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An Evaluation of Mergers in the U.S. Petroleum Industry

Matthew D. Capozzi
Oberlin College

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This paper analyzes the effects of mergers and acquisitions on the profitability of both participating firms and competitor firms in the U.S. petroleum industry. It also identifies distinct economic conditions and firm specific characteristics that are correlated with the performance of the firm and the merger. The span of the study reaches from 1995-2011. It incorporates four unique, yet characteristic mergers of the domestic petroleum industry. The paper finds evidence that mergers and acquisitions affect the profitability of participating firms positively and competitor firms negatively. This study also provides insight into how uniform mergers and acquisitions in this industry may truly be.

D. Matthew Capozzi
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Introduction

The U.S. Petroleum industry has experienced extensive restructuring throughout its history. The frequency of mergers and acquisitions within U.S. oil corporations creates a prime opportunity for examining the repercussions of these industry reorganizations. This paper utilizes four transactions to assess how restructuring affects both the profits of firms partaking in the transaction and the profits of rival firms. Furthermore, it investigates the specific economic and firm characteristics that may be correlated with the performances of the firms and their mergers and acquisitions. Through examination, I hope to isolate those factors linked with successful mergers as well as those that may be associated with failure. "Obtaining an understanding of how these mergers have affected the performance of the industry leaves us better placed to formulate appropriate policy in anticipation of future mergers" (Hyde, 2002). Thus, by determining the driving forces of previous merger performance and their overall industry effect, this research may offer insights for analyzing future petroleum mergers.

Over the past 17 years, petroleum firms have consistently traded assets, acquired companies, and merged with one another in order to respond to technological changes, globalization, shifts in competition, alterations in financial industry dynamics, and repeated oil price shocks (Weston, 2002). Modern merger and acquisition theory holds that motivations for such transactions are in one sense, all of the same nature. That is, one group must believe that the target company can, in some way, be worth more than it currently is or than "the company's owners believe [it to be]. No merger will take place unless this condition is fulfilled" (Waldman and Jensen, 105). Further, Waldman and Jensen also postulate that the unique, intricate details behind the public scene of mergers

allow theory to yield seven major reasons for their occurrence. These include, obtaining market power, acquiring efficiency gains, existing financial motives, reducing risk, building "empires", failing firms, and ageing owners. Regardless of the specific reason, empirical evidence suggests that "around the time of a merger [completion] the acquired firm experiences a significant increase in [expected profitability]" (Waldman and Jensen, 111). This is often accompanied by a zero change for acquiring firms, as they typically do not experience any significant, immediate profit at the time of the merger. Still, this sums to a positive net change. My analysis hopes to determine whether such theory holds for the U.S. petroleum industry. Isolating the effects of oil mergers and acquisitions will hopefully allow me to evaluate the common, aggregate perspectives surrounding them.

The paper uses annual data from 1995 to 2011. I have selected ten firms to include in the examination throughout this seventeen-year period, focusing only on mergers and acquisitions that exceeded the nominal price of 5 billion dollars. Given that acquisitions occur so regularly within this industry, the price stipulation allows for the incorporation of firms that were not involved in a merger over this period, by these standards. Such firms will act as a control group in the regression and will allow me to measure them against the firms that restructured, thereby granting better ability to isolate the effects of mergers and acquisitions. Of the ten firms, two of them fall under this category of not having participated in a merger from 1995 to 2011: Sunoco Inc. and Tesoro Corp. The other eight firms comprise the list of those that did participate in a merger or acquisition. These firms include, Exxon Corp. and Mobil Corp. (ExxonMobil Corporation, 1999), Phillips Petroleum Co. and Conoco Inc. (ConocoPhillips, 2002), Chevron Corp. and Unocal Corp. (Chevron Corporation, 2005), and Valero Energy Corp. and Premcor Inc.

(Valero Energy Corporation, 2005).[1] In each case, the former was the primary or acquiring firm of the transaction, while the latter was the secondary or target firm.

This paper focuses on large corporations in order to abstract from a wider range of specific firm-related factors that influence the restructuring of smaller petroleum companies. Unlike the transactions within my analysis, these smaller mergers and acquisitions may lack the ability to stimulate a powerful effect on other firms or the industry. Thus, this paper investigates the mergers and acquisitions of larger, more influential corporations whose success is usually determined by common factors of production efficiency, coordination, and marketing.

Previewing my econometric results, I find significant evidence that participating in a merger does indeed improve the profitability of the new firm. The results show that while the variable indicating the initial occurrence of a merger may be negative, the majority of the merger effect is likely captured by the lagged merger variable. This variable measures the effect of the merger or acquisition around the time its conglomeration would be completed, in the year following the transaction. This subsequent year appears to have a statistically significant, large, and positive effect on the profitability of the participating firm. The gains seem to outweigh other negative effects and thereby, indicate mergers increase profitability. I believe the overall robustness of my results is enough to conclude that these mergers have a positive effect on the profitability of participating firms.

My principal specification also yielded further evidence of how mergers and acquisitions affect the profitability of rival firms. My results suggest that when the largest

[1] See Appendix A for a timeline of the 17-year period and a summary of each merger within the sample.

petroleum corporations partook in mergers, the restructuring had a very negative effect on the profitability of competing firms, and possibly the industry as a whole. Yet, when smaller firms participated in these transactions, the effect on competitors was less significant and negative. My specification was clearly able to isolate evidence of distinct, aggregate petroleum industry trends resulting from the completion of mergers and acquisitions.

Literature Review

Despite the aforementioned merger and acquisition theory that such restructuring sums to positive effects, empirical studies of such transactions in the oil industry have found contradictory evidence. Charles E. Hyde's (2002) analysis of Australian petroleum mergers, for instance, found no evidence of mergers or acquisitions having a statistically significant effect on profitability. It concluded that while mergers may enhance market power, higher profitability was not achieved as the gains were offset by exacerbated managerial inefficiency. The inefficiencies likely arise from complications within the process of integrating two large corporations. The analysis did, however, find some evidence that suggested the enhanced market power stemming from mergers was associated with a decline in petroleum industry profitability (Hyde, 2002). Thus, as a firm increased its share of the market through a merger or acquisition, the new power the firm obtained made it harder for rival firms and the industry to compete. Industry profitability thereby declined on a wide scale.

At the same time, several case studies have produced findings that would support the notion of an aggregate positive effect stemming from oil mergers and acquisitions. J.

