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Public Enforcement of Securities Market Rules: Resource-based evidence from the Securities Exchange Commission

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Abstract: We empirically investigate whether increases in the U.S. Securities and Exchange Commission's (SEC) budget have an effect on firms' compliance behavior with securities market rules. Our study uses a dataset on the SEC's resources and its enforcement actions over a period beginning shortly after the Second World War and ending in 2010. We find that increases in the SEC's resources both improve compliance and lead to an increased activity level of the SEC. The higher level of compliance is reflected by a decrease in the numbers of enforcement cases. The increased activity level is reflected by a surge in the number of investigations conducted by the SEC.

JEL Classification Codes: G14, G18, D21, K22

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1. Introduction

In an effort to restore investor confidence in financial markets the Securities and Exchange Commission's (SEC) budget was doubled between 2007 ($830 million) and 2010 ($1.6 billion). Given this significant increase in funding we investigate whether investors in the U.S. financial market can expect firms to improve their compliance with securities laws enforced by the SEC. This question about the effectiveness of public enforcement of securities laws has provoked a substantial debate in the literature.[1] La Porta et al. (2006) and Djankov et al. (2008) find no evidence that public enforcement impacts standard measures of financial market development (such as stock market capitalization in relation to GDP, trading volume, the number of domestic firms, or the number of IPOs). Consequently, the World Bank (2006), La Porta et al. (2006) and Djankov et al. (2008) have argued that financial market development is solely aided by private rather than by public enforcement of securities market rules. From their point of view, resources should be devoted primarily to promote private enforcement institutions.[2] Jackson and Roe (2009) do not share this view. They replicate the analysis by La Porta et al. (2006) but use a different measure of regulatory intensity. La Porta et al. (2006) employ an index based upon regulators' formal powers. Jackson and Roe (2009) use regulators' resources to proxy regulatory intensity.[3] In contrast to La Porta et al. (2006), Jackson and Roe (2009) do find a significant and positive impact of public enforcement on financial market development.

Interestingly, the channel through which public enforcement affects market development has not been analyzed yet. We fill this gap in the literature by studying firms' compliance behavior in reaction to increases in the SEC's resources. We investigate if and how increases in the resources available for public enforcement of securities markets rules impact the compliance of securities market participants. In practice, before enforcement can lead to better financial markets, i.e. markets where investors demand relatively lower returns on their capital as they do not have to be afraid of being defrauded, that enforcement must initially influence firms' decisions to comply with securities market rules. By focusing on the incentives for firms' dis-

[1] As the results of Brown et al. (2013) suggest, this question is likely to have effects on the real economy.

[2] Some researchers at the International Monetary Fund and the European Central bank seem to share this assessment of the limited value of public enforcement (Berglöf and Claessens, 2006, and Hartmann et al., 2007, respectively).

[3] Actually, Jackson and Roe (2009) measure public enforcement using regulators' budget and staff. La Porta et al. (2006) use a self-composed index of the regulator's formal qualities (such as independence from the executive, its investigative powers, its capacity to issue remedial orders, and the range of criminal sanctions available) to quantify public enforcement.

closure behavior provided by the SEC's enforcement, our study closes this gap. It is those changes in compliance that – over time – can lead to improved financial markets.

Our study uses a dataset on the SEC's resources and its enforcement actions over more than 60 years starting shortly after World War II and ending in 2010. We expect that increases in the SEC's resources result in an improved level of compliance. A decreased number of enforcement actions filed by the SEC captures this improvement in compliance. Following Jackson and Roe (2009), we use the SEC's budget to proxy the resources available for public enforcement.[4] We measure compliance, or rather misbehavior, using the number of SEC's enforcement actions aimed at stopping ongoing misbehavior. The SEC's primary tools for stopping such misbehavior are injunctions (see section 3 for more details). We even analyze the number of administrative proceedings and two measures for the SEC's investigative activity.[5] By using vector autoregressions as our econometric tool (VAR), we are able to cope with the problems known from the economics of crime literature, i.e. the fact that the two central variables, the level of misbehavior and the resources targeted at law enforcement, respectively, are determined simultaneously.

We find evidence that increases in the SEC's resources deter financial market participants from misbehaving and lead to a higher compliance in the medium-term. This higher level of compliance is reflected by a decrease in the number of enforcement cases. We establish our results in the following manner: First, using Granger-causality tests we establish that there is a significant link between the SEC's resources and corporations' contemporaneous misbehavior.[6] Second, we find that the result of an increase in the SEC's resources is a decrease in (reported) ongoing misbehavior. The results from the VAR analysis suggest that a positive budget shock leads to an aggregate decrease in the number of ongoing misbehavior, this is reflected by a decrease in the number of injunctions by 11% within five years and by 14% years within ten years, respectively. This is clear evidence for the compliance hypothesis with

[4] The SEC, being a federal agency, receives its budget from the federal government. It nevertheless also generates its own revenue. This revenue stems from fees, securities registrations and tender offers, etc. However, the SEC can only spend the amount agreed upon by the federal government. Since 1982, these revenues have always exceeded the SEC's budget and the SEC has thus positively contributed to the federal budget. The SEC's annual report for fiscal year 2001, e.g. states that the agency collected \$2.06 bn in fees (SEC, 2001). 48 % of that sum was generated from securities registrations; 50 % came from securities transactions. The remaining 2 % were from tender offer, merger, and other items. The agency's 2001 budget was \$430 million.

[5] The question how corporate fraud can be detected before being sanctioned by institutions such as the SEC is analyzed in detail by Dyck et al. (2010).

[6] Granger causality is a statistical concept that is concerned with the question of whether past values of one variable can be used to forecast another variable.

firms being more compliant and explains Jackson and Roe's (2009) finding of the effectiveness of public enforcement.

Our results are robust when we extend our measures of SEC enforcement to include administrative proceedings. Administrative proceedings are another enforcement measure that the SEC may employ (see section 3 for details). We also find support for our results when we examine the SEC's investigative powers. In addition to enforcing financial market rules using injunctions and administrative proceedings, the SEC may conduct investigations into both present and past misbehavior. Given that the SEC can make broad use of its investigative powers, we find that the level of regulatory activities, i.e. the number of the agency's investigations, increases at first as the agency gets more resources. Again, this result is supported by, among others, Granger causality tests.

The remainder of the paper is organized as follows: The next section briefly reviews the related literature and clarifies further the contribution of this paper. The data, some institutional details about enforcement activities by the SEC and the compliance hypothesis are presented in section 3. Section 4 contains the econometric analysis and section 5 provides robustness tests. The final section 6 concludes.

2. Literature

Our study is related to two strands of literature: one on financial market development and the other on the economics of crime. The relevance of the second strand is due to the fact that our paper investigates empirically how incentives impact compliance behavior. With regard to the theoretical economics of crime literature, it is a central prediction of Becker's (1968) path-breaking work that an increase in expected punishment will deter criminals and lead to a decrease in criminal activity, i.e. to a higher compliance with the applicable laws.[7] Increases in expected punishment can be the result of a change in the probability that a criminal is apprehended or of an increase in the expected punishment given apprehension. Drago et al. (2009) refer to this as general deterrence. Our focus on the SEC's budget draws on the detection probability: regulators' larger resources determine a higher probability of being detected in case of noncompliance and thereby lower incentives for misbehavior. However, due to econometric reasons there is, so far, rather limited empirical evidence for the deterrence hypothesis

[7] Shleifer and Wolfenzon (2002) demonstrate this in a corporate finance model.

in the theoretical literature.[8] Empirical tests of deterrence, and thus compliance, are complicated by the fact that the two central variables, the level of criminal activity and the resources targeted at law enforcement, respectively, are determined simultaneously. Thus, a regression where crime, or in our case the number of injunctions, serves as the dependent variable and the resources targeted at law enforcement serve as an independent variable is likely to suffer from an endogeneity problem. Indeed, Spelman (2008) and, in particular, Marvell and Moody (1996, p. 639) argue that "[i]t is hard to overemphasize the importance of specification problems." One way to address this problem is to use VAR analysis. Lofting and McDowall (1982), Corman and Joyce (1990), Corman et al. (1987) and Marvell and Moody (1996) use Granger causality tests to determine the direction of causality. These tests, which are central part of VAR analysis, refrain from making restrictions about which variables are exogenous. Instead, tests of Granger causality simply investigate whether the knowledge of past observations of resources targeted at law enforcement helps to forecast crime.[9]

In terms of the literature on the development of financial markets, the papers closest to ours are by Jackson and Roe (2009) and La Porta et al. (2006). However, our analysis differs crucially in three aspects. First, neither article studies how resources available for enforcement directly influence firms' decisions to comply with securities market rules. Instead, both studies investigate how enforcement affects financial market development. While financial market development is likely to be the longer-term result of enforcement, it is not directly affected by enforcement.[10] Second, Jackson and Roe (2009) (and La Porta et al. 2006), rely on international cross sectional evidence using point observations dating from 1999-2003 (La Porta et al., 2006) or the run-up to the financial crisis (Jackson and Roe, 2009). The data come from a very diverse group of countries. In their sample some countries are highly developed, such as the U.S. and Canada, while others can be considered to be medium income countries, like

[8] Cameron (1988) writes that 18 of 22 studies analyzing the relationship between police presence and crime are unable to find a deterrence effect. Marvell and Moody (1996) present similar results in their literature review. Tauchen (2010) provides for some recent studies supporting the existence of a deterrence effect.

[9] Alternatively, some papers address the identification problem by employing methodologies where they can isolate shifts as being exogenous (i.e. an exogenous shift in the policing intensity). Di Tella and Schargrodsky (2004) test how the increases in police surveillance after a terrorist attack affect car theft. Drago et al. (2009) use an exogenous change in sentencing. Levitt (1997) uses election-induced changes in the size of the police force as an instrument to investigate their impact on crime. Edmark (2005) employs county-level data to identify the effect of unemployment on crime. Corman and Mocan (2000) use high frequency data to address the simultaneity issue.

