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Vertical mergers in the technology, media and telecom sector – Note by Margaret E Slade

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Vertical Integration and Mergers:

Empirical Evidence and Evaluation Methods

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Abstract:

The stylized facts about vertical mergers and integration are discussed and levels and trends in vertical merger enforcement actions are explored. The ex post evidence concerning vertical efficiencies and competitive harm are then examined. Subsequently, techniques for ex ante forecasting the consequences of mergers in both horizontal and vertical contexts are presented and the two contexts are compared. Specifically, upward pricing pressure measures and merger simulations are assessed. Finally, recommendations for vertical merger screening are made. With each topic, I pay particular attention to mergers in the technology, media, and telecom sectors, which constitute the majority of contested vertical mergers.

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1 Introduction

There is perhaps no other area of economics that is more controversial than the relationships between up and downstream firms. In particular, opinions vary from the position that all vertical mergers and restraints are efficient and should therefore be per se legal to a much more skeptical view that foreclosure, entry deterrence, and other anticompetitive motives lie behind most of those arrangements. Furthermore, policy makers are hampered by the fact that the findings from both theoretical models and empirical assessments of those models are most often ambiguous and, even when conclusions are reached, they are apt to be weak.

I start my discussion with several claims: First, most vertical mergers are efficient but there is a small number that deserve close scrutiny. As a consequence, there is a need for efficient screening. Second, vertical relationships are more complex than horizontal. Indeed, whereas horizontal mergers involve one market, vertical mergers involve two, one up and one downstream, as well as the interface between the two. As a consequence, techniques that are used to forecast the effects of horizontal mergers, such as merger simulations, are more likely to be inaccurate when they are applied to vertical combinations. Third, compared to horizontal mergers, production and distribution efficiencies are less apt to motivate vertical mergers. Instead, the transfer of knowledge, the mitigation of contracting costs, and the provision of incentives for efficient physical and human capital investment are more common motives. Fourth, relative to other sorts of vertical efficiencies, the removal of double marginalization has been overemphasized in theory and practice. One reason for this emphasis is the difficulty of measuring other vertical efficiencies that involve the transfer of intangibles. Finally, vertical mergers in the technology, media, and telecom (TMT) sectors tend to be larger and more complex that those in other industries. This means that most of my claims are even more true for those sectors. In what follows, I attempt to justify these claims.

The organization of the paper is as follows: Section 2 contains a discussion of vertical mergers in general as well as in the telecom, media, and technology sectors. In particular, I look at vertical merger actions in the US over the last 25 years. Section 3 assesses vertical merger efficiencies in theory and practice with emphasis on the TMT sectors. A sim-

ilar exercise is performed for competitive harm. Section 4 discusses quantitative techniques for vertical merger assessment and contrasts them with those used to evaluate horizontal mergers. Finally, in the last section, some conclusions are drawn and some policy recommendations are made.

2 Some Facts about Vertical Mergers

Over time, mergers have grown in size and become more international. Moreover, the developed countries have moved from industrial economies, with giant firms like Standard Oil, US Steel, and American Tobacco that produce physical products, to knowledge economies, with giant firms like Amazon, Microsoft, Facebook, and Google. Furthermore, since the TMT sectors dominate the list of today's largest companies, it is not surprising that those firms also dominate the list of today's largest vertical mergers.

One can get a picture of levels and trends in vertical mergers by examining merger actions, where actions include challenges as well as certain proposed transactions that are known to have been abandoned in the face of Agency concerns. Those mergers are important because they were potentially anticompetitive. Salop and Culley (2018) document all US vertical merger actions between 1994 and 2018. Specifically, they provide the year of the action, the case name, a description of the proposed merger, the theory of vertical harm, and the remedy. That study reveals a number of stylized facts. In particular, the mergers that caused concern are not a random sample; instead the industries are often characterized by high concentration, economies of scale and scope, two–sided markets, and/or networks. Furthermore, the challenges tend to be based on foreclosure, elimination of potential entrants, creation of entry barriers, facilitating coordination, and exchange of sensitive information.

Their study can also be used to assess levels and trends in vertical merger actions. Table 1, which is organized by decade as well as the entire period, contains my analysis of their findings. In particular, I compare actions in the TMT sectors to overall actions and look at one regularity in the intensity of vertical merger policy enforcement.

The entries in the table are split into three subperiods, roughly the 1990s, 2000s, and 2010s. The first row in the table contains the number of merger actions in each subperiod

as well the the total number, the second row shows the number that were in the technology, media, and telecom sectors, and the third contains their ratio — the fraction of actions that were in the industries of interest. Somewhat surprisingly, that percentage, which is over 60%, has not changed much in 25 years.