Fred Weston's case study (2003) examines the largest oil industry merger ever completed: Exxon and Mobil's consolidation. The two corporations elected to merge as a result of the potential synergy and efficiency that could be achieved. Their combination raised revenue, strengthened market share, advanced technological ability, and decreased production costs. The two fit so well together that Weston estimates their initial synergy of $2.8 billion eventually soared to approximately $4.6 billion. The ExxonMobil merger provides evidence to counter Hyde's conjectures. In fact, Weston finds that the nine major oil industry mergers in the U.S. from 1998 to 2001 were all "value increasing for acquirers as well as targets." This paper attempts to verify if mergers are indeed this beneficial, or if Weston's approach and abbreviated time period may have biased his results.

My paper proposes that mergers and acquisitions carry implications not only for the participating firms but, also, for numerous competitor or rival firms. The Federal Trade Commission seems to agree with my hypothesis as it has "reviewed every significant petroleum industry merger since 1981. [Furthermore, it] has taken enforcement action against 15 major petroleum mergers that would [have] likely resulted in significant [competition] reductions." In 11 of these cases, the FTC required major divestitures of assets before the merger was permitted. In the other four, the transactions were either abandoned or blocked completely. Clearly, these mergers and their consequences occupy a crucial, influential niche within the American economy and deserve to be thoroughly monitored and studied.

Prior to beginning my examination of this influential niche, taking previous theory, studies, and findings into account has led me to hypothesize that:

(i) Mergers and acquisitions have a positive effect on participating firm profitability.

(ii) There are economic and firm specific characteristics that help explain the performance of the firm and of such transactions.

Furthermore, even as governmental oversight looks to prevent mergers or acquisitions from having profound economic effects on the industry, I hypothesize that:

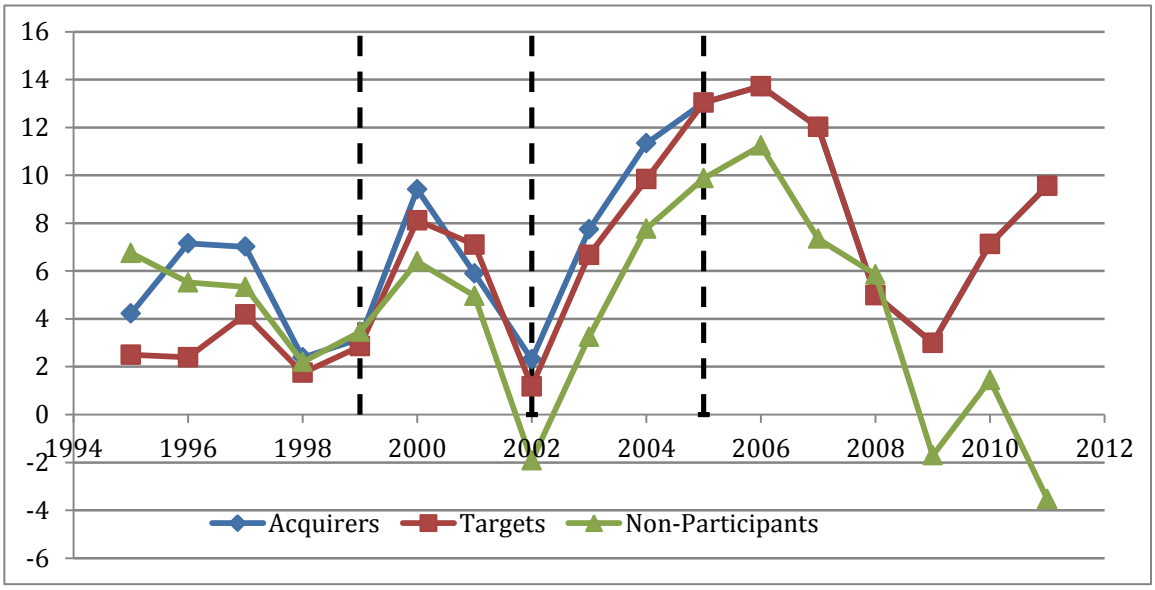
(iii) Such restructuring still has a negative effect on rival firm profitability.

Methodology

Providing a format for analyzing the performance of mergers and their effect on the on the overall domestic industry requires first establishing a proxy that can be used to measure profitability. Many papers rely heavily on valuation metrics such as the return on assets (ROA), defined as the ratio of net income to total assets. Studies of mergers and acquisitions are then able to illustrate the effects of restructuring on the profitability of both merging and non-merging firms. This paper will do the same and use two metrics in order to substantiate its findings. The first measure of profitability I use is the same as previously mentioned, the return on assets. ROA is a measure that "explicitly takes into account the assets used to support business activities [and] determines whether the company is able to generate an adequate return on these assets rather than simply showing robust return on sales" (Hagel, Brown, and Davison, 2010). To demonstrate how this proxy fluctuates over the 17-year period, Figure 1 depicts the average return on

assets for firms that were the acquirers in this paper's mergers and acquisitions, firms that were the targets, and firms that did not participate in a merger (the vertical lines indicate the occurrence of a merger). This study hopes to isolate the motivations behind these aggregate changes in profitability.

Figure 1: ROA

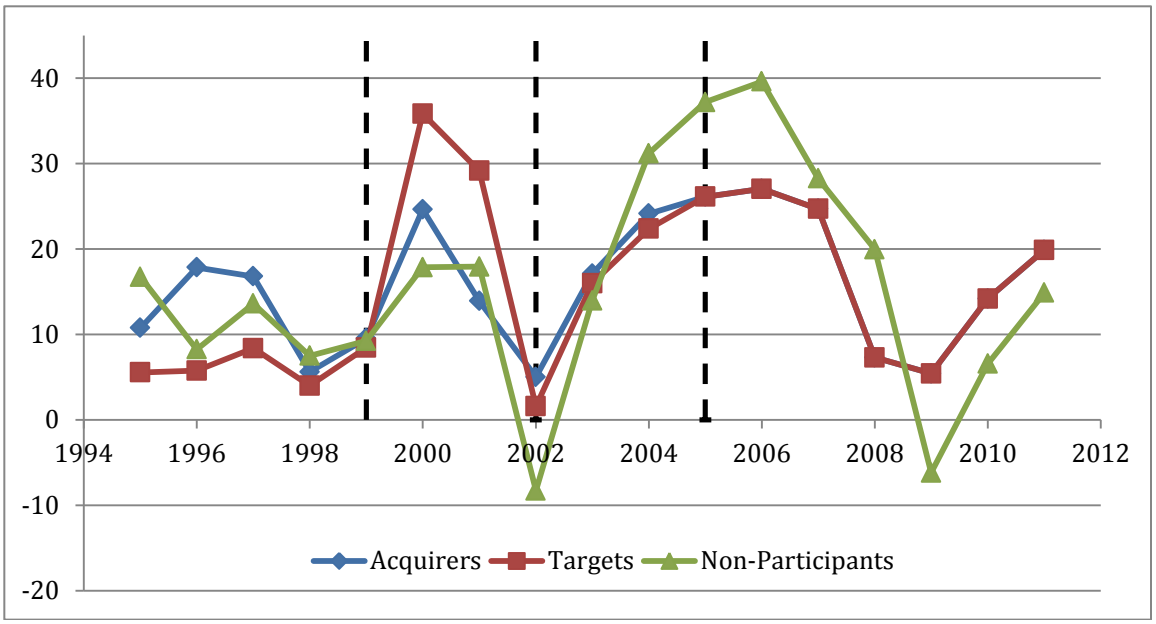


The second metric is return on equity (ROE), which is a ratio of net income to total shareholder equity. This valuation metric focuses on the return to the shareholders of the company, a measure of profitability that often determines the public's willingness to invest in the firm. Figure 2 illustrates its aggregate fluctuations, which appear to be very similar to the movements of return on assets.

