the NTSB was made independent to safeguard its objectivity (NTSB, 2015). Its central role is to issue safety recommendations based on its investigations and safety studies "with one aim—to ensure that such accidents never happen again" (NTSB, 2015). However, the NTSB is not a regulatory agency; it can only *recommend* actions to agencies with the relevant authority, such as the Federal Aviation Administration (FAA).

The FAA is legally bound to *respond* to NTSB recommendations, but does not have to adopt them. Indeed, regulatory agencies are usually required to weigh costs and benefits of proposed rules.[4] Consequently, "the NTSB can make recommendations that represent the ideal safety system without regard to cost, while the FAA must respond to the recommendation based on a legislatively mandated cost/benefit analysis" (Holanda, 2009). This paper thus treats NTSB recommendations as *potential* new rules, and studies the *fraction/probability of recommendations adopted* as measures of regulatory activity. Importantly, I take advantage of the fact that the NTSB grades the FAA's responses as, e.g., "Unacceptable," "Acceptable," or "Exceeds Recommended Action."[5]

[4]The precise requirements about whether and what kind of cost-benefit analysis needs to be done vary by the type of regulation or action, and have also evolved over time (FAA, 1998).

[5]I disregard recommendations that have not yet been processes ("Await Response," "Initial Response Received"), or are "No Longer Applicable," "Superseded," or "Reconsidered."

For example, after several incidents of taxiing aircraft wingtips colliding with other planes, the NTSB recommended that the FAA "require the installation of anti-collision aid" on new aircraft where this might be a concern. However, the FAA argued that "the limited safety benefit of a taxi anti-collision system, such as wingtip cameras, does not justify the cost burden of an FAA mandate for their installation on the transport airplane fleet." The recommendation was closed in "Unacceptable" status.[6]

3 Data

Data on NTSB recommendations and FAA responses come from two sources. First, I collect information from the NTSB's Safety Recommendations Database.[7] Second, I scrape NTSB-FAA correspondence texts from the FAA Aviation Safety Information Analysis and Sharing database. For variables covered in both databases, I use NTSB records as default and fill in from the FAA data where needed.[8] Accident data are from the NTSB's Aviation Accident Database & Synopses.[9] I define "major" U.S. accident fatalities as those related to major domestic and foreign carriers, air taxies, and commuter airlines (i.e., operating under Parts 121, 135, and 129 of the regulatory code).

From the Bureau of Economic Analysis, I obtain real (chained 2005 US$) value added for the air transport industry (2002 NAICS 481), available from 1977-2011, and real annual GDP (chained 2009 US$). U.S. air traffic volumes (domestic and international available seat miles) are from the airline trade association *Airlines for America*. Lastly, I collect data on reviews of proposed regulations performed by the Office of Information and Regulatory Affairs (OIRA) from the OIRA website.[10]

[6] Recommendation A-12-048.

[7] I use both downloadable data from the current (2015) NTSB website, and more detailed scraped data from a previous version (2013).

[8] While both databases contain some errors, the NTSB file is more recent and not subject to scraping errors. The results are robust to excluding observations with NTSB-FAA disagreement about "Unacceptable" status.

[9] Data for 1982-present are on the main database website. Pre-1982 data are available separately at URL: http://app.ntsb.gov/avdata/

[10] Specifically, I scrape OIRA review counts and "economically significant" designations from www.reginfo.gov in quarterly intervals from 1981-2013.

4 Empirical Analysis

4.1 Recommendation-Level Analysis

I model FAA regulators as assigning each NTSB recommendation j issued at time t expected benefits and costs based on their objective function(s), which are unobservable to the econometrician. The resulting expected net benefits, $y^{\star}_{jt}$, are thus a latent variable assumed to be a function of covariates X_{jt} and an error ε_{jt} :

$$y^{\star}_{jt} = X'_{jt}\boldsymbol{\beta} + \varepsilon_{jt} \tag{1}$$

The FAA's observable decision y_{jt} is to implement the recommendation if the expected net benefits are positive:

$$y_{jt} = \begin{Bmatrix} 1 \text{ if } y^{\star}_{jt} \geqslant 0 \\ 0 \text{ if } y^{\star}_{jt} < 0 \end{Bmatrix}$$

