UP OR DOWN? THE PRICE EFFECTS OF MERGERS OF INTERMEDIARIES

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Intermediaries purchase from input suppliers and sell to consumers. Given the position of intermediaries in the middle of supply chains, the impact of a merger of intermediaries on prices in output markets may depend on the impact of the merger in input markets. These same feedback effects can work in reverse as well. Recent mergers in industries ranging from food-service distribution[1] to health insurance[2] highlight the need for analytic models to assess these effects.

Making sense of intermediary mergers requires a comprehensive analysis that ties together negotiations with input suppliers (upstream effects) and competition for customers (downstream effects). Prior studies rely either on excessively complex modeling or on overly simplified assumptions. Our article attempts to overcome both problems. As in prior studies, we model the negotiations between intermediaries and input suppliers and allow the merging intermediaries' input and output prices to be simultaneously determined. To simplify the analysis, we model the change in output prices through the well-known upward pricing pressure framework.

We find that an intermediary merger is more likely to result in lower output prices if three conditions are met.

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[1] FTC v. Sysco Corp., 83 F. Supp. 3d 1 (D.D.C. 2015).

[2] United States v. Anthem, Inc., 236 F. Supp. 3d 171, 181 (D.D.C.), *aff'd*, 855 F.3d 345 (D.C. Cir.), *cert. dismissed*, 137 S. Ct. 2250 (2017).

First, the upstream input market must not be very competitive and the downstream market must be highly competitive. If the upstream input market is not very competitive and the downstream market is highly competitive, the merging intermediaries will not have a lot of bargaining leverage with input suppliers. The merger, therefore, may increase the merging intermediaries' bargaining leverage—an effect that puts downward pressure on the input price. A reduction in the input price, in turn, puts downward pressure on the output price.

Second, the merging intermediaries must not be close competitors. The closeness of competition between the merging intermediaries can be measured by "diversion," the fraction of consumers who would substitute from one merging intermediary to the other merging intermediary if the consumer's preferred intermediary were not available. Diversion between the merging intermediaries leads to direct upward pressure on output prices and direct downward pressure on input prices. The latter effect leads to indirect downward pressure on output prices. For a given amount of diversion, however, the direct upward pressure on output prices is greater than the indirect downward pressure on output prices. As a consequence, an intermediary merger is more likely to result in lower output prices if diversion between the merging intermediaries is low, all else equal.

Third, for the consumers who would substitute from one merging intermediary to the other merging intermediary if the consumer's preferred intermediary were not available, the merging intermediaries and non-merging intermediaries must not be close competitors for these consumers. We refer to the fraction of these consumers who would not switch to a non-merging intermediary if neither of the merging intermediaries were available as "diverted diversion." If diverted diversion is low, an intermediary merger will increase the merging intermediaries' bargaining leverage with input suppliers more than if diverted diversion were high. The greater increase in the merging intermediaries' bargaining leverage will, in turn, result in greater downward pressure on input prices and, therefore, greater downward pressure on output prices.

It is unlikely that all three of these conditions will be satisfied in many markets. For example, if the upstream input market is not very competitive and the downstream market is highly competitive, we might expect low diversion between the merging intermediaries and high diverted diversion from the merging intermediaries to other intermediaries.

We also find that an intermediary merger may result in higher input prices even if the merger increases the merging intermediaries' bargaining leverage with input suppliers. The upward pressure on output prices from the loss of downstream competition, as well as the increased surplus created by opera-

tional efficiencies, means that the merging intermediaries and their input suppliers will have more profits to bargain over. As a result, input suppliers may benefit from a larger pie, even if their share of the pie shrinks.

Our model sheds new light on the recently litigated Anthem-Cigna merger.[3] Specifically, our model shows that the merger likely would have led to higher output prices in most (if not all) places where Anthem and Cigna compete. In defending the merger, economic experts for the merging parties claimed that the merger would allow Cigna to pay lower input prices and that the resulting downward pressure on output prices would more than offset any upward pressure on output prices caused by a lessening of competition.[4] The government countered that the input-price reductions did not meet the standard of cognizability in the Horizontal Merger Guidelines.[5] For efficiencies to be cognizable, the Guidelines require that they be verifiable and merger-specific and that they not arise from anticompetitive reductions in output or service.[6] In Anthem-Cigna, the district court agreed with the government that the savings from input-price reductions were not verifiable or merger-specific, but left open whether lower input prices resulting from an increase in upstream bargaining leverage could be cognizable.[7]

If the input-price reductions were cognizable efficiencies, an analysis of the merger's impact on output prices would have needed to account for these input-price reductions. The challenging question is how to account for these potential input-price reductions in a model. Anthem presented an ad hoc and highly idiosyncratic way to account for input-price reductions, a model that the government challenged on theoretical and empirical grounds.[8] Methods in the academic literature offered a way to incorporate input-price reductions, but these methods were either based on complicated procedures that were impractical for the Anthem-Cigna case—indeed, impractical for almost any litigation—or based on potentially unrealistic assumptions about consumer substitution patterns.

In this article, we offer a workable model for measuring the effects of input-price reductions. We use this model to reconsider the effects of the proposed Anthem-Cigna merger. We find that even with input-price reductions, the merger likely would have led to higher output prices in all of the markets contested by the government.

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[3] *See id.* at 368–69 (affirming district court's permanent injunction against the merger).

[4] *Anthem*, 855 F.3d 345 at 353.

[5] *See* Brief of Appellees the United States of America and Plaintiff States at 57, United States v. Anthem, Inc., No. 17-5028 (D.D.C. Mar. 13, 2017).

[6] U.S. Dep't of Justice & Fed. Trade Comm'n, Horizontal Merger Guidelines § 10 (2010).

[7] *Anthem*, 236 F. Supp. 3d at 181.