To uncover specific firm characteristics that may be correlated with the performance of the merger, the regressions use these proxies for profitability as dependent variables. The explanatory variables then consist of macroeconomic indicators as well as firm specific characteristics. The data for all variables were obtained from the financial records of the New York Stock Exchange, annual individual firm financial

statements required by the Securities and Exchange Commission, and data releases from the U.S. Energy Information Administration.

Figure 2: ROE



This paper maintains a unique data vector for each firm within the sample throughout the 17-year period. However, once a merger has occurred, the data points post-merger become identical for the two merging firms as they are now each representing the same company. This results in two series for every merger, one for each company involved; unique firm data exist before the merger and identical data after.[2] An example of a time-series-cross-sectional pooled regression used in this paper is provided by equation (1).[3]

Furthermore, to test my secondary hypothesis that mergers and acquisitions have a

[2] Due to the face that post-merger observations are duplicated through the incorporation of two series for each merger (one for every firm involved), there is the potential for the results of the regression to be biased. In order to prevent the duplicated post-merger observations from creating such bias, this paper investigated a regression that doubled the weight of pre-merger observations. However, the unweighted results were only substantiated by the weighted regression, as the signs, sizes, and significances of the estimates were all consistent.

[3] Table 6 provides the results of this regression.

negative effect on rival firms in the industry, I have included another model within the analysis. The regression is provided by equation (2):[4]

(1) $PROF_{it} = \beta_0 + \beta_1 MERG_{it} + \beta_2 MERG_{i,\,t-1} + \beta_3 POIL_t + \beta_4 IMP_t + \beta_5 ARCA_t + \ldots + \beta_6 PROD_{it} + \beta_7 POLT_t + \beta_8 LOC_{it}$

Where:
PROF represents the profitability of firm, i, in year t, as measured by ROA and ROE.

***MERG*$_{it}$** is a dummy variable that reflects the presence of a merger (0 if the merger has not occurred, 1 for its occurrence and every year after). According to my hypothesis, this variable should have a positive relationship with profitability.

***MERG*$_{i,\,t-1}$** is the same dummy variable as "*MERG*$_{it}$", but it is lagged one year to isolate the effect of mergers in the year following their occurrence (it is abbreviated as *MERG1* in the appendix). I expect the lagged variable to demonstrate the positive effects of mergers given that the time period allows for the corporations to solve any complications or inefficiencies and capitalize on their synergies.[5]

POIL is the percentage change in the price of a barrel of oil from the previous year. This variable should have a positive correlation with profitability as increased prices commonly lead to higher profits.[6]

IMP is the quantity of oil imported by the U.S. (measured in hundreds of millions of barrels) in year t. I expect this variable to be negatively correlated with firm profitability as rises in imports likely signify foreign firms and prices outcompeting domestic ones.

ARCA is the percentage change in the ARCA Oil Index, a price-weighted index based on the change in stock prices of the leading companies involved in the exploration, production, and development of petroleum. This paper also investigated lagging the *ARCA* variable to prevent any endogeneity, but a lag did not create any significant difference in the results. The variable should have a positive effect on profitability, as increases in such stock indices are associated with industry wide gains.

PROD measures the amount of crude oil production firm i was exposed to in year t (in hundreds of millions of barrels), by evaluating how much total crude oil was produced in the region (East, Midwest, South, Rockies, or West) that the firm was headquartered in. This number is then scaled (divided) by total U.S. production of oil to create a ratio (regional production / U.S. production); thereby making it a percentage of total U.S. production. The U.S. Petroleum Administration for Defense District lines are used to determine regional boundaries. I expect *PROD* to be positively correlated with profitability as higher exposures to production imply that firms are in an area where

[4] Table 7 provides the results of this regression.

[5] A Bayesian Information Criterion test and an Akaike Information Criterion test each signified one lag was the appropriate number to include.

[6] Variables measuring the percentage change in real U.S. GDP, the change in unemployment rate, and the U.S. business cycle classification of year t were also previously included to measure total effects of the economy on profitability. The significance of *POIL* seemed to capture most of the variation of these variables and thus, they were dropped due to insignificance and repetitiveness.

demand is higher or production is more efficient and less costly, each raising the potential for profits.
POLT is a dummy variable that reflects the political orientation of the President of the United States during year t (0 for Republican administrations, 1 for Democratic administrations). I expect this variable to have a negative effect on profitability, as Democratic administrations are associated with stricter marker regulation, while Republican ideals allow for less governing of corporations.
LOC is a dummy variable that reflects whether or not the firm's headquarters are located within the south (0 for south, 1 otherwise). The U.S. Petroleum Administration for Defense District lines are again used to determine the South's boundaries. Similarly to the *PROD* variable, I hypothesize *LOC* will be positively correlated with profitability. The south has the most oil reserves in the lower 48 and is where the vast amount of production occurs. The high levels of production are due to efficiencies achieved from ease of access to resources. Thus, firms in the south likely have lower costs, larger scales of production, and more potential for profits.

(2) $PROF_{it} = \beta_0 + \Sigma\beta_i EQUATION\ (1)\ VARIABLES_{it} + \Sigma\beta_2 EFFECT_{jt}$

Where j=1, 2, 3

Where:
EQUATION (1) VARIABLES represents the sum of independent variables listed above in Equation (1).
EFFECT is the sum of dummy variables created to isolate the specific effects of the mergers and acquisitions (*XOM*=ExxonMobil, *COP*=ConocoPhillips, *CVX*=Chevron-Unocal in the Appendix). For instance, to isolate the ExxonMobil merger, this dummy variable (*XOM*) will be 0 before the merger occurs and 1 after it for every firm in the series except Exxon and Mobil, where it will be 0 throughout the 17 years. This withholds Exxon and Mobil from biasing the results. This method provides insight into how each of the four mergers specifically affected the other firms within the sample. However, an important notice is that there are only three effect variables for four mergers and acquisitions. This is due to the fact that the Valero-Premcor merger occurred during the same year as the Chevron-Unocal acquisition. Thus, by including a variable for each transaction, the regression would effectively be measuring how the two mergers influenced each other, as their data series would be mirror images. To prevent this, one variable must be dropped and only one merger effect can be measured. This paper selected the Chevron-Unocal merger as its size and strength is likely to have a more significant, influential effect. I expect most mergers to have a negative effect on the profitability of rival firms as consolidation likely increases participants' market share and heightens industry competition. Mergers will only occur if they are expected to raise participants' profits or reduce the success rate of competitors.

