Double Markups, Information, and Vertical Mergers

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Abstract
In vertical contracting models with complete information and linear prices, double markups that arise between independent firms provide an efficiency rationale for vertical mergers since these eliminate double markups (EDM). However, the double markups vanish even without vertical integration if the firms are allowed to use two-part tariffs. Hence, the efficiency rationale for vertical mergers in models of complete information requires restrictions on the contracts that firms can use. In a sense, with complete information, two-part tariffs are simply too powerful. If instead one allows incomplete information and removes the restriction on contract forms, then vertical mergers continue to have an effect that is analogous to EDM, but they also have the potential to affect the overall efficiency of the market to the detriment of society. Consequently, the social surplus effects of vertical integration depend on the underlying market structure, and vertical mergers are, in and of themselves, neither good nor bad. We illustrate through an example that with incomplete information, the private benefits from vertical integration tend to be excessive; that is, vertical mergers remain profitable even when they are socially harmful.

Keywords
vertical integration, double marginalization, antitrust, incomplete information Industrial organization (IIIO)

I. Introduction
Vertical integration has traditionally been viewed favorably by antitrust authorities because it is associated with socially beneficial synergies, in particular in the form of eliminating double markups (EDM).1 This favorable view is reflected in the 2020 Vertical Merger Guidelines.2 However, in part motivated


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by—real or perceived—problems associated with the tech industry, the traditional view has recently come under scrutiny and been challenged. Indeed, the Federal Trade Commission rescinded its support for the new guidelines in September of 2021, with Commissioners commenting that the guidelines did not appreciate various mechanisms by which vertical mergers could be harmful to consumers and competition.³

Of course, as has long been recognized, within the almost ubiquitously used models with complete information, the EDM benefit of vertical integration hinges on a restriction on the contracting space. Specifically, if the standalone firms were allowed to use two-part tariffs, there would be no double markup to be eliminated with vertical integration. Put differently, with complete information, two-part tariffs are too powerful and make restrictions on the set of allowable contracts necessary for there to be EDM benefits from vertical integration. Unfortunately, restrictions on the contracting space are typically ad hoc and not robust to the Lucas critique—even if a specific form of contract, like linear prices, is used in a given environment, the presumption that the same type of contract will be used following a change in the environment is not warranted because the form of the contracts that are used depends on the environment.⁴

Incomplete information models with independent private values provide an alternative to complete information models. Importantly, in the incomplete information approach, there is a close analogue to EDM that does not hinge on contractual restrictions,⁵ and from the perspective of social surplus, there are costs and benefits of vertical integration that depend on market conditions. In this paper, we illustrate this alternative approach, discuss the insights that emerge from it, and contrast this approach and the associated findings with the traditional approach based on complete information models.

As we discuss, the social surplus effects of vertical integration depend on the underlying market structure, and vertical mergers are, in and of themselves, neither good nor bad.⁶ Furthermore, as we illustrate through an example, with incomplete information, the private benefits from vertical integration tend to be excessive; that is, vertical mergers remain profitable even when they are socially harmful. This suggests that the FTC’s concern that the 2020 Vertical Merger Guidelines were overly generous regarding the likely economic benefits of vertical mergers may be well placed.

Section 2 explains why contractual restrictions are required in order for EDM to arise in complete information models. In Section 3, we discuss incomplete information models, which do not require problematic contractual restrictions. In Section 4, we illustrate key differences in implications between restricted complete information models and incomplete information models of vertical integration. Section 5 concludes the paper.

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⁴ A simple illustration is provided by Simon Loertscher and Ellen V. Muir, Monopoly Pricing, Optimal Randomization, and Resale, 130 J. Polit. Econ. 566 (2022): if a monopoly firm with increasing marginal costs sells homogeneous goods using linear prices in two separate markets that differ with respect to the maximum willingness to pay, then the monopoly may optimally switch to using a form of price discrimination after the two markets are integrated into a single market.
⁶ For further commentary on this point, see Simon Loertscher and Leslie M. Marx, The Possibility of Social-Surplus-Reducing Vertical Mergers, CPI ANTITRUST CHRON., Oct. 2020, at 1.
II. EDM Does Not Arise in Complete Information Models in the Absence of Restrictions on Allowable Contracts

Vertical mergers are frequently analyzed within the context of a “vertical contracting” model in which a small number of downstream firms contract with a small number of upstream firms for an input. Each upstream firm has some cost to produce the input, and each downstream firm sells the input (or a transformed version of it) in a downstream market characterized by a demand curve that embodies a large number of atomistic price-taking consumers. Each downstream firm might be a monopolist with respect to some group of consumers, or the downstream firms might compete as oligopolists with respect to consumers, for example, through Cournot competition (also known as quantity competition). A common assumption on the upstream firms’ costs is that each firm has a constant marginal cost and no fixed cost. Furthermore, it is typically assumed that there is “complete information,” which in the context of a vertical contracting model means that the upstream firms’ costs and the demand conditions in the downstream market are common knowledge to all the firms.

