

# Anticipated versus Realized Benefits

Can Event Studies Be Used To Predict the Impact of New Regulations?

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## Abstract

Economists often use event study methodology to evaluate the impact of new regulations on firms before there is enough data to empirically estimate the effects. This research investigates the degree to which event study methodology can provide useful information in this regard by studying how accurately markets predict the actual benefits associated with a new law. Utilizing a unique change in U.S. trade law, I compare the benefits predicted by event study methodology with the actual benefits accruing to individual firms. The results indicate that estimates from event study methodology are poor predictors of the true effect of new policies.

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# 1 Introduction

Economists are often asked to evaluate the impact of a new set of regulations on particular industries well before there is enough data to empirically estimate the effects. One method that economists have used to tackle this challenge in the past is the event study, which assumes that in an efficient market security prices fully reflect all available information and adjust immediately to new information.<sup>1</sup> Therefore, the degree to which a new policy will impact a given firm should be reflected in the change in the firm's security price at the time the new policy was first anticipated.

Although researchers using event study methodology typically acknowledge the difficulties they face in estimating an event study, few consider the degree to which markets can correctly anticipate the impact of a new policy on a firm. I study in this research whether event studies can provide useful information on the effect of a particular policy change on a firm given that investors typically have extremely limited ability to anticipate the true impact of the policy. In other words, while event studies may be able to reveal how investors *think* a policy will impact a firm, these expectations may be poor predictors of the true impact.

A change in U.S. antidumping law enacted in 2000 known as the Byrd Amendment provides a unique opportunity to study the degree to which markets are able to correctly anticipate the financial rewards from new policies.<sup>2</sup> Prior to the Byrd Amendment, the tariff revenue collected due to successful antidumping petitions was deposited in the U.S. treasury. The Byrd Amendment, however, requires the U.S. Customs Service to distribute these antidumping duties to firms that supported the original petition associated with the duties. Passage of the Byrd Amendment came as a complete surprise to most firms and analysts and provided new information on the future revenue stream of beneficiary firms not previously incorporated in security prices; thus, event study methodology should be able to estimate the degree to which investors expected firms to benefit from the new law. Because the U.S. Customs Service is required to report each year the amount of money distributed under the Byrd Amendment to individual firms, this is one of the few laws in which the exact

monetary benefits realized by each firm due to the law is public information.<sup>3</sup> Thus, the law provides the perfect opportunity to study the extent to which markets can accurately estimate the effect of new regulations.

The results suggest that investor's expectations regarding the impact of the Byrd Amendment on U.S. firms were inaccurate, although perhaps not to as great a degree as one might expect. For example, investor's anticipated a significant, positive impact of the Byrd Amendment on only five of the 41 public companies that collected rewards under the law in 2001. However, this result is not surprising given that many of these firms received only modest monetary benefits under the new law, particularly when compared to the firm's total annual revenue. Moreover, regression results indicate that passage of the law had a greater impact on the returns of firms in which Byrd receipts account for a large share of total revenue, as one would expect if investors could accurately predict the impact of the law. However, the results also indicate that investors significantly overestimated the impact of the Byrd Amendment on a subset of firms.

The rest of the paper proceeds as follows. In the next section I present a brief review of the legislative history of the Byrd Amendment and the monetary rewards that firm's have been awarded under the law. Section [3] discusses event studies in general and the multivariate regression methodology used in this particular event study. Section [4] analyzes the results from the event study, and specifically investigates whether those firms that investors expected to realize gains under the Byrd Amendment benefited as much as anticipated. Finally, Section [5] concludes.