If the error term in (1) follows the standard logit distribution, the probability that the FAA implements the recommendation is thus given by:

$$\Pr(y_{jt} = 1) = \Pr(Acceptable_{jt} = 1) = \frac{e^{X'_{jt}\boldsymbol{\beta}}}{1 + e^{X'_{jt}\boldsymbol{\beta}}} \tag{2}$$

Industry conditions could enter the FAA's assessment through multiple channels under both public and private interest theories of regulation. For example, after a negative supply shock due to an oil price increase, additional costs through new rules could lead to negative profits and reductions in service (see, e.g., Borenstein and Rose, 2003, on airline Chapter 11 filings and service reductions). As aviation is imperfectly competitive, changes in market structure due to new rules may thus be of greater concern during downturns. With oil price shocks, there should be no incentive to simply delay new rules as the current price is the best predictor of the future price. In other cases, delays could be an additional FAA response margin. However, I find that recommendations which are eventually closed in "Acceptable" status have slightly shorter -

rather than longer - closure times if they were issued following a downturn (see Online Appendix Table A3).

The estimated coefficients on industry growth in X_{jt} identify the effect of fluctuations *on FAA behavior* if growth is uncorrelated with unobservables affecting recommendation adoption probabilities. If, however, recommendations are directly affected by economic conditions, then the coefficient will measure the *net* effect of fluctuations due to changes in both NTSB and FAA behavior.

As described in Section 2, NTSB recommendations are based on accident investigations and studies with the sole purpose of reducing the future likelihood of such accidents. While recommendations should thus be unaffected by cost fluctuations, some endogeneity concerns remain:

First, Rose (1990) finds that lower airline profitability is associated with higher accident risk. Consequently, an industry downturn could affect recommendations by increasing accidents. I thus control for the number of recommendations issued each year, and for accident fatalities. It should also be noted that accident investigation completion times vary greatly, with a mean of 384 days and a standard deviation of 407 days between accidents and issuance.[11] Consequently, recommendations issued in year t are based on accidents from a range of previous years. I thus fail to detect a significant relationship between recommendation issuance and output growth (see Online Appendix Table A1 and Figure A1). Of course, the possibility remains that the NTSB adjusts the content of recommendations. In this case, the analysis would measure the *net* effect of economic conditions on recommendation adoption.

Finally, reverse causality could bias the estimated coefficients downwards if (anticipation of future) regulatory activity depresses industry growth. To the extent that this occurs, the results provide a lower bound on the pro-cyclicality of regulatory activity.

[11] This measure is available for 3,818 of the 4,172 observations. For 53 (382) observations, the recorded completion time is negative (zero). If these are set to missing, the mean (std. dev.) becomes 433 (406) days.

4.2 Aggregate -Level Analysis

Analyses of individual-level outcomes as a function of macro-level aggregates can suffer from correlated errors within groups (Moulton, 1990), which are air industry growth episodes in this setting. Clustering standard errors at the annual level may not address this issue sufficiently when the number of groups is small (Donald and Lang, 2007). As an alternative specification, I thus model the aggregate *share* of recommendations issued in year t that receive an "Acceptable" or better response, θ_t :

$$\theta_t = X_t \boldsymbol{\alpha} + \epsilon_t \tag{3}$$

A fractional logit model is used to estimate (3) via GLM (Papke and Wooldridge, 1996). With regards to stationarity, Dickey-Fuller tests indicate that a unit root in θ_t and industry growth can be confidently rejected (with p-values of 0.0216 and 0.0000, respectively).

4.3 Results

Figure 1 depicts the fraction of recommendations issued in a given year receiving an "Unacceptable" response against lagged air transport industry growth. The "Unacceptable" rate appears strikingly inversely related to industry growth, consistent with pro-cyclicality.

Table 2 presents the recommendation-level results. A 1% increase in air industry growth in period $t-1$ is estimated to increase the odds that the FAA will implement recommendations issued in year t by a factor of 1.016-1.025. A one-standard deviation increase in industry growth (8.3%) increases the adoption odds by a factor of 1.14-1.24. While the point estimates on GDP growth also suggest a positive association, they are not precisely estimated.

The results further imply that recommendations based on more fatal source accidents are (marginally significantly) more likely to be adopted. Though imprecisely estimated, recommendations based on "personal" flight accidents (e.g. pleasure general aviation) appear less likely to be implemented. Both findings are consistent with cost-benefit considerations by the FAA. Interestingly, both lagged and contemporaneous *aggregate* major U.S. air crash fatalities appear to significantly increase the likelihood of a positive FAA response.