Table 1: US Vertical Merger Actions, 1994–July 2018

	(1) 1994–2000	(2) 2001–2009	(3) 2010–2018	(4) All Years
Number of VM Actions	31	10	18	59
Number of TMT Actions	19	6	12	37
Ratio TMT/VM	0.61	0.60	0.67	0.63
Actions/year	4.4	1.1	2.1	2.4
US President	Clinton	G.W. Bush	Obama	
Years in office	1993–2000	2001–2008	2009–2017	

VM stands for vertical mergers

TMT stands for vertical mergers in the technology, media, and telecom sectors

US president is the president that was in office during most of the period‘

Years in office are the years in which the named president was in office

The next three columns contain the average number of actions per year, the US president who was in office during most of the subperiod, and the years during which that president was in office. Compared to the third row, the numbers in the fourth are more striking. Indeed, the action rate during the Clinton years was comparatively large, during the Bush years it was much smaller, and the during the Obama years it was in between. It therefore appears that the TMT sectors have dominated actionable vertical mergers throughout the 25 year period but that changes at the top have affected merger policy enforcement. This is not surprising, given that economists often have different priors about the likelihood of anticompetitive harm.

3 Ex Post Evidence

There is a large body of empirical work that evaluates the effects of vertical integration and that work tends to show that vertical integration is efficient.[2] However, one should be cautious when using that literature for the purpose of antitrust policy. Indeed, many of the industries that are studied are workably competitive (e.g., fast food, apparel, and hotels), not the industries where vertical mergers are typically challenged. In addition, some of the benefits that integrated firms enjoy, such as those that are due to geographic proximity, cannot usually be achieved through merger. Finally, much of the empirical work looks at one side of the problem — costs or benefits — whereas mergers typically involve tradeoffs between the two. Nevertheless, those studies shed light on vertical mergers.

3.1 Vertical Efficiencies

In a striking study of vertical integration in US manufacturing, Atalay, Hortacsu, and Syverson (2014) found that one half of upstream establishments do not ship to their integrated downstream divisions.[3] Indeed, the median internal shipment was 0.4% (equally weighted) or 0.1% (value weighted). When no vertical shipments occur, it lessens the strength of certain motives, for example foreclosure and the elimination of double marginalization.

[2] See Lafontaine and Slade (2007) for a survey of earlier work.

[3] The authors use a broad definition of vertical integration that partially accounts for the strength of this finding.

Why would firms integrate vertically when exchange of goods is not involved? Fortunately, four Nobel Prize winners have looked at this question. They emphasize a number of motives, such as mitigating contracting, holdup, and renegotiation costs, facilitating specific investments in physical and human capital, providing effort incentives, and allocating risk efficiently. In addition, vertical mergers can be motivated by the ability to coordinate other aspects of the vertical chain and by the expectation of productivity increases due to knowledge transfers. These motives do not require product flows; instead they involve the transfer of intangibles. Unfortunately, that fact complicates the assessment of the effects of vertical integration.

Although there are many efficiencies that can be associated with a vertical merger, the removal of successive monopoly markups or double marginalization, an idea that was first formalized by Spengler (1950), tends to dominate antitrust discussions. However, it is not a supply side efficiency, one that lowers input requirements or leads to increased productivity. Instead, it is a pricing externality which, although opposite in sign, is similar to the pricing externality that dominates the discussion of harm in horizontal merger analysis. Indeed, when two firms combine, they capture the effects of their pricing decisions on newly acquired products, regardless of whether those products are inputs or outputs.

Furthermore, contrary to what is often claimed, the elimination of double marginalization (EDM) need not be efficient. As Salinger (1991) noted, when firms produce multiple products, although the removal of double marginalization is apt to cause the price of the product whose input was integrated to fall, the price of the other products that the integrated firm produces can rise,[4] and it is even possible for all prices to rise. Like so many factors in vertical relationships, the overall effect of EDM can therefore be ambiguous. Moreover since most large vertical mergers in the technology, media, and telecom sectors involve many products, both up and downstream, that ambiguity can be important. Finally, Salinger's possibility is not just a theoretical nicety. For example, Luco and Marshal (2018) find that, when Coke and Pepsi acquired their bottlers, Coke and Pepsi prices fell but the prices of the

[4] The intuition behind this result is as follows. When double marginilization is eliminated, the products with eliminated margins become relatively more profitable to sell. This gives the firm incentives to divert demand towards those products by increasing the prices of the products for which double marginalization was not eliminated

integrated bottlers' other soft drinks — i.e., Dr Pepper products — rose. More surprisingly, the average soft drink price rose.

There have been a number of recent empirical studies of the technology, media, and telecom sectors that draw conclusions concerning EDM. However, most findings, though consistent with the removal or creation of double marginalization, are not direct tests of that possibility. Instead, they look at the behavior of prices. For example, Gil (2015) finds that movie theater ticket prices rose after forced vertical divestitures and (Chipty, 2001) concludes that prices of program bundles were lower when cable TV providers were vertically integrated. In contrast to those more suggestive studies, Crawford, Lee, Whinston, and Yurukoglu (2018) estimate a structural model of regional sports TV networks that quantifies the effects of EDM. Moreover, they allow for less than full coordination across divisions of the integrated firm, which might be the case if, for example, vertical divisions of the integrated firm make independent pricing decisions. Although the authors find that efficiencies tend to dominate, there are important cases where the reverse is true.