[8] *Id.*

I. ECONOMIC MODELS OF INTERMEDIARY MERGERS

Following a string of unsuccessful DOJ and FTC challenges to hospital mergers, economists have developed increasingly sophisticated models of insurer/provider negotiations.[9] These models focus on hospital competition and patients' choices, but they do not account for competition among insurers; the models typically assume that there is just one insurer in the relevant market. The FTC has used the frameworks in these models to challenge mergers successfully in Toledo, Ohio; Rockford, Illinois; and Harrisburg, Pennsylvania.[10]

A recent paper by Kate Ho and Robin Lee expands these models to incorporate competition among hospitals and insurers alike.[11] Ho and Lee show how insurer mergers affect the prices that insurers negotiate with providers and the premiums that insurers charge to their customers.

In Ho and Lee's model, consumers have preferences for different insurers and providers, and insurers negotiate reimbursement rates with providers and premiums with plan sponsors.[12] The outcomes of these negotiations are computed through a Nash bargaining framework.[13] In Nash bargaining, a buyer and a seller set a price such that if an agreement is reached, each party benefits in comparison with that party's fallback option should the bargaining

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[9] *See, e.g.*, Cory Capps, David Dranove & Mark Satterthwaite, *Competition and Market Power in Option Demand Markets*, 34 RAND J. ECON. 737, 740–48 (2003); Robert Town & Gregory Vistnes, *Hospital Competition in HMO Networks*, 20 J. HEALTH ECON. 733, 737–42 (2001). Some of the failed merger challenges include California v. Sutter Health Sys., 84 F. Supp. 2d 1057 (N.D. Cal.), *aff'd mem.*, 217 F.3d 846 (9th Cir. 2000), *revised on remand*, 130 F. Supp. 2d 1109 (N.D. Cal. 2001); FTC v. Tenet Healthcare Corp., 17 F. Supp. 2d 937 (E.D. Mo. 1998), *rev'd*, 186 F.3d 1045 (8th Cir. 1999); United States v. Long Island Jewish Med. Ctr., 983 F. Supp. 121 (E.D.N.Y. 1997); FTC v. Butterworth Health Corp., 946 F. Supp. 1285 (W.D. Mich. 1996), *aff'd mem.*, No. 96-2440, 1997 WL 420543 (6th Cir. July 8, 1997); United States v. Mercy Health Servs., 902 F. Supp. 968 (N.D. Iowa 1995), *vacated as moot*, 107 F.3d 632 (8th Cir. 1997); FTC v. Freeman Hosp., 911 F. Supp. 1213 (W.D. Mo.), *aff'd*, 69 F.3d 260 (8th Cir. 1995); and Adventist Health Sys., 117 F.T.C. 224 (1994).

[10] For Toledo, see ProMedica Health Sys., Inc., FTC Docket No. 9346 (2011); Press Release, Fed. Trade Comm'n, FTC Approves ProMedica Health System's Divestiture of Former Rival St. Luke's Hospital (June 24, 2016). For Rockford, see Press Release, Fed. Trade Comm'n, OSF Healthcare System Abandons Plan to Buy Rockford in Light of FTC Lawsuit; FTC Dismisses Its Complaint Seeking to Block the Transaction (Apr. 13, 2012). For Harrisburg, see Press Release, Fed. Trade Comm'n, Statement from FTC's Bureau of Competition Director Debbie Feinstein on Decision by Penn State Hershey Medical Center and PinnacleHealth System to Abandon Their Proposed Merger (Oct. 17, 2016).

[11] Kate Ho & Robin S. Lee, *Insurer Competition in Health Care Markets*, 85 ECONOMETRICA 379, 380 (2017).

[12] *Id.* at 396. For additional examples of markets in which intermediaries negotiate with upstream suppliers, see James E. Rauch & Joel Watson, *Network Intermediaries in International Trade*, 13 J. ECON. & MGMT. STRATEGY 69, 69–93 (2004); and Daniel F. Spulber, *Market Microstructure and Intermediation*, J. ECON. PERSP., Summer 1996, at 135, 135–52.

[13] Ho & Lee, *supra* note 11, at 381.

fail.[14] Depending on how the bargaining unfolds, the price may be set high so that the buyer is only as well off as its fallback option, the price may be set low so that the seller is only as well off as its fallback option, or the price may be set somewhere between these prices.[15]

In Nash bargaining, a party with a better fallback option (i.e., a party with less to lose if the deal is not consummated) generally will be able to negotiate a more favorable price. For example, providers may have the upper hand in bargaining with one insurer if, in the event that the negotiation breaks down and the providers are no longer in the insurer's network, the providers can make up for the lost business by providing services to another insurer's enrollees. With such a strong fallback option, providers can command higher prices from insurers. A merger of insurers changes fallback options for all parties because the merging insurers are no longer available as substitutes for one another.[16]

The Ho and Lee model also allows every insurer and every provider to renegotiate prices in response to changes in the insurers' provider networks and premiums.[17] By allowing everything to adjust in response to a change in the insurers' market structure, Ho and Lee can make subtle predictions about how consumer welfare changes in response to changes in the insurers' market structure. For example, using data from the California Public Employee Retirement System (CalPERS) and its negotiations with three insurers—Kaiser Permanente, Blue Cross, and Blue Shield—Ho and Lee find that if Kaiser Permanente were to exit the market, CalPERS would pay lower premiums to Blue Cross but higher premiums to Blue Shield.[18] For Blue Cross, the downward pressure on premiums resulting from Blue Cross' greater bargaining leverage with providers would overcome the upward pressure on premiums resulting from the elimination of competition from Kaiser Permanente. For Blue Shield, the upward pressure on premiums resulting from the elimination of competition would overcome the downward pressure on premiums resulting from the greater bargaining leverage.[19]

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[14] *Id.* at 381–82 ("This bargaining protocol, used in other studies of bilateral oligopoly to model the division of surplus, implies an equilibrium relationship between the 'gains-from-trade' created when two parties come to an agreement and negotiated premiums and prices. Nash bargaining parameters allow for potentially asymmetric splits.") (citations omitted).

[15] *Id.*

[16] For example, if negotiations break down between a provider and one of the merging insurers, the provider will no longer be able to make up for lost business by providing services to the other merging insurer's enrollees.