Table 2 provides the aggregate results in terms of marginal effects (evaluated at the mean). A 1% increase in lagged industry growth is predicted to increase the share of recommendations implemented by 0.28-0.41 percentage points (against a mean implementation rate of 78%, standard deviation 10%). A one-standard deviation increase in industry growth (8.3%) is estimated to increase the adoption share by 2.1-3.1 percentage points (regression not shown), corresponding to 20-30% of the standard deviation in the implementation rate. Again, I fail to detect a significant correlation between GDP growth and FAA responses.

The results also show a positive and significant association between air crash fatalities and the implementation rate. In order to assess the fit of the model, Figure 2 plots the predicted and actual shares of implemented recommendations issued in each year (based on the full model in Column 3 of Table 2). The model tracks the data with some error, but performs quite well in predicting fluctuations in adoption.

4.4 Robustness

The analysis focuses on economic conditions in the recommendation *issue* year, rather than the *closure* year.[12] This is because closure is at the NTSB's discretion and may thus not reflect a contemporaneous FAA decision, especially for recommendations in "Unacceptable" status. As shown in Online Appendix Table A3, closure takes 40% longer for these recommendations, and occurs when the NTSB "concludes that further correspondence on, or discussion of, the matter would not change the recipient's position" (NTSB, 2016). In some cases, closure occurs well after the FAA disagreed with a recommendation. In other cases, however, a recommendation's status may change over time. As the median (mean) closure time is 2 years (3 years), this raises questions about the appropriate timing of the analysis.

I address this concern as follows. First, Table 3 repeats specification (2) only for recommendations that were closed within one year of issuance. As one would hope, the estimated effect of

[12] The main analysis also includes recommendations that are still in "Open" (acceptable or unacceptable) status.

lagged industry growth is now much larger: a one-standard deviation increase raises the adoption odds by a factor of 1.68-2.1. Contemporaneous GDP growth is now also estimated to significantly increase the adoption odds by a factor of 1.15-1.21.[13] Second, I extract NTSB ratings of the FAA's *initial* response letter from correspondence texts, and repeat the aggregate analysis at the *initial response-year* level. Unfortunately, the text extraction measures initial ratings with some error (as, e.g., the NTSB may refer to multiple recommendations in a letter). Lagged industry growth nonetheless appears to (marginally significantly) increase the fraction of recommendations receiving a positive initial FAA response (see Online Appendix Table A4). Lastly, I repeat Figure 1 and specification (3) by *closure* year (Online Appendix Figure A2 and Table A2). While the fraction "Unacceptable" and lagged industry growth appears visually similar to Figure 1, the regression coefficients are imprecise. However, contemporaneous GDP growth is now positively and marginally significantly associated with "Acceptable" recommendation closures, broadly consistent with pro-cyclicality.

Finally, I also experiment with international oil prices as exogenous industry cost shifters. Repeating specification (3) with real oil prices or oil price *shock* estimates from Kilian (2009),[14] I find a negative and significant effect of oil price (shocks) on the fraction of recommendations adopted, in line with the main results. Unfortunately, stationarity tests indicate that a unit root cannot be rejected even for the oil price shock series. The estimated effect of oil price *changes* - which are stationary - is not significantly different from zero, but the point estimate is negative.[15] Though only suggestive, these results are tentatively consistent with accommodative regulatory activity.

[13] However, in one of the four specifications, contemporaneous industry growth appears significantly correlated with decreased implementation odds.

[14] I specifically use Kilian's (2009) estimates of oil supply and oil-specific demand shocks, but exclude aggregate demand-based shocks.

[15] These results are available upon request.