Because vertical mergers have a direct effect on how transactions occur between the merging upstream and downstream firms, analyzing such mergers requires that attention be paid to the form of the contracts between upstream and downstream firms and how those contracts are determined in the marketplace. To simplify the price-formation process, a typical assumption is that there is one upstream firm and multiple downstream firms, or that there is one downstream firm and multiple upstream firms. Then, it is assumed that the firm on the monopoly side of the market makes take-it-or-leave-it offers of contracts to the firms on the other side of the market.

For example, suppose that there is one upstream firm facing multiple downstream firms that compete in the downstream market as Cournot oligopolists. Suppose further that the upstream firm makes take-it-or-leave-it offers to the downstream firms. To keep things simple, assume that the upstream firm’s offers are made simultaneously and observed by all of the downstream firms. In this setting, the upstream firm could offer two-part tariff contracts consisting of a per-unit price and a fixed fee. The per-unit prices could be set so that the downstream firms’ incentives are aligned for them to produce the monopoly quantity and sell at the monopoly price in the downstream market. The fixed fees could be set so that all (or almost all) of the downstream firms’ monopoly profits are extracted by the upstream firm. In this way, the upstream firm can extract all of the available profit from the market. Of course, in this case, there is no incentive for the upstream firm to vertically integrate with a downstream firm because, even in the absence of vertically integration, the upstream firm gets everything.

To summarize, the assumption of complete information and unrestricted contracts creates the problem that there is no incentive for vertical mergers. In this sense, the model is not useful for analyzing questions related to vertical mergers. In models with complete information, two-part tariffs are simply too powerful. Consequently, this result means that one cannot use this type of setup to analyze the potential competitive effects of vertical integration because vertical integration does not arise in the


first place. There are two pathways out of this dilemma. One option is to stay within complete information models but to restrict the set of allowable contracts by, for example, requiring linear contracts (i.e., the upstream and downstream firms can only use a single per-unit price with no fixed fees or quantity discounts). Another option is to generalize the model to allow incomplete information.

Traditionally, the first option has been chosen—economists have stayed within complete information models but imposed contract restrictions that rule out two-part tariffs and made other assumptions to ensure that vertical integration is profitable.9 Although complete information vertical contracting models with restrictions on the contract space are commonly used, the contract restrictions significantly limit the applicability of any insights derived from complete information models. Relying on contract restrictions is problematic because efficiencies that hinge on restrictions of the contracting space need not be merger-specific,10 begging the question whether those efficiencies could be achieved simply by moving to more general contracts.11

These concerns are avoided in the second option of generalizing the model to allow incomplete information. In an incomplete information model, knife-edged results whereby one firm captures all the profits available in a market are avoided because each firm’s willingness to pay (or willingness to sell) is its own private information. Furthermore, an approach that involves generalization rather than additional restriction of the model is preferable as long as other sacrifices, for example, in terms of tractability, are not substantial. In what follows, we argue that appropriately structured incomplete information models are tractable and provide a useful framework for analyzing vertical integration.

III. Incomplete Information Models and Vertical Integration

To relax the assumption of complete information, one would typically assume that the upstream firms’ costs and/or the downstream firms’ willingnesses to pay are their own private information. This is typically modeled by assuming that the firms’ private values and costs are random draws from known distributions. In this setting, one need not impose any restrictions on the contract space. Market outcomes can be modeled directly as the outcome of a market mechanism that, say, maximizes social surplus subject to incentive compatibility and participation constraints, and the constraint that the (fictitious) market maker would break even.

To give an example of the tractability of incomplete information models for the study of vertical integration, consider a simple procurement setting with one buyer and two or more symmetric suppliers.12

9. The option of restricting contracts restores the profitability of vertical integration in some cases. As shown by, e.g., Hart and Tirole, O’Brien and Shaffer, McAfee and Schwartz, Shaffer and Marx, REY AND TIROLE, Bedre-Defolie, and Do and Miklós-Thal, supra note 8, vertical contracting models with complete information and a restriction to linear contracts allow for profitable vertical integration when contracting involves secret take-it-or-leave-it offers and “passive beliefs,” but not with (i) public take-it-or-leave-it offers or (ii) secret take-it-or-leave-it offers and “symmetric beliefs.”