Prior to moving into this paper's discussion of my econometric analysis, I have included sample statistics in order to make my data set more transparent. Table 1 displays

an overall summary of the sample statistics of the dependent variables and the incidence of a merger variable. Taking the preliminary analysis of the data further, Table 2 includes the sample statistics of the dependent variables prior to mergers occurring. Table 3 then contrasts this data as it demonstrates the statistics after the completion of mergers.[7]

Table 1:

Variable	Mean	Std Dev.	Minimum	Maximum
ROA	6.37	5.82	-12.59	19.82
ROE	14.58	19.88	-169.98	58.97
MERG	.43	.49	0	1

Table 2:

Variable	Mean	Std Dev.	Minimum	Maximum
ROA	4.47	4.39	-12.59	14.29
ROE	12.27	23.46	-168.98	58.97

Table 3:

Variable	Mean	Std Dev.	Minimum	Maximum
ROA	8.85	6.51	-11.44	19.82
ROE	17.58	13.49	-29.63	38.47

By testing if the means of the variable "*MERG*", which indicates the occurrence of each merger, are equal within Table 2 and 3 (before and after the merger occurrence), I can better formulate a hypothesis for how mergers affect the profitability of participating firms. For instance, if a significant difference allows me to reject the null hypothesis that the means are equal, then I will have reason to believe that mergers have a non-zero effect on profitability. The result of this test is given in Table 4.

Table 4:

Diff:	Mean (1)-Mean (0)	Diff > 0 Pr(T < t)	Diff ≠ 0 Pr(|T| > |t|)	Diff < 0 Pr(T < t)	95% CI
ROA	4.37	0.00**	0.00**	1.00	(2.63, 6.12)
ROE	5.30	0.03*	*0.06*	0.96	(-.34, 10.96)

Significance levels: Italics=0.10; *=0.05; **=0.01.

[7] Appendix B contains sample statistics for the rest of the independent variables of Tables 1, 2, and 3.

As demonstrated by these results, the means before and after mergers are significantly different. The mean post-merger appears to be significantly higher at the one percent level for ROA and the five percent level for ROE. Hence, mergers and acquisitions appear to increase the profitability of firms, thereby supporting my initial hypothesis and justifying econometric analysis.

Econometric Analysis

To evaluate my hypotheses and answer the question of how mergers and acquisitions affect the profitability of participating and competitor firms, I first examined if the firms in my sample could be pooled together within the same regression. This used two bivariate specifications between the independent variables and the dependent variable, *MERG*, in order to determine how much these distinct transactions diverge from each other. If the aggregate effects of mergers and acquisitions were similar enough across the sample, pooling them together in the same regression would be informative of petroleum industry restructuring conformity. To test this, I began with the hypothesis that the eight firms partaking in mergers could be restricted by the same sets of coefficients:[8]

$$\text{Ho: } \beta_1^{\,k} = \beta_1 \text{ for all } k=1\ldots 8.$$

$$\text{Ha: At least one } \beta_1^{\,k} \neq \beta_1$$

Given the results provided by Table 5, I cannot reject the null hypothesis that all coefficients are the same, even at the 10% level of significance for either dependent variable. Thus, the four mergers and eight firms are uniform enough to contribute to a common aggregate effect and can therefore be restricted to a pooled regression within the

[8] I could not test the two control firms as their inclusion resulted in multicollinearity, given that their merger variable is zero throughout the sample. Therefore, only the eight merging firms are included.

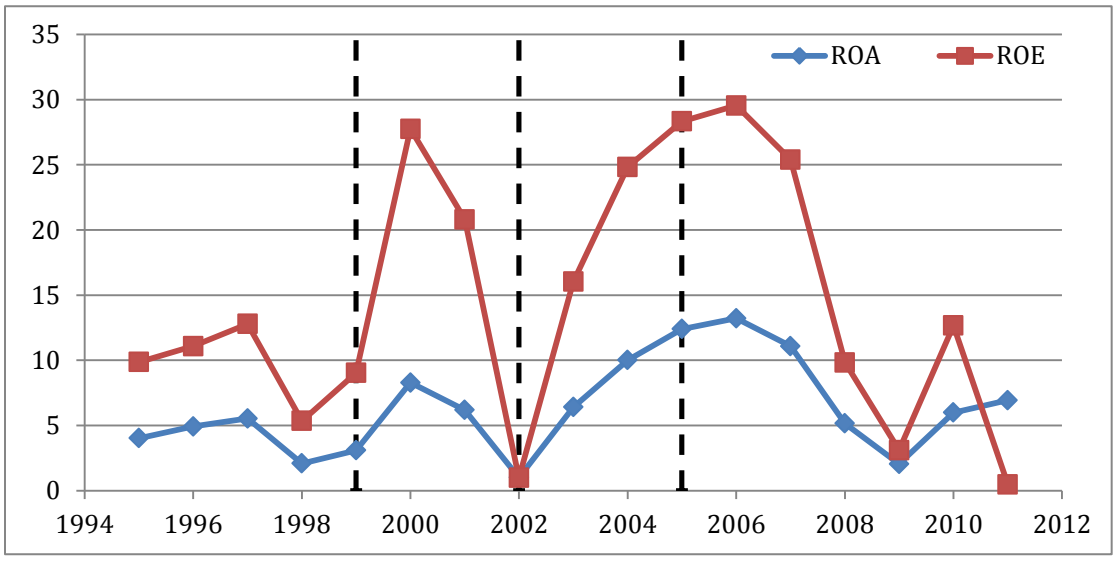
same model. Still, it is important to keep in mind these findings are predicated on a bivariate specification, which assumes that profitability is only driven by mergers and acquisitions. While we know this assumption is likely not accurate since numerous factors influence firm performance and profitability, "deducing the effects of these omitted variables is difficult to fully accomplish since what matters is both the relative variability of these different variables and their [distinct] dynamic effects" on profitability (King and Watson, 1997).