[10] Jackson (2013) discusses recent literature also using the variables by Jackson and Roe (2009) to investigate the effect of public enforcement on market development defined by many different proxies. However, there are only two studies that provide some evidence of how enforcement translates into market development. Firstly, Samarasekera et al. (2012) investigate the impact of enforcement (specified differently than by Jackson and Roe (2009)) on accounting quality. They find that accounting quality only improves for cross-listed firms. Secondly, Brogi (2011) explores the efficacy of Bank of Italy sanctions in disciplining bank board members. However, sanctions had only a rather limited effect.

Brazil, but there are also low-income countries like Kenya. Due to the timing of the observations, it is possible that the results from this data might not be fully applicable to investigate how changes in the availability of enforcement resources impact stock market development. This is particularly true because the financial crisis had a varying impact on different stock markets. In particular, stock markets in developed countries were hit harder than those in less developed countries. In addition, as mentioned above, the financial crisis has resulted in a significant increase in the resources available to securities regulation. Besides, as Jackson and Roe (2009) remark, there might be considerable differences in how the regulatory agency's budget is used in different countries.[11] Our data build upon time series analysis techniques and address this problem. Instead of using point observations from a heterogeneous group of countries that are collected around a potentially non-representative year, we use U.S. data stemming from a single regulatory agency covering a time span of more than sixty years. Third, both La Porta (2006) and Jackson and Roe (2009) discuss how inputs (enforcement) and output (financial market development) might be determined simultaneously. This is also an issue raised by the models of Bebchuk and Neeman (2010) and Pagano and Volpin (2003). In particular, Jackson and Roe (2009, p. 208) state "[m]aybe more public enforcement produces better outcomes; maybe stronger financial outcomes call forth higher budgets and deeper staffing." We are able to tackle this highly relevant problem. Using VAR analysis we address the issue of endogeneity and test for Granger causality. Specifically, we test whether resources available for public enforcement Granger cause the levels of compliance and vice versa.

3. Hypothesis and Data

3.1. Hypothesis

Standard economic theory going back to Becker (1968) suggests that changes in the probability of apprehension affect behavior. An increase in the probability of apprehension should, consequently, decrease criminal activity. Building upon this central result, we propose our hypothesis. Our hypothesis reflects the fact that we cannot measure misbehavior directly but that we can rely on enforcement data and data on regulatory activity. Furthermore, we pre-

[11] Jackson and Roe (2009, Table 2) show that Nigeria, a country usually associated with high corruption, spends $300,000 on financial market regulation per billion of GDP while the U.S. spends only $83,232.

sume that increases in the SEC's budget are likely to be correlated with an increase in the probability of apprehension.

> *Compliance Hypothesis*
> Increases in the SEC's resources result in an improved level of compliance. A decreased number of enforcement actions filed by the SEC captures this improvement in compliance.

3.2. Data

We have hand collected data from the SEC's annual reports from the 1940s to 2010.[12] The data encompasses information on the SEC's resources, the number of investigations filed by the SEC and its enforcement activity. The arguments provided by Coffee (2007) suggest that the SEC data are particularly well suited to test our compliance hypothesis. He states that the SEC uses a policy of formal enforcement that aims at deterring potential wrongdoers. In contrast to other regulators, e.g. the United Kingdom's Financial Services Authority, the SEC will not rely on informal guidance or advice. Furthermore, given that we only use enforcement and funding data from the United States our analysis is not susceptible to Jackson and Gkantinis's (2007) concerns with respect to the comparability of international financial market regulation data. Because we use time series data spanning a period of more than 60 years, our study necessarily concentrates on broad categories. We measure noncompliance with the SEC's rules using broad categories of the agency's enforcement activities. In addition, we explore whether the agency uses rises in its resources to increase its regulatory activity level as captured by investigations.

Budget: We use the SEC's budget, i.e. the agency's appropriated spending authority, to measure its resources. We use the Bureau of Labor Statistics' consumer price index to adjust for inflation and thereby derive the variable "SEC Budget."[13]

Enforcement: We measure the SEC's enforcement activity using two broad measures. First, we employ the annual number of injunctions filed by the SEC to derive the variable "Injunc-

[12] We publish this data in our internet appendix. Due to some changes in the SEC's annual reports the earliest observations used as depended variables in our models date from 1946 for some variables and 1948 for other variables. Given that some of the variables used in our models are in first differences and due to the fact that we use two lags in our models we need observations from t-3 to start estimating our models over the period [t, 2010]. We discuss the variables in detail below.

[13] The SEC also generates revenue from fees, securities registrations and tender offers, etc. However, the SEC can only spend the amount agreed upon by the federal government. Since 1982, revenues collected by the SEC have always exceeded the SEC's budget and the SEC has thus positively contributed to the federal budget. E.g. in 2001 the SEC collected $2.06 billion in fees. At the same time the agency's budget was equal to $430 million. About 48% of that sum was generated from securities registrations and 50% came from securities transactions. The remaining 2% were from tender offers, mergers, and other items.

tion." An injunction is a court order requiring that a party performs, or is restrained from performing, a particular act. Looking at the time period relevant for our analysis, 1946-2010, injunctive actions are, as Ochs et al. (2007, p. 186) state, considered the "SEC's principal tool for combating violations of the securities laws."[14] The importance of injunctive actions for the SEC's enforcement activity is reflected by the fact that each of the central laws that govern the SEC gives the agency the power to seek injunctions in a federal court.[15] According to these laws the SEC may seek an injunction where "it shall appear to the Commission that any person is engaged or is about to engage in acts or practices constituting a violation" of securities market rules. The words "is engaged or is about to engage" underline the point that injunctions serve as enforcement tools against ongoing misbehavior or against future misbehavior.[16] Typically, when filing an injunction the SEC will seek some kind of relief such as freezing the defendant's assets or replacing a firm's management by a temporary management appointed by the SEC. A party that fails to comply with an injunction faces criminal or civil penalties and may have to pay damages or accept sanctions. In some cases, breaches of injunctions are considered serious offenses that merit arrest and possible prison sentences. Given a violation of an injunction the SEC may, through the Department of Justice, seek to have the defendant held in contempt of court. In addition, a court issuing injunctions may even order wrongdoers to disgorge profits earned by wrongdoing. Injunctions are easier to obtain than criminal sanctions as the latter require higher standards of proof as well as more stringent procedural and constitutional guarantees. Injunctions nevertheless require some substantial production of evidence (GAO, 1985).[17]

As a second broad measure of enforcement, the SEC may also prosecute and impose sanctions for violations of securities laws by administrative proceedings. To do this the SEC may bring cases in front of one of the Commission's administrative law judges.[18] Administrative sanctions include, among others, cease-and-desist orders, suspensions or revocations of securities licenses, bars against persons from serving as an officer or director of a public company and

[14] Weiss (2006, p. 240) remarks: "Since the founding of the Commission more than seventy years ago, the injunction has served as the SEC's most reliable enforcement tool." Historically, an injunction was not only the Commission's most important form of relief but often its only option for a remedy. From 1934, when the SEC was created, until 1984, when Congress passed the Insider Trading Sanctions Act (ITSA), the primary tool available to the SEC Enforcement Division was an injunction.

[15] Among these laws are the Securities Act of 1933, Securities Exchange Act of 1934 and the Investment Company Act of 1940.

[16] Maletta et al. (2007, p. 287) point out that "it is not necessary that the SEC shows conclusive proof of past violations."

[17] GAO (1985, Appendix, p. 22) reports some statistics for the time period between 1977 and 1983. During this period it took about 300 to 400 days to initiate an injunction. It took about 600 days to initiate an administrative proceeding.

[18] Cases can be appealed to the Commission and to the United States courts of appeal thereafter.

civil money penalties. A cease-and-desist order is an order to halt an activity and not take it up again later or else face legal action. The Remedies Act (Securities Enforcement Remedies and Penny Stock Reform Act of 1990) extended the SEC's powers with respect to administrative proceedings. It is this act that broadened the scope of administrative proceedings from regulated entities (broker-dealers) to other persons and parties and that introduced cease-and-desist orders.[19] Administrative actions can be considered "[t]he SEC's increasingly important enforcement alternative" (Mills et al. 2007). While data about the number of injunctions is relevant for the full sample period, our econometric strategy needs to reflect that the Remedies Act changed the character of administrative proceedings. For our econometric study, that aim demands a long time series. Consequently, beside "Injunction," we create a second variable, called "Total Enforcement," which is based upon the sum of the annual numbers of injunctions and administrative proceedings and that can be used over the whole sample period. The "Total Enforcement" variable also reflects the fact that injunctive actions and administrative proceedings are, to some extent, substitutes. As a robustness check we nevertheless run our VARs and structural break tests even with the number of "Administrative Proceedings."[20]

Investigations: To measure the agency's regulatory activity level, we use the annual number of SEC investigations. The laws that govern the SEC give the agency the right to use investigations if it suspects that rules under the SEC's supervision "have been or are about to be violated" (e.g. Securities Act of 1933). Thus, it is important to note that investigations can be used to police past and ongoing misbehavior. Indeed, in 2011 the agency was still looking for parties responsible for the 2007-2009 financial crises (Reuters, 2011). When conducting investigations, the SEC is able to require witnesses to testify and to produce the records necessary for effective regulation. Violations that can lead to SEC investigations include a wide range of issues such as misrepresenting or omitting important information about securities, manipulating the market prices of securities, stealing customers' funds or securities, violating broker-dealers' responsibility to treat customers fairly or insider trading (SEC, 2009). The SEC's enforcement manual, SEC (2013a), underlines that the SEC will try to conserve its resources by only starting an investigation if the agency believes that there is a significant violation of US securities law or when the practice undermines the liquidity or fairness of U.S. financial markets. Given that the SEC's investigations may be employed broadly, we use investigations (New and Total) to measure the agency's activity level as a kind of robustness

[19] According to Mills et al. (2007) there exist a number of distinctive differences between administrative proceedings and civil actions. Most importantly, the SEC may obtain some monetary fines against wrongdoing only by using civil injunctive actions.

