ECONOMIC TOOLS FOR ANALYZING VERTICAL MERGERS IN HEALTHCARE

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I. INTRODUCTION

The Federal Trade Commission ("FTC") and the Department of Justice ("DOJ") recently released Draft Vertical Merger Guidelines ("VMG"),[2] which describe the framework under which the federal antitrust agencies propose to evaluate vertical mergers. "Vertical" mergers involve firms that operate at different levels of the supply chain and are distinguished from "horizontal" mergers, which combine firms that compete at the same level of the supply chain. In vertical mergers, economists differentiate upstream firms, which produce an input or provide a service that may be used or relied upon by other firms, from downstream firms, which sell their products to end consumers. We use these "upstream" and "downstream" labels throughout this article.

The VMG are short — just nine pages long — and are not tailored to one industry or supply chain. While the VMG outline general principles that the agencies intend to use in evaluating vertical mergers, they lack specifics. In this article, we discuss the relevance of the VMG to healthcare mergers — where vertical transactions and investigations by the FTC and DOJ are common — and provide an overview of some economic tools that comport with the guidance offered by the VMG. While not limited to use in healthcare, these tools may be used by practitioners to quickly assess whether a vertical merger may give rise to antitrust concerns.[3]

II. RECENT ENFORCEMENT ACTIONS

Given the complex and multi-level nature of healthcare markets, vertical concerns have arisen in several contexts in recent healthcare transactions. Before discussing the economic tools that can be used to evaluate vertical effects in these mergers, we briefly describe some of these transactions to provide context to our discussion. We start by noting that as physicians increasingly move away from independent practice towards employment by hospital systems, one issue that is likely to arise in these transactions is whether such employment arrangements have the potential to disadvantage competing hospital systems. A recent example involves the acquisition of Saltzer Medical Group in Nampa, Idaho — which was at the time the largest multi-specialty physician practice in Idaho — by St. Luke's Health System. Competing systems expressed concern that after the acquisition, St. Luke's, which also operated hospitals, would block referrals from Saltzer-employed physicians to competing hospitals.[4]

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2 Federal Trade Commission, FTC and DOJ Announce Draft Vertical Merger Guidelines for Public Comment (2020), https://www.ftc.gov/news-events/press-releases/2020/01/ftc-doj-announce-draft-vertical-merger-guidelines-public-comment (last visited April 13, 2020).

3 The VMG describe the possibility that a merger could diminish competition by enabling or encouraging post-merger coordinated interaction among firms (coordinated effects), or that a merger may diminish competition between the merged firm and upstream or downstream competitors (unilateral effects). The Horizontal Merger Guidelines make the same distinction. We focus here on economic tools for evaluating the likelihood of unilateral competitive effects in vertical mergers as most recent enforcement action has focused on this possibility.

4 While the FTC successfully enjoined the transaction based on the horizontal overlap for adult primary care provider services, St. Alphonsus and Treasure Valley — two private hospital plaintiffs — alleged the type of vertical foreclosure concerns we described.

Another vertical transaction involved an acquisition by Fresenius — a manufacturer of dialysis equipment and consumables for hemodialysis machines — of NxStage. In addition to its role as an upstream supplier, Fresenius was the largest operator of outpatient hemodialysis clinics in the United States. NxStage primarily sold hemodialysis equipment and consumables.[5] Although the FTC only required divestitures related to the parties' horizontal overlap in bloodline tubing supplies,[6] two commissioners also expressed concerns about the vertical effects of the transaction. The commissioners noted that NxStage also manufactured a leading home hemodialysis machine, which raised the potential for vertical harm by foreclosing Fresenius's competitors from access to NxStage's unique home dialysis equipment. In addition, one commissioner noted that the acquisition had the potential to stifle innovation in development of home hemodialysis machines because the vertically integrated Fresenius would have little incentive to purchase equipment from entrants.[7]