[17] *Id.* at 386.

[18] *Id.* at 406–07.

[19] *Id.* at 408.

To implement the Ho and Lee model, it is necessary to estimate consumers' preferences for different providers and for different insurers. Such an estimate requires detailed data on hospital reimbursement rates, insurance premiums, medical claims, admissions, and household characteristics.[20] Ho and Lee's methodology is computationally challenging and time-consuming to implement. Solving for the new equilibrium reimbursement rates, premiums, and network structures given a change in insurer market structure is also challenging.[21]

In another recent paper, Gloria Sheu and Charles Taragin avoid the statistical complexities of Ho and Lee by simplifying the underlying theoretical model of buyer/supplier negotiations.[22] They develop a model in which consumers have preferences for different downstream retailers and the products supplied by upstream wholesalers, while retailers negotiate input prices with wholesalers and then sell to consumers.[23] Like Ho and Lee, Sheu and Taragin assume Nash bargaining between wholesalers and retailers; they also assume that input and output prices are simultaneously determined.[24] Sheu and Taragin also allow all retailers and wholesalers to renegotiate their contracts in response to a merger, allow retailers to adjust the prices charged to consumers, and allow consumers to adjust their purchases.[25]

To avoid the complexity and data requirements of Ho and Lee's framework, Sheu and Taragin assume that consumers' preferences for products can be modeled under logit demand.[26] With logit demand, consumer substitution between any two goods is exactly in proportion to the market shares of the goods.[27] When products are differentiated, however, substitution between

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[20] *See id.* at 391.

[21] *See id.*

[22] Gloria Sheu & Charles Taragin, *Simulating Mergers in a Vertical Supply Chain with Bargaining* 2 (Econ. Analysis Group, Antitrust Div., U.S. Dep't of Justice, Working Paper No. 17-3, 2018).

[23] *Id.* at 16–18.

[24] *Id.* at 7.

[25] *Id.* at 10–18.

[26] *Id.* at 1.

[27] *See*, *e.g.*, Gregory J. Werden & Luke M. Froeb, *The Effects of Mergers in Differentiated Products Industries: Logit Demand and Merger Policy*, 10 J.L. ECON. & ORG. 407, 420 (1994). For example, suppose that products *A*, *B*, and *C* have respective market shares of 60%, 30%, and 10%, and we seek to know which product customers of product *C* would purchase if *C* were no longer available. If consumers have logit demand, they will be twice as likely (60/30 = 2) to purchase product *A* than to purchase product *B*. In this example, logit demand predicts that the diversion ratio from *C* to *A* is 66.7% and the diversion ratio from *C* to *B* is 33.3%. (The diversion ratio from *C* to *A* is the fraction of *C*'s customers that would choose *A* if *C* were no longer available. In the case of logit demand, the fraction of *C*'s customers that would choose *A* is assumed to be equal to *A*'s market share divided by the total market share of all of *C*'s competitors.)

products may not be well-approximated by their market shares.[28] In those cases, the predictions of Sheu and Taragin's model may be systematically biased. Because health insurers are often highly differentiated based on quality, reputations, locations (for example, the geographic reach of provider networks that an insurer has assembled), and other characteristics, Sheu and Taragin's model may be inappropriate for studying the impact of insurer mergers.

To avoid Ho and Lee's complexity and Sheu and Taragin's logit assumption, we model the change in output prices using the upward pricing pressure framework. This approach allows us to predict price changes without making potentially unrealistic assumptions about consumer substitution patterns.

The upward pricing pressure framework is analytically simpler than Ho and Lee's and Sheu and Taragin's merger simulation models because, in the upward pricing pressure framework, the effect of a merger on the output price can be calculated through a single equation. This analytic simplicity, however, comes at a twofold price.

First, we do not allow rivals' prices to adjust to price changes by the merging parties. Normally, rival upstream and downstream prices are likely to move in the same direction as the merging firms' prices, although we cannot rule out opposite effects.[29]

Second, we must make an assumption about the pass-through rate (the rate at which the intermediaries pass along upstream-cost changes to their downstream customers). We assume that the pass-through rate is fixed at the pre-merger level, whereas both Ho and Lee and Sheu and Taragin allow the intermediaries to adjust the pass-through rate optimally after a merger. Our use of the pre-merger pass-through rate has support in the work of Sonia Jaffe and Glen Weyl, who have concluded that this simplifying assumption is not likely to cause substantial bias.[30]

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[28] Jerry Hausman, Gregory Leonard & J. Douglas Zona, *Competitive Analysis with Differentiated Products*, 34 ANNALES D'ÉCONOMIE ET DE STATISTIQUE [ANNALS ECON. & STAT.] 159, 179 (1994).

[29] In the upstream market, if the merging firms negotiate lower prices from suppliers, those lower prices will influence the prices that other suppliers can charge. Thus, we would expect a merger to cause other (non-merging) intermediaries to enjoy increased bargaining leverage and thus to negotiate lower upstream prices. Likewise, if the merging firms raise output prices, we would expect other intermediaries to do the same, because output prices are normally strategic complements. However, this effect may depend on the nature of the demand faced by each intermediary.