Table 5:

	ROA [F(7,120)]	ROE [F(7,120)]
F-Statistic	1.68	1.08
Prob > F	.1213	.3833

Nevertheless, the uniform bivariate findings suggest the presence of common factors in the model and the mergers, which I later seek to uncover. Figure 3 plots the aggregate profitability for the 10 firms within my sample over the 17-year period. Finding the driving forces behind these commonalities requires delving deeper into the cross sectional pooled specification.

Figure 3:



The results of my progression can be viewed within Table 6. The model began with a specification that solely included control variables and excluded any variable that indicated the presence of a merger. This determines a baseline regression from which I can estimate how much profits are driven by factors other than mergers. As demonstrated by regression 6.1, the significance of this control variable regression implies that many of the included factors do indeed influence petroleum corporation profitability. For instance, in the ROA specification the total number of barrels imported, the Arca oil index, and the amount of exposure to crude oil production all appear to be significant factors affecting firm profitability. The coefficient of .35 on the imported oil variable signifies that for every hundred million barrels imported the return on assets of petroleum corporations will increase by approximately .35 points. While one may assume that increases in imported oil provide evidence of foreign firms outcompeting domestic production, my regression implies this is not the case. Rather, the increases in imports are indicative of higher domestic demand, from which domestic and foreign production both respond.

Meanwhile, the estimate of .12 on the Arca oil index variable implies that regardless of a merger, in the case of a one percent increase in the index, the profitability of firms will also increase, but by .12 points. Because the Arca index is designed to capture the aggregate movements of the petroleum industry, this result implies that as the industry experiences overall profitability, the firms in my sample do as well.

At the same time, the significance of the production variable suggests that for every hundred million barrels of oil produced domestically, firm profitability rises by 5.06 points. One possible explanation for this is that the more production surrounding a firm, the more likely it is to be in an area where exploration and attainment costs are low

while production capabilities are high. While this would imply the firm experiences greater competition, it would also likely allow for profits to be driven up at a faster rate. Taking these three factors into account, the firms in my sample appear to react positively to increases in imported oil, industry wide profitability, and surges in domestic crude oil production. Speculation leads to the conclusion that these factors may be representative of increases in domestic demand for oil and transitively, times of higher profits for petroleum corporations. These findings are also somewhat supported by the results of the ROE regression (6.3), where similar signs and coefficients are achieved, just not at the same level of significance. Clearly, petroleum industry profitability does not follow a random walk but rather, is driven by underlying common factors and correlations. This allows me to verify my second hypothesis that economic and firm specific characteristics are correlated with the profitability of firms and the effects of mergers and acquisitions.

Next, I included merger specific variables within the regression (6.2) to answer the central question of this paper: how do mergers affect profitability? The initial, simple indicator variable, merger, with a coefficient of -.41 came up insignificant. While this suggests that firm profitability declines during the year the merger occurs, possibly due to complications and uncertainty that stems from the integration of such massive corporations, it is not a significant variable on its own. However, much of a merger's effects are captured by the lagged merger variable, which measures the specific effect of the merger in the following year (once it has had the time to be completed). Here, the statistically significant coefficient of 4.05 on the one-year lagged merger variable implies that the in the subsequent year, the firm's return on assets increases by 4.05 points. This represents a 64 percent increase when compared to the average ROA (6.37) of this

sample. The initial negative plunge followed by a very significant, large, and positive effect on profitability is also substantiated by the ROE regression (6.4), where the statistically significant coefficients of -5.17 and 7.12,[9] imply similar profitability responses to these mergers. These one-year lag rises in profitability may be due to immediate synergy and production efficiency achieved through the mergers and are likely characteristic of future gains attained from the transactions.

Table 6:

	ROA		ROE	
	Reg (6.1): F=22.26 R^2=.3140 DoF=163	Reg (6.2): F=24.14 R^2=.3727 DoF=161	Reg (6.3) F=16.09 R^2=.1259 DoF=163	Reg (6.4) F=12.08 R^2=.1314 DoF=161
Merger		-.41 (.78)		-5.17* (2.41)
Merger Lagged 1 Year		4.05** (.93)		7.12** (2.25)
Price per Barrel of Oil	.01 (.01)	.01 (.01)	.06 (.04)	.07 (.04)
Total Imports of Oil	.35** (.10)	.12 (.11)	.59 (.48)	.46 (.58)
Arca Oil Index	.12** (.02)	.13** (.02)	.21* (.08)	.23** (.08)
Production	5.06* (2.21)	2.42 (2.28)	1.69 (12.85)	.98 (12.04)
Political Orientation	.36 (1.21)	-.735 (1.22)	-2.88 (5.66)	-3.67 (6.07)
Location	.94 (.94)	.95 (.88)	-.19 (2.55)	-.05 (2.53)
Constant	-12.94* (5.17)	-3.08 (5.54)	-13.33 (19.62)	-7.94 (23.73)

Significance levels: Italics=0.10; *=0.05; **=0.01

The commonality of the signs and significance between the ROA and ROE regressions is also very informative of the uniform effect petroleum mergers and

[9] The magnitudes of the coefficients in the ROE specification will tend to be larger than those of the ROA specification as returns on equity are much more variable and volatile.

acquisitions may have. This lag uniformity implies the existence of additional similarities amongst petroleum industry restructuring and may suggest the emergence of long run positive effects from mergers and acquisitions. Regardless, the aggregate positive effects of mergers in both the ROA and ROE regressions allow me to confirm my first hypothesis and conclude that mergers and acquisitions appear to have a positive overall effect on firm profitability.

The progression of Table 6 also offers further evidence for my second hypothesis that economic and firm specific characteristics help explain the performance of the firm and of such transactions. Even as some variables, such as "location", contradict both my sign and significance expectations, they all offer insight into the underlying correlations and motivations behind firm profitability. The overall significance of each regression (6.1 through 6.4) indicates that while variables may be individually insignificant, they are able to jointly produce an accurate, representative model.

The final stage of my progression culminated with regressions 7.1 and 7.2, which seek to analyze how mergers and acquisitions affect the profitability of participating firms and particularly, competitor firms. Expanding regressions 6.2 and 6.4 to include variables analyzing the effect on competitors allows for three substantive conclusions to be drawn. The first conclusion (i) is that the aforementioned results regarding the merger variables are largely upheld. Here, in regressions 7.1 and 7.2, we see the signs, coefficients, and significances are very similar to the previous regressions. This evidence again confirms my initial hypothesis that petroleum mergers and acquisitions appear to increase the profitability of participating firms.