10. Antitrust practice generally looks for any claimed merger efficiencies to be merger specific (see, e.g., U.S. Department of Justice and Federal Trade Commission, Horizontal Merger Guidelines (Aug. 19, 2010), https://www.justice.gov/atr/public/guidelines/hmg-2010.pdf, at 28; 2020 Vertical Merger Guidelines at 11). The 2020 Vertical Merger Guidelines at 12 elaborate that the agencies will consider “contracts between similarly situated firms in the same industry and contracting efforts considered by the merging firms,” but that “The Agencies do not, however, reject the merger specificity of the elimination of double marginalization solely because it could theoretically be achieved but for the merger, if such practices are not reflected in documentary evidence.”

11. For an in-depth discussion of the problems associated with arguments based on the elimination of double markups, see also Choné et al., supra note 5.

Suppose that the buyer solicits bids from the suppliers, whose costs are their own private information, for the provision of an input to the buyer’s production process. For illustration purposes, suppose first that the buyer holds a descending-price auction with no reserve, with the result that the buyer purchases from the lowest-cost supplier at a price equal to the second-lowest cost. Notably, the buyer pays a price that is, in general, strictly greater than the lowest cost, so there would be a “mark-up.”

In this setup, vertical integration between the buyer and one of the suppliers produces a vertically integrated firm that can either produce the input internally or can procure the input from one of the external suppliers. The vertically integrated firm will, of course, only purchase from one of the external suppliers if it can do so at a price that is less than its internal cost of production. The firm could hold a descending-price auction among the external suppliers with a reserve price equal to its internal cost of production. This would allow it to purchase from the lowest-cost external supplier whenever that cost is below its internal cost of production. And, when the internal supplier has the lowest cost, the vertically integrated firm would use the internally produced input and only have to pay the actual cost, resulting in savings to the vertically integrated firm that might be passed along to downstream consumers.

But now, let us tweak the setup slightly by giving the buyer the power to set a binding reserve price, that is, a maximum price above which it will not purchase. If the buyer’s value for the input is sufficiently large, then it will always purchase the input, so even a buyer with the power to set a binding reserve will not do so. In that case, the nonintegrated buyer proceeds as before, holding a descending-price auction with no reserve. However, once the buyer has vertically integrated with one of the suppliers, things change. The vertically integrated firm always has the option of sourcing the input internally, which leads the vertically integrated firm to behave more aggressively vis-à-vis the external suppliers. The vertically integrated firm optimally sets a reserve price that is binding with positive probability. In particular, for some realizations of the external suppliers’ costs, the lowest cost among the external suppliers will be less than the cost of the internal supplier but greater than the reserve price. In that case, the vertically integrated firm sources internally even though an external supplier has a lower cost.

Vertical integration in this scenario causes a market that was formerly efficient, in the sense that the buyer purchased from the lowest-cost supplier, to become inefficient. Furthermore, as shown in Loertscher and Marx (2019), supra note 12, the loss of efficiency in the input allocation translates into a distortion of investment incentives and so a loss of efficiency in firms’ investment decisions.13

As this simple example illustrates, the economic effects of vertical integration can be positive or negative depending on the details of the market, including, as shown above, the price-formation process, buyer power, and market structure. Going beyond this simple example, recent advances in the economics literature allow one to consider vertical integration in an incomplete information setting with multiple buyers and suppliers, where prices are negotiated and where the buyers and suppliers have different bargaining powers.14

Moving beyond the procurement setup just discussed, in a general incomplete information bargaining setup, it is well established that when there is only one buyer and one seller, efficient trade is not possible when there is overlap in the range of possible values for the buyer’s willingness to pay and the range of possible values for suppliers’ costs,15 which we refer to as the case of “overlapping ranges.” Subsequent research extends this result to the case of one buyer and multiple suppliers.16 We refer to the impossibility of efficient trade in the presence of overlapping ranges as the “Myerson-Satterthwaite problem.”