The acquisition of DaVita Medical Group by UnitedHealth similarly raised both horizonal and vertical concerns.[8] United offers Medicare Advantage plans to seniors in the Las Vegas area; in addition, United employs physicians in Las Vegas. DaVita, on the other hand, operated a competing group of physicians in Las Vegas. Both United's and DaVita's Las Vegas physician groups contracted with insurers participating in Medicare Advantage to provide what the FTC characterized as "managed care provider organization" ("MCPO") services. MCPO services involved coordinating care, managing utilization, and controlling healthcare expenditures for Medicare Advantage plan members. The FTC alleged that United and DaVita were the two largest providers of MCPO services in Las Vegas and that the acquisition would diminish competition for MCPO services (i.e. horizontal effects). In addition, the FTC alleged that the merger would give United control over DaVita's physician group, which it saw as a "competitively significant input" for rival insurers offering Medicare Advantage plans in Las Vegas (i.e. vertical effects). As a result, the FTC alleged that United could have negotiated higher rates with or refused to contract with rival Medicare Advantage plans.

A final pair of examples can be found in the recent mergers of pharmacy benefits managers (PBMs) and health insurers: the acquisition of Express Scripts by Cigna and the acquisition of Aetna by CVS.[9] Neither matter resulted in the federal agencies taking enforcement action to alleviate potential vertical concerns, but the DOJ noted that it investigated the potential for such concerns in both matters. Specifically, in its closing statement for the *Cigna/Express Scripts* investigation, the DOJ noted that it considered whether the merger might "raise the cost of PBM services to Cigna's health insurance rivals" but ultimately concluded there was no cause for concern.[10] In the *Aetna/CVS* matter, the DOJ settlement required divestiture of Aetna's Medicare Part D individual prescription drug plan business to address horizontal overlap concerns between Aetna's and CVS's competing Medicare prescription drug plans.[11] In addition to this horizontal concern, the DOJ also considered whether the merger might give rise to a vertical concern by raising the cost of PBM services or retail pharmacy services to competitors. However, as with the *Express Scripts/Cigna* transaction, the DOJ ultimately concluded that there was no concern that *Aetna/CVS* might foreclose competing health insurers' access to either CVS's PBM or retail pharmacy network.[12]

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5 NxStage operated a very small number of hemodialysis clinics, primarily designed to test its own equipment.

6 Bloodline tubing sets are used to connect blood access devices to hemodialysis machines.

7 Dissenting Statement of Commissioner Rohit Chopra In the Matter of Fresenius Medical Care AG & Co. KGaA and NxStage Medical, Inc., FTC File No. 171-0227, (February 19, 2019), https://www.ftc.gov/system/files/documents/public_statements/1455733/171_0227_fresenius_nxstage_chopra_statement_2-19-19.pdf (last visited April 13, 2020); Dissenting Statement of Commissioner Rebecca Kelly Slaughter In the Matter of Fresenius Medical Care/NxStage, FTC File No. 171-0227, (February 19, 2019), https://www.ftc.gov/system/files/documents/public_statements/1455740/171_0227_fresenius-nxstage_slaughter_statement_2-19-19.pdf (last visited April 13, 2020).

8 Complaint, *U.S. et al. v. UnitedHealth Group Inc., et al.,* No. C-4677, https://www.ftc.gov/system/files/documents/cases/181_0057_c4677_united_davita_complaint.pdf (last visited April 13, 2020).

9 In addition to operating a PBM (Caremark), CVS also operates retail pharmacies and ambulatory care centers ("Minute Clinics") in the United States.

10 Statement of the Department of Justice Antitrust Division on the Closing of Its Investigation of the Cigna–Express Scripts Merger, Justice.gov (2018), https://www.justice.gov/atr/closing-statement (last visited April 13, 2020).