[20] We report these results in the internet appendix.

check. In particular, we check whether the agency increases its enforcement activities as it acquires more resources. As it might take the SEC more than a year to complete an investigation, we consider both the "Total Number of Investigations" and the "Number of New Investigations."

Figure 1 shows resources available to the SEC for the period 1946-2010. Panel 1 presents the inflated SEC budget in (2010 dollars). Panel 2 shows the natural log of the series shown in panel 1. Panel 3 displays the latter after removing the linear and quadratic trend.[21] We refer to the series shown in panel 3 as *SEC Budget*. Figure 1 shows that starting from the mid-1950's when the resources to the SEC decreased, there has been a considerable increase in the SEC's budget over time. Panel 3 shows how the series has fluctuated along its long term trend.

Insert *Figure 1* about here

Figure 2 displays the number of injunctions (panel 1), the number of injunctions in natural logs (panel 2) and the latter in first differences (panel 3). We refer to the series shown in panel 3 as *Injunctions*. Overall, the series displays some significant growth and, looking at Panel 3, some considerable variation. The standard deviation of *Injunctions* is equal to 0.22.

Insert *Figure 2* about here

Figure 3 shows the three plots for total enforcement, which is the sum of the annual number of injunctions and administrative proceedings.[22] Panel 1 presents the raw series; Panel 2 the series in natural logs. Panel 3 presents *Total Enforcement* which is the series shown in panel 2, but now in first differences.[23]

Insert *Figure 3* about here

With respect the number of total investigations and new investigations, both of which we show in our internet appendix[24], we find that the number of new investigations shows an apparent mild negative trend over the 1945 to 1980 period. Thereafter, we see that the number

[21] We investigate the stationarity of our variables below.

[22] We present the figure for the annual number of administrative actions in our internet appendix.

[23] With regard to the total enforcement series we find that there is a significant variation in the number of cases from 1951 to 1953. This fall is due to a considerable variation (we observe, e.g., an increase of 100 per cent.) in the number of administrative proceedings that occurred during this period. This change in the number of administrative actions is reflected in the SEC's annual reports (SEC, 1951, p. 51 and SEC, 1952, p. 61).

[24] The appendix is availiable from the authors.

of new investigations doubled between 1990 and 2010. The increase in the number of total investigations during the period from 1990 until 2010 is even stronger. It nearly quadruples.

3.3. Stationarity of the variables

We now proceed to prepare our variables, all of which we express in natural logs, for our time series analysis. We assess the order of integration of our variables of interest using the ADF-GLS test of Elliott et al. (1996) besides the usual augmented Dickey-Fuller test. Table 1(a) contains these results.

Insert *Table 1(a)* about here

The simple ADF test suggests that only the natural log of the *SEC Budget* (in 2010 $) is stationary around a quadratic and simple deterministic trend, respectively. We remove this trend by regressing the natural log of the inflated budget on a second order polynomial. This gives us, as mentioned above, the *SEC Budget* series. The unit root tests suggest that all other variables have a unit root. As a result, we take the first difference of all other variables to induce stationarity. As introduced in Figures 2 and 3, we use italics to refer to the differenced series *Injunctions* (Figure 2, Panel 3), *Total Enforcement* (Figure 3, Panel 3), *New Investigations* and *Total Investigations.*[25]

To further assess the non-stationarity hypothesis of our variables of interest, we also perform the Bai and Perron (1998) structural break test. In particular, we employ the sequential approach and the suggested parameter values that are recommended by Bai and Perron (1998). Table 1(b) shows these results. Allowing up to five breaks, we find that the natural log of the inflation adjusted SEC Budget variable does not suffer from structural breaks over the period of interest. The fact that the logged SEC Budget series does not suffer from structural breaks reinforces the decision to use the detrended series to obtain the main results in the paper. The sequential approach indicates three breaks for the injunction series, expressed in natural logs, in 1954, 1968, and 1996, respectively. The 95% confidence intervals around those breaks are [1952, 1954], [1968, 1970], and [1994, 1998], respectively. Next, the Bai and Perron structural break test picks one break for the New Investigations (again in natural logs) variable in 2001 with a 95% confidence interval between 2000 and 2003. The structural break tests also find a break in the Total Investigations (in natural logs) series in 2000, with a 95% confidence interval between 1998 and 2010. However, it seems that this break is not reliably estimated

[25] In our internet appendix we even consider *Administrative Proceedings* which is the natural log of the number of administrative proceedings in first differences.

given the large confidence interval. Finally, we find three breaks for the natural logs of the Administrative proceedings series in 1956, 1991, and 2001, respectively. The confidence intervals for the last two breaks again appear relatively wide. Nevertheless, the break in the Administrative Proceedings series in 1991 coincides with the introduction of the Remedies Act that extended the use of administrative proceedings. With respect to the combined series of Injunctions and Administrative Proceedings that we call Total Enforcement (in natural logs) the sequential procedure finds three breaks that are significant at the 5% significance level. The breaks and their 95% confidence intervals are 1958 (with confidence interval [1954, 1963]), 1991 (with confidence interval [1990, 1996]), and 2001 (with confidence interval [2000, 2002]), respectively. The Total Enforcement variable appears to pick up the breaks at dates similar to those corresponding to the Administrative Proceedings variable. Table 1(b) presents the results.

Insert *Table 1(b)* about here

4. Methodology and Empirical Results

4.1. Methodology

The *compliance hypothesis* claims that increases in the SEC's contemporaneous resources will result in an improved level of compliance. As a result, we expect to find that an increase in the SEC budget will lead to a decrease in the number of injunctive actions filed by the SEC. To test our hypothesis we use VAR analysis to capture the interaction between the two series. We estimate the following system of equations

(1) $$y_t = c + \Phi_1 y_{t-1} + \Phi y_{t-2} + \ ... \ + \Phi_p y_{t-p} + \varepsilon_t \ ,$$

where c denotes a (2×1) vector of constants and Φ_j an (n×n) matrix of autoregressive coefficients for j = 1, 2, … p. y_t is a vector of two variables in period t, i.e., *SEC budget* and one of the enforcement variables (*Injunctions* or *Total Enforcement*) . The (2×1) vector ε_t is a vector generalization of white noise. To identify the model, we apply the commonly used Choleski decomposition, where we assume that the contemporaneous innovations in e.g. *Injunctions* do not affect the contemporaneous values of *SEC Budget*. This assumption is consistent with the considerable effort necessary to change an agency's budget, due to its workload, during the fiscal year. In addition, since the correlation between the errors terms is small (e.g., -0.052 in the case of the VAR between the *SEC Budget* and *Injunctions*), changing the ordering will not make a difference.[26] We use standard lag selection criteria to fit the models.[27] Table 2 displays the selection criteria results. In particular, we use a three-step process to fit our models. First, we pre-estimate the number of lags using the Akaike, Bayesian Schwartz, and Hannah-Quinn criterions, respectively. Second, we estimate each VAR using the number of lags indicated by the parsimonious Schwartz criterion. Third, we make sure that there is no serial correlation left in any of the residuals from each equation. If that is not the case we add further lags. Following this approach, we find that the optimal number of lags is two in all bivariate VAR equations.

Insert *Table 2* about here

The estimation of the VARs allows for a number of insights. Granger causality tests analyze whether past values of one series have predictive power for the present value of the same series or another series. Innovation accounting, namely impulse response analysis and variance decomposition, examines the interaction between the variables. The impulse responses, which build upon the moving average representation of (1) can graphically depict the time path of a typical real increase in, e.g., *SEC Budget* and its effect on *Injunctions*. In other words, it shows how, e.g., *Injunctions* respond to a shock in *SEC Budget*. By examining the time path and aggregating the effect we can test our hypothesis. Given that *Injunctions* and *Total Enforcement* serve as a proxy for the level of noncompliance we can see how firms' compliance decisions are impacted by increases in *SEC Budget*. In accordance with the literature, we present the results for a one standard deviation shock to our variables in question. As the impulse responses are obtained using estimating coefficients it is necessary to account for this error. This is done by estimating confidence bands for the impulse response functions, which allows them to serve as a formal test for our theory.[28] We follow Sims and Zha (1999) to form confidence bands at the 68% and 95% levels, respectively. Finally, the variance decomposition quantifies the proportion of the movements of a series resulting from its own shocks and from the shocks attributable to the other series.

In order to investigate our hypothesis, we focus on two groups of bivariate VARs. These VARs are estimated, respectively, for *SEC Budget* and *Injunctions* over the period from 1946 until 2010, and for *SEC Budget* and *Total Enforcement* from 1948 until 2010.[29] In addition,

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[26] This point aligns with Enders (2004, p. 276).

[27] See Enders (2004) for an overview of model selection criteria.

[28] Following Sims and Zha (1999), we obtain confidence bands by Monte Carlo integration.

[29] Our results are unaffected when estimating the VAR for *SEC Budget* and *Injunctions* for 1948-2010.

we also perform the VAR analysis on two different subsamples to investigate whether our results are potentially driven by two particular episodes, one due to the Enron scandal and the other due to the recent financial crisis. Thus, we assess our results on the periods starting in 1946 (1948) and ending in 1999, 2006, and 2010, respectively.

4.2. Assessing the Compliance Hypothesis

Tables (3a) and (3b) report the results of our Granger-causality tests and the innovation accounting exercise for the bivariate VARs between (a) *SEC Budget* and *Injunctions* and (b) *SEC Budget* and *Total Enforcement*.