4.5 Generalizability

While the drivers of regulatory rule-making in aviation safety are arguably of independent interest, the generalizability of the main result is clearly an important question. As a broader measure of the government's proclivity to support new regulations, I consider the rate at which proposed new rules are subjected to additional scrutiny by the Office of Information and Regulatory Affairs (OIRA). OIRA is a part of the Office of Management and Budget, and reviews significant proposed rules before they can be issued. If a regulation is further designated as "*economically* significant," it must pass a more rigorous review, including formal cost-benefit analysis.[16]

Figure 3 plots the fraction of "economically significant" OIRA reviews against contemporaneous U.S. GDP growth.[17] Visually, OIRA scrutiny appears strikingly negatively correlated with GDP growth: proposed rules face stricter reviews during downturns, in line with pro-cyclicality in regulatory activity. Table 4 presents results for a regression of the "economically significant" share of OIRA reviews on GDP growth, a time trend, and a Republican President indicator.[18] The results indicate that a $+1\%$ increase in contemporaneous GDP growth significantly decreases the share of "economically significant" OIRA reviews by -0.5% (against a mean of 21%). Of course, these results are only suggestive due to the identification problems outlined above.[19] They do, however, suggest that the pro-cyclicality of FAA decisions documented in this paper may be generalizable to other areas of regulatory activity.

[16] A regulation is "'economically significant' if OIRA determines that it is likely to have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities" (Executive Order 12866, September 30, 1993).

[17] The analysis focuses on the post-1993 era as Executive Order 12866 greatly narrowed the scope of OIRA reviews. Online Appendix Figure A3 depicts the economically significant share from 1981-2012. Online Appendix Figure A4 also replicates Figure 3 at the quarterly level.

[18] OIRA reviews are well-known to be influenced by political factors (Bolton, Potter, Thrower, 2016).

[19] In contrast, reverse causality would bias the results towards counter-cyclicality in regulatory activity (i.e., if regulatory activity caused lower GDP growth).

5 Conclusion

This paper provides new evidence on the drivers of regulation, focusing on economic fluctuations and U.S. aviation safety. The central finding is that regulatory activity appears to tighten (loosen) in response to growth (downturns): An increase in air transport industry growth significantly increases the fraction of NTSB safety recommendations issued the following year that will be adopted by the FAA. Exploratory analysis further suggests that regulatory stringency may be pro-cyclical in other areas as well, as new regulations are significantly more likely to be deemed "economically significant" and subject to stricter OIRA review when GDP growth is lower.[20] While such pro-cyclicality can be consistent with both public and private interest theories of regulation, I also find that accident fatalities increase safety recommendation adoption rates. Both the welfare implications and the generalizability of pro-cyclicality in regulatory activity are thus interesting questions for future work.

[20] An earlier draft of this paper (Barrage, 2014) also explored changes in the Code of Federal Regulations as measured by RegData (Al-Ubaydli and McLaughlin, 2012) and growth in select industries. While a formal cross-industry analysis is beyond the scope of this study, it is an interesting possibility for future research.

6 Figures and Tables

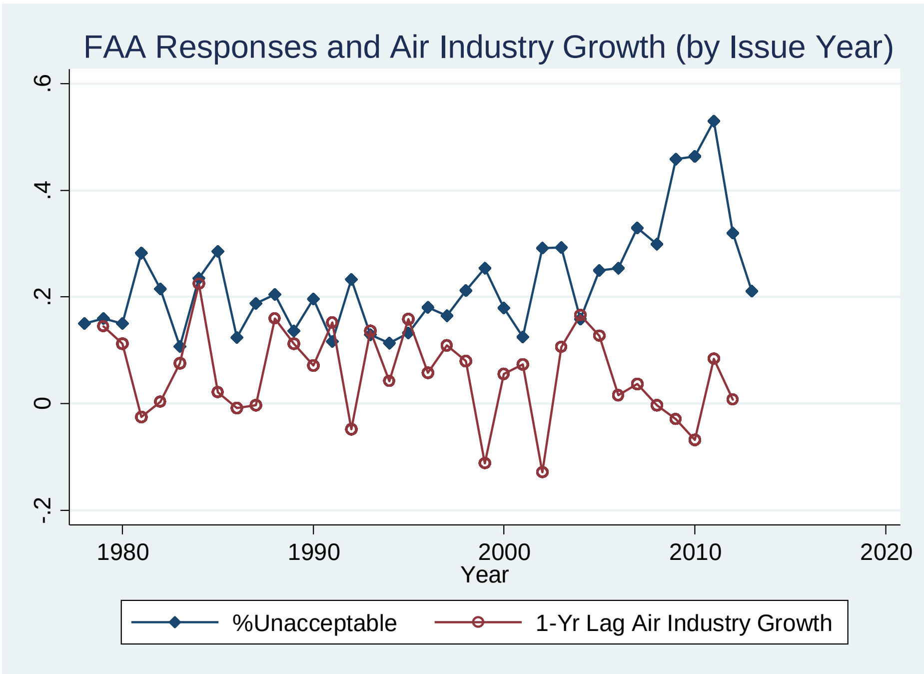

Figure 1: Fraction of NTSB recommendations issued in year t receiving "Unacceptable" FAA response vs. the real air transport industry growth rate in year $t-1$.