11 Final Judgment, *U.S. et al. v. CVS Health Corp. and Aetna Inc.*, 1:18-cv-02340 (D.D.C. September 4, 2019), https://www.justice.gov/atr/case-document/file/1199836/download (last visited April 13, 2020).

12 Department of Justice, United States v. CVS and Aetna, Questions and Answers for the General Public (2018), https://www.justice.gov/opa/press-release/file/1099806/download (last visited April 13, 2020).

III. FORECLOSURE & RAISING RIVALS' COSTS

With these examples in mind, the VMG discuss two mechanisms that can lead to unilateral competitive effects in vertical mergers: foreclosure and raising rivals' costs.[13] Balancing the potential for anticompetitive effects, vertical mergers may give rise to the same types of economic efficiencies that are associated with horizontal mergers. The VMG also acknowledge that, in principle, vertical mergers naturally give rise to a type of efficiency called the "elimination of double marginalization" ("EDM") which occurs when the upstream division stops selling inputs to the downstream division at a markup and instead sells to them at cost. The presence of EDM is the reason that some economists distinguish vertical mergers from horizontal mergers in terms of competitive effects. The VMG discuss when efficiencies from EDM might be large and when they might be mitigated by other factors.[14]

Foreclosure refers to a situation in which the upstream merged division refuses to supply rivals of its downstream division with an input that those rivals need to effectively compete. After a vertical merger, the upstream division may have an incentive to engage in foreclosure if the downstream division benefits from sales lost by the foreclosed downstream rivals. This conduct may increase the market power of the downstream division to the detriment of consumers.[15]

Raising rivals' costs is a less extreme form of input foreclosure: rather that refusing to supply a downstream rival with an input, the upstream division of the merged firm continues to supply the input to rivals but charges more for the input. After a vertical merger, the upstream division may have an incentive to raise downstream rivals' costs because doing so makes it harder for those rivals to effectively compete. The lost sales suffered by the disadvantaged downstream rivals may benefit the merged firm but harm consumers. Compared to input foreclosure, raising rivals' costs has a smaller impact on the profits of both the targeted rival and the merging firm and, in many situations, economic models predict that raising rivals' costs is profitable even when foreclosure is not.

As we describe in more detail below, two key considerations determine whether both foreclosure and raising rivals' cost are likely to be profitable following a vertical transaction. The first consideration is whether downstream rivals have alternative input suppliers and the second consideration is the closeness of competition between the downstream division and the targeted rivals.[16] Because the same economic considerations affect the likelihood of both foreclosure and raising rivals' costs, it is the views and conduct of industry participants that will likely determine whether the agencies investigate the potential either for foreclosure or for raising rivals' cost. For example, when an insurer proposes acquiring a physician practice, if the insurer's rivals express concerns to the agencies about the acquired practice demanding higher reimbursement rates, the agencies might investigate the potential for harm from raising rivals' costs. On the other hand, if these same rival insurers express concerns that the physician practice will no longer agree to be a network provider, the agencies might investigate the potential for harm from foreclosure.

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13 The VMG also discuss access to competitively sensitive information from upstream or downstream rivals as a source of unilateral anticompetitive effects in vertical mergers, but we do not discuss that issue here.

14 VMG, Section 6. The VMG appear to treat the existence of EDM with some skeptism and place the burden on the merging parties to "identify and demonstrate whether and how the merger eliminates double marginalization." That is, like a traditional efficiency in a horizontal merger, EDM is an affirmative arugment that must be made by the parties.

15 While this situation is referred to as "input foreclosure," there is also the potential for "customer foreclosure." In such a situation, the downstream division may attempt to disadvantage rivals to its upstream merged division (for example, by refusing to buy inputs from those rivals). This may provide the upstream merged division with enhanced market power. Economic analysis of customer foreclosure generally mirrors the analysis of input foreclosure that we describe below, except that the loss in profits suffered by the downstream division is weighed against the increase in profits to the upstream division that comes from disadvantaging its rivals.

