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Vertical integration, raising rivals' costs and upstream collusion

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ABSTRACT

This paper analyzes the impact vertical integration has on upstream collusion when the price of the input is linear. As a first step, the paper derives the collusive equilibrium that requires the lowest discount factor in the infinitely repeated game when one firm is vertically integrated. It turns out this is the joint-profit maximum of the colluding firms. The discount factor needed to sustain this equilibrium is then shown to be unambiguously lower than the one needed for collusion in the separated industry. While the previous literature has found it difficult to reconcile raising-rivals'-costs strategies following a vertical merger with equilibrium behavior in the static game, they are subgame perfect in the repeated game studied here.

1. Introduction

The anticompetitive effects of vertical integration continue to be an active and controversial topic of research in industrial economics. Antitrust decisions hostile towards vertical mergers in the US in the 1950s and 1960s were based on the idea that vertical integration can harm competition by removing resources from the input market, thereby leveraging monopoly power from one market to another. These arguments have been labeled as naïve (Rey and Tirole, 2007) because they lacked a rigorous formal basis. The more recent post-Chicago theories of vertical mergers (for example, Salinger, 1988; Hart and Tirole, 1990; O'Brien and Shaffer, 1992) formally derive many of the conclusions of the older theories. In game-theoretic models a connection is established between vertical integration and potentially anticompetitive outcomes. The post-Chicago theories of vertical integration differ in various details, for example, assumptions about the integrated firm's market power and the contractual arrangements between the parties involved. There are several dominating approaches though, including the "raising-rivals'-costs" and the "facilitating-collusion" theory (Riordan, 2008).[1]

The raising-rivals'-costs theory of vertical merger highlights the possibility that vertically integrated firms may drive up the price of the input its unintegrated downstream rivals pay. In a seminal contribution, Ordover et al. (1990), henceforth OSS (1990), argue that vertical mergers might change the incentive to compete in the input market. When a vertically integrated firm withdraws from the input market, upstream price competition becomes weaker. This reduction in upstream

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[1] Riordan (2008) lists "restoring monopoly power" as a third major post-Chicago theory of anticompetitive vertical merger. On this approach, see Hart and Tirole (1990), Martin et al. (2001), and Rey and Tirole (2007). Riordan's classification includes two further groups of theories, "eliminating markups" and "single monopoly profit", which he attributes to the Chicago School.

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competition implies a higher price for the input which means higher cost for the non-integrated downstream firms. Since the downstream unit of the integrated firm benefits when its rivals' costs are raised, the integrated firm is better off withdrawing from the market compared to the case where it competes in the input market. In other words, it pays for the integrated firm to forgo business with non-integrated downstream firms and instead gain from its downstream rivals becoming less competitive as a result of the increased the price of the input.

The facilitating-collusion theory argues that vertical integration might make price agreements among upstream firms easier. This concern has been expressed in the 1984 Non-horizontal Merger Guidelines and in several cartel cases (see Riordan, 2008). The idea has recently been formalized in a dynamic model by Nocke and White (2007).[2] They analyze collusion in the infinitely repeated game among upstream firms which charge two-part tariffs for the input. Nocke and White compare the minimum discount factor required for collusion where one or more firms are vertically integrated to the case of vertical separation. It turns out that vertical integration unambiguously facilitates collusion.

This paper builds on and adds to both the raising-rivals'-costs and the facilitating-collusion theory of vertical integration.[3] It combines OSS' (1990) idea that raising-rivals'-costs effects change the incentives of vertically integrated firms to compete in the input market with the presumption that vertical integration facilitates collusion. In terms of the modeling strategy, the paper can merge these two strands of the literature because they share several central assumptions (e.g., bilateral oligopoly with perfect competition upstream and imperfect competition downstream). In this paper, the stage game is modeled as in OSS (1990) and allows for a raising-rivals'-costs effect but, in contrast to the static model of OSS (1990), this paper studies repeated interaction in a dynamic model. The analysis of the impact of vertical integration on collusion is similar to Nocke and White (2007). However, departing from Nocke and White (2007) and following OSS (1990), downstream firms pay a linear price for the input here.

