THE POSSIBILITY OF SOCIAL-SURPLUS-REDUCING VERTICAL MERGERS

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The left column is a table of contents.

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I. INTRODUCTION

The U.S. Department of Justice and Federal Trade Commission's "Vertical Merger Guidelines" (June 30, 2020) emphasize positive effects of vertical integration:[2] "Vertical mergers combine complementary economic functions and eliminate contracting frictions, and therefore have the capacity to create a range of potentially cognizable efficiencies that benefit competition and consumers" (p. 11). That said, they also recognize that "While the agencies more often encounter problematic horizontal mergers than problematic vertical mergers, vertical mergers are not invariably innocuous" (p. 2).

In this paper, we discuss and explain a remarkably general scenario in which a vertical merger reduces social surplus – that is, reduces the total value of the allocation that occurs in equilibrium. The results described here reflect findings in our recent paper called "Countervailing Power, Integration, and Investment under Incomplete Information," which provided the foundation for remarks made at CPI's online event "CRESSE Special Policy Session on Vertical Mergers: Enforcement Developments and Guidelines" (July 1, 2020).

II. A VERY SIMPLE MODEL OF VERTICAL INTEGRATION

We begin by describing the simplest possible model of vertical integration. Assume that we have one upstream supplier and one downstream buyer. In the absence of vertical integration, there is a market process through which the buyer procures an input from the supplier.

Let us assume that the supplier's cost to produce the input is the supplier's own private information – that is, the supplier knows its own cost, but the buyer does not know that cost. The buyer only knows that the supplier's cost is somewhere between $1 and $10. And symmetrically, let us assume that the buyer's willingness to pay for the input is the buyer's own private information, but that it is common knowledge that the buyer's willingness to pay for the input is between $1 and $10.

What do we expect to happen here? Sometimes the buyer's willingness to pay will turn out to be less than the supplier's cost, and then, of course, there will be no trade. But even when the buyer's willingness to pay is greater than the supplier's cost, the two firms will not know that. They will negotiate with each other, each trying to get the best possible price. As we know, both from theory and from data, this bargaining process can

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2 Indeed, FTC Commissioner Rebecca Kelly Slaughter criticizes the Guidelines in her dissent for their "over-emphasis on the benefits of vertical mergers" and Commissioner Rohit Chopra states in his dissent that they "support the status-quo ideological belief that vertical mergers are presumptively benign, and even beneficial."

break down even when there are gains from trade.[3] That is, because of the presence of private information, even when there are gains from trade, bargaining can fail to result in trade.

But now consider vertical integration by these two firms. In that case, the problem is, arguably, solved. Whenever the integrated firm can produce the input internally at a cost that is less than the downstream entity's value for the input, it will do so. Efficiency is restored.

III. A VERY SLIGHTLY MORE COMPLICATED MODEL OF VERTICAL INTEGRATION

We now make two changes to the model. First, we move the range of the buyer's willingness to pay up to $20 to $25. Notice that now the range of the buyer's willingness to pay no longer overlaps with the range of the supplier's cost. With this change, it is always efficient for the buyer and supplier to trade because there are always positive gains from trade. And, second, we add another supplier whose cost lies somewhere between $1 and $10, so that now we have one buyer whose willingness to pay is between $20 and $25 and two suppliers with costs between $1 and $10.

In this setup, without integration, the buyer can hold a competitive procurement. Specifically, it can hold an auction and obtain bids from the two suppliers. For example, the buyer could hold a descending-price auction starting at a price of $10.[4] It could continue to lower the price until only one supplier remains active, and then buy from that supplier. That procurement process would be efficient – assuming competitive bidding, it would always result in trade between the buyer and the lowest-cost supplier.

In this model of the pre-vertical-integration market, we have one buyer and two suppliers, and the market is efficient because the buyer's procurement process always results in its purchasing from the lowest-cost supplier. With this as our baseline, we now consider what happens if the buyer vertically integrates with one of the suppliers.

Suppose that the buyer vertically integrates with supplier 1, leaving supplier 2 as an independent supplier. The vertically integrated firm could either produce the input internally at whatever supplier 1's cost is, or it could instead purchase the input from the independent supplier. Consider the question of how much the vertically integrated firm is willing to pay to purchase the input from the independent supplier. The vertically integrated firm is not willing to pay more than the cost at which it could produce the input internally. So now we have an integrated firm whose willingness to pay for the independent supplier's input is determined by its internal cost of production, which is some amount between $1 and $10. And, remember, the independent supplier's cost is also some amount between $1 and $10. So now we're are back in the situation that we first discussed. We have a buyer with a willingness to pay and a supplier with a cost that are drawn from the same range.