16 These considerations are implicit in Section 3 of the VMG. Upstream shares relate to the potential for input substitution and downstream shares relate to diversion ratios. Upstream and downstream margins also play an important role. All these factors are related to the drivers of unilateral effects in horizontal mergers, and similar intuition underlies the economic tools used to assess horizontal and vertical mergers. An example we discuss below is the vGUPPI, which measures upward pricing pressure in vertical settings, and is closely related to, and calculated with similar inputs, as the GUPPI, which is referenced in the Horizontal Merger Guidelines and measures upward pricing pressure in that setting.

IV. MODELS AND TOOLS

Neither the VMG nor the Horizonal Merger Guidelines describe specific tools that the agencies use to evaluate a merger. Rather, these guidelines state that the agencies will utilize their "extensive experience, [and] apply a range of analytical tools … to evaluate competitive concerns in a limited period of time."[17] However, we believe that there are some tools that can be used — at least as initial screening tools — to evaluate the likelihood that a vertical merger may give rise to anticompetitive effects. Of course, any economic model is based on assumptions that may not reflect the current or future competitive dynamics of the industry, and we do not mean to suggest that the models we describe are always appropriate or always produce accurate predictions. Rather, as the FTC and DOJ state, we believe it is more informative to consider whether different economic models "consistently predict substantial price increases."[18]

A. Evaluating Foreclosure Concerns

As a concrete example of how these models might be applied to vertical mergers in healthcare, suppose that a nationwide physician practice of radiologists, Downstream Radiology Practice ("DRP"), is acquiring a manufacturer of imaging machines, Upstream Imaging Equipment ("UIE"). The merged firm would have an incentive to foreclose access by downstream rival radiologist practices to the upstream division's imaging equipment — suppose UIE had developed a state-of-the-art X-ray machine — if doing so increased the merged firm's overall (i.e. upstream and downstream) profits. To evaluate this incentive, we need to separately consider how such foreclosure would affect the profits earned by the merged firms' downstream and upstream divisions.

The downstream division's profits typically increase after *successful* foreclosure by the upstream division.[19] This is because the act of foreclosure makes the downstream division's rivals' product or service less attractive to consumers. How much the downstream division's profits increase depends on how many of the foreclosed rivals' customers switch to the merged firm's downstream division. For example, supposed that UIE refused to sell its state-of-the-art X-ray machine to radiology practices that compete with DRP. Some patients who previously received care at those competing radiology practices may choose to find another doctor, and some of the patients who switch may choose DRP. How many patients leave the competing radiology practices and switch to DRP depends on several considerations. For example, how many patients would switch doctors to get access to the state-of-the-art UIE machine? Can rival radiology practices buy from other equipment makers or find used UIE X-ray machines in a secondary market? Of the patients who sought a new doctor, how many would choose DRP? The answers to these questions, along with DRP's margins, will determine the downstream profit gain to DRP from foreclosing competitors' access to UIE's X-ray machines.

Economists use a common nomenclature when quantifying these effects. After the merged firm forecloses a downstream rival, some fraction of the rival's customers will stop purchasing from that firm. This fraction is referred to as a *departure rate*.[20] Typically, the more important a merged firm's input is to the downstream rival, the higher the departure rate. For example, if UIE forecloses a rival radiology practice's access to its imaging machines but there are many competing X-ray machines for sale and these machines are largely indistinguishable to radiologists and patients, the departure rate from the rival practice will be low. But if most of the rival's radiologists prefer UIE machines and there are few manufacturers of suitable alternative machines, the departure rate from the rival radiology practice will be high.

Diversion rates measure where the departing customers from the foreclosed rivals will go,[21] and determine (along with the departure rate) how many new downstream customers the merged firm will gain after foreclosing its rival.

Finally, *downstream margins* determine the profitability of the foreclosure to the merged firm's downstream operations. The product of DRP's per-patient margin and the number of new downstream patients the firm gains (which depends on the departure and diversion rates) is the downstream profit opportunity to the merged firm's downstream division from foreclosing a rival.