First, the Granger causality tests show that *SEC Budget* Granger causes *Injunctions.* This result is significant at the 5% level for the full sample and the sample from 1946-2006. It is significant at the 10% level for the shorter sample period. This means that changes in the SEC's budget result in changes in the number of injunctions filed by the SEC. Furthermore, the variance decomposition shows that an important part of the variance in *Injunctions*, namely 11 %, for the full sample, is explained by the variation of the *SEC Budget*. Over the 1946-1999 period it appears that *Injunctions* also Granger cause the *SEC Budget*. Looking carefully at the VAR results, it seems that primarily the 2^{nd} lag of *Injunctions* matters for the current level of the *SEC Budget*. Therefore, it appears that prior to 1999 there is evidence that past misbehavior affected current *SEC Budget*. But with the exception of this subsample (1948-1999) we find that causality is unidirectional: the *SEC Budget* Granger causes the number of *Injunctions* but not the reverse. This means that for these two samples (1946-2006 and 1946-2010) we cannot reject the null hypothesis that poor compliance in $t - i$, $i > 0$, does not impact spending on public enforcement in $t + j$, $j \geq 0$. This suggests that the SEC is unable to signal to the U.S. Congress that it needs more resources to cope with a situation of poor compliance. A possible explanation for why we are unable to reject the null hypothesis – *Injunctions* do not Granger cause *SEC Budget* – might be that following high profile scandals like Enron and Madoff politicians might have been forced to raise the SEC's budget to satisfy the public's desire for an immediate governmental reaction. However, our methodology does not consider the political dimension that certainly came along with these high profile scandals. We only take into account the number of enforcement actions.

Insert *Table 3(a)* about here

The results shown in Table 3(b) are consistent with the results of Table 3(a). *SEC Budget* Granger causes *Total Enforcement* at the 5% level. On average, *SEC Budget* explains about

5% to 6% of the variance of the composite measure. Furthermore, across all time periods the composite variable of injunctions and administrative proceedings, i.e. *Total Enforcement*, does not Granger cause *SEC Budget*. We also run two sets of VARs between *SEC Budget* and *Administrative actions*. The first set of VARs leaves the extreme variation in 1951-53 untreated.[30] The second set uses dummies to treat these years. The results can be found in our internet appendix. The results do not deviate materially from the results using the *Total Enforcement* variable. However, for the time period from 1948-1999 *SEC Budget* only Granger causes *Administrative actions* at conventional levels if we correct for the years 1951-1953.

Insert *Table 3(b)* about here

Figure 3 presents the graphs of the impulse response functions for *SEC Budget* and *Injunctions* estimated over the full sample period. Analyzing the impulse response functions presented in the lower left panel in Figure 3 we can investigate our hypothesis.[31] We find that the impulse responses provide support for the compliance hypothesis. A one standard deviation shock in *SEC Budget* reduces *Injunctions* in periods $t + 1$ through $t + 9$. The graph indicates that the effect on *Injunctions* of a one standard deviation shock to the *SEC Budget* is statistically significant and negative at the 95% level (68% level). Indeed, for $t + 1$ and $t + 3$ ($t + 1$ to $t + 6$) the confidence interval does not include zero. Aggregating the overall impact of the positive shock to the *SEC Budget* we find that the aggregated effect is negative (see Table 3, last row). For example, a one standard deviation increase in the SEC's budget leads to an aggregated decrease in *Injunctions* by 11% (within 5 years; 14% within 10 years). Moreover, Figure 3, upper-left panel, shows that following a typical shock to itself, *SEC Budget* has a tendency to increase for two periods before it declines towards zero by the 10th year. The response of *Injunctions* to its own shock, shown in the lower left panel, indicates an oscillating behavior before it dies out relatively shortly after three periods. Finally, the upper right panel suggests that the *SEC's Budget* reaction to a shock to *Injunctions* is slightly positive and significant at the 1 standard deviation level. This finding aligns with the results of the Granger causality tests in Table 3 (a).

Insert *Figure 3* about here

[30] The number of administrative actions varies greatly in the years 1950 (administrative actions: 47), 1951 (122) and 1952 (43).

[31] We follow Sims and Zha (1999) and use their suggested approach to emphasize confidence bands based on likelihood-based approaches rather than those based on asymptotic justification.

The impulse responses for the *SEC Budget* and *Total Enforcement* for the full sample which are presented in Figure 4 look very similar to the ones from above. Thus, following a one standard deviation shock to the *SEC Budget, Total Enforcement* falls significantly. The shock dissipates within approximately 10 years. The negative effect is significant at the 5% level for $t + 1$ through $t + 8$. Within this time framework and assuming that the shock occurs at its equilibrium, *Total Enforcement* is lower by 9% within 5 years and by 13% within 10 years, respectively. Figure 5 further shows that the response of the *SEC Budget* to a shock to *Total Enforcement* is not statistically significant. The other qualitative findings outlined above are preserved.[32]

Insert *Figure 4* about here

5. Robustness Tests

To assess the robustness of our results we conduct two sets of additional tests. First, we test whether an increase in the SEC's budget leads to increased regulatory activity. To do this we apply the methodology used to test our hypothesis to investigate the interdependence of the *SEC Budget* and (a) *New Investigations*, and (b) *Total Investigations.* The idea behind this approach is that the tests used to investigate our hypothesis presented in the previous section employ quantitative information on the two enforcement measures that can primarily be used against ongoing noncompliance, namely injunctions and administrative proceedings. However, the SEC may also conduct investigations into violations of the agency's rules that may have occurred in the past. It may, e.g., refer the case to the Department of Justice for criminal proceedings. Given that investigations are not restricted to ongoing misbehavior we use investigations as a measure of regulatory activity. Second, we estimate a four variable VAR to acknowledge the fact of co-dependence between investigations (*New* and *Total*), enforcement (*Injunction*s) and the funding available to the Commission (*SEC Budget*).

For our first robustness check, we estimate two groups of separate bivariate VARs between the *SEC Budget* and the number of *New Investigations* and the *SEC Budget* and *Total Investigations,* respectively. As before, we employ three different samples to isolate the potential impact of the Enron scandal and that of the financial crisis, respectively. Table 4 summarizes the results. We find that that there is a richer interaction between *SEC Budget* and *Total Investigations* than between *SEC Budget* and *New Investigations*. The Granger causality tests indi-

[32] In our internet appendix we provide for the impulse response function of SEC Budget and Administrative proceedings. Again, we find that the results are preserved. However, the effect is only significant at the one standard deviation level.

cate that the *SEC Budget* Granger causes *Total Investigations* for all three time periods (significance level between 1% and 5%) and that the *SEC Budget* Granger causes *New Investigations* over the 1948-2010 and 1948-2006 periods (both at the 5% level). However, it appears that *SEC Budget* does not Granger cause the number of *New Investigations* when we look at the shortest subsample, 1948-1999. In addition, we find that neither *New Investigations* nor *Total Investigations* Granger causes the *SEC Budget*. This finding reinforces the previous results obtained from our two enforcement variables (*Injunctions* and *Total Enforcement*). Innovation accounting allows for further insights. The *SEC Budget* has predictive power of up to 11% of the variance of *New Investigations* and up to 24% of the variance of *Total Investigations*. The error variance of the *SEC Budget* explained by *Total Investigations* is, however, much larger (11%) than the portion of the *SEC Budget* explained by *New Investigations* (2%), indicating that increases in the agency's resources allow for longer investigations and that the SEC does allow itself to take on more investigations.

Insert *Table 4* about here

Figure 6 shows the impulse response functions for the *SEC Budget* and *New Investigations* and underscores that the SEC increases its activity level once it faces a higher budget. The impulse responses indicate that the effect of the *SEC Budget* on *New Investigations* is significant and positive at the 68% level for the first two periods. Thereafter, even this impulse response underscores that there is a compliance effect. The decrease in *New Investigations* that can be observed in periods 4 – 7 is significant at the 5% level. This evidence provides support that an increase in the SEC's budget leads to increases in its enforcement activities, at least in the short-run, and to improved compliance thereafter.

Insert *Figure 6* about here

Figure 7 shows the impulse response function for the *SEC Budget* and *Total Investigations*. The impulse response function for *Total Investigations* provides strong support for an increased activity level.[33] An increase in the SEC's budget leads, at first, to an increased number of matters under investigation by the SEC. By the second year this effect has diminished and by the third (68% level) or fifth (95% level) the effect of an increase in *SEC Budget* on *Total Investigations* is negative. From the observation that the number of *New Investigations*

[33] The lower right panel of Figure 5 indicates that the number of *Total Investigations* does not respond significantly to its own shocks. This finding further strengthens the evidence in Table 3, which indicates that the number of *Total Investigations* does not Granger cause itself even though it accounts for a sizeable proportion of its own variance.

does not increase past the second year, one can infer that the SEC uses the increased resources to pursue more cases simultaneously and to conduct its investigations more thoroughly.

Insert *Figure 7* about here

With regard to the second robustness check it is Table 5 that reports the results from the joint four variables VAR. As before, the variable *SEC Budget* is considered to be the most exogenous variable. We experimented with various orderings (e.g., *Injunctions* prior to *New Investigations*) but the results were virtually unchanged. While overall the results do not suffer important changes relative to the individual VARs, some differences arise. Thus, it appears that the *SEC Budget* does not directly have predictive power for forecasting the number of *New Investigations*, but it does so indirectly through the number of *Injunctions*. Just as before, the *SEC Budget* has significant predictive content for *Injunctions* (20.69%) and *Total Investigations* (21.53%). Table 4 also shows how the two measures of investigations and *Injunctions* affect each other. Thus, the number of *Injunctions* has an important predictive content for the number of *New Investigations*, but the latter does not affect the former. In addition, neither the two measures of investigations nor *Injunctions* have predictive content for forecasting the *SEC Budget*. In unreported results, the impulse response functions of the enforcement variables after a one shock to the *SEC Budget* have the same qualitative interpretation as the ones in the single VAR case. Thus, the response of *Injunctions* is highly significant and negative, while the responses to *New* and *Total Investigations*, while positive, appear short-lived. Those findings provide additional support for our hypothesis. The results with respect to *New* and *Total Investigations* underscore that increases in the SEC's budget lead to more regulatory enforcement.