Although efficiency motives for vertical mergers that involve the transfer of intangibles are important, they are more difficult to evaluate empirically. However, indirect evidence of the importance of intangibles is provided by Acemoglu, Aghion, Griffith, and Zilbotti (2010), who show that an incomplete contracts model in the spirit of Grossman and Hart (1986) and Hart and Moore (1990) can explain some observed patterns in vertical integration. Specifically, they predict that upstream technology intensity will lower the probability of vertical integration whereas downstream technology intensity will cause it to rise. Moreover, those predictions are confirmed by their analysis of UK manufacturing data. The intuition behind their prediction is that, when an input is technologically complex, it is beneficial for its producers to retain residual control rights, whereas when downstream production is relatively more technical, the downstream firm should have the right to make important decisions that involve the production of its input.

Other consequences of vertical integration that are easier to measure, including effects on cost, price, investment, and quality, are summarized in table 16 in Lafontaine and Slade (2007), which is reproduced in the appendix. With those studies, most of the evidence is positive. In other words, the evidence in that table leads one to the conclusion that vertically

integrated firms tend to be more efficient. Furthermore, some more recent studies reinforce those conclusions. For example, Ciliberto (2006) finds that vertical integration between doctors and hospitals leads to greater investment in health care services, Chipty (2001) and Crawford, Lee, Whinston, and Yurukoglu (2018) find that vertical integration can, but need not, lead to increased coverage of some types of TV channels, and Gil and Warzynski (2014) find that vertical integration is associated with the provision of higher quality video games. Finally, in studies of the film industry, Corts (2001) finds that vertical integration lowers release date clustering and Gil (2007) finds that contractual complexity leads to vertical integration.

3.2 Competitive Harm

As with vertical merger efficiencies, competitive harm can be due to many factors including foreclosure and elimination of potential entrants, creation of entry barriers, and facilitation of collusion through exchange of sensitive information. Nevertheless, foreclosure has received the most attention in the empirical literature.

Foreclosure involves the restriction of output in one market through the use of market power in another. However, as is the case with double marginalization, many empiricists do not assess foreclosure directly.[5] Instead, they examine whether the vertically integrated firm favors its integrated products, and a positive finding is interpreted as evidence that is consistent with foreclosure (e.g., Chipty, 2001; Suzuki, 2009; Bilotkach and Huschelrath, 2013). The problem is that, if vertical integration lowers production or transaction costs or if it eliminates double marginalization, any firm will favor the products that it acquires through integration, regardless of market structure and even when the effect on rivals is ignored.

Foreclosure is usually considered to be detrimental. Nevertheless, as with double marginalization, foreclosure can be a two edged sword. Indeed, a vertical merger can result in foreclosure while at the same time overcoming the foreclosure that existed prior to the merger. For example Suzuki (2009) finds that, prior to the merger between Turner Broadcasting and

[5] Earlier empirical assessments of foreclosure are summarized in table 15 in Lafontaine and Slade (2007), which is reproduced in the appendix.

Time Warner, many of Turner's channels were foreclosed by Time Warner, whereas after the merger, remaining unintegrated channels (e.g., Fox News and Disney) were foreclosed. As with most vertical practices therefore, the net effect of foreclosure can be ambiguous and can only be determined empirically.

Much of the empirical evidence concerning foreclosure pertains to the cable TV industry (e.g., Chipty, 2001; Suzuki, 2009; Bilotkach and Huschelrath, 2013; Crawford, Lee, Whinston, and Yurukoglu, 2018) and most find evidence that it exists. However, in spite of this fact, efficiencies often dominate so that the net effect of a vertical merger is positive. Nevertheless, Crawford et. al., who estimate a structural model, find that there is considerable heterogeneity in welfare, with some positive and some negative effects that can depend on the regulatory setting. Competition and regulatory policies are therefore complementary and the respective agencies should work together. In particular, not all problems are best solved by the former.

Some recent studies of market structure effects are less optimistic. For example, Nishiwaki (2016) assesses incentives to collude in vertically integrated firms in the cement and concrete industry and finds that integration facilitates collusion among upstream firms, which is attributed to the increase in unintegrated firm concentration; Lee (2013) examines exclusivity in video games and concludes that exclusivity is associated with lower sales, which is attributed to the lack of competition that results from incompatibility; and McGowan (2017) finds that a fall in concentration in coal markets leads to less vertical integration because the increase in output due to the removal of double marginalization causes prices to fall and makes vertical integration less profitable. Finally, in an experimental setting, Norman (2011) finds that markets with a vertically integrated firm are less competitive than those without integration. The findings in the last two papers imply that, not only does horizontal market structure effect vertical integration, but also vertical integration affects horizontal market structure.

