



What motivates merger and acquisition activities in the upstream oil & gas sectors in the U.S.?☆☆☆



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ABSTRACT

The U.S. oil and gas (O&G) industry has experienced a tremendous amount of growth in the last decade or so due to the development of horizontal drilling and fracking technology. In the meantime, the industry has experienced heavy merger and acquisition (M&A) activity, especially in the upstream sectors. While these M&A activities may be related to the aggregate M&A waves in the country, they are unique in their own respect. We recognize that the M&A activities in the energy industry in general, and the O&G sectors in particular, can be different from the traditional sense of M&A activities. In this paper, we provide some stylized facts on the M&A patterns in the upstream O&G sectors, focusing on the factors that influenced these patterns. Our empirical evidence suggests that among the variables we studied, oil price and O&G production are the most important factors that influence M&A activities, while other variables do not show consistent effect across regions and definitions of M&A. In addition, the M&A activities had momentum-building periods and had patterns consistent with a wave hypothesis. Our findings support the notion that industry-specific factors are more important than general economic conditions in determining M&A in the O&G industry. We find evidence supporting both the behavioral and neoclassical theories on M&A.

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1. Introduction

The U.S. oil and gas (O&G) industry has a tremendous impact on the U.S. economy. In the past several decades, energy prices, especially oil prices, have influenced aggregate economic activities significantly and caused economic fluctuations at the national and international levels. The U.S. O&G industry has experienced its own transformation more recently, particularly due to the development of new technology in horizontal drilling and hydraulic fracturing. These new technologies have enabled exploration and production (E&P) activities in previously unexplored territories and have caused O&G production booms unseen in many years, especially since about 2005. While these booms have led to interesting and important price dynamics and economic responses to the changing prices, they have also provided some unique perspectives

on the merger and acquisition (M&A) activities in the industry, especially in the upstream sectors of the industry.

M&A activities in the upstream sector of the U.S. O&G industry have experienced some ups and downs. M&A activities in the industry were relatively infrequent until about 2006, but their frequency started to increase afterwards. Hsu et al. (2014) depicted some general patterns in M&A activities in the upstream sectors of the U.S. O&G industry and observed a general upward trend in M&A activities during the period of 2006 to 2013. While there was a rapid increase in M&A activities prior to the 2008 recession, the recession appeared to have slowed down M&A activities. Post-recession M&A activity peaked in 2011 and then tapered off toward 2013. They also noted that while there were some large-value transactions, most of the M&A deal values in the E&P sector were smaller than 300 million dollars. In addition, most M&A activities occurred in a few geographical locations such as the Gulf Coast, the Midcontinent, the Rockies, and the Permian Basin, which is not surprising, as these locations are the major U.S. O&G producing areas. One of the interesting patterns noted by Hsu et al. (2014) is that the activities in each shale region exhibited wave patterns, with the waves being formed at different times. For example, Barnett, Hayesville, and Fayetteville witnessed some early movement of M&A activities, while the latecomers included the Bakken Shale in North Dakota and the Mississippian Lime in Northern Oklahoma and Southern Kansas. These M&A waves appear to have coincided with the development and production time frames in their respective producing regions.

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In this paper, we investigate the factors that motivate the M&A activities in the upstream sectors of the U.S. O&G industry. We intend for our study to contribute to the O&G literature, as well as the investment literature, especially the M&A literature, in several ways. There is much literature on the determinants of M&A activities in general, and many factors have been proposed as drivers of mergers and acquisitions. Among these factors are behavioral types; for example, managers make decisions about M&A based on the stock market valuation of the firms. Other factors include shocks to fundamental economic factors and ease of access to market capital. While there are many studies of M&A activities in other industries, the academic studies of M&A in natural resource and extracting industries in general, and the O&G industry in particular, are extremely rare, a notable exception being Ng and Donker (2013).

This study is distinctive in three ways. First, we provide some stylized facts regarding U.S. O&G upstream M&A activities and also a study of the determinants of M&A in the U.S. O&G industry. Ng and Donker (2013) provided empirical evidence regarding the M&A activities for the Canadian O&G industry. Our study complements Ng and Donker (2013) by providing empirical evidence on the determinants of the O&G M&A in the U.S. market. Second, our study sheds light on the general applicability of M&A theories to the energy industry; we test the general theories of M&A, as well as variables unique to the industry, in a unified framework as initially proposed in Ng and Donker (2013), to illustrate the idea that M&A activities in the O&G industry could largely be determined by the characteristics of the O&G industry itself, though the common economic variables may still have some influence, but to a much lesser degree. Third, recognizing the uniqueness of the M&A data at the aggregate level, we adopt an appropriate econometric approach to tackle the issue. As our dataset provides mainly count data regarding M&A activities, we utilize the dynamic count data method to model the response of M&A activities to various economic and industry-specific factors.