13. See also Loertscher and Riordan, supra 12.
14. See Loertscher and Marx (2022), supra note 5.
As noted by Loertscher and Marx (2022), supra note 5, the Myerson-Satterthwaite problem gives us the immediate result that vertical integration improves efficiency when there is only one buyer and one seller with overlapping ranges. Trade is inefficient prior to vertical integration because of the Myerson-Satterthwaite problem and efficient after vertical integration as long as there are no within-firm agency problems. Furthermore, we have another immediate result that vertical integration reduces efficiency when there is one buyer and multiple sellers with nonoverlapping ranges. In that case, the nonoverlapping ranges allow the pre-integration market to be efficient, but integration changes the buyer’s willingness to pay so that it is bounded above by the integrated supplier’s cost, resulting in overlapping ranges in the post-integration market, and hence vertical integration causes a Myerson-Satterthwaite problem in the post-integration market.

Therefore, in general, the social surplus effects of vertical integration can go either way. In particular, a presumption that vertical integration improves social surplus is not warranted.

IV. Profitable Social-Surplus Decreasing Vertical Integration

Complete information models showing the EDM benefit of vertical integration imply that whenever vertical integration is profitable for the integrating firms, it is also beneficial to society. This implication no longer holds when one recognizes the presence of incomplete information. As we illustrate below, in a setting with incomplete information, while the integrating firms benefit from the elimination of the markup between the two of them, they do not internalize the loss to society from inefficient self-sourcing. As a result, firms can have incentives for “too much” vertical integration.

In addition, we show that the profitability of vertical integration and the social surplus effects of vertical integration vary with the market structure. As we show, the profitability of vertical integration is greatest when there are fewer outside suppliers, which resonates with the view expressed in a recent Wall Street Journal article that vertical integration is more profitable in less competitive markets. In thin supply markets, the gains to the vertically integrating firms outweigh efficiency losses, but for relatively thick supply markets, while the integrating firms still gain, efficiency losses dominate and so vertical integration reduces social surplus.

To illustrate these effects, consider a market with one downstream buyer and multiple upstream suppliers, where the suppliers produce an input that is valued by the buyer. The buyer’s willingness to pay for the input is the buyer’s private information and each supplier’s cost to produce the input is its own private information. For simplicity, we assume that the buyer’s value and the suppliers’ costs are independent draws from the same distribution. This implies that we are in a setting with overlapping ranges and that we have a Myerson-Satterthwaite problem both before and after vertical integration, provided that there are at least two suppliers before integration. Furthermore, we assume that trades and associated payments are determined through the incomplete information bargaining process that maximizes the total surplus of the firms.

In the absence of vertical integration, the buyer trades with the lowest-cost supplier whenever there is sufficient margin between that supplier’s cost and the buyer’s willingness to pay. If the buyer vertically integrates with one of the suppliers, then it can either source the input from the internal supplier at that supplier’s cost (with no margin) or purchase from one of the external suppliers and pay a margin.

17. The auto industry “is again embracing elements of vertical integration, a strategy that traces its roots to the early days of the auto industry when some manufacturers owned or acquired much of the supply chain necessary for production. Traditionally, auto makers have been able to improve profitability by pitting suppliers against one another. With just a handful of players making the highest quality batteries and chemicals, auto makers have diminished pricing power” (Ben Foldy, GM, Volkswagen Build Up Their Battery Supply Chains Amid Electric-Vehicle Push, WALL STREET J., Jan. 3, 2022), https://www.wsj.com/articles/gm-volkswagen-build-up-their-battery-supply-chains-amid-electric-vehicle-push-11641205981.

18. See Loertscher and Marx (2022), supra note 5, for the details of incomplete information bargaining with bargaining weights. Total surplus is maximized in incomplete information bargaining when all firms have the same bargaining weights.
If the lowest-cost external supplier has a cost that is sufficiently low relative to both the integrated buyer’s willingness to pay and its cost of internal supply, then the vertically integrated firm will purchase from that external supplier, and otherwise it will supply internally.

In the absence of vertical integration, markups result in inefficiency. Even though the buyer will always purchase from the lowest-cost supplier when it does purchase, in some cases when the buyer’s willingness to pay is greater than the lowest cost, the buyer still will not purchase the input because the difference between the willingness to pay and the lowest cost is not sufficient to cover the required margin.

Following vertical integration, the relevant considerations change. If the internal supplier has a cost that is less than the downstream buyer’s willingness to pay, then, of course, trade always occurs (at least with the internal supplier, if not with one of the external suppliers) because no margin is required for internal trades. But, if that is not the case, that is, if the internal supplier’s cost is greater than the buyer’s willingness to pay, then as in a nonintegrated market, trade sometimes does not occur even though it is efficient because of the margin required for trade with the external suppliers. In addition, a new source of inefficiency arises as a result of vertical integration. Even when an external supplier has the lowest cost, the buyer may choose to trade with its internal supplier instead because of the margin applied to external trades. Thus, a vertically integrated firm sources internally “too often” relative to what would be efficient. Low-cost nonintegrated suppliers are denied the opportunity to supply the integrated firm when they would have been chosen to supply the buyer in the absence of vertical integration.