[30] *See* Sonia Jaffe & E. Glen Weyl, *The First-Order Approach to Merger Analysis*, AM. ECON. J.: MICROECONOMICS, Nov. 2013, at 188, 211. For a discussion of pass-through in different economic models, see E. Glen Weyl & Michal Fabinger, *Pass-through as an Economic Tool: Principles of Incidence Under Imperfect Competition*, 121 J. POL. ECON. 528, 568–69 (2013). For simulations that show that using pre-merger pass-through rates is not likely to cause substan-

II. THE IMPACT OF A HORIZONTAL MERGER OF INTERMEDIARIES ON INPUT AND OUTPUT PRICES

In this Part, we present our model of intermediary mergers. The model is based on Joseph Farrell and Carl Shapiro's well-known model of upward pricing pressure. Farrell and Shapiro show that the net impact of a horizontal merger on output prices can be decomposed into two competing effects: (1) upward pressure that results from elimination of output-market competition between merging parties and (2) downward pressure that results from merger-specific reductions in costs, some of which are passed through to consumers.[31]

Farrell and Shapiro show that there is a logical and mathematical equivalence between these two effects—an equivalence that facilitates a unified approach to merger analysis.[32] The logic is as follows: First, consider the output market. If firm *A* reduces price, some sales are diverted from firm *B*. This diversion reduces *B*'s profit by the number of diverted units multiplied by *B*'s per-unit nominal margin. Likewise, if *B* reduces price, some sales are diverted from *A*. If *A* and *B* merge, these reductions in profits become "cannibalization taxes"—opportunity costs. That is, when one of the two merged firms lowers its price, it takes some business from the other merged firm. If each merging firm is setting its price to maximize the joint profits of the merged entity, each firm will account for this cannibalization when considering a price reduction.

This thinking affects the merged firm's pricing incentives in the same way that the merged firm's marginal costs affect its pricing incentives. Thus, the impact of the cannibalization tax on *A*'s price is determined by *A*'s pass-through rate, as is the impact of any actual reduction in *A*'s marginal cost. Likewise, the impact of the cannibalization tax on *B*'s price is determined by *B*'s pass-through rate. Thus, to determine whether the merger creates net upward pricing pressure on a product sold by one of the merging firms, we can examine whether the cannibalization tax in the output market is larger or smaller than the reduction in marginal cost stemming from efficiencies. If the cannibalization tax is larger, the merger creates net upward pricing pressure.

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tial bias, see Lydia Cheung, *The Upward Pricing Pressure Test for Merger Analysis: An Empirical Examination* (Auckland Univ. of Tech., Working Paper No. 2013/03, 2013); and Nathan H. Miller et al., *Approximating the Price Effects of Mergers: Numerical Evidence and an Empirical Application* (Econ. Analysis Grp., Antitrust Div., U.S. Dep't of Justice, Working Paper No. 12-8, 2012).

[31] Joseph Farrell & Carl Shapiro, *Antitrust Evaluation of Horizontal Mergers: An Economic Alternative to Market Definition*, 10 B.E. J. THEORETICAL ECON., Vol. 10, No. 1, Art. 9, at 1, 2 (2010), faculty.haas.berkeley.edu/shapiro/alternative.pdf.

[32] *See id.* Farrell and Shapiro's upward pricing pressure framework builds on earlier work by Gregory Werden, who first introduced an approach to approximate the competitive effects of a merger without a full model of how each firm in the market would respond to the merger. *See generally* Gregory J. Werden, *A Robust Test for Consumer Welfare Enhancing Mergers Among Sellers of Differentiated Products*, 44 J. INDUS. ECON. 409, 409–13 (1996).

If the cannibalization tax is smaller, the merger creates net downward pricing pressure.

Farrell and Shapiro show that these two effects—the upward pressure that results from elimination of output-market competition between merging parties and the downward pressure that results from merger-specific reductions in costs—can be combined in a single equation that reflects the net pressure on each merging firm's price for each product[33]:

$$UPP_A = \delta_{AB} m_B + \Delta k_A \tag{1a}$$

$$UPP_B = \delta_{BA} m_A + \Delta k_B. \tag{1b}$$

In equation (1a), δ_{AB} is the diversion ratio from firm A to B (share of the sales lost by A captured by B when the price of A increases), m_B is firm B's pre-merger nominal profit margin, and Δk_A is the merger-specific change in firm A's marginal cost. Similarly, in equation (1b), δ_{BA} is the diversion ratio from firm B to A, m_A is firm A's pre-merger nominal profit margin, and Δk_B is the merger-specific change in firm B's marginal cost.

Farrell and Shapiro approximate output-price effects by multiplying the net pressure on each merging firm's price by the pre-merger pass-through rate[34]:

$$\Delta^{FS} p_A = \alpha[\delta_{AB} m_B + \Delta k_A] \tag{1c}$$

$$\Delta^{FS} p_B = \alpha[\delta_{BA} m_A + \Delta k_B]. \tag{1d}$$

In these equations, α is the pre-merger pass-through rate. The pre-merger pass-through rate is used as an approximation of the rate at which the cannibalization tax and changes in marginal cost are passed through to prices post-merger. By focusing only on the cannibalization tax and changes in marginal cost, Farrell and Shapiro ignore the effect of a merger on competing firms' upstream and downstream prices.

In our approach to measuring the output-price effects of an intermediary merger, we follow Farrell and Shapiro and use the pre-merger pass-through rate, the diversion ratio, intermediaries' margins, and merger-specific changes in marginal cost. Like Farrell and Shapiro, we also ignore the potential effect of the merger on non-merging intermediaries' input and output prices.

We depart from Farrell and Shapiro's model in two important ways.

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[33] Farrell & Shapiro, *supra* note 31, at 12.

[34] *See* Joseph Farrell & Carl Shapiro, *Recapture, Pass-Through, and Market Definition*, 76 ANTITRUST L.J. 585, 596 (2010).