We intend to approach the problems by incorporating several factors in our analysis, one of which is the general economic activity represented by stock market performance, which captures the effect of stock valuation on M&A activities. While the general practice is to use the book-to-market ratio to gauge the impact of the stock valuation for a specific firm in a firm-level study, we use aggregate stock market activity for our aggregate-level study, as market valuation is positively related to stock market performance (Bouwman et al., 2009). Another variable, the difference between the loan rate and the federal funds rate, or the interest rate spread, reflects general capital market liquidity conditions, as suggested by the neoclassical theories of M&A activities (Harford (2005)). We will provide more detail below. The industry-specific variables we consider include O&G prices and O&G production. We can interpret O&G production as a variable that reflects the technological advances in the O&G industry, as no precise measurement of technological advance in the industry is available. Production can also be treated as an indication of the recoverable reserves of O&G in a certain area. O&G prices are the important variables determining the value of the reserves, which is at the center of the reserve-acquisition motive of M&A, as suggested by Ferguson and Popkin (1982) and Ng and Donker (2013). Furthermore, to gauge the momentum of M&A activities, our models estimate the lagged effects of M&A activities on M&A.

As M&A activities in the E&P sector of the O&G industry are defined differently from the traditional sense of M&A and we have information on the measurement of traditional M&A in our dataset, we provide empirical evidence based on both definitions of M&A, the broadly defined and the narrowly defined (traditional) M&A.¹ We perform our analysis

at the aggregate M&A levels, as well as for the M&A at different locations. Specifically, we study the patterns of M&A determination for six areas: Eastern, Ark-La-Tex, Gulf Coast, Midcontinent, Permian, and Rockies. The differentiation of the definitions of the M&A highlights our findings; our findings in turn lend further support to the conclusions of Ng and Donker (2013), which are that an increase in reserves and productive capacity is an important motive for M&A in energy E&P sectors.

Our empirical results suggest that the economy-wide stock valuation variable, aggregate stock market performance, did not seem to be statistically correlated with M&A activities in the upstream sector of the U.S. O&G industry. However, the oil price variable is highly statistically significant. This may be understandable, as O&G industry performance and thus E&P company valuations may not be as closely related to overall stock market performance as to oil prices. It is not surprising that O&G companies' valuation is heavily tied to commodity prices,² as commodity prices determine the value of the output and, more importantly, the value of an O&G company's assets, which is heavily influenced by the value of its reserves. We also find that M&A activities were closely related to O&G output growth during the sample period. As we will argue later in the paper, O&G E&P takes place in sequences, and production in a geographical area is an important indication of the volume of potential reserves and the value of the reserves. Companies may increase their M&A activities in the area due to considerations of potential production as a major factor that will determine the return on their investments. Therefore, it is very reasonable to see production growth as a driver of M&A activities. This evidence is also consistent with the theory put forth by Ng and Donker (2013), who suggested that O&G companies intend to increase the value of their firms by acquiring reserves through M&A activities. Ng and Donker (2013) also provided strong evidence supporting their theory of reserve acquisition as a motive for M&A by O&G companies.

Our study complements the study of Ng and Donker (2013), which uses a sample of Canadian oil and gas companies by focusing on a sample of U.S. E&P firms. In addition, Ng and Donker (2013) focused on the traditional definition of merger and acquisition; our study goes beyond the traditional definition by including other forms of M&A as defined in the industry. Our broader evidence appears to be consistent with that obtained from the more narrowly defined definitions, providing additional support to the notion proposed in Ng and Donker (2013) that O&G companies acquire reserves and other production assets in order to increase shareholder values. In addition, our study provides evidence to suggest that companies do this by going beyond engaging in the traditional sense of M&A, and they may accomplish the same objectives by acquiring assets directly.

In addition to production and stock valuation, we tried to find the influence of capital market liquidity conditions on M&A activities. O&G companies often utilize the method of equity financing, but firms also take advantage of debt to finance M&A activities. The right economic conditions and/or firm-specific conditions may provide a motivation for M&A activities; liquidity constraints, as well as the cost of borrowing, could potentially influence the success of M&A deals as well, especially when market valuation is relatively low. Conventionally, one would expect the use of debt financing to imply a negative relationship between credit tightness and M&A activity. However, there could be a different relationship between credit market tightness and M&A activities in the O&G industry. As the capital expenditure of O&G companies is typically large and companies have to engage in E&P activities to maintain their reserve base, they may choose to sell assets (including the firms themselves) to finance their capital spending when the credit market is tight. In this sense, the tighter the credit market (i.e., the larger the interest rate spread), the more M&A activities may take place. While our study finds some empirical evidence to support both arguments, the

¹ Types of M&A transactions in O&G industries include acreage, corporate, joint venture, property, royalty, and volumetric production payments. The narrowly defined M&A only considers joint venture and corporate (acquisition of companies). The broadly defined M&A contains all types. Detailed discussion of types of M&A in O&G industries is in a later section.

² For evidence of the connection between stock performance of oil and gas companies and oil prices, see, for example, Dayanandan and Donker (2011).

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