## **2 The Byrd Amendment**

As noted above, the goal of this research is to compare the benefits investors anticipated firms getting from the Byrd Amendment with the increase in profits these firms actually realized under the new law. To accomplish this task, I utilize event study methodology which exploits the fact that if market participants are rational, the anticipated benefits of

particular policy change will be reflected immediately in the security prices of the beneficiary firms. In other words, the anticipated impact of the law can be measured by examining security prices surrounding the event. If market participants have previously anticipated a policy change, then its impact will already be embedded in the security price and event study methodology will be ineffective. However, I argue in this section that passage of the Byrd Amendment was completely unanticipated, thus the expected increase in profits should be reflected in the change in security prices in the days following passage of the law.<sup>4</sup>

The “Continued Dumping and Subsidy Offset Act of 1999,” was introduced in both the House and Senate in March of 1999, and then referred to committees with oversight over international trade matters where it languished for nearly two years. Later in the Fall of 2000, Congress worked furiously to complete the agriculture appropriations bill prior to the end of the fiscal year. When conferees met on October 3 to resolve differences between the House and Senate versions of this appropriations bill, Senator Robert Byrd proposed to include the “Continued Dumping and Subsidy Offset Act.” The new language, now known as the Byrd Amendment, was incorporated into the agricultural appropriations bill by a vote of 7 to 6. Traditionally, conference reports are passed with minimal debate and no amendments, and the 2001 agriculture appropriations bill with the Byrd Amendment was no exception. Following its passage, the Byrd Amendment was strongly criticized by U.S. importers and exporters, as well as its leading trading partners. The World Trade Organization ruled in September 2002 that the law violates the international agreement on subsidies and directed the United States to abolish the law. There are currently multiple bills pending before Congress that would repeal the Byrd Amendment, although it is unclear when action on these bills will be taken.

Most analysts knew from the beginning that the long-term viability of the Byrd Amendment was questionable given U.S. obligations under the World Trade Organization. However, given the length of the WTO’s dispute settlement process it was equally clear that some firm’s would reap significant rewards from the bill’s passage, at least temporarily. Moreover, the method in which Byrd Amendment money is distributed is extremely transparent. Any firm

that supported the initial antidumping petition can submit a list of “qualified expenditures” to the U.S. Customs service.<sup>5</sup> Antidumping duty revenue is then distributed to the eligible firms proportionately to each firm’s qualified expenditures. Therefore, investors could theoretically estimate the amount of antidumping duty revenue that would be collected in the first year of the Byrd Amendment’s existence as well as each firm’s approximate share of this revenue.

In 2001, the first year of the Byrd Amendment’s existence, Customs distributed \$206.9 million to 136 firms. The value of individual awards ranged from hundreds of dollars to more than \$60 million. Of the total value distributed, 41 public companies collected \$94.8 million. As can be seen in Table [1], the leading public beneficiaries include the Timkem Company, Lancaster Colony Corporation, and Tomkins PLC.

### 3 Empirical Methods

Event studies allow one to determine the impact of an unexpected economic or policy change on the value of a subset of firms by measuring the abnormal returns that accrue to those firms in the financial market place during the “event window.” In this research, I assume that the event window includes  $T_e$  days surrounding October 3, 2000, the day the Byrd Amendment was included in the Agriculture Appropriation bill, thus ensuring its passage.

Event studies often estimate the abnormal return associated with a particular event using the residuals from a market model, which assumes that the return to firm  $i$  is linearly related to the return of a market portfolio. However, the basic market model assumes that these residuals are independent and identically distributed, which is unlikely to be the case if the event occurs during the same calendar time period for all firms in the sample. Instead, I utilize the multivariate regression model (MVRM) to calculate the abnormal return to firm  $i$ .<sup>6</sup> In this model, the return for each security  $i$  in period  $t$  is defined as:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \sum_{d=1}^{T_e} D_{itd} \gamma_{id} + \epsilon_{it}$$

where  $R_{it}$  and  $R_{mt}$  are the period  $t$  returns on security  $i$  and the market portfolio,  $\beta_i$  is the systematic risk of security  $i$ , and  $\epsilon_{it}$  is a zero-mean error with a constant variance of  $\sigma_i^2$ . The variable  $D_{itd}$  is a dummy variable that equals 1 during the  $d^{th}$  day of the event window and zero otherwise. The parameter  $\gamma_{id}$  thus captures the abnormal return accruing to firm  $i$  on day  $d$  of the event window. Given the parameter estimates, I estimate the cumulative abnormal return to firm  $i$  during the event window as the sum over the event window, or:

$$CAR_i = \sum_{d=1}^{T_e} \gamma_{id}.$$

Based on these assumptions, the covariance matrix of the abnormal returns is defined as:

$$\sigma_i^2 [I + X_{ie}(X_i'X_i)^{-1}X_{ie}']$$

where  $I$  is a  $T_e$  by  $T_e$  identity matrix,  $X_i$  and  $X_{ie}$  are the matrices of the explanatory variables for firm  $i$  over the estimation period and the event period, respectively. Specifically, both matrices include a column vector of ones for the constant term, the return to the market portfolio  $R_m$ , and the dummy variables for the event window. Using the delta method, one can compute the variance of the cumulative abnormal returns as the sum of the variances of the individual day abnormal return plus twice the sum of their covariances or

$$Var(CAR_i) = \sigma_i^2 \tau' [I + X_{ie}(X_i'X_i)^{-1}X_{ie}'] \tau$$

where  $\tau$  is a  $T_e$  by 1 unit vector.

The parameters for each of the  $N$  firms,  $(\alpha_i, \beta_i, \gamma_{id})$ , are estimated jointly using generalized least squares (GLS). Although the estimates and standard errors for the individual firm's cumulative abnormal returns will be identical to the results obtained using ordinary least squares, the GLS estimates will allow for testing of two joint hypotheses. I first test whether the average abnormal return during the event period surrounding passage of the Byrd Amendment is zero, or  $\frac{1}{N} \sum_i CAR_i = 0$ . Next I test whether the abnormal returns during the event period are equal to zero for all firms,  $CAR_i = 0 \forall i$ . Both hypotheses can be tested using the test statistic explained in Binder (1985),

$$\frac{NT - NK}{Q} * \frac{(c - C\hat{\beta})'(C[X'(\Sigma^{-1} \otimes I)X]^{-1}C')^{-1}(c - C'\hat{\beta})}{(R - X\hat{\beta})'(\Sigma^{-1} \otimes I)(R - X'\hat{\beta})}.$$

In this equation,  $NT$  is the number of firms multiplied by the  $T$  days in the estimation period,  $NK$  is the number of firms multiplied by the  $K$  explanatory variables,  $I$  is a  $T$  by  $T$  identity matrix,  $\Sigma$  is an  $N$  by  $N$  covariance matrix,  $\hat{\beta}$  is the  $NK$  by 1 vector of parameter estimates,  $X$  is a  $NT$  by  $NK$  block diagonal matrix of explanatory variables, and  $R$  is the  $NK$  by 1 vector of returns. The term  $Q$  is the number of restrictions tested in the system; there is one restriction in the first hypothesis and  $N$  restrictions in the second hypothesis. To complete construction of the test statistic,  $c$  is a vector of zeros of length  $Q$ , and  $C$  is a matrix with  $Q$  rows that aggregate the abnormal returns. The test statistic has an  $F$  distribution with  $Q$  and  $NT - NK$  degrees of freedom if the null hypothesis is true. Note that both hypotheses imply that the passage of the Byrd Amendment had no influence on the returns to the firms in the data sample.

This research utilizes firm-level stock return data from the Center for Research on Security Prices (CRSP) database for those public firms that received Byrd Amendment revenue in 2001, or 41 firms. The value weighted index of all securities included in the CRSP database is used as a proxy for returns on the market portfolio. The estimation period includes 226 market days prior to the inclusion of the Byrd Amendment in the Agricultural Appropriations Bill and the three market days including and following the day of the amendment's inclusion in the bill. I define the event window as two market days prior to inclusion of the Byrd Amendment in the appropriations bill through two days after the inclusion.

## 4 Results

Estimates of the cumulative abnormal returns for each firm in the data sample are presented in Table [1]. Estimates suggest that only six of the 41 public firms in the data sample had significant, positive abnormal returns, which ranged from 12.5 percent to 21.3 percent. The abnormal returns for all other firms proved insignificant. Interestingly, those firms with significant abnormal returns do not appear to be correlated with those firms that received the most money under the Byrd Amendment in 2001. For example, of the leading five bene-

ficiaries in the data sample only one, the American Italian Pasta Company, had significant, positive returns. Moreover, the simple correlation coefficient between the cumulative abnormal returns and the total 2001 Byrd disbursements is -0.006, suggesting that abnormal returns for beneficiaries decreased with the amount of money collected by the firm under the new law.