First, we allow the change in one merging intermediary's output price (e.g., firm *A*'s output price) to affect the change in the other merging intermediary's output price (e.g., firm *B*'s output price). As equations (1c) and (1d) above show, Farrell and Shapiro use the other merging intermediary's pre-merger margin and therefore do not account for potential feedback effects from changes in the other merging intermediary's output price. An increase in the output price of one of the merging intermediaries increases its profit margin; this change increases the cannibalization tax on the other merging intermediary's output price and vice versa.[35]

Second, we modify Farrell and Shapiro's model to account for how negotiated input prices affect the merging intermediaries' marginal costs. Farrell and Shapiro include one parameter in their model to measure a firm's merger-specific change in marginal cost. We decompose this parameter into two components: (1) the change in negotiated input prices and (2) the change in other components of marginal costs, which we refer to generically as "operational costs."[36] The change in operational costs is unrelated to the merging intermediary's negotiations with input suppliers. This change comes from merger-specific efficiencies and is exogenous—that is, it is not affected by the change in the output price. The change in the negotiated input price, however, is not exogenous; it depends on the change in the output price because the output price affects the merging intermediary's bargaining leverage when negotiating with an input supplier. In our framework, we allow the changes in the merging intermediaries' input prices and output prices to affect each other. We show that the changes in input prices are positively related to the changes in output prices and negatively related to the changes in operational costs. That

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[35] Farrell and Shapiro's upward pricing pressure approach holds the prices of other products fixed, including the price of the product sold by the other merging firm. Farrell & Shapiro, *supra* note 31, at 11. Farrell and Shapiro recognize that allowing for changes in the prices of other products represents a closer approximation to the real world, but they argue that holding the prices of other products fixed allows the upward pricing pressure to be expressed without introducing a system of equations. *Id.* In this article, we propose a system of equations that we believe is sufficiently workable in merger reviews.

A related issue is whether, when calculating the upward pricing pressure of the other merging product, one should allow for changes in one merging product's marginal cost. *See* Richard Schmalensee, *Should New Merger Guidelines Give UPP Market Definition?*, CPI ANTITRUST CHRON., Winter 2009, at 3 (arguing that it does not seem logically consistent to take into account reductions in one merging product's marginal cost without accounting for changes in the other merging product's marginal cost); *see also* Joseph Farrell & Carl Shapiro, *Upward Pricing Pressure and Critical Loss Analysis: Response*, COMPETITION POL'Y INT'L, Winter 2010, at 3 (responding that one reason for not accounting for reductions in the other merging product's marginal cost is because it has the flavor of "efficiency offense"—i.e., treating a larger efficiency on one product, because it increases upward pricing pressure on the other product, as possible evidence to prohibit a merger) (citing FTC v. Procter & Gamble Co., 386 U.S. 568, 579 (1967)).

[36] The terms for change in cost, Δk_A and Δk_B in equations (1c) and (1d) respectively, can be separated into the changes in negotiated input prices, Δt_A and Δt_B, and the changes in other components of marginal cost, Δc_A and Δc_B (i.e., $\Delta k_A = \Delta t_A + \Delta c_A$ and $\Delta k_B = \Delta t_B + \Delta c_B$).

is, upward pressure on output prices and reductions in operational costs put upward pressure on input prices because increases in output prices and reductions in operational costs increase the merging intermediaries' profit margins. The merging intermediaries' input suppliers capture some of the higher profit margins through higher input prices.

To allow the changes in the merging intermediaries' input and output prices to affect each other, we specify and solve a system of equations for the changes in the merging intermediaries' input and output prices. The expressions for the merging intermediaries' output-price changes are extensions of equations (1c) and (1d) above:

$$\Delta p_A = \alpha[\delta_{AB}(m_B + \Delta p_B - \Delta t_B - \Delta c_B) + (\Delta t_A + \Delta c_A)] \quad (2a)$$

$$\Delta p_B = \alpha[\delta_{BA}(m_A + \Delta p_A - \Delta t_A - \Delta c_A) + (\Delta t_B + \Delta c_B)]. \quad (2b)$$

In these equations, Δc_A and Δc_B are the changes in intermediary *A*'s and intermediary *B*'s operational costs, respectively.

In equations (2a) and (2b), the change in intermediary *A*'s output price from a given merger depends on eight factors: (1) *A*'s pass-through rate, (2) the diversion from *A* to *B*, (3) *B*'s pre-merger margin, (4) the change in *B*'s output price, (5) the change in *B*'s operational costs, (6) the change in *B*'s negotiated input price, (7) the change in *A*'s operational costs, and (8) the change in *A*'s negotiated input price. The same logic applies to the change in intermediary *B*'s output price. All else equal, the changes in output prices are larger if pass-through, diversion, and pre-merger margins are high. The changes in output prices are smaller, and output prices may even decline, if the merging parties enjoy large reductions in operational costs and/or negotiated input prices.

We use a Nash bargaining model to derive expressions for the changes in the merging intermediaries' input prices. We assume that input suppliers' products are imperfect substitutes for each other. The intermediaries purchase inputs and use them to make finished products, which they then sell to consumers. Because the input suppliers' products are imperfect substitutes for each other, the intermediaries' finished products are different depending on the inputs they use to make the finished product. An important implication is that consumers may choose an intermediary based on the intermediary's supplier, so an intermediary may lose customers if it fails to contract with a given supplier, even as it maintains contracts with other suppliers.

This framework can be applied to different settings in which intermediaries negotiate with suppliers. We can think of the intermediaries as supplying menus of finished products where each product on the menu is produced with a different input. This framework may be appropriate, for example, if intermediaries are retailers that sell finished products made by different manu-

facturers. Alternatively, we might think of intermediaries as making finished products that use inputs from one or more suppliers. This interpretation describes health insurers, which offer consumers access to health services and negotiate with multiple health-service providers to create networks.

We assume that when an input supplier and intermediary negotiate an input price, they act as if the output prices are being set simultaneously with the input prices. An implication of this assumption is that an input supplier and intermediary will view the output prices as fixed when negotiating an input price. If the output prices are fixed, the output quantities will also be fixed, which means that an input supplier and an intermediary are effectively negotiating a lump-sum transfer for the fixed quantity of inputs.[37]

We also assume that when an input supplier and intermediary negotiate an input price, they act as if all other input prices are being negotiated simultaneously. An implication of this assumption is that an input supplier and intermediary, when negotiating, will view all other input prices as fixed. Thus, in the event of a disagreement between an input supplier and intermediary, the fallback options of the supplier and intermediary are based on the input prices they have each already negotiated with other parties. Those input prices, by assumption, would not be renegotiated.[38]

The negotiated input price will depend on how much the intermediary and input supplier would benefit from a supply agreement. The more the intermediary would benefit, the higher the negotiated input price. The more the input supplier would benefit, the lower the negotiated input price. How an intermediary merger affects a negotiated input price depends on the extent to which the merger changes the bargaining stakes.