At the same time, analyzing the effect of mergers on other firms in this sample may serve as a proxy for how restructuring influences the profitability of rival firms or the industry as a whole. As previously mentioned, this paper only uses three effect variables for four mergers and acquisitions due to the fact that the Valero-Premcor merger occurred during the same year as the Chevron-Unocal acquisition. Therefore, had it included an effect variable for each of these two mergers, these variables would simply be measuring how the mergers influenced each other, and nothing else. This consequence would be unavoidable as the variables' data series are essentially mirror images. To prevent this, one variable must be dropped from the regression and thus, only one merger effect can be measured. This paper selected to use the Chevron-Unocal merger variable as its size and strength is likely to have a more significant effect than the smaller, Valero-Premcor transaction.

In regression 7.1, two of the three "effect on competitor firms" variables appear to have a statistically significant, negative effect on the profitability of other rival companies. These two variables are the effect of the ExxonMobil and Chevron-Unocal mergers. As the coefficients of -5.12 and -3.29, respectively, demonstrate a negative effect on the profitability of other firms in my sample, I am able to arrive at my second conclusion (ii): since the largest firms, and the only super-majors[10] in the sample, participated in these two mergers, it appears as though mergers involving the largest, multinational petroleum corporations influence the profitability of competitor firms, and possibly the whole industry, negatively. The coefficients of -12.07 and -9.79 within the ROE regression (7.2) also support this finding and conclusion. These results may be a

[10] A super-major is one of the world's five largest publicly owned petroleum corporations.

consequence of the attainment of an overwhelming share of the market as these corporations expand to new heights. Smaller firms may simply lack the resources to compete with such empires.

Table 7:

	ROA	ROE
	Regression (7.1): F=22.69 R^2=.5131 DoF=158	Regression (7.2): F=11.53 R^2=.2099 DoF=158
Merger	*-1.30* *(.74)*	-7.88** (2.23)
Merger Lagged 1 Year	3.50** (.79)	6.95* (2.69)
Price per Barrel of Oil	*.02* *(.01)*	.09* (.04)
Total Imports of Oil	.74** (.15)	2.43** (.62)
Arca Oil Index	.09** (.02)	.10 (.10)
Production	2.32 (2.22)	1.34 (11.46)
Political Orientation	1.72 (1.30)	3.22 (4.20)
Location	.52 (.93)	-.48 (2.60)
Effect of ExxonMobil Merger	-5.12** (.91)	-12.07** (3.56)
Effect of ConocoPhillips Merger	1.11 (1.09)	-3.16 (4.48)
Effect of Chevron-Unocal Merger	-3.29* (1.26)	-9.79 (6.45)
Constant	-25.90** (6.89)	-81.17** (25.26)

Significance levels: Italics=0.10; *=0.05; **=0.01

Meanwhile, the third conclusion (iii) of my analysis isolates a completely different trend: the effect of the ConocoPhillips merger, with coefficients of 1.11 and -3.16 in the ROA and ROE specifications, each have less of a negative and significant

effect on the performance of competitor firms within this sample. Because specific motivations driving mergers and acquisitions are often convoluted in the eye of the public, to some, the desire of smaller corporations to restructure possibly suggests an attempt to avoid potential inefficiencies, failures, or future demises. These mergers may occur out of need rather than desire and thus, could have less potential to succeed or to damage competitor profitability. However, because the coefficient on the effect of the ConocoPhillips merger is negative in the ROE regression, it is feasible that this result provides further evidence of the negative effect on rival profitability that these transactions generate. Although these results provide mixed evidence for my hypothesis, I can conclude that smaller mergers seem to have less of a negative, influential effect on the profitability of competitor firms than larger, super-major mergers do. While further enquiry is necessary in order to determine the precise effect of these mergers on other firms, I feel comfortable postulating that the aggregate negative nature of my results implies large mergers and acquisitions have a detrimental effect on the profitability of firms not participating in the transaction.[11]

While this paper finds significant evidence regarding the effect of mergers and acquisitions on participant and rival profitability, it is important to keep in mind its shortcomings. (i) The span of my sample is relatively limited as it only includes the results and implications of four major mergers, from which, the paper makes speculative generalizations about oil industry restructuring. While the mergers included are all rather different, they are also very characteristic of the sector. I believe this enables them to be

[11] My research also included a "Years since Specific Merger" variable, which measured the years since each specific merger in my sample for every firm that had not participated in the merger. I hoped to gain insight into how differently, or similarly, each of my four mergers affected the distinct firms in my sample over a period of time. Thus, generating the effect as the years progressed, rather than just the aggregate. For the most part, the results proved to be insignificant and were largely uninformative.

representative of industry restructuring as a whole. (ii) There is much debate upon the question of what the best metric for profitability is. My paper only uses two out of the many important and informative valuation measures. However, recent inquiry has validated the merit and scope of return on assets and thus, I feel comfortable utilizing it as the predominant measure of profitability within this paper. It is important to keep these caveats in mind when evaluating the results of this study.

Conclusion

Through the incorporation of four mergers and acquisitions that are unique and yet, simultaneously, characteristic of the aggregate restructuring within the oil industry, I have investigated how such reorganization affects the profitability of both participating and competitor firms. Furthermore, I have isolated distinct economic conditions and firm traits that are correlated with the performance of these mergers and the profitability of these firms.

My findings allow me to conclude that when proxies, such as ROA and ROE,[12] are used to measure profitability, evidence suggests that mergers have a positive net

[12] This study also aimed to incorporate a regression that measured profitability through the percentage change in stock price. The results of this regression could not support all of the aforementioned findings. While some similar trends and implications were evident in the stock price data and its results, none were significant or substantial enough to be included or reported. This is likely due to the large fluctuations in stock prices. Figure 4 in Appendix D illustrates these fluctuations in stock price for acquiring firms, target firms, and firms that did not participate in a merger over the 17-year period. The aberrations make attempting to create an informative and encompassing regression, very difficult. The lack of specific results may be consequence of the fact that stock prices are subject to a wider range of influences than returns on assets or equity. Motivations behind stock price changes include human patterns and predictions, unexplainable shifts, and many similar pressures; all of which are subject to extreme error and variation. This lack of results does not harm this paper, as a stock price regression would largely measure the market's prediction of profitability, rather than actual internal firm profitability. Still, it is clear that commonalities do exist within stock price alterations. Isolating the motivations behind these changes and their relationship to mergers and acquisitions will require increasing the span of this study. Only then can I hope to uncover the effects of mergers and acquisitions on stock prices.