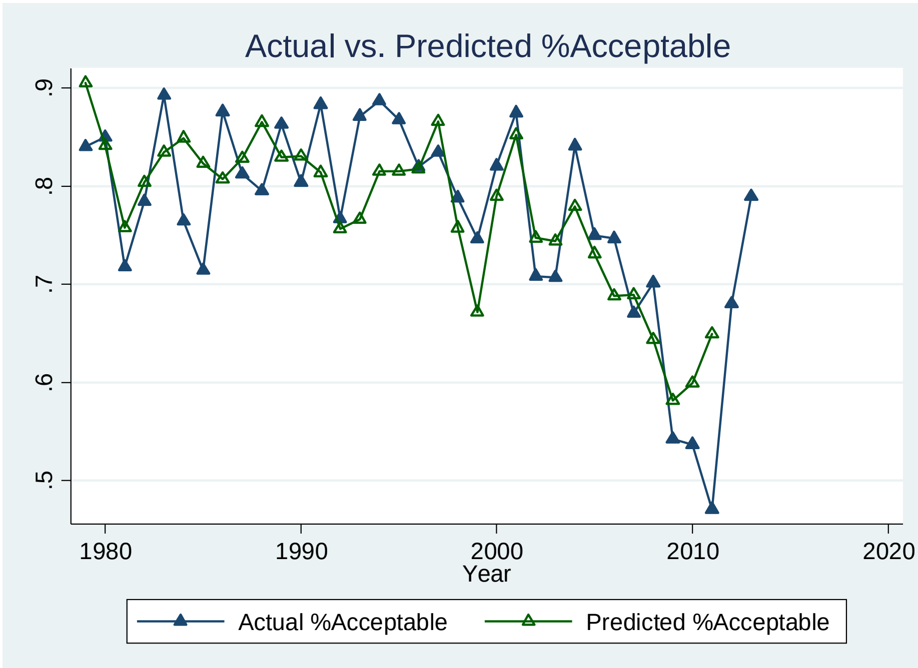

Figure 2: Fraction of NTSB recommendations issued in year t receiving "Acceptable" or better FAA response in the data ("Actual") vs. "Predicted" in the full logit model (Table 2 Column 3).

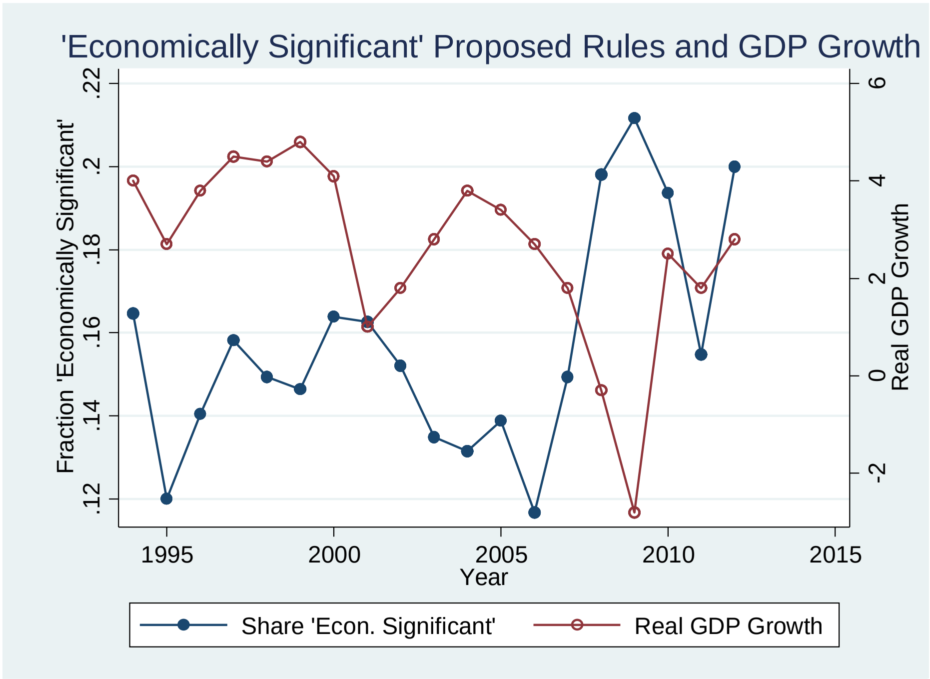

Figure 3: Fraction of regulatory rules reviewed by OIRA that are designated as "economically significant" vs. real GDP growth.