We know that bargaining in a setting like this is inefficient. Sometimes bargaining will break down and the vertically integrated firm will not purchase from the independent supplier even though the independent supplier has a lower cost than the integrated supplier. In that case, the buyer will turn to internal supply even though the internal supplier has a higher cost. The buyer will source internally in some cases when it would be more efficient for it to source the input from the independent supplier.

To recap, prior to vertical integration, we had a market with one buyer and two suppliers that was fully efficient. And then, following vertical integration, the market was no longer efficient. Vertical integration caused the market to become inefficient. Vertical integration caused the market to change from one in which the buyer efficiently purchased from the lowest-cost supplier, to one in which the integrated firm's internal

3 Foundational work by Myerson & Satterthwaite (1983) provides conditions under which efficient bargaining (i.e. bargaining that results in trade if and only if there are gains from trade) is not possible (see also Williams, 1987; Gresik & Satterthwaite, 1989). Empirical work that recognizes and quantifies inefficiency in bargaining includes Larsen (2020) for wholesale used cars and Backus et al. (2019, 2020) for eBay listings. Backus, M., T. Blake, B. Larsen & S. Tadelis (2020): "Sequential Bargaining in the Field: Evidence from Millions of Online Bargaining Interactions," *Quarterly Journal of Economics*, 135, 1319–1361. Backus, M., T. Blake & S. Tadelis (2019): "On the Empirical Content of Cheap-Talk Signaling: An Application to Bargaining," *Journal of Political Economy*, 127, 1599–1628. Gresik, T. & M. Satterthwaite (1989): "The Rate at which a Simple Market Converges to Efficiency as the Number of Traders Increases: An Asymptotic Result for Optimal Trading Mechanisms," *Journal of Economic Theory*, 48, 304–332. Larsen, B. J. (2020): "The Efficiency of Real-World Bargaining: Evidence from Wholesale Used-Auto Auctions," *Review of Economic Studies*. Loertscher, S. & L. M. Marx (2020): "Countervailing Power, Integration, and Investment under Incomplete Information," Working Paper, University of Melbourne. Myerson, R. & M. Satterthwaite (1983): "Efficient Mechanisms for Bilateral Trading," *Journal of Economic Theory*, 29, 265–281. Williams, S. R. (1987): "Efficient Performance in Two Agent Bargaining," *Journal of Economic Theory*, 41, 154–172.

4 If one assumes, for example, that the suppliers' costs are uniformly distributed on the interval between $1 and $10, then the optimal reserve price for a buyer with a willingness to pay of 20 or greater, as in our example, is $10. Thus, starting a descending-price procurement from a price of $10 is an optimal procurement for the buyer in our setting.

source of supply caused its willingness to pay for the input to change. Specifically, it caused that willingness to pay to be drawn from the same range as the independent supplier. And we know that bargaining is inefficient in a setting like that in which parties are not certain of the willingness to pay or cost of the party on the other side of the bargaining table, and in which the ranges for the buyer's willingness to pay and the supplier's cost overlap.[5]

IV. EFFECTS ON INVESTMENT

We have seen that vertical integration can lead to market inefficiency. This means that goods are being produced by suppliers that do not have the lowest cost. That means that we have deadweight loss. Social surplus is reduced below what it would be in the absence of vertical integration.

But the loss of efficient trade has follow-on effects. For example, suppose that suppliers can make investments that reduce their production costs – more specifically, that change their cost distribution, for example, making lower costs more likely and higher costs less likely. If bargaining in a market with private information is efficient, then suppliers will have the right incentives for efficient investment. Their incentives for investment will be aligned exactly with what a social planner would want those investments to be. But if bargaining is not efficient, then incentives for investment are unlikely to be aligned with efficiency.

When vertical integration disrupts the efficiency of a market, it also disrupts the efficiency of investment. It changes a market from one where efficient investments in cost-reducing technologies are an equilibrium outcome for the suppliers to one in which suppliers' equilibrium investments are no longer the first-best.

If a given vertical merger renders bargaining efficient, then it will also align the firms' incentives for investment with the first-best. Thus, a merger that corrects inefficiencies in market transactions potentially has additional benefits as it aligns firms' decision making on issues such as investment. But a merger that introduces inefficiency into the market will also introduce distortions into firms' incentives for investment.