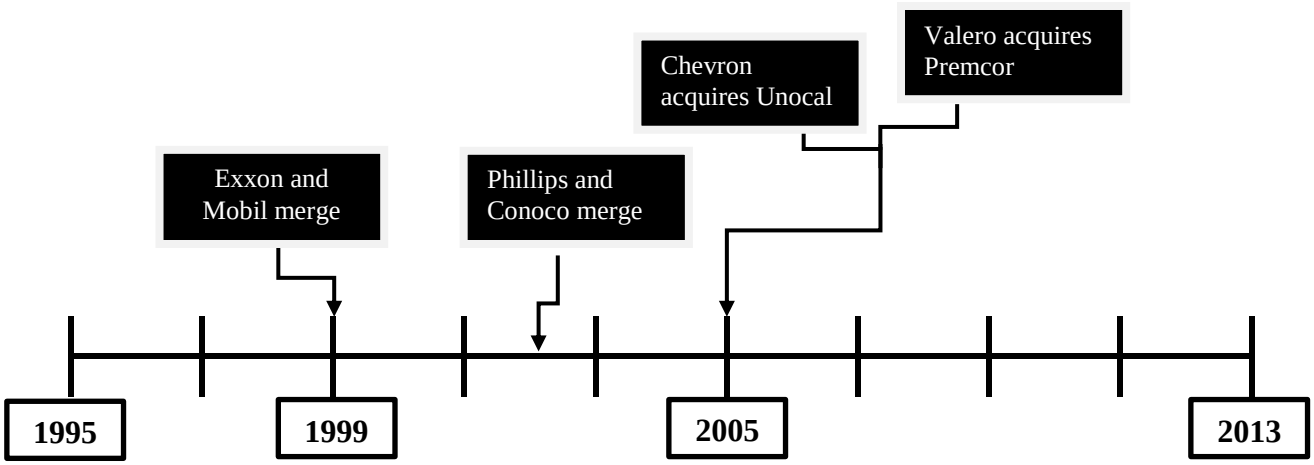
effect on profitability. It appears that the production and synergy gains outweigh any costs, complications, and inefficiencies that may arise through the merger and acquisition process. This positive effect is largely generated in the year following the merger and counters any initial declines in profitability the firm may experience during the transaction.

My results also provide evidence that when the largest petroleum corporations participated in mergers, the restructuring had a very negative effect on the profitability of competing firms, and possibly on the industry. This is likely a consequence of smaller firms' inability to compete with the overwhelming empire that these larger corporations create through merging and acquiring. Meanwhile, the restructuring of smaller firms had a much less negative and significant effect on the industry. Perhaps this is due to the broad variability in the performance of smaller mergers and a lower rate of success or influence.

Similarly to previous papers (Hyde), a goal of this study was to obtain an understanding of how these mergers affected the profitability and competitiveness of the industry, thereby allowing us to formulate better policy in anticipation of future mergers and acquisitions. Given the significance of the results within this paper, contemplating their ramifications should enable one to contrive policy implications and pass judgment on the performance of the FTC. Evidence that these mergers and acquisitions have a detrimental effect on rivals suggests that the FTC may not be doing a sufficient job in its investigation and enforcement process. This would imply that stricter regulations and requirements are merited during these transactions.

Yet, corporations only merge and acquire if they believe it to be advantageous for their profitability or detrimental for others. As one increases its own profits, it only naturally follows that another is likely to bear the consequences. The FTC should not prevent firms from profiting simply because others are unable to compete. So, while the policy implications of these results may suggest the need for more stringent regulation, the question of how negative these effects are must be answered first. If the negative effects on rival firms are only moderate in magnitude then the FTC is doing its job adequately. However, if the negative effects end up severely harming competition in the long run, causing the consequences to fall not only on rival firms, but also on consumers, then tighter oversight of these mergers is necessary. Unfortunately, the answer to this question lies beyond the scope of this paper and will require further research and insight. Regardless, whatever the case may be surrounding this paper's findings and their implications, the data and results of this study undoubtedly contain evidence of the aggregate, uniform effects within U.S. petroleum mergers and acquisitions. It is absolutely imperative that we continue to monitor and study these important effects.

Appendix A:



Exxon Mobil:[13] The merger was agreed upon and announced in December 1998. The transaction was then completed in November 1999 for $81 billion. In order to gain FTC approval, Exxon and Mobil sold approximately 2,400 retail stations across the country. This merger was looked upon as a friendly merger of near equals; it integrated two of the largest public petroleum corporations of the time. The transaction was a horizontal merger as it was comprised of direct competitors. The merging of all production and retail processes for the two firms resulted in ExxonMobil establishing itself as the largest public petroleum corporation in the world. It hoped to bring about greater efficiencies in the face of decreased crude oil prices. Interestingly, the merger also "brings back together two pieces of the former Standard Oil Co., the Rockefeller-run oil titan that was split apart in 1911 due to a Supreme Court decision."

ConocoPhillips:[14] The merger was agreed upon in November 2001. It was then completed on August 30th, 2002 for $15.12 billion. The merger resulted in the creation of the U.S.'s third largest oil producer. This transaction was also viewed as a friendly horizontal merger of equals, specifically of two mid-sized corporations. The smaller size of the participants meant the FTC investigation was expected to culminate with few regulatory obstacles or stipulations. Nevertheless, the FTC did require some divestitures, as it feared the merger might reduce competition. "The $750 million in savings expected [from the merger was due to] operational efficiencies and not necessarily from workforce cuts."

Chevron-Unocal:[15] The merger was announced in April 2005. Chevron fully absorbed Unocal by early August for $17.9 billion. The transactions boosted Chevron's exploration

[13] All Information for the Exxon Mobil text box was obtained through "Exxon-Mobil Merger Done" (1999).

[14] All Information for this text box was obtained through "Phillips, Conoco Set Merger" (2002) and "With Conditions, FTC Approves Merger of Phillips and Conoco" (2002).

[15] All Information for this text box was obtained through "Chevron Gets OK to Acquire Unocal" (2005) and Baker, David R. (2005).

and production means, but had no effect on retail. The acquisition was expected to "increase [Chevron's] reserves 15 percent and swell its daily production to 2.8 million barrels." Unlike the other mergers within this sample, "the deal almost didn't happen. For months, Chevron battled a rival bid from China National Offshore Oil Corporation, which coveted Unocal's Asian oil reserves." The foreign firm's competitive bid reached, $18.5 billion, $600 million more than Chevron's offer. Had the "bid from CNOOC, partly owned by the Chinese government, [not] provoked an outcry in Congress, where politicians view China's growing thirst for oil as a threat," it may have succeeded in purchasing Unocal. While Unocal seemed to welcome either acquirer, fierce political criticism forced China National to rescind its bid and Chevron's offer was the only option left. Upon FTC review, Chevron was forced to concede its new ownership of Unocal's patent on reformulating gasoline for fear of harming the industry's competitiveness.