Insert *Table 5* about here

6. Conclusion

The financial crisis has led policy makers to significantly increase the regulation of securities markets. Both the passage of the Dodd–Frank Wall Street Reform and Consumer Protection Act and the doubling of the SEC's budget between 2007 and 2010 illustrate the increased interest in financial market regulation. Looking at the increase in the regulative effort, it could be expected that there exists substantial evidence supporting the claim that regulation, measured both in terms of the number of rules that firms have to follow and the resources available for enforcing regulation, improves financial market outcomes. Such evidence would, in particular, be expected when considering the increase in the SEC's budget in light of the U.S.'s fiscal situation. This is not the case. Surprisingly, there exists only a single study, Jackson and Roe (2009), providing some international evidence that increasing resources spent on public enforcement of securities market rules improves financial market outcomes. Their findings are, however, contrasted by a number of important cross-country studies, e.g. La Porta et al. (2006), which cannot find any benefits associated with the public enforcement of securities market rules. In fact, these studies advocate private rather than public enforcement. Given the increase in the SEC's budget, we investigate whether investors in the U.S. financial market of today can expect to invest in a financial market that is better policed than the one of 2007.

In the present paper we analyze whether and how increases in the resources available for public enforcement of securities markets rules improve firms' compliance. We use SEC data on the agency's funding and its enforcement activities from the 1940s to 2010. VAR analysis allows us to explicitly model and test how causality flows from the enforcement of securities law to the level of misbehavior and vice versa. We find that causality is (with one exception) unidirectional: the SEC's budget Granger causes firms' compliance. We show that firms react to an increase in the SEC's budget by improving their compliance behavior. Impulse response functions show the quantitative relevance for the medium term (compliance increase by 9% up to five years) and in the long run (by 13% up to ten years). To proxy changes in compliance behavior, we analyzed the development of several SEC enforcement measures such as injunctions and administrative proceedings. Our results turn out to be robust to these measures and also with respect to the time periods that we use when estimating our VARs. Moreover, we show that more resources lead, initially, to an increase in the SEC's regulative activity reflected by the increased number of investigations. This implies that the taxpayers' funds are indeed used to intensify the supervision financial market rules and not for empire building.

Our results are important for a number of reasons. First, the U.S. financial market is the world's largest. In 2009, the market capitalization of the U.S. equities market was $15.1 trillion (domestic equities). As a comparison, the UK's (Japan's) stock market, which in 2009 was the world's second largest (third largest) had a market capitalization of $3.4 trillion ($ 3.3 trillion). In terms of market capitalization, the U.S. equity market is larger than all of the European equity markets taken together. The same holds true for all of the equity markets in the Asia-Pacific region. Second, given that the SEC was founded before WWII, it has experienced a number of long-term spending cycles. We thus have some considerable variation in our data. Third, with respect to the regulator of its securities market the U.S. has shown some considerable institutional continuity. Indeed, today, more than 70 years after it was founded, the SEC is still in charge of policing the U.S securities market. This institutional continuity, which is also reflected in the way its annual reports are presented, sets the U.S. apart from, e.g., the UK or Germany where the securities market regulators were merged with their counterparts for banking or insurance regulation. As a result, the SEC enforcement data are particularly well suited for time series analysis. Fourth, the SEC uses a system of explicit enforcement of its rules. This ensures that cases of misbehavior are recorded publically. In addition, our study captures the more direct effects related to the public enforcement of securities market rules. This sets our study apart from the study of Jackson and Roe (2009) which looks at how public enforcement of securities market rules affects financial market development.

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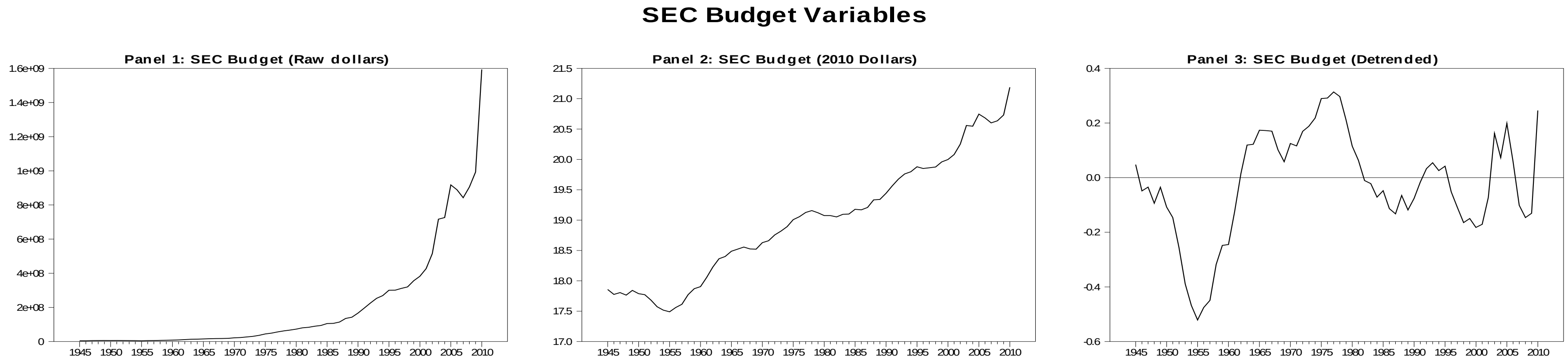
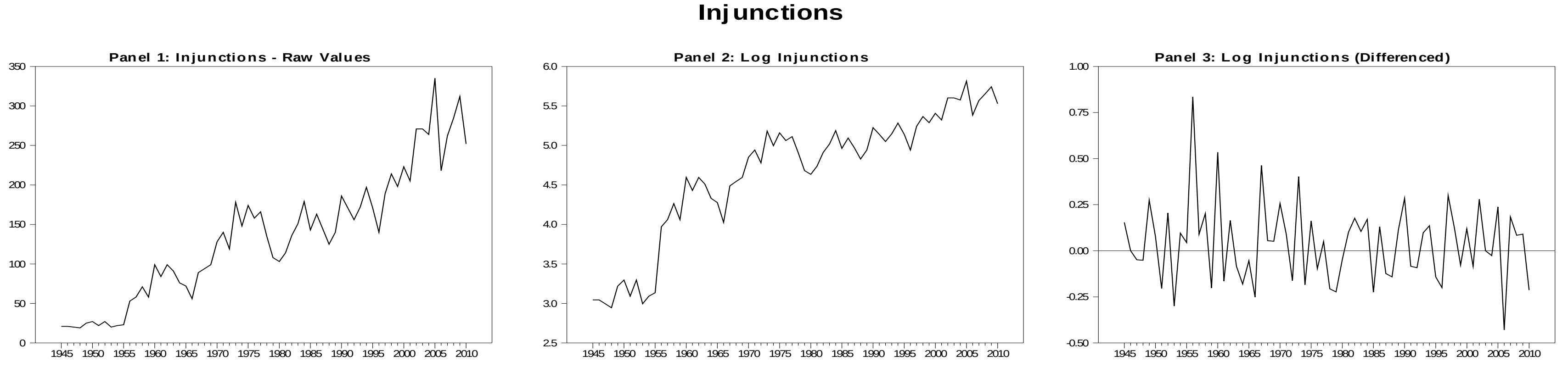
Figure 1: Plots of the SEC Budget



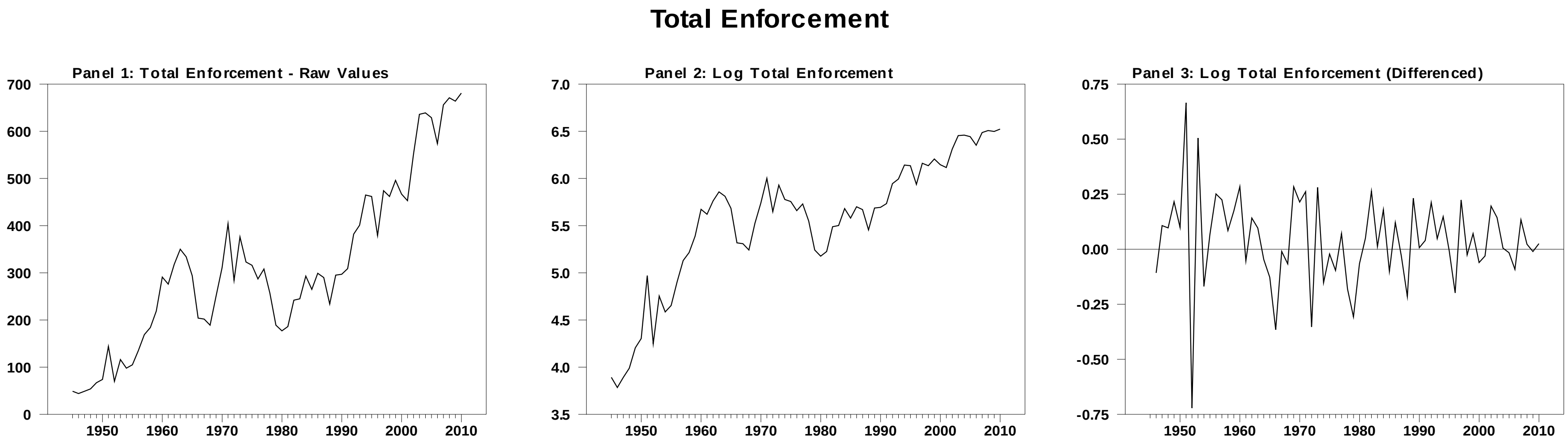
Panel 1 shows the inflation adjusted budget of the SEC (in $ 2010). Panel 2 shows the natural log of the inflation adjusted SEC budget. Panel 3 shows the detrended series (*SEC budget*). We detrend the series by regressing the natural log of the inflation adjusted SEC budget on a second order polynomial. Data is collected from the SEC's annual reports. We provide the data (in nominal terms) in our internet appendix.