The example here involves investment in technology that would improve the distribution of suppliers' costs – that is, the investment would make lower costs more likely. But the result that the efficiency of investment incentives is tied to the efficiency of the market process also holds for investment by the downstream firm that improves the distribution of its willingness to pay for the input and for investments by the upstream suppliers in the quality of their inputs. This is true if an upstream supplier's investment in quality only improves the quality of its own product. The analysis is more complicated if one supplier's investment also improves the quality of its rivals' products.

V. DISCUSSION

As just discussed, if the pre-integration market involves a buyer using an *efficient* procurement process to purchase from two suppliers, then the post-integration market will be less efficient than the pre-integration market. The post-integration market will be less efficient because it will have an integrated firm that, at least sometimes, sources the input internally, from its integrated supplier, even when the remaining independent supplier has a lower cost. This happens because bilateral bargaining between the integrated firm and the independent supplier is inefficient – it suffers from what economists might refer to as a Myerson-Satterthwaite problem – that is, bargaining between a potential buyer and potential seller of a good, both with private information about their willingness to trade, is inefficient when their willingnesses to trade are drawn from overlapping ranges. In this case, vertical integration *changes* the nature of the price-formation process in a way that causes an efficient market to become inefficient.

A number of lessons can be distilled from these examples. First, it is important to recognize that the efficiency of the market process is something that is *affected* by market structure and can *change* when market structure changes. This means that an evaluation of the competitive effects of a vertical merger, or any merger for that matter, needs to consider the possibility that the efficiency with which the market operates will be affected by the transaction. Of course, if it is anticipated that the efficiency of the price-formation process will be affected by a transaction, then that leads to other questions, such as how investment and other choices of firms in the industry, including both the merging party and

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5 These conclusions do not depend on there being a single independent supplier or the buyer having demand for a single input. See, for example, Delacrétaz et al. (2019) for general conditions for the impossibility of efficient trade. Delacrétaz, D., S. Loertscher, L. Marx & T. Wilkening (2019): "Two-Sided Allocation Problems, Decomposability, and the Impossibility of Efficient Trade," *Journal of Economic Theory*, 416–454.

others, will be affected. Second, economic theory teaches that in some settings a vertical merger changes the market structure in a way that *harms* the efficiency of the market process. We are able to conclude from this that there should be no presumption that vertical integration is efficiency enhancing.

Although we have argued based on very simple setups, the result that vertical integration can cause an efficient market to become inefficient is quite general. First, the result that trade between a buyer and a supplier is inefficient in a setting with private information and overlapping ranges for agents' willingness to trade is a general result with theoretical foundations going back to a seminal paper by Nobel prize winning economist Roger Myerson and co-author Mark Satterthwaite in 1983. They show that when there is overlap in the range of values for the buyer's willingness to pay and the supplier's cost, then there exists *no* efficient trading mechanism that satisfies the standard constraints of incentive compatibility, individually rationality, and no budget deficit. Subsequent research has extended Myerson & Satterthwaite's result on the impossibility of efficient trade to rich environments in which buyers and sellers have multi-dimensional private types, many-to-many trades, and heterogeneous objects. Further, in our example with one buyer and two suppliers, we considered the case in which the buyer holds a competitive procurement. But, holding fixed our assumptions about the ranges for the agents' values and costs, other assumptions on the pre-integration price-formation process, such as bargaining with equal bargaining powers, deliver the same result. Our use of a competitive procurement was just one example. We emphasize the possibility that vertical integration can take an efficient market and cause there to be the Myerson-Satterthwaite problem that efficient trade is impossible.

Analysis and discussion of vertical mergers invariably leads to the concept of elimination of double markups, so it is perhaps remarkable that the discussion above does not use that term. The elimination-of-double-markups rationale for vertical integration rests on models that impose a restriction on the contracting space – linear prices rather than two-part tariffs – with complete information. In such a setup, the downstream firm faces a marginal cost that is different from the true production cost of the upstream firm, which results in prices to downstream consumers that are distorted away from the efficient level. The Myerson-Satterthwaite problem discussed here is a private information analogue to the double-markup problem that, importantly, does not rest on restrictions of the contracting space. When suppliers have private information about their costs, there will be situations in which the vertically integrated firm uses its internally supplied input even though one of the independent suppliers has a lower cost to supply the input. That is an inefficiency that arises as a result of vertical integration, regardless of markups. We emphasize here the need to keep in mind that vertical integration creates this type inefficiency, which we can think of as a form of customer foreclosure.

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