Table 1: Recommendation-Level Results

Dependent Variable: Indicator for "Acceptable" FAA Response to NTSB Recommendation (=1)				
	(1)	(2)	(3)	(4)
	Odds Ratio	Odds Ratio	Odds Ratio	Odds Ratio
Real Air Transport Industry Growth$_t$	1.007	1.008	1.005	1.011
	(0.00939)	(0.0106)	(0.00784)	(0.00777)
Real Air Transport Industry Growth$_{t-1}$	1.024**	1.016	1.022**	1.026**
	(0.0110)	(0.0109)	(0.00951)	(0.0109)
Real GDP Growth$_t$		1.031	1.039	1.012
		(0.0450)	(0.0378)	(0.0308)
Real GDP Growth$_{t-1}$		1.045	0.996	1.021
		(0.0460)	(0.0426)	(0.0466)
Source Accident #Fatalities	1.003*	1.002*	1.002	
	(0.00141)	(0.00144)	(0.00139)	
Source Accident Personal Dummy	0.854	0.866	0.869	
	(0.176)	(0.181)	(0.183)	
Total #Recs Issued$_t$			0.999	1.002
			(0.00323)	(0.00328)
Total Major Accident Fatalities$_t$			1.001***	1.001**
			(0.000413)	(0.000572)
Total Major Acc. Fatalities$_{t-1}$			1.001	1.001**
			(0.000578)	(0.000618)
Republican President$_t$			0.934	1.095
			(0.161)	(0.211)
Year	0.968***	0.971***	0.978**	0.996
	(0.0101)	(0.00982)	(0.0110)	(0.0112)
Constant	1.186e+29***	1.607e+26***	6.114e+19**	6,804
	(2.468e+30)	(3.255e+27)	(1.404e+21)	(156,247)
Observations	2,461	2,461	2,461	3,521
Log-Likelihood	-1239	-1237	-1232	-1788
Wald χ^2(df); p-value	29.45(5); 0.000	41.8(7); 0.000	66.5(11); 0.000	45.5(9); 0.000

Table presents Logit estimation results for regression of an indicator that a safety recommendation issued in year t received an "Acceptable" FAA response on the contemporaneous (year t) and lagged (year $t-1$) real air transport industry growth rate, GDP growth rate (columns 2-4), the number of fatalities involved in the recommendation's source accident (columns 1-3), an indicator that the purpose source accident flight was personal (columns 1-3), the total number of recommendations issued in year t (columns 3-4), the total number of fatalities in major commercial accidents in years t and $t-1$, and a Republican President indicator. Robust standard errors (clustered at issue-year level) are in parentheses (*** p<0.01, ** p<0.05, * p<0.1).

Table 2 : Aggregate Time Series Results

Dependent Variable: Share of NTSB Recs. Issued at t with "Acceptable" FAA Response			
	(1)	(2)	(3)
	%Accpt.	%Accpt.	%Accpt.
	mfx (at mean)	mfx (at mean)	mfx (at mean)
Real Air Transport Industry Growth$_t$	0.0012	0.0017	0.0013
	(0.0018)	(0.0020)	(0.0013)
Real Air Transport Industry Growth$_{t-1}$	0.0036**	0.0028*	0.0041**
	(0.0016)	(0.0016)	(0.0016)
Real GDP Growth$_t$		0.0004	0.0039
		(0.0071)	(0.0055)
Real GDP Growth$_{t-1}$		0.0091	0.0020
		(0.0078)	(0.0076)
# Recs. Issued$_t$			0.0003
			(0.0005)
Total Major Accident Fatalities$_t$			0.0002***
			(0.0001)
Total Major Accident Fatalities$_{t-1}$			0.0002**
			(0.0001)
Republican President$_t$			0.0302
			(0.0340)
Year	-0.0053***	-0.0048***	-0.0010
	(0.0018)	(0.0017)	(0.0018)
Observations	33	33	33

Table presents fractional Logit results for regression of the fraction of NTSB recs. issued in year t receiving "Acceptable" or better FAA response on the contemp. (year t) and lagged (year $t-1$) real air transport industry growth rate, GDP growth (cols. 2-3), the total number of recommendations issued in year t (col. 3), the number of fatalities in major commercial accidents in years t and $t-1$, and a Republican President indicator. Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1).