Figure 2: Plots of Injunctions



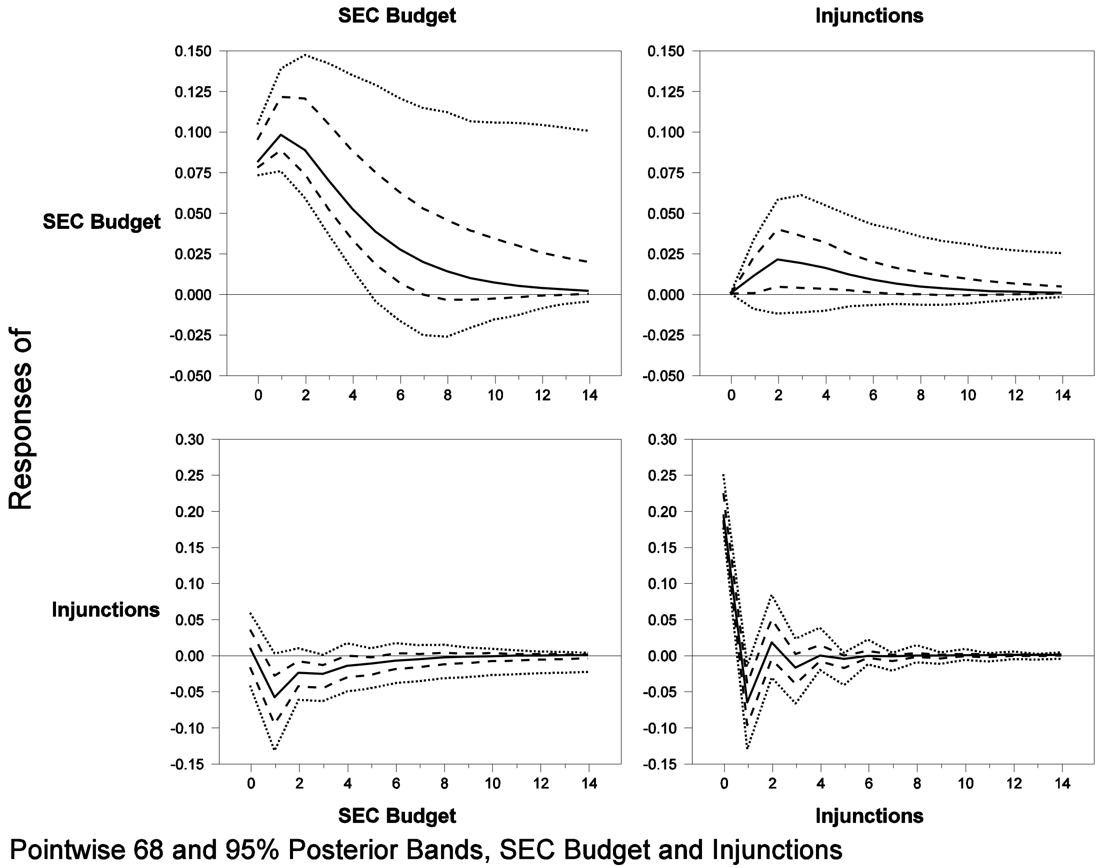
Injunctions are the annual number of injunctions filed by the SEC (Panel 1). Panel 2 shows the natural log of injunctions. Panel 3 shows the logged number of injunctions in first differences. The data shown in panel 1 can be found in our internet appendix. Data is collected from the SEC's annual reports. We refer to the series shown in panel 3 as *Injunctions*.

Figure 3: Plots of Total Enforcement



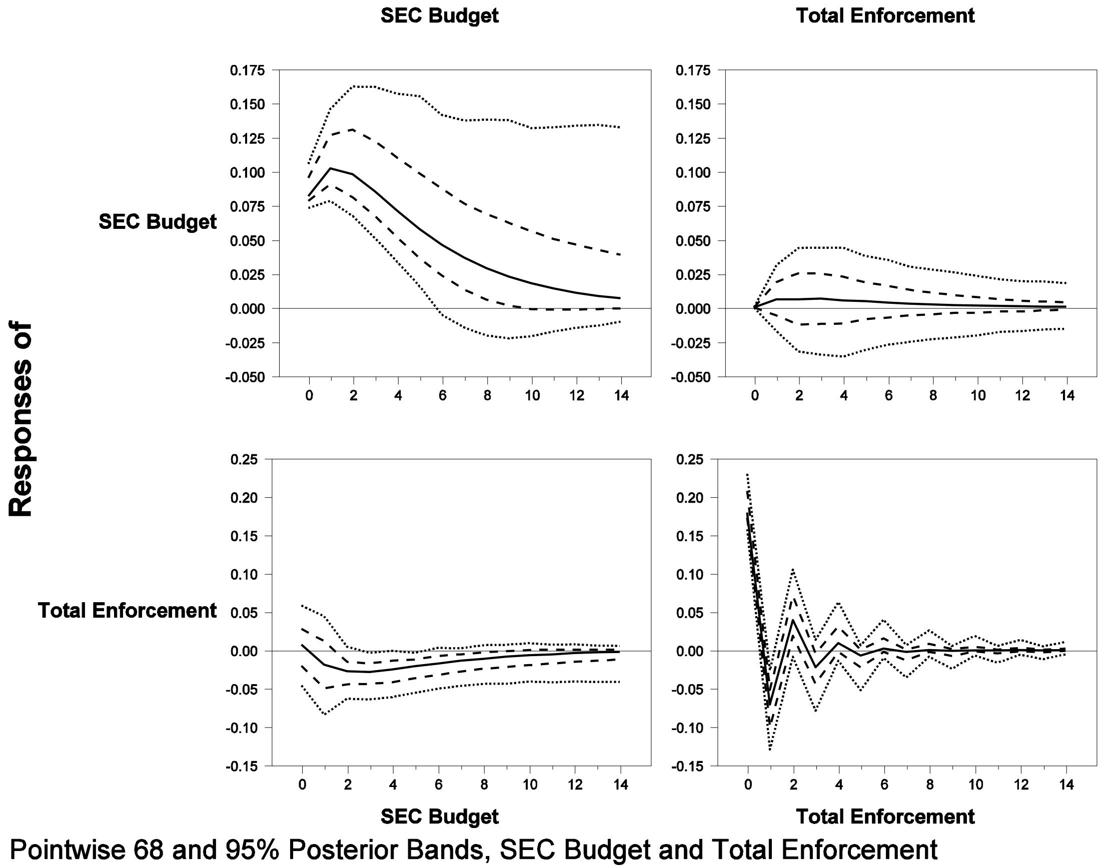
Total Enforcement measures the annual number of the sum of Administrative Proceedings and Injunctions filed by the SEC (Panel 1) in a given year. Panel 2 shows the natural log of Total Enforcement. Panel 3 shows the logged number of Total Enforcement in first differences (panel 3). We refer to the series shown in panel 3 as *Total Enforcement*. The data shown in panel 1 can be calculated by adding the data found in the columns named "Number of injunctive actions" and "Number of Administrative Proceedings" found in the internet appendix. Data is collected from the SEC's annual reports.

Figure 4: Impulse response analysis - *SEC Budget* and *Injunctions*



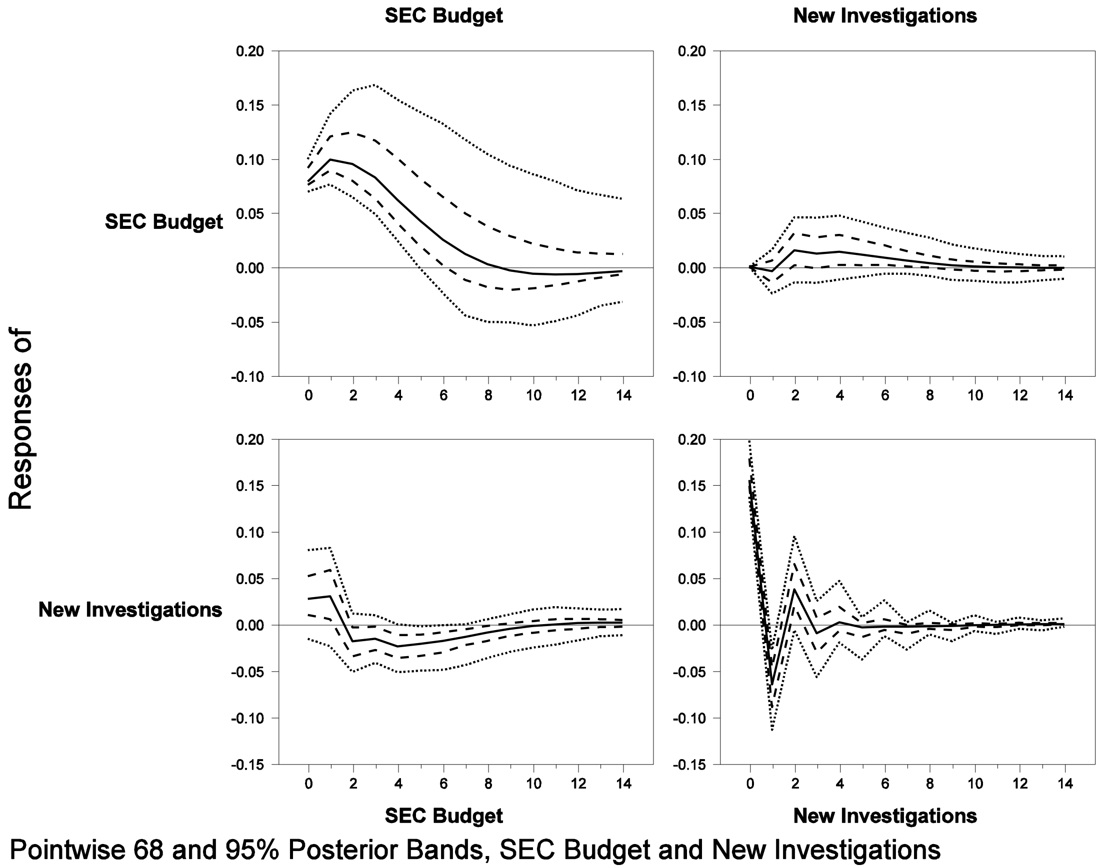
SEC Budget marks the detrended natural log of the inflation adjusted budget of the SEC. We remove the trend by regressing the natural log of the inflation adjusted SEC Budget on a second order polynomial. *Injunctions* mark the first difference of the natural log of the annual number of injunctions filed. Data on *SEC Budget* and *Injunctions* comes from the SEC's annual reports. Estimated over 1946-2010. Data can be found in our internet appendix. The upper-left panel shows the reaction of *SEC Budget* to a one standard deviation shock to *SEC Budget*. The lower-left panel shows the reaction of *Injunctions* to a one standard deviation shock to *SEC Budget*. The upper-right panel shows the reaction of *SEC budget* to a one standard deviation shock to *Injunctions*. The lower-right panel shows the reaction of *Injunctions* to a shock to itself. Dashed lines mark the 68% and 95% posterior bands obtained by Monte Carlo integration.