In a first step, the paper provides a general analysis of upstream collusion in the presence of an integrated firm. The analysis focuses on the collusive equilibrium that requires the lowest discount factor (see Compte et al., 2002, for a similar analysis). It turns out that this equilibrium is the one where the profits of the colluding firms are maximized. In other words, the payoff dominant equilibrium also relaxes the incentive constraint as far as possible. Other equilibria exist but they require a higher discount factor and give lower profits to the colluding players. A general finding of the analysis of collusion involving an integrated firm is that, because the integrated firm operates both upstream and downstream, collusive pricing is rather different from the standard case of upstream collusion among vertically separated firms. One of these differences is that the downstream unit of the integrated firm is involved in the collusion in that the price of the downstream integrated firm is higher than its myopic best reply. This result confirms and extends Chen's (2001) findings.

Based on this preparatory analysis, the paper derives two main results. First, the paper's contribution to the raising-rivals'-costs literature is to show that an outcome similar to the one analyzed in OSS (1990) can actually be sustained as a subgame perfect Nash equilibrium. Second, the contribution to the facilitating collusion theory is that vertical integration facilitates collusion also with linear contracts. To appraise these findings, more background information and details of the results are needed.

Regarding the significance of the first main result, one needs to recall that OSS' raising-rivals'-costs argument has been criticized as not robust. Hart and Tirole (1990) and Reiffen (1992) pointed out that, even though withdrawing from the input market is a profitable strategy for the integrated firm ex ante, it has an incentive to compete in the input market ex post. Therefore, vertical integration does not make any difference at all in the static Nash equilibrium. The intuition of this argument is that, since the price of the input increases once the integrated firm withdraws from the input-good market, the integrated firm has an incentive to deviate. Rather than withdraw from the input market, it will re-enter and undercut the upstream competitors' price in order to gain the business of the non-integrated downstream firms. The integrated firm's upstream rivals will anticipate such a deviation and will expect the re-entry in the market. In that case, upstream competition is the same as without vertical integration in the static game.

Several papers in the literature have shown before that the outcome OSS (1990) propose can be made robust and compatible with Nash equilibrium behavior (see OSS, 1992; Choi and Yi, 2000; Church and Gandal, 2000).[4] However, these papers are only partially successful in confirming the OSS (1990) approach as they circumvent, to some extent, the problem posed in the original analysis. For example, in OSS (1992), non-integrated downstream firms procure the input in a descending-price auction. In such a scenario, the integrated firm will drop out early in the auction, the input market will be monopolized by the non-integrated upstream firm and, hence, the outcome is indeed as in OSS (1990). Note that deviation from this equilibrium is prevented by the rules of the auction. By dropping out, the integrated firm commits itself not to re-enter. Thus, if available, commitment works in this case, but this does not answer the question raised by Hart and Tirole (1990) and Reiffen (1992). Their point is whether commitment will be available at all, and why vertical merger should enable to commit. Arguably, few markets are organized as descending-price auctions. Therefore, it is still subject to debate whether the rasing-rivals'-costs theory has implications beyond the perhaps somewhat restrictive scenarios the literature has hitherto suggested.[5]

[2] Riordan and Salop (1995) and Chen (2001) are also associated with the facilitating-collusion theory.

[3] The first version of the present paper, Normann (2004), was developed independently of Nocke and White's (2003) first version.

[4] For less closely related raising-rivals-costs models, see also Riordan (1998) and Chen and Riordan (2007).

[5] Choi and Yi (2000) assume that the integrated upstream firm can produce a specialized input for its downstream division. The specialized input serves as a technological commitment not to supply the external input market. Similarly, in Church and Gandal (2000), the final good consists of a hardware component and complementary software. When a hardware and a software firm integrate, they commit themselves not to compete by making the software incompatible with rival technologies.