Based on these results, it is unsurprising that I fail to reject the null hypothesis that the average cumulative abnormal return for the firms in the sample is equal to zero. However, I do reject the null hypothesis that all firms in the sample have zero abnormal returns, suggesting that investors believed that at least a subset of firms would reap significant gains from the Byrd Amendment.<sup>7</sup>

Further analysis of the results suggest that investors may have overestimated the impact of the Byrd Amendment on those firms with significant, positive abnormal returns. The firms with significant cumulative abnormal returns are listed in Table [2]. The estimated increases in returns far outweigh the approximate increases in revenue that occurred under the Byrd Amendment. For example, estimates suggest that investors expected the value of American Italian Pasta Company to increase 13.3 percent while the actual increase in revenue in 2001 was 1.8 percent. The market returns of other firms exceeded the actual returns by even greater margins. The high returns could be a reflection of a future stream of revenues investor's expected firms to earn under the Byrd Amendment either due to future antidumping petitions or greater revenue collection.

To further analyze the determinants of cumulative abnormal returns, I regress the abnormal returns on the ratio of 2001 Byrd Revenue to the firm's net sales in 2000, as well as net sales and a dummy variable for steel producers. Because the steel industry has accounted for such a large share of antidumping petitions over the past 20 years, one might expect investor's to anticipate that the Byrd Amendment would have a larger impact on steel-producing firms than others. The results from the regression are presented in Table [3].

The results indicate that a one percentage point increase in the proportion of Byrd Revenue in net sales results in a 3.8 percentage point anticipated increase in the value of

the firm. Although it appears that investor's correctly anticipate which firms would benefit more from the Byrd Amendment than others, they severely overestimated the total impact of the law. Once again, this could represent investor's anticipation that firms would earn a higher stream of revenue in future years under the Byrd Amendment. However, given the uncertainty surrounding the future viability of the Byrd Amendment I would expect the impact on the firm to be much less than the 2001 Byrd receipts once investor's take into account the probability that the law would be overturned in future years. The steel dummy variable proved insignificant in the regression, but abnormal returns increased with the total size of the firm.<sup>8</sup>

## 5 Conclusion

Although economists often attempt to analyze the impact of new laws on firms using event study methodology, it is questionable that investors have enough knowledge to estimate the effects of these laws and even ex post their impact is often quite uncertain. This study suggests that while investors correctly anticipated that most firms would gain little from passage of the Byrd Amendment they significantly overestimated the returns accruing to some firms due to the law and failed to recognize that other firms would reap rewards. As a result, while event studies may be able to tell economists something about how investors think a policy will impact a firm, the results are poor predictors of the true impact of new policies.

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Table 1  
Public Companies Benefitting from the Byrd Amendment, 2001

Firm	Byrd Disbursements (thousands)	Cumulative Abnormal Return	t-statistic
The Timken Company	30,977.4	-0.0079	-0.1584
Lancaster Colony Corp.	15,600.0	0.0188	0.2661
Tomkins PLC	8,361.3	-0.0039	-0.0599
American Italian Pasta Company	7,659.2	0.1334*	2.1742
Micron Technology	5,194.3	-0.1672	-1.6399
Bethlehem Steel	4,265.0	-0.0829	-1.0952
AK Steel Holding Corp.	3,716.4	0.0239	0.2970
E.I. du Pont de Nemours and Co.	3,019.0	0.1235*	2.1355
Carpenter Technology Corp.	2,787.3	0.0094	0.1680
Olin Corp.	2,621.8	0.0307	0.4246
United States Steel Corp.	2,312.8	0.0426	0.7774
Allegheny Technologies Inc.	2,070.9	0.0192	0.3319
LTV Corp.	865.2	0.2134*	2.3897
Tyco International Ltd.	860.7	0.0457	0.5657
Archer Daniels Midland Co.	732.4	0.1103*	2.0938
Dana Corp.	607.1	0.0392	0.7053
Illinois Tool Works Inc.	441.3	0.0796	1.5108
BorgWarner Inc.	433.9	0.1251*	2.9335
3M Co.	413.7	0.0305	0.6288
FMC Corp.	405.2	0.0075	0.1578
National Steel Corp.	280.8	0.0665	0.8453
Dixon Ticonderoga Co.	252.7	-0.0994	-0.9692