Figure 5: Impulse response analysis - *SEC Budget* and *Total Enforcement*



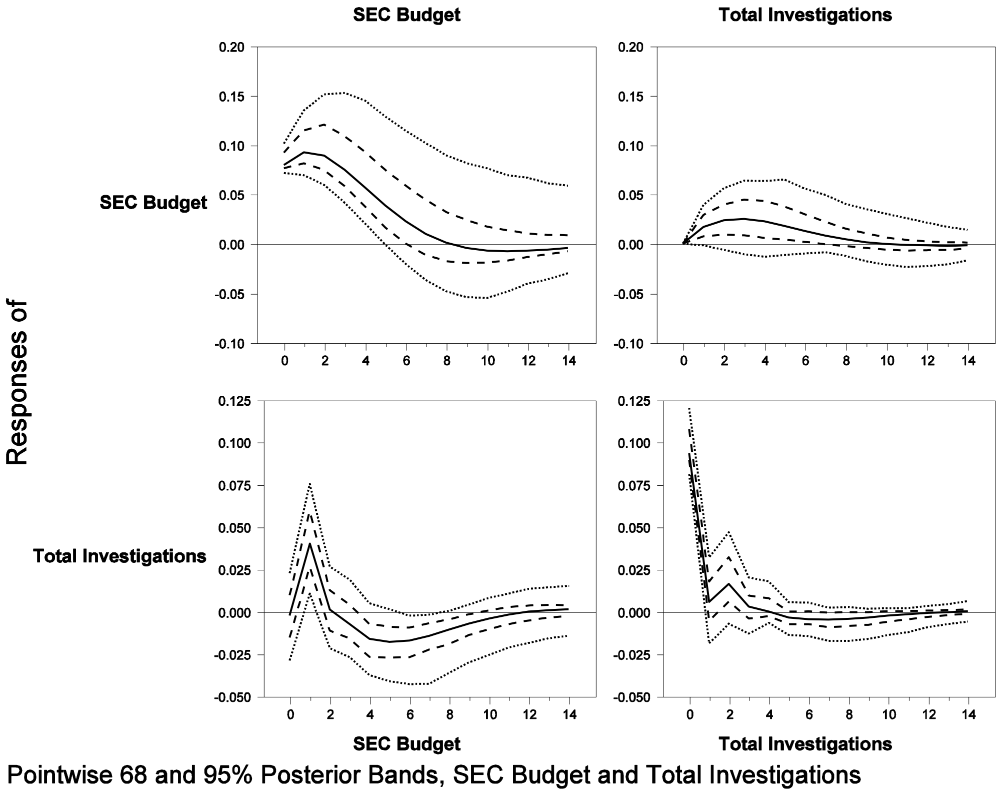
SEC Budget marks the detrended natural log of the inflation adjusted budget of the SEC. We remove the trend by regressing the natural log of the inflation adjusted SEC Budget on a second order polynomial. *Total Enforcement* is the first difference of the real log of the sum of the number of Injunctions and Administrative proceedings. Data on SEC Budget and Total Enforcement come from the SEC's annual reports. Estimated over 1948-2010. Data can be found in our internet appendix. The upper-left panel shows the reaction of *SEC Budget* to a one standard deviation shock to *SEC Budget*. The lower-left panel shows the reaction of *Total Enforcement* to a one standard deviation shock to *SEC Budget*. The upper-right panel shows the reaction of *SEC budget* to a one standard deviation shock to *Total Enforcement*. The lower-right panel shows the reaction of *Total Enforcement* to a shock to itself. Dashed lines mark the 68% and 95% posterior bands obtained by Monte Carlo integration.

Figure 6: Impulse response analysis - *SEC Budget* and *New Investigations*



SEC Budget marks the detrended natural log of the inflation adjusted budget of the SEC. We remove the trend by regressing the natural log of the inflation adjusted SEC Budget on a second order polynomial. *New Investigations* mark the first difference of natural log of the annual number of *New Investigations* filed. Data on *SEC Budget* and *New Investigations* comes from the SEC's annual reports. Estimated over 1948-2010. We publish the data in our internet appendix. The upper-left panel shows the reaction of *SEC Budget* to a one standard deviation shock to *SEC Budget*. The lower-left panel shows the reaction of *New Investigations* to a one standard deviation shock to *SEC Budget*. The upper-right panel shows the reaction of *SEC budget* to a one standard deviation shock to *New Investigations*. The lower-right panel shows the reaction of *New Investigations* to a shock to itself. Dashed lines mark the 68% and 95% posterior bands obtained by Monte Carlo integration.

Figure 7: Impulse response analysis - *SEC Budget* and *Total Investigations*



SEC Budget marks the detrended natural log of the inflation adjusted budget of the SEC. We remove the trend by regressing the natural log of the inflation adjusted SEC Budget on a second order polynomial. *Total Investigations* mark the first difference of real log of the annual number of *Total Investigations* filed. Data on SEC Budget and Total Investigations comes from the SEC's annual reports. Estimated over 1948-2010. The upper-left panel shows the reaction of *SEC Budget* to a one standard deviation shock to itself. The lower-left panel shows the reaction of *Total Investigations* to a one standard deviation shock to *SEC Budget*. The upper-right panel shows the reaction of *SEC budget* to a one standard deviation shock (sd) to *Total Investigations* . The lower-right panel shows the reaction of *Total Investigations* to a shock to itself. Dashed lines mark the 68% and 95% posterior bands obtained by Monte Carlo integration.

Table 1(a): Unit Root and Stationarity Tests

	ADF	ADF – GLS	Number of Lags
ln(SEC Budget, $ 2010)	**-4.20*** **	**-2.92***	**7**
ln(Injunctions, raw)	-2.28	-1.77	1
ln(New Investigations, raw)	-1.32	-1.54	7
ln(Total Investigations, raw)	-1.23	-1.48	7
ln(Admin Proceedings, raw)	-2.47	-1.57	1
ln(Total Enforcement, raw)	-2.48	-1.83	**7**

SEC Budget $ 2010 is the SEC's budget inflated to 2010 dollars using the CPI. The data is collected from the SEC's annual reports. Tests conducted over 1946-2010. Total enforcement marks the sum of injunctions and administrative proceedings. The data can be found in our internet appendix. The values in bold suggest the rejection of the unit root null hypothesis. The number of lags is chosen such that the residuals display white-noise properties using a general-to-specific approach. ADF marks test results from augmented Dickey-Fuller unit root test. ADF-GLS marks the results from the ADF –GLS test of Elliot et al. (1996). *** marks significance at the 1 % level, ** 5 % and * 10 % level. The ADF unit root test employs the following testing equation: $\Delta y_t = \delta y_{t-1} + \sum_{k=1}^{p} \beta_k \Delta y_{t-k} + \varepsilon_t$. In the ADF-GLS test, the series is transformed using a generalized least squares regression before performing the test.

Table 1(b): Structural Break Tests

Test	Sequential Procedure	Break 1	Break 2	Break 3
(1)	(2)	(3)	(4)	(5)
ln(SEC Budget ($ 2010))	0	NA	NA	NA
ln(Injunctions, raw)	3	1954; [1952,1954]	1968; [1964,1970]	1996; [1994,1998]
ln(New Investigations, raw)	1	2001; [2000,2003]	NA	NA
ln(Total Investigations, raw)	1	2000; [1998,2010]	NA	NA
ln(Admin Proceedings, raw)	3	1956; [1946,1957]	1991; [1991,2009]	2001; [1999,2002]
ln(Total Enforcement)	3	1958; [1954,1963]	1991; [1990,1996]	2001; [2000,2002]

SEC Budget ($ 2010) is the SEC's budget inflated to 2010 dollars using the CPI. The data is collected from the SEC's annual reports. Tests conducted over 1946-2010. Total enforcement marks the sum of injunctions and administrative proceedings. The data can be found in our internet appendix. The entries in column 2 show the number of breaks found using the sequential procedure. The entries in columns 3 through 5 show the break dates and the entries in brackets show the 95% confidence intervals, respectively. None of the series shows more than three breaks.