We illustrate these effects in Figure 1. The blue bars in the figure show the change in expected social surplus due to vertical integration as a function of the number of nonintegrated suppliers in the post-integration market, denoted \( n \), varies (the corresponding number of suppliers prior to vertical integration is \( n + 1 \)).

Note. Assumes one buyer with single-unit demand and multiple suppliers with single-unit supply. Assumes that the buyer’s willingness to pay and suppliers’ costs are uniformly distributed on \([0, 1]\).

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We illustrate these effects in Figure 1. The blue bars in the figure show the change in expected social surplus due to vertical integration as a function of the number of nonintegrated suppliers in the post-integration market (implying that one additional supplier was present in the market prior to vertical integration). As shown, vertical integration benefits society (the blue bars are positive) when the number of suppliers is sufficiently small (0, 1, or 2 external suppliers in the example of Figure 1), and vertical integration harms society (the blue bars are negative) when the number of suppliers is relatively large. Nevertheless, as shown by the orange bars, vertical integration is always profitable for the two integrating firms (all orange bars are positive), so that for larger numbers of suppliers, firms’

19. The results for social surplus are an extended and reformatted version of the results in Figure in F.1 in the Online Appendix of Loertscher and Marx (2022), supra note 5.
private incentives result in “too much” vertical integration from a social perspective. Finally, the red bars, which are negative, show that the external suppliers are harmed by vertical integration.

The effects illustrated in Figure 1 imply that while vertical integration is profitable for the two integrating suppliers, it can be bad for society because of the resulting inefficiency, which reduces total social surplus. Which effects dominate depend on the competitiveness of the supply side of the market. If what follows we explore further the effects of the thickness of the supply side of the market.

If the number of suppliers in the market is small, then competition among suppliers does little to limit the margin that the buyer must pay to suppliers, and so the elimination of that margin looms large. As a result, when the number of suppliers in the market is small, vertical integration tends to increase social surplus; that is, vertical integration is efficiency enhancing. However, when the number of suppliers is relatively large, competitive forces naturally limit the required margin, and the buyer’s tendency to produce internally even when there is an external supplier with a lower cost dominates; as a result, vertical integration is efficiency reducing. In the limit as the number of suppliers grows large, these effects become small.

In contrast, regardless of the number of suppliers in the market, the joint profit of the buyer and a supplier is increased through vertical integration, so vertical integration is profitable. However, as the number of suppliers in the market grows large, the buyer essentially extracts all the surplus either with or without vertical integration, so the gain from vertical integration becomes small, although it still remains positive.

The illustration provided here suggests that when one accounts for incomplete information, vertical integration need not be socially desirable—in this example, it improves social surplus only for markets with two or fewer nonintegrated suppliers in the post-integration market, but it is always profitable for the integrating firms. This suggests that more antitrust scrutiny of vertical mergers may be warranted than would be indicated based on complete information models of vertical integration.

V. Conclusion

Traditional models of vertical integration assume that downstream buyers’ willingnesses to pay for an upstream input and the upstream suppliers’ costs of producing the input are commonly known to all market participants and that vertical contracts are restricted to involve only a wholesale price. Such models highlight the EDM benefit of vertical integration while failing to recognize countervailing harmful effects. A more general model that allows for incomplete information and does not impose restrictions on contracts shows that EDM benefits can be outweighed by inefficiencies that result from vertical integration. In light of this, the 2020 Vertical Merger Guidelines may have been too generous as far as the likely economic benefits of vertical integration are concerned.

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20. To provide a specific extensive-form acquisition game that corresponds to this analysis, one can assume that prior to the realization of private information, the buyer makes a take-it-or-leave-it offer of an acquisition price to exactly one supplier, which that supplier either accepts or rejects. Of course, other formulations of the acquisition game are possible. To the extent that a supplier’s rejection of an acquisition offer results in a market in which the buyer is vertically integrated with a rival supplier, then the relevant outside options in the bargaining game differ and so bargaining outcomes can be expected to differ. See Loertscher and Riordan (2019), supra note 12, at Online Appendix A.1, for an analysis of an acquisition game involving sequential offers by the buyer to suppliers.