4 Ex Ante Forecasting

The empirical evidence leads one to conclude that most vertical mergers are efficient. One should not assume, however, that vertical merger policy should be lax. Indeed, some vertical mergers are anticompetitive, most of those mergers are among large firms in concentrated markets, and many are in the technology, media, and telecom sectors. It is therefore important to have methods to separate efficient from inefficient mergers that rely only on premerger data.

There are a number of techniques that are routinely used to forecast the competitive effects of horizontal mergers and it is tempting to conclude that they can easily be modified to handle vertical mergers. Unfortunately, however, the techniques become more complex when applied in a vertical context, especially to the sorts of mergers that receive attention from competition authorities. I focus on two such techniques, upward pricing pressure and merger simulations. With each, I sketch how they are applied in a horizontal setting before turning to the vertical context. I do this because the vertical analogs are more complex modifications of their horizontal counterparts and thus suffer from the same flaws. The techniques are usually developed in the context of firms that produce differentiated products and engage in Bertrand competition and I follow that convention here.

Both forecasting techniques are methods of assessing pricing externalities. Indeed, if products are related in demand, when the price of one changes, it has repercussions on the other prices. Moreover, if two goods or services are produced by the same firm, that externality is internalized whereas, if they are not, the externality is not captured. This means that, in order to use those techniques to forecast the impact of merger–related incentives to change prices, one must have estimates of cross price elasticities, slopes of demand functions, or diversion ratios.

4.1 Upward Pricing Pressure

4.1.1 Horizontal Upward Pricing Pressure

The upward pricing pressure (UPP) measure due to Farrell and Shapiro (2010) is often used in the context of a horizontal merger. The UPP is not a prediction of post merger prices;

instead, it predicts the direction of local price changes — the incentive to change prices. To illustrate the calculation of a UPP, suppose that two firms, each of which produces one product, will merge. The net upward pricing pressure on product 1 is the price cost margin of product 2, $p_2 - c_2$, times the diversion ratio from 1 to 2 minus the reduction in marginal cost of 1, where the diversion ratio is the fraction of sales gained by 1 when its price falls that come at the expense of sales of product 2. In other words, the diversion ratio is a measure of substitution between the two merging products, and upward pricing pressure measures the value of diverted sales that are associated with a horizontal merger, i.e., the value of the externality that was previously ignored.[6] Finally the gross upward pricing pressure index or GUPPI, which is easier to compute, does not consider efficiency gains. It should be clear that upward pricing pressure rises with 2's profit margin and with the degree of substitutability between the products, and if either is zero, there is no pressure.

UPP suffers from a number of shortcomings. For example, it does not consider the possibility that nonmerging firms will respond by changing prices. Furthermore, it does not incorporate the passthrough from cost to prices that depends on higher order properties of demand. Nevertheless, UPPs are simple to compute, they do not require information on nonmerging parties, and there is no need for market definition. Moreover, Garmon (2017) finds that UPPs are more accurate tools for flagging potentially anticompetitive mergers than traditional screening tools such as concentration indices. Furthermore, Miller, Remer, Ryan, and Sheu (2017), who consider firms that produce multiple products, use Monte Carlo simulations to identify the circumstances under which UPPs yield accurate predictions of merger effects and conclude that UPPs are not less accurate than predictions from misspecified merger simulations or those that rely on imprecise demand elasticities.

4.1.2 Vertical Upward Pricing Pressure

Moresi and Salop (2013) propose analogs of the GUPPI — vGUPPIs — in the context of vertical mergers. Specifically, the vGUPPIu gauges the incentive to raise the *input price* that the upstream division of the merged firm charges *targeted downstream rivals*, the vGUPPIr gauges the incentive of the *targeted rivals* to raise their *output prices* in response to the higher

[6] When each firm produces multiple products, there are matrices diversion ratios and UPPs from i to j.

input price, and the vGUPPId assesses the *downstream firm's* incentives to raise or lower its *output price* in response to a merger.

Of the three, the vGUPPIu is closest to the GUPPI. Nor surprisingly then, calculation of the vGUPPIu is similar to the calculation of the GUPPI. They differ, however, in that the two products are not substitutes, they are in an input/output relationship — product 1 is upstream and product 2 is downstream — and the diversion ratio is vertical. In particular, the vertical diversion ratio is the fraction of the upstream firm's sales that are lost when it raises its price to the downstream rival that are gained by its integrated downstream division, and the vGUPPIu is an indicator of the upstream firm's unilateral incentive to increase its price.[7]

An increase in the upstream firm's price will raise the marginal cost of the targeted rival and the vGUPPIr captures the rival's response to that increase. For this reason the vGUPPIr is derived from the vGUPPIu. However, it also involves the cost passthrough rate of the upstream firm. Finally, the vGUPPId is similar to the upstream measure except for the fact that the diversion ratio is from 2 to 1 and it is multiplied by the upstream firm's margin. Moreover, it contains a term that captures the incentive to remove double marginalization.