Table 2: Vector Autoregressive (VAR) Lag Selection Criteria

Pre-estimation suggested number of lags	**AIC**	**BIC**	**HQC**	**LR Test**	**Ljung-Box Q stat pval eq 1/eq. p**	**Optimum lag order**
(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
SEC Budget and *Injunctions*	2 (-2.286)	1 (-2.071)	1 (-2.197)	9.422 (0.051)	0.108/0.886	2
SEC Budget and *New Inv*	5 (-2.829)	2 (-2.476)	3 (-2.705)	16.806 (0.002)	0.287/0.512	2
SEC Budget and *Total Inv*	2 (-3.841)	2 (-3.495)	2 (-3.705)	18.524 (0.001)	0.41/0.863	2
SEC Budget and *Admin Proc*	2 (-1.771)	1 (-1.555)	1 (-1.684)	8.619 (0.071)	0.209/0.984	2
SEC Budget and *Total Enforcement*	2 (-2.391)	1 (-2.177)	1 (-2.304)	7.874(0.096)	0.196/0.999	2
SEC Budget and *all other enf*	1 (-4.497)	1 (-3.450)	1 (-4.087)	48.489 (0.003)	0.717/0.597/ 0.969/ 0.863/0.801	2

SEC Budget marks the detrended natural log of the inflation adjusted budget of the SEC. We remove the trend by regressing the natural log of the inflation adjusted SEC Budget on a second order polynomial. The data is collected from the SEC's annual reports. VAR considering *SEC Budget* and *Injunctions* is estimated over 1946-2010. All other VARs are estimates over 1948-2010. Total enforcement marks the sum of injunctions and administrative proceedings. The data can be found in our internet appendix. We pretest the optimal lag selection by employing three information criteria: AIC (Akaike criterion), BIC (Schwartz Bayesian Criterion), and HQC (Hannah-Quinn criterion). Columns 2 through 4 show the optimum number of lags as suggested by each criterion and in parentheses we display the corresponding criterion value. Further, we test whether we need to add lags to make sure that the residuals display white noise properties. For instance, under the null of the LR test we assume that the optimal number of lags is the one suggested by the BIC criterion (p). Under the alternative hypothesis, the optimum number of lags is p+1. Column (5) displays the LR test statistic with the corresponding p-value in parentheses. Finally, we employ the Ljung-Box Q statistic to make sure all serial correlation has been removed from the residuals in each equation. The final optimum number of lags is displayed in column (7). All other variables in italics are the first differences of the natural logs. *All other enf* refers to the following series: *Injunctions, Total Investigations, New Investigations.*

Table 3(a): Granger Causality and Variance Decomposition Results *SEC Budget* and *Injunctions*

	Granger Causality Test						Percent Variance Explained by Explanatory Variable (up to 10 years)					
Explanatory Variable (in rows)	Dependent variable ***SEC Budget***			Dependent variable ***Injunctions***			Dependent variable ***SEC Budget***			Dependent variable ***Injunctions***		
Sample	46-99	46-06	46-10	46-99	46-06	46-10	46-99	46-06	46-10	46-99	46-06	46-10
SEC Budget	Yes***	Yes***	Yes***	Yes*	Yes**	Yes**	88%	95%	96%	6%	12%	11%
Injunctions	Yes*	No	No	Yes*	Yes**	Yes**	12%	5%	4%	94%	88%	89%
Cumulative Impact that a 1 Standard Deviation Shock to *SEC Budget* has on *Injunctions*, 1946-2010												
5 Years -10 (-11%)							**10 Years** -13 (-14 %)					

Injunctions marks the logged number of injunctive actions in first differences. *SEC Budget* marks the detrended natural log of the inflation adjusted budget of the SEC. We remove the trend by regressing the natural log of the inflation adjusted SEC Budget on a second order polynomial. Data is collected from SEC's annual reports and can be found in the internet appendix. Lags were added until all the residual autocorrelation was removed and the null of normality was not rejected for the residuals. VAR was estimated using a Choleski decomposition, where *sec** was considered the most exogenous variable in all specifications. ***, **, and * denote significance at the 1%. 5%, and 10% level, respectively. The cumulative impact marks number of cases (relative effect in parentheses).

Table 3(b): Granger Causality and Variance Decomposition Results *SEC* and *Total enforcement*

	Granger Causality Test						Percent Variance Explained by Explanatory Variable (up to 10 years)					
Explanatory Variable (in rows)	Dependent variable ***SEC Budget***			Dependent variable ***Total Enforcement***			Dependent variable ***SEC Budget***			Dependent variable ***Total Enforcement***		
Sample	48-99	48-06	48-10	48-99	48-06	48-10	48-99	48-06	48-10	48-99	48-06	48-10
SEC Budget	Yes***	Yes***	Yes***	Yes**	Yes**	Yes**	97%	98%	99%	5%	5%	6%
Total Enforcement	No	No	No	Yes**	Yes**	Yes***	3%	2%	1%	95%	95%	94%
Cumulative Impact that a 1 Standard Deviation Shock to *SEC Budget* has on *Injunctions and Adm Proceedings*, 1948-2010												
5 Years -23 (-9%)							**10 Years** -33 (-13 %)					

SEC Budget marks the detrended natural log of the inflation adjusted budget of the SEC. We remove the trend by regressing the natural log of the inflation adjusted SEC Budget on a second order polynomial. *Total Enforcement* marks the logged number of the sum of injunctive actions and administrative proceedings in first differences. *SEC Budget* marks the detrended and logged SEC budget in 2010-dollars. *SEC budget* is the detrended natural log of the inflation adjusted Budget of the SEC. Data is collected from SEC's annual reports and can be found in the internet appendix. Lags were added until all the residual autocorrelation was removed and the null of normality was not rejected for the residuals. VAR was estimated using a Choleski decomposition, where *sec** was considered the most exogenous variable in all specifications. ***, **, and * denote significance at the 1%. 5%, and 10% level, respectively. The cumulative impact marks number of cases (relative effect in parentheses).

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Table 4: Granger Causality and Variance Decomposition Results: Additional Bivariate VARs

(a) Bivariate VAR between *SEC Budget* and *New investigations*

	Granger Causality Test						Percent Variance Explained by explanatory variable (up to 10 years)					
Explanatory Variable (in rows)	Dependent Variable ***SEC Budget***			Dependent Variable ***New Investigations***			Dependent Variable ***SEC Budget***			Dependent Variable ***New Investigations***		
Sample	48-99	48-06	48-10	48-99	48-06	48-10	48-99	48-06	48-10	48-99	48-06	48-10
SEC Budget	Yes***	Yes***	Yes***	No	Yes**	Yes**	99%	98%	98%	6%	10%	11%
New Inv.	No	No	No	Yes***	Yes***	Yes***	1%	2%	2%	94%	90%	89%

Cumulative Impact that a 1 standard deviation shock to *SEC Budget* has on *New Investigations,* 1948-2010

5 years -0.3 (0%) **10 years** -30 (-5%)

b) Bivariate VAR between *SEC Budget* and *Total investigations*

	Granger Causality Test						Percent Variance Explained by explanatory variable (up to 10 years)					
Explanatory Variable (in rows)	Dependent Variable ***SEC Budget***			Dependent Variable ***Total Investigations***			Dependent Variable ***SEC Budget***			Dependent Variable ***Total Investigations***		
Sample	48-99	48-06	48-10	48-99	48-06	48-10	48-99	48-06	48-10	48-99	48-06	48-10
SEC Budget	Yes***	Yes***	Yes***	Yes**	Yes***	Yes***	94%	89%	93%	15%	20%	24%
Total Inv	No	No	No	No	No	No	6%	11%	7%	85%	80%	76%

Cumulative Impact that a 1 Standard Deviation shock to *SEC Budget* has on *Total Investigations, 1948-2010*

5 years 26 (2%) **10 years** -84 (-5%)

New Investigations (***Total Investigations)*** mark the natural log of the number of new investigations (total investigations, administrative proceedings) in first differences. *SEC Budget* marks the detrended natural log of the inflation adjusted budget of the SEC. We remove the trend by regressing the natural log of the inflation adjusted SEC Budget on a second order polynomial. Lags were added until all the residual autocorrelation was removed and the null of normality was not rejected for the residuals. VAR was estimated using a Choleski decomposition, where *SEC Budget* was considered the most exogenous variable in all specifications. Data is collected from SEC's annual reports. Data can be found in internet appendix. The cumulative impact marks number of cases (relative effect in parentheses). ***, **, and * denote significance at the 1%. 5%, and 10% level, respectively.

Table 5: Granger Causality and Variance Decomposition Results – four variable VAR

	Granger Causality Test (Variance Decomposition)	Granger Causality Test (Variance Decomposition)	Granger Causality Test (Variance Decomposition)	Granger Causality Test (Variance Decomposition)
Explanatory Variable (in rows)	Dependent Variable ***SEC Budget***	Dependent Variable **New Investigations**	Dependent Variable ***Injunctions***	Dependent Variable **Total Investigations**
SEC Budget	Yes*** (90.4%)	No (9.2%)	Yes** (20.69%)	Yes* (21.1%)
New Investigations	No (1.36%)	Yes*** (75.32%)	No (14.75%)	No (5%)
Injunctions	No (6.71%)	Yes* (11.52%)	Yes** (63.75%)	No (9.2%)
Total Investigations	No (1.53%)	No (4.05%)	No (0.81%)	No (64.52%)

The VAR specifications employed the logged *Total Investigations*, *Injunctions* and *New Investigations* in first differences. *SEC Budget* marks the detrended natural log of the inflation adjusted budget of the SEC. We remove the trend by regressing the natural log of the inflation adjusted SEC Budget on a second order polynomial. Lags were added until all the residual autocorrelation was removed and the null of normality was not rejected for the residuals. Results were obtained using a Choleski decomposition, where *SEC Budget* was considered the most exogenous variable in all specifications. VAR is estimated over 1948-2010. ***, **, and * denote significance at the 1%. 5%, and 10% level, respectively.