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Price uncertainty and vertical integration: an examination of petrochemical firms

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Abstract

The petrochemical industry employs assets subject to temporal and site specificity. The OPEC oil price shocks of the 1970s made it difficult to write contracts covering business dealings in the industry. I use this production and economic setting as a natural experiment to test transaction cost theory. In support of the theory, I find that input price uncertainty in the 1970s positively affected the extent of vertical integration by firms into input stages. Moreover, the positive reaction of vertical integration to price uncertainty mainly occurs in transactions subject to asset specificity. I also examine price controls and market power as alternative explanations for vertical integration in the industry, but fail to find support for these hypotheses. © 2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

In his presidential address to the American Finance Association, Jensen (1993) asserts that the OPEC oil price shocks in the 1970s and the associated ten-fold increase in oil prices have had far-reaching implications on corporate structure. He further pinpoints that the wave of mergers and restructuring in the 1980s actually began in 1973, the year of the first oil price shock. In support of the Jensen's thesis, Mitchell and

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Mulherin (1996) find that industry shocks affect merger and restructuring activities. In this paper, I provide further refinement of this argument through a microanalytic treatment of Jensen's insights within a particular industry. I analyze and empirically test several hypotheses pertaining to the causes of vertical integration in the petrochemical industry. The period of study is the 1970s during which two oil price shocks induced high input price uncertainty in the industry. I examine how increased price uncertainty affects the extents of input self-sufficiency by petrochemical firms. Within the petrochemical industry, abundant prior evidence suggests that major operational restructuring took place subsequent to the oil price shocks.[1] The time period and the industry together provide a natural experiment to test how an organization adapts its structure to economic changes.

The transaction cost theory of Williamson (1971, 1975, 1979) and Klein et al. (1978) maintains that vertical integration is a response to asset specificity caused by specialized investment that has lower value outside a given transaction. If a contract is drawn to govern the transaction, the specialized investment creates an ex post bilateral bargaining situation in which opportunistic rent seeking, or holdup, by the transactors may occur. Vertical integration is proposed as a solution to the holdup problem, because the possibility of holdup is suppressed under the common ownership. The theory also emphasizes that uncertainty is a necessary condition for asset specificity to influence organizational structure. Without uncertainty, a perfect contract can be written to safeguard the transaction; hence, there is no need for vertical integration. By the same token, given the existence of asset specificity, vertical integration will react positively to an increase in uncertainty.

Prior empirical tests of the transaction cost theory have focused on asset specificity. Consistent with the theory, these studies generally find that vertical integration increases with asset specificity. Relatively less evidence is available on the role of uncertainty. Relevant to the current paper, several studies examine the effects of the oil price shocks on contract provisions (Goldberg and Erickson, 1987; Crocker and Masten, 1988, 1991). These studies document decreases in contract length, more frequent price adjustment and renegotiation for long-term contracts in the petroleum coke and natural gas industries after 1973.

As a complement to prior research, I compare the relative advantage between vertical integration and contract governance in the petrochemical industry during the 1970s. The industry is marked by substantial asset specificity. I examine whether firms embark on vertical integration to avoid holdup problems in supply contracts, which are exacerbated by high price uncertainty. I also test the hypothesis that the degree of the impact of price uncertainty on a firm's extent of vertical integration varies systematically with the degree of asset specificity. To capture asset specificity in the industry, proxy variables are constructed for the input substance and industry agglomeration. Lastly, I examine two alternative explanations for vertical integration in the industry. One possibility is

[1] See Bower (1986), Spitz (1988), Stobaugh (1988), Chapman (1991), Lane (1993), and Arora and Gambardella (1998).

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