A vertical GUPPI, while sharing the disadvantages of the horizontal GUPPI, looses some of its advantages. Specifically, there is now a need to have information on nonmerging firms — the targeted rivals that might be foreclosed — and one must decide which firms are targeted, which is similar to defining a market. In addition, whereas there is only one GUPPI, there are at least three vGUPPIs. Moreover, when there are multiple products, the GUPPI involves one matrix of diversion ratios but the vGUPPIu requires several matrices, one for the merged firm as well as for each targeted downstream rival. Finally, the vGUPPIr also needs a vector of cost passthroughs. The data and estimation requirements are therefore much higher.

Unfortunately, there are few studies that assess vGUPPIs. However, in a critique of the use of vGUPPs, Das Varma and De Stefano (2018) note that, in applications, antitrust authorities have adopted a three stage process, first evaluating competitive harm — the

[7] Both horizontal and vertical GUPPIs are often expressed as ratio of values, i.e., in the case of the vGUPPIu, it is the value of sales diverted to the downstream merging partner divided by the value of sales lost by the upstream merging partner.

foreclosure or raising rivals' costs effect (RRC), second assessing the elimination of double marginalization effect (EDM), and third comparing the two to see which is larger.[8] They argue that there is a problem with this practice; in particular, RRC is not independent of EDM but instead depends on it. Specifically, when the price of the integrated downstream product falls due to EDM, the demand for the unintegrated downstream product shifts in. With most demand specifications, this changes the elasticity of rival demand with respect to the upstream input price. For example, with a linear (logit) specification, this makes demand more (less) elastic with respect to the upstream price, which can reverse (strengthen) the incentive for RRC. In addition, Das Varma and De Stefano show that the upstream firm's bargaining strength is also an important determinant of RRC. To illustrate the problem, they consider examples that use linear and logit demands and bargaining strengths of 1 (the upstream firm makes take–it–or–leave–it offers), 0.75, and 0.5. These examples show that the merger related change in the equilibrium price that the integrated firm charges its targeted downstream rival can range from -0.7 to 18.7% and that the change in the average equilibrium retail price can range from -8.5 to 3.8%. Finally, they also find that, under the same circumstances, the vGUPPIu ranges from 2.8 to 8.2%.

Finally, in the context of an upstream monopolist facing downstream duopolists, Domenenko and Sibley (2018) use Monte Carlo merger simulations to compare predictions from the simulations to those from up and downstream vGUPPIs. They assume linear demand and take–it–or–leave–it offers, which are the circumstances that are most favorable to a sign reversal in RRC and might therefore be considered a straw man. Nevertheless, the Moresi and Salop specification assumes take–it–or–leave–it offers and, in the sense that the diversion ratio does not depend on EDM, they implicitly assume linear demand. Domnenko and Sibley conclude that the vGUPPIu is not an accurate predictor of the sign of the change in the price that the upstream firm charges the unintegrated rival (it is wrong in 59% of the cases). However, the vGUPPId performs better in predicting the sign of the integrated downstream price change (it is accurate in 82% of the cases).

In my view, vertical GUPPIs should not be used as screening tools, that is, as tools for deciding which mergers warrant further investigation. However, they can be useful for

[8] This process is described in Rogerson (2014) and advocated in Shapiro (2019).

assessing contested mergers. Moreover, vGUPPIs would be more accurate if all three effects were combined so that the overall balance between foreclosure and elimination of double marginalization could be assessed. However, the vGUPPIu (and hence the vGUPPIr) holds the premerger price of the input constant.

All of my comments are especially applicable to mergers in the technology, media, and telecom sectors. In particular those mergers usually involve many products both up and downstream, some of which might be susceptible to foreclosure and others which might not be. For example, before the contested merger between AT&T and Time Warner, Time Warner owned many content providers including Warner Bros., Turner, HBO, and, CNN, each of which provided many products, and AT&T distributed video programming and had millions of direct to consumer relationships as well as high speed networks. Forecasting the effects of such a complex transaction using vGUPPIs and EDM alone would be subject to many type 1 and 2 errors. Furthermore, the US Justice Department focused on the merged firm's increased bargaining leverage, and vGUPPIs do not incorporate bargaining between up and downstream firms.

4.2 Merger Simulations

4.2.1 Horizontal Simulations

Unlike upward pricing pressure measures, horizontal merger simulations look at post merger equilibria. In particular, whereas a GUPPI is evaluated at pre merger prices, simulations compute post merger equilibrium prices. Nevertheless, the two techniques are related. Specifically, with a horizontal pricing game, if there are n products and m firms, the m agents choose the prices of the products that they own. A simulation solves the n first order conditions for profit maximization to obtain the n post merger equilibrium prices. In contrast, a GUPPI evaluates the merger related increment to those first order conditions at pre merger prices.