Table 3: Rec.-Level Results for Recs. Closed within 1-Year of Issuance

Dependent Variable: Indicator for "Acceptable" FAA Response to NTSB Recommendation (=1)				
	(1)	(2)	(3)	(4)
	Odds Ratio	Odds Ratio	Odds Ratio	Odds Ratio
Real Air Transport Industry Growth$_t$	0.981	0.977	0.948	0.933**
	(0.0244)	(0.0263)	(0.0345)	(0.0252)
Real Air Transport Industry Growth$_{t-1}$	1.083***	1.065*	1.096**	1.091***
	(0.0293)	(0.0354)	(0.0495)	(0.0366)
Real GDP Growth$_t$		1.176**	1.211***	1.155**
		(0.0867)	(0.0806)	(0.0735)
Real GDP Growth$_{t-1}$		1.132	0.894	0.856
		(0.137)	(0.151)	(0.0950)
Source Accident #Fatalities	1.004	1.004	1.004	
	(0.00659)	(0.00689)	(0.00824)	
Source Accident Personal Dummy	2.446	2.438	2.099	
	(2.612)	(2.735)	(2.504)	
Total #Recs Issued$_t$			0.991	0.995
			(0.00807)	(0.00761)
Total Major Accident Fatalities$_t$			1.007**	1.006***
			(0.00333)	(0.00241)
Total Major Acc. Fatalities$_{t-1}$			1.005**	1.006***
			(0.00230)	(0.00222)
Republican President$_t$			0.919	0.863
			(0.621)	(0.419)
Year	0.975	0.960	0.989	1.000
	(0.0339)	(0.0283)	(0.0450)	(0.0343)
Constant	6.674e+22	1.021e+36	2.136e+10	1.118
	(4.622e+24)	(5.978e+37)	(1.958e+12)	(77.02)
Observations	512	512	512	696
Log-Likelihood	-141.6	-138.4	-132.2	-176
Wald χ^2(df); p-value	12.93(5); 0.0240	17.85(7); 0.0126	37.39(11); 0.000	24.75(9); 0.0033

Table presents Logit estimation results for regression of an indicator that a safety recommendation issued in year t received an "Acceptable" FAA response on the contemporaneous (year t) and lagged (year $t-1$) real air transport industry growth rate, GDP growth rate (columns 2-4), the number of fatalities involved in the recommendation's source accident (columns 1-3), an indicator that the purpose source accident flight was personal (columns 1-3), the total number of recommendations issued in year t (columns 3-4), the total number of fatalities in major commercial accidents in years t and $t-1$, and a Republican President indicator. Robust standard errors (clustered at issue-year level) are in parentheses (*** $p<0.01$, ** $p<0.05$, * $p<0.1$).

Table 4: Regression Results for OIRA Review Designations

Dependent Variable: % of OIRA Reviews Designated as "Economically Significant"		
	(1)	(2)
Real GDP Growth$_t$	-0.493***	-0.493***
	(0.174)	(0.151)
Real GDP Growth$_{t-1}$	-0.235	-0.235
	(0.172)	(0.191)
Republican President$_t$	-3.464***	-3.464***
	(0.832)	(0.901)
Quarter	0.057***	0.057**
	(0.020)	(0.026)
Constant	9.187**	9.187*
	(3.765)	(4.695)
Observations	76	76
R-squared	0.376	
Standard Errors	OLS	Newey-West

Table presents results for OLS regression of the fraction of OIRA regulatory reviews deemed "economically significant" each quarter (Q1,1994-Q4,2012) on contemporaneous (t) and lagged ($t-1$) quarterly (seasonally adjusted) real (chained 2009) GDP growth rates, a linear time trend, and a Republican President indicator. Robust Newey-West standard errors (4 lags) in parentheses for column 2 (*** p<0.01, ** p<0.05, * p<0.1).

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