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17 U.S. Department of Justice & Federal Trade Commission, Horizontal Merger Guidelines Section 1 (2010).

18 VMG, Section 5.a.

19 The immediate consequence of UIE foreclosing DRP's rival is that the rival will need to obtain imaging equipment from an alternative supplier. When this happens, DRP's profits necessarily increase. It is possible that foreclosure could have additional "second-order" effects on the downstream rival that affect the profits of DRP. While these second-order effects may ultimately be important in evaluating the competitive effects of the transaction, a full model of upstream and downstream competition and repositioning would be needed to assess those effects.

20 For example, if the rival has 1000 customers before foreclosure and the departure rate is 50 percent, foreclosure will cause the downstream rival to lose 500 customers.

21 Continuing the previous example, suppose the diversion from the foreclosed downstream rival to the merged firm is 50 percent. Then 250 of the 500 customers that depart the downstream rival will switch to the merged firm after foreclosure.

After foreclosure, the downstream division's increased profits are weighed against the upstream division's profit loss from a reduction in its sales. The upstream division's profits decline because the act of foreclosure causes them to lose sales to the now foreclosed downstream rivals, and their associated profits.[22] The number of lost sales multiplied by the *upstream margins* determines the size of this profit loss. If the sum of the two offsetting effects on the upstream and downstream divisions is positive, then the merged firm will find it profitable to foreclose one or all of its downstream rivals.

In summary, foreclosure is more likely to be a concern in situations in which the upstream division of the merged firm produces an important input for downstream rivals (i.e. the departure rate is high), the merged firm's downstream division and the targeted downstream rival are close competitors (i.e. diversion from the downstream rival to the downstream division is high), and the merged firm's downstream division is profitable relative to its upstream division (i.e. downstream margins are large relative to upstream margins.) Interestingly, the economic factors that determine whether foreclosure (or raising rivals' costs) is profitable are similar to those that determine if a horizontal merger is problematic: diversion ratios and margins. In both cases, high diversion ratios and substantial margins associated with diverted sales imply greater potential for concern. While the VMG provide little discussion of either consideration, a great amount has been written about estimating both diversion ratios and margins in the context of evaluating horizontal mergers, and the methods and lessons discussed in that literature can also be applied to evaluating vertical mergers.

B. Evaluating Raising Rivals' Costs Concerns

The previous section discussed the example in which the merged firm refuses to supply a downstream rival with an input. Rather than refusing to supply a downstream rival, the merged firm can instead increase the price it charges the downstream rival. For example, UIE could charge or demand 10 percent more for its X-ray machines. This price increase may not prevent competing radiology practices from buying UIE machines, but the 10 percent increase in the practices' costs may lead those practices to negotiate higher reimbursement with insurers, or to engage in quality-reducing cost reductions, potentially leading some patients to choose DRP instead.[23]

As with foreclosure, disadvantaging downstream rivals by raising their costs increases the downstream division's profits. The size of this profit opportunity depends on answers to many of the same questions as in the foreclosure analysis. Can rival radiology practices buy from other equipment makers? To what extent will rival radiology practices absorb this increase in X-ray machine costs or pass it along to their patients? How many rival practices' patients will switch doctors in response to the increased costs? And of the patients who sought a new radiologist, how many will choose DRP? The answers to these questions, along with DRP's margins, will determine the downstream profit gain to DRP from increasing the prices of UIE's X-ray machines.

To assess this incentive to raise rivals' costs, economists use a different set of tools that rely on many of the same inputs as the foreclosure calculations. These tools are related to those that investigate foreclosure because, as discussed, the economics underlying a merged firm's incentives to foreclose rivals and to increase their costs are similar. Although related, these tools answer a different question: Instead of asking *whether* the merged firm has an incentive to foreclose its rivals, they yield measures of *how strong* the merged firm's incentives to raise its rivals' costs are.