Consider a market where each of n firms produces a single differentiated product and engages in Bertrand competition. Each firm will solve its own profit maximization problem, ignoring the effects that its decisions have on the profits of the other firms in the market.

However, if firms 1 and 2 merge, the merged firm will capture the pricing externality from 1 to 2 and 2 to 1 but ignore the remaining ones. Since the products are substitutes, the externality will cause p_1 and p_2 to rise unilateraly. Moreover, the new prices will have second order effects on the prices of the nonmergerd products that will be smaller than the first order effects but still positive, and so on. Eventually, the market will settle down into a new equilibrium. Absent efficiencies, prices will rise post merger by construction. The question, however, is by how much? Applications of horizontal merger simulations include Hausman, Leonard, and Zona (1994), Nevo (2000), Pinkse and Slade (2004) and Ivaldi and Verboven (2005).

A horizontal merger simulation has three components: i) a system of related demand equations, one for each product, ii) a set of marginal costs that are often assumed to be constant and to not change with the merger, and iii) an assumption about the game that the firms are playing (an equilibrium concept), often differentiated product Bertrand. With those three components, it is possible to write down the profit function of each firm, both pre and post merger. The n first order conditions can then be solved to obtain post merger equilibrium prices that can be compared to forecast or actual pre merger prices. The difference between pre and post is that, if there are m decision makers pre merger, there are $m-1$ afterwards.

There are a number of problems that are associated with horizontal merger simulations. First, consider demand. Simulations can be very sensitive to the specification of demand. For example, Slade (2009) finds that demand elasticities from one specification need not lie in the confidence region of those obtained from another.

Second, consider costs. There are several methods of obtaining marginal costs. However, the most popular is to retrieve them from first order conditions. Specifically, the researcher asks the question: given demand, what would costs have to have been to rationalize the equilibrium assumption? This means that, if either demand or the game is misspecified, the costs so obtained can be poor approximations to true costs. Furthermore, if marginal costs are not constant, they will vary with merger related changes in output, and that variation is usually not captured.[9] In addition, as with a UPP, if cost efficiencies are considered, they

[9] Grieco, Pinkse, and Slade (2018) consider endogenous merger–related cost changes that are due to

are most often obtained exogenously.

Third, consider the game. If the firms are playing a different game from the one that is assumed, price forecasts will be inaccurate. The most troubling possibility is that the game will change post merger. For example, the market could become more collusive after the merger, a possibility that and Miller and Weinberg (2017) assess and find to be true after a beer joint venture.

Finally, retrospective analysis of horizontal mergers indicates that simulation models have not predicted well (Peters, 2006; Weinberg, 2011; Weinberg and Hosken, 2013; Bjornerstedt and Verboven, 2016). Nevertheless, a merger simulation that incorporates assumptions that are consistent with the market that is studied can be a useful tool.[10]

4.2.2 Vertical Simulations

As with upward pricing pressure, the extension of a horizontal merger simulation to a vertical merger involves a number of complications. First, a vertical simulation must deal with two markets, one up and one downstream and it must specify both up and down stream games. Second, it must specify how the two links in the chain interact, and there are several possibilities. For example, a simulation could consist of two horizontal Bertrand games with input prices to the downstream affiliate set at marginal costs, while prices that are charged unintegrated downstream rivals determined by the upstream game. Alternatively, the interface could be a bargaining game with a separate negotiation for each upstream/downstream pair. Furthermore, with both possibilities, the integrated price need not be set at marginal cost, which might be the case if divisions of the integrated firm make separate pricing decisions. Finally, timing is important. For example, upstream firms could set prices prior to the downstream game and therefore have first–mover advantages, or up and downstream prices could be determined simultaneously. Given that a vertical simulation involves additional assumptions, there are more places where it can be misspecified and thus lead to biased predictions.

Unfortunately, unlike horizontal merger simulations where there is a large body of empiri-

nonconstant returns to scale and technology transfer.

[10] Hausman and Leonard (2005) discuss tests that can be used to assess the reliability of the assumptions that underlie merger simulations.

cal academic research, vertical merger simulations have thus far received much less attention. For example, when I searched Econlit for the phrase 'merger simulation' in the abstract, I received 85 hits. None, however, pertained to a vertical merger. Nevertheless, empirical research on vertical markets can be adapted to simulate vertical mergers.[11]

A vertical merger simulation should have four components: i) a specification of *downstream* demand, ii) an assumption concerning the upstream horizontal or alternatively bargaining game, iii) an assumption concerning the downstream horizontal game, and iv) a method of obtaining marginal costs.

There are a number of possible demand specifications. For example, logits (Sheu and Taragin, 2017), nested logits (Brenkers and Verboven, 2006), and random coefficient models (Berto Villas–Boas, 2007; Bonnet and Dubois, 2010) have been used, but there are many other possibilities. Furthermore, as with horizontal merger simulations, the predictions from vertical simulations can be expected to be sensitive to that choice.