We show in the Appendix, infra, that merger-related changes in input and output prices can be expressed in terms of a merger's effect on (1) output prices holding input prices fixed and (2) input prices holding output prices fixed. We refer to these effects as first-round effects.

The first-round output price effect depends on several factors:

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[37] This is a standard assumption. In addition to the Ho and Lee article, *supra* note 11, and the Sheu and Taragin working paper, *supra* note 22, see Gregory S. Crawford et al., *The Welfare Effects of Vertical Integration in Multichannel Television Markets*, 86 ECONOMETRICA 891, 904, 910–11 (2018); and Michaela Draganska et al., *A Larger Slice or a Larger Pie? An Empirical Investigation of Bargaining Power in the Distribution Channel*, 29 MARKETING SCI. 57, 60 (2010).

[38] This, too, is a standard assumption. In addition to Sheu and Taragin, see Gregory S. Crawford & Ali Yurukoglu, *The Welfare Effects of Bundling in Multichannel Television Markets*, 102 AM. ECON. REV. 643, 675–76 (2012); and Matthew Grennan, *Price Discrimination and Bargaining: Empirical Evidence from Medical Devices*, 103 AM. ECON. REV. 145, 160 (2013).

- The diversion or closeness of competition between the merging intermediaries;
- The merging intermediaries' pre-merger margin;
- The change in the merging intermediaries' operational costs; and
- The merging intermediaries' pre-merger pass-through rate.

The first-round output-price effect will be smaller if the merging intermediaries' pre-merger margin is low and diversion between the merging intermediaries is low. This point implies that an intermediary merger will create less upward pressure on output price if the intermediary market is highly competitive and the merging intermediaries are not close competitors.

The first-round input-price effect depends on several factors:

- The reduction in an intermediary's sales if the intermediary does not contract with the input supplier (which we refer to as the departure rate);
- The diversion between the merging intermediaries;
- The "diverted diversion" from the merging intermediaries to other intermediaries;[39]
- The input supplier's pre-merger margin;
- The change in the merging intermediaries' operational costs; and
- The change in the input supplier's marginal cost.

The first-round input-price effect will be larger if the departure rate is high (i.e., if the intermediary is more dependent on the input supplier), diversion between the merging intermediaries is high, diverted diversion from the merging intermediaries to other intermediaries is low, and the supplier's pre-merger margin is high.

The above analysis implies that an intermediary merger will create more downward pressure on input prices if the input market is not very competitive, diversion between the merging intermediaries is high, and diverted diversion from the merging intermediaries to other intermediaries is low. If the input market is not very competitive, intermediaries will be dependent on a few input suppliers, and the input suppliers will have more bargaining leverage and high margins before the merger. This conclusion means that there will be more bargaining leverage and margin for the merged intermediary to take

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[39] The diverted diversion from merging intermediaries *A* and *B* to non-merging intermediary *C* is the percentage of those consumers who would have switched from intermediary *A* to *B* in the event that *A* did not reach an agreement with a given supplier *S*, who would switch from *A* to *C* in the event that *A* and *B* do not reach agreements with *S*.

from the input suppliers. High diversion between the merging intermediaries and low diverted diversion from the merging intermediaries to other intermediaries will imply a larger proportional shift in bargaining leverage from suppliers to the merged intermediary.[40]

Pulling all of this analysis together leads to several overall conclusions:

- How market power is distributed along the supply chain prior to a merger is an important predictor of an intermediary merger's effects. In our model, the upward pressure on output prices will be smaller and the downward pressure on input prices will be larger if, before the merger, the input market is not very competitive and the intermediary market is highly competitive.
- The closeness of competition between the merging intermediaries affects the direct upward pressure on output prices. It also affects the downward pressure on input prices, which leads to indirect downward pressure on output prices. For a given amount of diversion, however, the direct upward pressure on output prices is greater than the indirect downward pressure on output prices. An implication is that when the merging intermediaries are not close competitors, all else equal, the increase in output prices will be smaller.
- The diverted diversion from the merging intermediaries to the non-merging intermediaries affects the increase in the merging intermediaries' bargaining leverage with input suppliers. Low diverted diversion results in a greater increase in the merging intermediaries' bargaining leverage, which, in turn, puts greater downward pressure on input prices and, therefore, greater downward pressure on output prices.

Figure 1 illustrates these points. In each panel, the X-axis is the diversion between the merging intermediaries, and the Y-axis is the diverted diversion from the merging intermediaries to other intermediaries. The four panels correspond to different assumptions about input supplier market power relative to intermediary market power. The gray shaded area identifies the combinations of parameter values for which the predicted change in the output price is positive. The unshaded area identifies the combinations for which the predicted change in the output price is negative. The black curve identifies the combinations for which the predicted change in the output price is exactly zero.