There are two commonly used tools in assessing raising rivals' costs: the first is measure of upward pricing pressure resulting from vertical mergers and the second is a measure of how bargaining dynamics might change because of a vertical merger.[24]

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22 Some of these lost upstream sales might be offset by additional sales to the merged firm's downstream division, since the act of foreclosure increases the downstream division's demand and the downstream division may need to purchase more upstream supplies to meet this demand. However, these additional sales to the upstream division will not fully offset the upstream division's losses since if they did, the upstream division wouldn't have found it profitable to sell to the downstream rival prior to the transaction.

23 This could happen because health insurers could use financial incentives to steer their members to alternative radiology providers such as DRP or because patients dislike the lower quality.

24 The tools used to measure incentives to foreclose rivals and raise rivals' costs typically yield results that are consistent with each other. If, for example, the agencies perform the foreclosure calculations discussed above and find that the merged firm would have a strong incentive to stop supplying downstream rivals with an input, then these tools will likely predict the merged firm has a strong incentive to raise rivals' costs.

1. Models of Upward Pricing Pressure

The first tool we discuss is the vGUPPI, which measures the extent to which a vertical merger removes competitive constraints on upstream and downstream prices.[25] Intuitively, the upstream division's incentives to raise downstream rivals' costs are strongest when doing so drives sales to the downstream division, and when these new sales are very profitable to the downstream division. If no input substitution is possible — that is, if the downstream rival has no choice but to accept the higher price from its upstream supplier — an increase in input price should cause downstream competitors to raise their own prices by some amount (depending on the pass-through rate) to consumers.[26] The increase in the price faced by consumers causes some of them to switch to the merged firm's downstream division, which increases that division's profits.

Continuing with our previous example, if physicians affiliated with rivals to DRP are not willing to switch to alternative imaging machines, these rivals have no choice but to continue to purchase UIE's machines at the higher prices. Among other things, UIE's incentive to increase the prices charged to DRP's downstream rivals will depend on downstream diversion ratios from the targeted rival to DRP and DRP's downstream margins.

If downstream competitors can substitute away from the upstream division's input, the upward pricing pressure from a vertical merger will be mitigated. The better the substitution possibilities available to downstream rivals, the smaller is the upstream division's incentives to raise rivals' costs. Suppose, for example, that GE Healthcare made an X-ray machine that was equivalent in price and capabilities to that made by UIE. Any attempt by UIE to raise prices to downstream firms would be pointless because those downstream firms could simply purchase their equipment from GE Healthcare. The vGUPPI framework readily incorporates this form of substitution.[27]

Absent input substitution or efficiencies such as the elimination of double marginalization and assuming that downstream rivals pass through some of their cost increases, the vGUPPI method always predicts that the merged firm will have some incentive to raise its upstream prices, although the strength of this incentive depends on the model inputs. This applies to the upward pricing pressure model used in horizontal mergers as well: absent efficiencies, that model always predicts that horizontal mergers will lead to higher prices.[28] This leads naturally to the question of what the safe-harbor level of the vGUPPI might be, which is not a question that the VMG address.[29]

2. Models of Negotiated Prices

Underlying the vGUPPI model is an assumption that all firms (downstream and upstream) are price-setters and all customers (including downstream firms) are price-takers. For example, a grocery store sets the price of flour, bakers can buy as much flour as they want at the store's price, and consumers can buy as many cakes as they want at the price set by the baker. In contrast to this model of sequential price-setting and price-taking, in the healthcare industry prices are often negotiated between upstream and downstream parties. In these situations, we can adapt a well-known model that was used to evaluate competitive effects in the Comcast-NBC Universal merger (the "Rogerson" model, named after a former economist at the Federal Communications Commission).[30]

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25 Serge Moresi & Steven C. Salop, *vGUPPI: Scoring Unilateral Pricing Incentives in Vertical Mergers*, 79 Antitrust L.J. 185 (2013), http://www.crai.com/sites/default/files/publications/vGUPPI-Scoring-Unilateral-Pricing-Incentives-in-Vertical-Mergers.pdf (last visited April 13, 2020). The authors derive several measures of the effects of a vertical merger on upstream and downstream prices. Below, we focus on what the authors call the "vGUPPIu," which is most closely related to the concept of raising rivals' costs. It measures the effect of the vertical merger on the prices the upstream division charges downstream rivals.