As with horizontal simulations, market games are often specified to be differentiated products Bertrand. However, other assumptions have been made, such as nonlinear pricing of inputs (Bonnet and Dubois, 2010) and a competitive downstream market (Brenkers and Verboven, 2006).

The most tractable bargaining specification is the Nash in Nash model that is due to Horn and Wolinsky (1988), which nests a Nash bargaining solution within a Nash equilibrium of a static game and has been applied by Crawford and Yurukoglu (2012), Gowrisankaran, Nevo, and Town (2015), and Crawford, Lee, Whinston, and Yurukoglu (2018). That assumption is tractable because it involves simultaneous upstream (bargaining) and downstream (market) games. Furthermore, it nests take–it–or–leave–it offers as special cases that result when one party has all of the bargaining power.

Finally, in applications, up and downstream marginal costs are often retrieved from first order conditions for profit maximization (e.g., Brenkers and Verboven, 2006; Berto Villas–Boas, 2007; Bonnet and Dubois, 2010). In other words, they are the costs that rationalize all of the other assumptions. Unfortunately, misspecification of any part of the model can

[11] Examples of research that could be relevant to the construction of a vertical merger simulation include (Brenkers and Verboven, 2006; Berto Villas–Boas, 2007; Bonnet and Dubois, 2010; Crawford and Yurukoglu, 2012; Gowrisankaran, Nevo, and Town, 2015).

lead to biased cost estimates.

The econometric evidence that pertains to vertical merger simulations is thin, but it is not nonexistent. For example, although Gowrisankaran, Nevo, and Town (2015), simulate a horizontal hospital merger, an important assumption of their analysis is that managed care organizations (MCOs) and hospitals bargain over the base price that each hospital will be paid by each MCO for hospital care. They find that, in important cases, the negotiated price will be lower than that predicted by Bertrand competition. In other words, bargaining restrains hospital prices. Moreover, the difference can be large due to the fact that consumers pay only part of the downstream cost (e.g., with hospital care they are responsible only for the copayment). With price insensitive demand, demand elasticities are small and thus Bertrand markups are large.

Unlike the above applications, Crawford, Lee, Whinston, and Yurukoglu (2018) use their estimated structural model to simulate vertical mergers and divestitures. They assume that regional sports networks and programming distributors in US multichannel television markets engage in Nash bargaining (i.e., the equilibrium is Nash in Nash). Their goal is to assess how the tension between efficiency enhancement due to the removal of double marginalization and competitive harm due to foreclosure interact to determine the net welfare effect. They find that welfare changes, which tend to be positive but can be negative, are sensitive not only to parameter values but also to the regulatory regime in place. This means that competition and regulatory agencies should work together and that not all problems are best solved by the former.

I conclude this section by emphasizing that tools that are often applied in the analysis of horizontal mergers, such as upward pricing pressure indices and merger simulations, become much more complex in a vertical context. Given this complexity and the resulting likelihood of inaccurate predictions, I think that one size fits all or other simple models will not be useful and that careful attention must be paid to the institutional details of the markets that are involved and how they interact. Practitioners therefore face a dilemma between using a tool that is simple enough that it can be explained to non economists and capturing all aspects of the market that could have important welfare implications. Nevertheless, if

properly applied, those tools could be useful complements to more traditional analysis of contested vertical mergers.

5 Some Recommendations

Some vertical mergers are anticompetitive and competition authorities must have ways to separate them from the vast majority of mergers that should not cause concern. Unfortunately, that is a difficult task and there is not much guidance on how to proceed. For example, although the US Department of Justice Nonhorizontal Merger Guidelines discuss the potential problems that can be associated with a vertical merger, they do not consider how one should determine which mergers are potentially anticompetitive. On the other hand, the EU Guidelines list concentration and market share thresholds that form safety zones. In other words, if the merged firm's shares and HHIs fall below those thresholds in all of its markets, the merger is unlikely to be given further consideration. Furthermore, they list circumstances, such as the existence of significant cross-shareholding relationships, the fact that one of the firms is considered to be a maverick, and suspicion that coordination is ongoing, under which mergers that fall into those zones are more likely to be investigated. Finally, conduct falling outside of the safety zones will not necessarily be challenged. The zones are therefore a first cut at the analysis of a merger.

Market shares and concentration indices have fallen out of fashion in merger analysis due to the fact that they are often poor predictors of margins, particularly in differentiated products markets.[12] Indeed, it is for that reason that practitioners have turned to other measures, such as upward pricing pressure indices and simulations, to assess mergers in those markets. Unfortunately, outside of commodity markets, which are usually in the energy, nonfuel mineral, and agricultural sectors, most products are differentiated, and virtually all mergers in the technology, media, and telecom sectors involve differentiated products. Moreover, even commodities can be differentiated due to their spatial locations. It is therefore imperative that methods that can be used to screen mergers in differentiated product markets

[12] Slade (2004) concludes that, when products are homogeneous, concentration indices predict markups reasonably well.

be developed.