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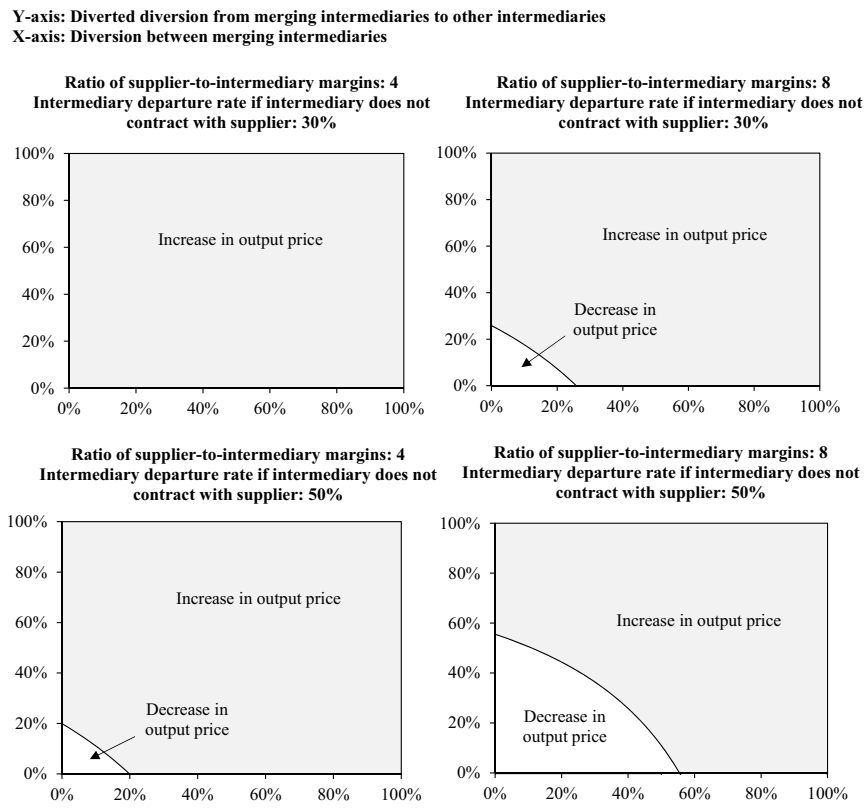
[40] There will be more consumers who will switch from one merging intermediary to the other if the merging intermediary does not reach an agreement with the supplier (i.e., diversion is high), but who will not switch from the merging intermediary to a non-merging intermediary if both merging intermediaries do not reach agreements with the supplier (i.e., diverted diversion is low).



Notes:
[1] The figure is based on the assumption that there are no reductions in variable cost for the supplier or intermediaries. Given this assumption, the sign of the predicted change in the output price does not depend on the Nash bargaining power parameter or the pass-through rate.
[2] The change in the merging intermediary's output price accounts for changes in the input price as well as changes in the other merging intermediary's input and output price.
[3] The merging intermediaries are assumed to be symmetric.

FIGURE 1: EFFECT OF A MERGER OF INTERMEDIARIES ON THE OUTPUT PRICE

The graphs in Figure 1 show that the change in output price is more likely to be negative when the input market is not very competitive and the intermediary market is competitive—i.e., when the ratio of the input supplier's pre-merger margin to the intermediary's pre-merger margin is relatively high and the departure rate is relatively high. The graphs also show that the change in output price is more likely to be negative when diversion between the merging intermediaries is low *and* diverted diversion from the merging intermediaries to non-merging intermediaries is low.

The conditions that would lead to a post-merger price decrease—a not-very-competitive input market, a competitive intermediary market, low diver-

sion between the merging intermediaries, *and* low diverted diversion from the merging intermediaries to non-merging intermediaries—are unlikely to appear in many markets. In a competitive intermediary market in which consumers have multiple attractive intermediary options, we might expect *low* diversion between the merging intermediaries, but *high* diverted diversion from the merging intermediaries to other intermediaries.[41] We therefore might not expect large proportional shifts in bargaining leverage from the input suppliers to the merged intermediary in a competitive intermediary market. This means that in a competitive intermediary market where the upward pressure on the output price may be smaller, the proportional shifts in bargaining leverage from the input suppliers to the merged intermediary might also tend to be smaller.

III. APPLICATION OF OUR MODEL TO THE ANTHEM-CIGNA MERGER

In this Part we apply our model to the Anthem-Cigna merger. The model predicts that the merger likely would have increased premiums in all of the markets contested by the government.

At the time of the merger, Anthem and Cigna were the second- and third-largest commercial health insurance carriers in the United States.[42] In 2015, Anthem had 38.6 million members.[43] The firm held an exclusive license to use the Blue Cross and/or Blue Shield brands in parts of 14 states.[44] In 2015, Cigna had approximately 15 million members.[45] The firm operated in all 50 U.S. states and the District of Columbia.[46]

Anthem and Cigna entered into a merger agreement in July 2015.[47] One year later, the U.S. Department of Justice, 11 states, and the District of Columbia (collectively, the government) challenged the merger. The government alleged that the transaction would harm competition in the sale of commercial health insurance to national-account customers in Anthem's 14 territories and

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[41] Specifically, we might expect that consumers who would switch from one merging intermediary to another if one of the merging intermediaries did not reach an agreement with the input supplier would switch from the merging intermediary to a non-merging intermediary if both merging intermediaries did not reach an agreement with the input supplier.

[42] *See* United States v. Anthem, Inc., 236 F. Supp. 3d 171, 178 (D.D.C.), *aff'd*, 855 F.3d 345 (D.C. Cir.), *cert. dismissed*, 137 U.S. 2250 (2017).

[43] Anthem, Inc., Annual Report (Form 10-K) at 3 (Feb. 19, 2016).

[44] Those states are California (Blue Cross license only), Colorado, Connecticut, Georgia, Indiana, Kentucky, Maine, Missouri (excluding 30 counties in western Missouri), Nevada, New Hampshire, New York (excluding certain areas), Ohio, Virginia (excluding certain counties near Washington, D.C.), and Wisconsin. *Id.* at 48–49.

[45] Cigna Corp., Annual Report (Form 10-K) at 49 (Feb. 27, 2016).

[46] *Id.* at 4.

[47] Anthem, Inc., *supra* note 43, at 3.

the United States, the sale of commercial health insurance to large groups in 35 local markets within the 14 Anthem territories, and the purchase of commercial health services in those same 35 local markets.[48]

A prominent feature of Anthem's defense was its claim that many employers would benefit from the transaction.[49] To support its claim, Anthem made two connected arguments.

Anthem's first argument—which the government did not dispute—was that the merged firm would have more bargaining leverage with providers, enabling it to negotiate lower reimbursement rates with providers.[50] Anthem estimated that the merger would produce input-market savings of $2.4 billion.[51]

Anthem's second argument—which the government did dispute—was that enough of the input-market savings would be passed through to employers to offset any harm resulting from the loss of sell-side competition between Anthem and Cigna.[52] The government countered that the input-market savings, even if they passed through to employers, were not efficiencies that antitrust law would allow the court to credit.[53] By a two-to-one margin, the U.S. Court of Appeals for the District of Columbia Circuit agreed with the government, but left open whether it would have approved the merger if the input-market savings were cognizable efficiencies.[54]

We will not revisit the arguments in *Anthem-Cigna* about cognizability. We instead focus on the following question: If the payment reductions had been cognizable, how would the merger have affected insurance premiums?