26 When no input substitution is possible, the vGUPPI becomes very similar to the GUPPI, which is a well-known upward pricing pressure formula described in the Horizontal Merger Guidelines that measures the incentives to raise price after a horizontal merger.

27 When input substitution is possible, the vGUPPI formula requires additional considerations. In addition to information on downstream rivals' margins and pass-through rates, the elasticity of the upstream division's sales to the downstream rival with respect to input price is also required.

28 There are several additional points to be considered when evaluating incentives to increase downstream prices. For example, we have not indicated whether the upstream division is targeting the downstream division's rivals simultaneously or individually. Both scenarios can be accommodated.

29 In some circumstances, the upstream firm will increase downstream rivals' price by approximately half the vGUPPI. For example, if the calculated vGUPPI is equal to 10 percent, the upstream firm will increase downstream rivals' prices by approximately 5 percent. We emphasize that this is the increase in the price of the input, not the price to consumers of the end product.

30 William P. Rogerson, *A Vertical Merger in the Video Programming and Distribution Industry: Comcast-NBCU*, *in* The Antitrust Revolution 534-575 (John E. Kwoka, Jr. & Lawrence J. White 6 ed. 2014); Jonathan B. Baker, *Comcast/NBCU: The FCC Provides a Roadmap for Vertical Merger Analysis*, 25 Antitrust 36 (2011), https://dx.doi.org/10.2139/ssrn.1755683 (last visited April 23, 2020).

The intuition of this model starts with a simple bargaining framework: independent upstream and downstream firms bargain over price and split the gains from reaching an agreement equally between them.[31] For example, suppose that pre-merger DRP and UIE negotiate over the price of UIE's X-ray machine. If DRP and UIE agree that their collective profits will increase by $10,000 if DRP purchases imaging equipment from UIE, then the bargaining model predicts that DRP and UIE will agree on a price for imaging equipment such that their profits each increase by $5,000.[32]

The Rogerson model considers how this bargaining dynamic will change for a vertically integrated firm. This dynamic changes after the merger because the gains from trade to the upstream division change. For the vertically integrated firm, the sale of a UIE X-ray machine to a downstream competitor of DRP represents an additional opportunity cost that did not previously exist. Before the merger, UIE did not consider the detrimental effect that its sales to downstream rivals had on DRP. After the merger, UIE recognizes that selling its machines to DRP's competitors will decrease DRP's downstream profits. As such, the benefits to UIE from trading with DRP's rivals decrease after a merger with DRP and UIE will ask to be compensated for this when negotiating with downstream firms.[33]

The new opportunity cost that is borne by the vertically integrated firm can be calculated from the same factors (e.g. departure rates, diversion ratios, margins) we discussed previously. The bargaining model then translates this increase in costs into a change in the price of X-ray machines that UIE charges DRP's rivals. To calculate this opportunity cost, suppose UIE stops supplying a rival downstream radiology practice with X-ray machines as we assumed above in Section 1 when discussing foreclosure.[34] The downstream radiology practice will then have to acquire equipment from its second-choice supplier, which may lead some of its physicians or patients to leave (because of a reduction in perceived quality, for example, or because the second-choice X-ray machine is more expensive and causes the competitor to raise its prices).