In spite of their deficiencies, market shares and concentration indices should play a role in the initial screening process. Indeed, in order for harm to occur, the merged firm must be able to behave noncompetitively in some market. Furthermore, safety zones do not preclude further investigation if warranted by other factors. However, other simple tests are required. One possibility is that, for each post merger unintegrated rival in each market, the question of where it can potentially obtain its supplies and/or where it can potentially sell its products, should be assessed. If in each market there will be viable sources of inputs and customers post merger, the merger is unlikely to cause concern. If not, however, further investigation is warranted. Of course, it is preferable to have a complete set of demand elasticities and marginal costs, but that sort of information can probably only be obtained after a merger has been singled out for further investigation. In particular, the data required for econometric estimation is often not publicly available, in which case it has to be obtained from the parties.

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Appendix

This appendix reproduces tables 15 and 16 from Lafontaine and Slade (2007). The first table looks at assessments of foreclosure, many of which do not consider countervailing efficiencies. However, when efficiencies are assessed, the net effect is reported in the last column of the table. The second table looks at the effects of vertical integration on a number of factors including profit, product and share prices, costs, investment, and quality. The fifth column in that table shows the effect of vertical integration on the indicated factor, whereas the final column indicates the effect on consumer welfare.

Table 1: Assessment of Foreclosure and Raising Rivals Costs

Author	*Year*	*Industry*	*Data/Technique*	*Variable Examined*	*Finding*
Allen	1971	Cement & concrete	Descriptive	Acquisitions	Foreclosure
Reiffen & Kleit	1990	Railroads & terminals	Descriptive	Access to railroad terminals	No foreclosure
Rosengren & Meehan	1994	Challenged mergers	Event study	Returns, unintegrated downstream rivals	No foreclosure
Waterman & Weiss	1996	Cable TV programming & distribution	Cross sectional regressions	Program offerings	Fewer rival programs carried Foreclosure
Snyder	1996	Crude oil & refining	Event study	Returns, integrated rivals	Foreclosure
Mullin & Mullin	1997	Iron ore & steel	Event study	Returns, downstream consumers	No foreclosure Efficiency gains
Ford & Jackson	1997	Cable TV programming & distribution	Cross sectional IV regressions	Subscription price Program cost	Foreclosure Lower program cost No welfare change
Chipty	2001	Cable TV programming & distribution	Cross sectional IV regressions	Program offerings, price, & subscriptions	Fewer rival programs carried Foreclosure Efficiency gains outweigh losses
Hastings & Gilbert	2005	Gasoline refining & sales	Difference in difference	Wholesale price to unintegrated rivals	Foreclosure
Hortacsu & Syverson	2007a	Cement & concrete	Panel Difference in difference Probit	Concrete price Concrete production Plant survival	No foreclosure Efficiency gains

* denotes significance at 5% using a two–tailed test.

Table 2: The Consequences of Vertical Integration

Author	*Year*	*Industry*	*Data/Technique*	*Variable Examined (y)*	*Effect on y*	*Effect on W*
Shelton	1967	Restaurant	Panel Data Description	Costs Profit	+ +	+
Levin	1981	Crude oil & refining	Panel regressions	Profit Stability of profit	- -*	+
McBride	1983	Cement & concrete	Regional panel	Delivered price	- *	+
Spiller	1985	Various	Cross section regressions	Financial gains Systematic risk	+* -	+
Helfat & Teece	1987	Various	Paired samples Difference in difference	Systematic risk	-*	+
Anderson	1988	Electronic Component sales	Cross section regressions	Index of opportunism	-*	+
Kerkvliet	1991	Coal & electricity	Panel regressions	Cost efficiency Exercise of monopsony power	+* -*	+
Muris, Scheffman & Spiller	1992	Soft drinks & bottlers	Panel regressions	Retail price	-*	+
Shepard	1993	Gasoline refining & sales	Cross section Regressions	Retail price	-*	+
Ford & Jackson	1997	Cable TV programming & distribution	Cross section regressions	Program cost Price	-* +*	?
Edwards, Jackson & Thompson	2000	Crude oil & refining & pipelines	Panel Ordered probit	Stock rating	+*	?
Corts	2001	Film production & distribution	Cross section Tobit	Release date clustering	- *	+
Mullainathan & Scharfstein	2001	Chemical	Panel Regressions	Investment responsiveness	- *	?
Ciliberto	2005	Physicians & hospitals	Panel Regressions	Investment in health care services	+*	+
Jin & Leslie	2005	Restaurant Chains	Panel Regressions	Quality (health scores)	+*	+
Gil	2007b	Movie Distribution	OLS Duration Analysis	Movie run Length	+*	+

* denotes significance at 5% using a two–tailed test.
Effect on W denotes the effect on consumer welfare.