Valero-Premcor:[16] The friendly merger was agreed upon in April 2005. It was then completed in September 2005 for a value of approximately $8 billion. Valero began to take action on the merger as 2005 seemed to be "shaping up to be another year of record earnings." The transaction was predicted to add around 14% to earnings per share. The companies also believed it would result in "$350 million in annual cost-savings in the second year after closing, including lower administrative and interest costs, lower crude oil costs due to purchasing leverage and operational improvements." The deal makes Valero the largest refiner of crude oil in North America as it surpassed ExxonMobil Corp. The FTC reviewed the proposed transaction and allowed it without any further actions, failing to find any violations.

Appendix B:

Table 1 (continued): Statistics for the entire sample

Variable	Mean	Std. Dev.	Minimum	Maximum
ROA	6.37	5.82	-12.59	19.83
ROE	14.58	19.88	-168.98	58.97
MERG	0.43	0.50	0	1
MERG1	0.38	0.49	0	1
POIL	14.40	27.51	-41.54	65.40
IMP	42.78	5.06	32.25	50.06
ARCA	10.99	16.58	-25.18	41.68
PROD	0.38	0.22	0	0.58
POLT	0.53	0.50	0	1
LOC	0.38	0.49	0	1
XOM	0.61	0.49	0	1
COP	0.47	0.50	0	1
CVX	0.33	0.47	0	1

[16] All Information for this text box was obtained through "Valero, Premcor in $6.9B Merger" (2005) & Creighton (2005).

Table 2 (continued): Sample statistics before the occurrence of a merger

Variable	Mean	Std. Dev.	Minimum	Maximum
ROA	4.47	4.4	-12.59	14.3
ROE	12.27	23.47	-168.98	58.97
MERG	0	0	0	0
MERG1	0	0	0	0
POIL	11.66	28.71	-41.54	65.4
IMP	40.5	4.97	32.25	50.06
ARCA	10.95	13.71	-25.18	41.68
PROD	0.29	0.23	0	0.58
POLT	0.65	0.48	0	1
LOC	0.53	0.5	0	1
XOM	0.58	0.5	0	1
COP	0.33	0.47	0	1
CVX	0.15	0.35	0	1

Table 3 (continued): Sample statistics after the occurrence of a merger

Variable	Mean	Std. Dev.	Minimum	Maximum
ROA	8.85	6.51	-11.44	19.83
ROE	17.58	13.49	-29.64	38.48
MERG	1	0	1	1
MERG1	0.89	0.31	0	1
POIL	17.97	25.61	-41.54	65.4
IMP	45.72	3.41	39.61	50.06
ARCA	11.05	19.79	-25.18	41.68
PROD	0.5	0.12	0.2	0.58
POLT	0.38	0.49	0	1
LOC	0.19	0.39	0	1
XOM	0.65	0.48	0	1
COP	0.65	0.48	0	1
CVX	0.57	0.5	0	1

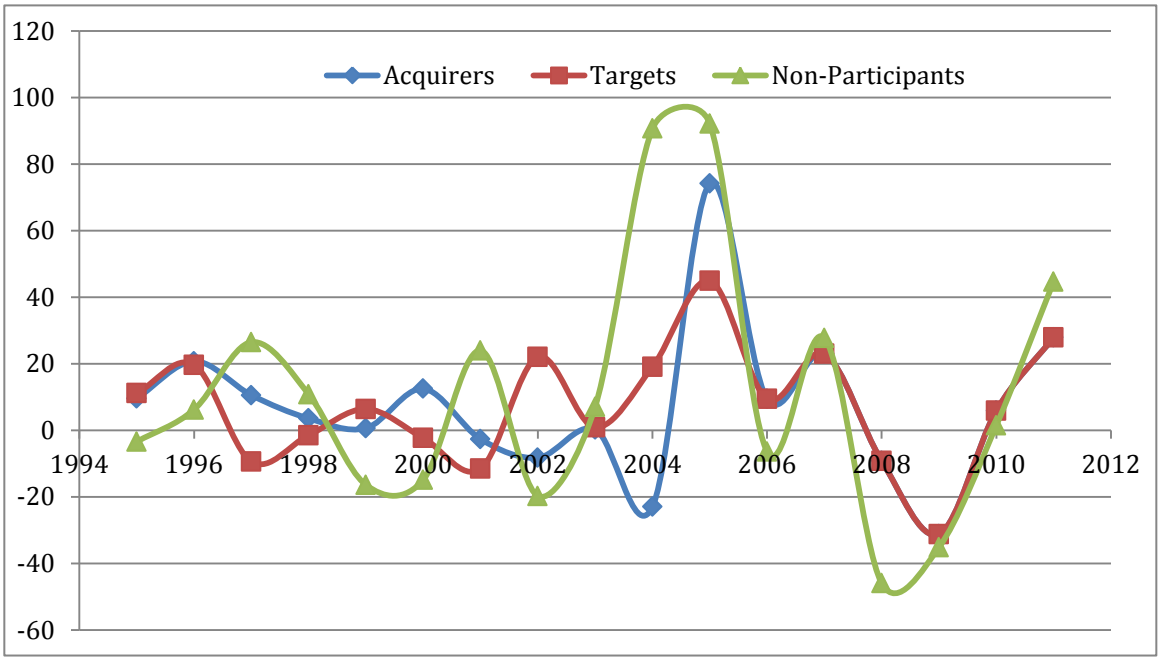
Appendix C:

Correlation Matrix:

	ROA	ROE	MERG	MERG1	POIL	IMP	ARCA	PROD	POLT	LOC	XOM	COP	CVX
ROA	1												
ROE	0.76	1											
MERG	0.37	0.13	1										
MERG1	0.37	0.14	0.91	1									
POIL	0.27	0.21	0.11	0.08	1								
IMP	0.41	0.27	0.51	0.47	0.25	1							
ARCA	0.43	0.26	0	-0.06	0.36	0.22	1						
PROD	0.20	0.07	0.49	0.45	0.06	0.24	-0.02	1					
POLT	-0.29	-0.23	-0.27	-0.22	-0.12	-0.76	-0.17	-0.14	1				
LOC	-0.11	-0.05	-0.35	-0.33	-0.04	-0.13	0	-0.8	0.06	1			
XOM	-0.15	-0.04	0.07	0.04	0.26	0.54	-0.09	-0.04	-0.36	0.13	1		
COP	0.27	0.08	0.31	0.31	0.10	0.59	0	0.07	-0.43	0.06	0.27	1	
CVX	0.11	-0.02	0.44	0.47	0.05	0.49	0.05	0.36	-0.14	-0.37	0.20	0.39	1
	ROA	ROE	MERG	MERG1	POIL	IMP	ARCA	PROD	POLT	LOC	XOM	COP	CVX

Appendix D:

Figure 4: Percentage Change in Stock Price



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