The opportunity cost to the merged firm from these would-be DRP customers is just the product of the number of additional customers and the per-customer profit margin. For example, if DRP typically earns $100 in profit for each radiology patient it serves and DRP would serve 15 additional patients if UIE stopped supplying a competing radiology practice with X-ray machines, then the opportunity cost (in terms of foregone profit) to the merged firm from UIE supplying DRP's competitor is $1,500. The Rogerson model predicts UIE will increase the price it charges DRP's rival for imaging equipment so that UIE's profits increase by $750.[35]

The Rogerson model can be extended to take into consideration the effect of EDM, merger efficiencies, input substitution, and so on. Absent these considerations, the Rogerson model will always predict the merged firm has some incentive to demand higher prices from downstream rivals. As with the vGUPPI model, the VMG provide no safe-harbor level of price increase for the Rogerson vertical model. However, the output of the Rogerson model is a predicted price increase for the input good (not the final good purchased by end consumers), so at least it is readily interpretable.

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31 A 50-50 split of gains from reaching an agreement is most commonly assumed in economic research, but it is straightforward to allow for alternative splits (e.g. 70-30 or 30-70) to account for differences in the bargaining skill of the parties.

32 A more common situation is to assume two individuals are negotiating over the price of an automobile that is worth $15,000 to the buyer and only $10,000 to the seller. The "gains from trade" in this setting are $5,000. Under Nash bargaining with a 50-50 split, the negotiated price will equal $12,500 so that both parties "split" the gains. At a price of $12,500 the buyer is made better off by $2,500 (he pays $12,500 for something worth $15,000 to him) and the seller is made better off by $2,500 (he receives $12,500 for something worth only $10,000 to him).

33 Returning to our previous example with the automobile, suppose the value of the automobile to the seller increases by $1,000 to $11,000. Since the "cost" to the seller has increased by $1,000, the bargaining model predicts that the negotiated price will increase by $500 from $12,500 to $13,000.

34 It may seem counterintuitive to consider the effects of foreclosure to evaluate UIE's incentive to raise DRP's rivals' costs. But recall that the Rogerson bargaining model assumes upstream and downstream firms split the gains from trade. To measure the gains from trade, we need to evaluate profits in the absence of trade or, in other words, after UIE forecloses DRP's downstream rival.

35 For example, if UIE sold DRP's rival two X-ray machines, then the bargaining model predicts a price increase of $375 per X-ray machine.

V. IMPLEMENTING VERTICAL MODELS

With these tools in hand, the question then turns to measuring the inputs that determine the magnitude of incentive to foreclose downstream rivals or raise their costs. The agencies may use a combination of the parties' ordinary-course data on revenues, expenses, and sales to estimate margins. But ordinary course data may be less informative about departure and diversion rates. For example, unless UIE has in the past terminated a contract with a downstream radiology practice, it may be hard to estimate departure rates. To overcome this lack of information, the agencies may rely on economic models that relate ordinary course data (e.g. market shares) to diversion ratios and departure rates.[36] We also note that all the tools discussed here can accommodate the complex differentiated nature of today's healthcare markets. For instance, these models can distinguish between segments of customers for which departure rates and diversion ratios may differ (e.g. consumers in poor health vs. consumers in good health). Or if UIE manufactures both MRI machines and PET scanners and the alternatives (i.e. departure rates) or margins for each type of equipment differ, it is not difficult to modify these models to account for these considerations.

VI. CONCLUSION

Recent investigations of vertical transactions in healthcare and the promulgation of the VMG suggest that these deals will continue to receive scrutiny from antitrust enforcers. While the VMG set forth the general framework that the agencies will use to assess vertical mergers, they are short on details and do not address the specific issues that may arise in healthcare transactions. In this article, we described the two primary types of unilateral harm in vertical mergers — foreclosure and raising rivals' costs — and economic models that can be used to quickly evaluate the level of antitrust risk associated with a vertical transaction.

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36 For example, discrete choice models estimated from customer choice data can provide estimates of diversion ratios.

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