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Table1–Continued

Firm	Byrd Disbursements	Cumulative	
	(thousands)	Abnormal Return	t-statistic
Trinity Industries Inc.	190.4	0.0427	0.9409
Synalloy Corp.	130.3	0.0249	0.3096
Federal-Mogul Corp.	107.5	-0.1136	-1.3850
Fortune Brands Inc.	76.4	-0.0022	-0.0423
Newell Rubbermaid Inc.	71.0	0.0259	0.3886
Lone Star Technologies Inc.	65.2	-0.0283	-0.3624
IPSCO	51.9	0.0065	0.1122
Shaw Group Inc.	42.3	-0.0858	-1.0616
Northwest Pipe Co.	24.3	-0.0033	-0.0516
Wellman Inc.	13.4	0.0680	1.0641
Alexander and Baldwin Inc.	8.1	-0.0533	-0.9926
Texas Industries Inc.	1.9	0.1381*	2.8407
Elkem ASA	1.3	-0.0120	-0.1086
Nucor Corp.	1.0	0.0428	0.7755
Birmingham Steel Corp.	1.0	-0.0528	-0.4051
Commerical Metals Co.	0.7	-0.0162	-0.3818
Planar Systems Inc.	0.3	-0.1167	-0.9317
Maverick Tube Inc.	0.2	-0.0399	-0.4123
NS Group Inc.	0.1	-0.1292	-1.3408

\* indicates those CARS significant at the 5 percent significance level.

Table 2  
Firms with Significant Abnormal Returns

Firm	Cumulative Abnormal Return	2001 Byrd Receipts as Share of 2000 Net Sales (percent)
American Italian Pasta Company	0.1334	3.078
Archer Daniels Midland Co.	0.1103	0.006
BorgWarner Inc.	0.1251	0.016
E.I. du Pont de Nemours and Co.	0.1235	0.010
LTV Corp.	0.2134	0.018
Texas Industries Inc.	0.1381	0.000

Table 3  
Determinants of the Cumulative Abnormal Return

Variable	Parameter Estimate	t-statistic
Byrd Share of Net Sales	3.8328**	1.7712
Steel	0.0195	0.6990
2000 Net Sales (Billions)	0.0041*	2.3440

Parameter estimate from a constant not reported. \*,\*\* indicate those parameters significant at the 5 and 10 percent significance level, respectively.

## Endnotes

<sup>1</sup>For examples of how this method has been used to estimate the impact of new trade agreements see Thompson (1993) and Mutti, Sampson and Yeung (2000). Similarly, Hartigan, Kamma, and Perry (1989) use event study methodology to estimate the impact of the imposition of antidumping duties on firms.

<sup>2</sup>U.S. antidumping law allows firms to request that the U.S. government impose duties on products from specific foreign countries because the unfairly low priced products are causing injury to domestic firms.

<sup>3</sup>The benefits accruing to the firm from the antidumping protection itself was not changed by the law.

<sup>4</sup>See Liebman and Reynolds (2005) for a more complete description of the passage of the Byrd Amendment.

<sup>5</sup>Qualified expenditures include money spent on manufacturing facilities, raw materials, personnel training, equipment, and research and development.

<sup>6</sup>See Binder (1985a), Binder (1985b) and Thompson (1993) for further discussion of the MVRM.

<sup>7</sup>Specifically, the test statistic for the null hypothesis that the average cumulative abnormal return is zero is 0.30, while the test statistic for the null hypothesis that cumulative abnormal return for all firms is zero is 1.59.

<sup>8</sup>Because the distribution of Byrd revenue tends to be proportional to firm size, the latter result may be due to the fact that investors overestimated the total amount of Byrd revenue that would be distributed in 2001.