After the merger, Anthem expected to continue offering both Anthem and Cigna insurance products. We assume that, post-merger, Anthem would have negotiated input prices for Anthem and Cigna products on an all-or-nothing basis, meaning that if a provider failed to reach an agreement with Anthem, that provider could not reach an agreement with Cigna later.

Under our model, as explained above, how a merger affects output prices depends on the departure rate from the insurer, the diversion between the merging insurers, the diverted diversion from the merging insurers to non-

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[48] Complaint at 5, United States v. Anthem, Inc., 236 F. Supp. 3d 171 (D.D.C.) (No. 1:16-cv-1493), *aff'd*, 855 F.3d 345 (D.C. Cir.), *cert. dismissed*, 137 U.S. 2250 (2017).

[49] We ascribe these defense arguments to Anthem because Anthem would have been the acquiring party.

[50] *See Anthem*, 236 F. Supp. 3d at 233.

[51] *See id.* at 234.

[52] *See id.* at 231–32.

[53] *See* Brief of Appellees the United States of America and Plaintiff States, *supra* note 5, at 57.

[54] *See* United States v. Anthem, Inc., 855 F.3d 345, 380 (D.C. Cir.), *cert. dismissed*, 137 U.S. 2250 (2017).

merging insurers, and pre-merger margins for providers and insurers. These values are market-specific. In the *Anthem-Cigna* case, the government argued that competition would be harmed in 35 distinct geographic markets, each of which may have distinct consumer-substitution patterns and pre-merger margins.[55] To account for this possible variation, we have analyzed multiple market-structure scenarios. For provider markets, we consider four variants: highly competitive, moderately competitive, less competitive, and monopoly. For insurer markets, we consider two variants: moderately competitive and less competitive.[56] Within each of these insurer market cases, we consider markets where Anthem and Cigna are close substitutes or are not close substitutes. Table 1 below presents our findings.

Provider and insurer market structures are relevant to departure rates. In highly competitive provider markets and/or not-very-competitive insurer markets, an insurer will not suffer much loss of enrollment just because it does not contract with any particular provider. In provider markets that are not very competitive and/or in competitive insurer markets, an insurer will suffer a larger reduction in enrollment if it does not contract with a dominant provider. In a monopoly provider market, across a wide range of insurer market structures, an insurer will suffer a large reduction in enrollment if it does not contract with the monopoly provider because consumers (employers or other purchasers of insurance) will switch insurers to maintain access to the monopoly provider.

Provider market structure and insurer market structure are also relevant to provider and insurer margins. We assume that provider margins range from $800 to $1,200 per inpatient day, depending on the competitiveness of the provider market. We assume that Anthem and Cigna's margins range from $10 to $30 per enrollee per month, depending on the competitiveness of the insurer market.[57]

The closeness of competition between Anthem and Cigna is relevant to the diversion between Anthem and Cigna and the diverted diversion from Anthem and Cigna to other insurers. In markets in which Anthem and Cigna are close competitors, we assume that diversion between Anthem and Cigna is 60

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[55] *Id.* at 351.

[56] For insurer markets, we consider only moderately competitive and less competitive cases because Anthem, United, Cigna, Aetna, and a competitive fringe of varying size operate in most—if not all—of the relevant markets identified by the government. That is, none of the relevant markets identified by the government could be characterized as highly competitive or monopoly.

[57] To express the provider margin in the same units as the insurer margin, we multiply the provider margin by an estimate of the expected number of inpatient days per enrollee per month (0.047). *See infra* Appendix D (detailing estimation).

percent and that the diverted diversion from Anthem and Cigna to other insurers is 20 percent. In markets in which Anthem and Cigna are not close

TABLE 1
PREDICTED EFFECTS OF ANTHEM-CIGNA MERGER

			Parameters	Provider Market Structure			
				Highly Competitive	**Moderately Competitive**	**Less Competitive**	**Monopoly**
Insurer Market Structure	**Moderately Competitive**	**Anthem and Cigna Are Close Substitutes**	Insurer Departure Rate	20%	70%	80%	90%
			Diversion	60%	60%	60%	60%
			Diverted Diversion	20%	20%	20%	20%
			Insurer Margin	$25.00	$20.00	$15.00	$10.00
			Provider Margin	$900.00	$1,000.00	$1,100.00	$1,200.00
			Predicted Changes				
			Provider Price	**($1.83)**	**($8.82)**	**($11.21)**	**($13.90)**
			Premium	**$9.96**	**$5.82**	**$3.00**	**$0.08**
		Anthem and Cigna Are Not Close Substitutes	Insurer Departure Rate	20%	70%	80%	90%
			Diversion	20%	20%	20%	20%
			Diverted Diversion	60%	60%	60%	60%
			Insurer Margin	$25.00	$20.00	$15.00	$10.00
			Provider Margin	$900.00	$1,000.00	$1,100.00	$1,200.00
			Predicted Changes				
			Provider Price	**$0.11**	**($0.97)**	**($1.47)**	**($2.06)**
			Premium	**$2.47**	**$1.43**	**$0.66**	**($0.16)**
	Less Competitive	**Anthem and Cigna Are Close Substitutes**	Insurer Departure Rate	10%	30%	50%	90%
			Diversion	60%	60%	60%	60%
			Diverted Diversion	20%	20%	20%	20%
			Insurer Margin	$30.00	$25.00	$20.00	$15.00
			Provider Margin	$800.00	$900.00	$1,000.00	$1,100.00
			Predicted Changes				
			Provider Price	**($0.60)**	**($3.00)**	**($5.98)**	**($12.87)**
			Premium	**$12.46**	**$9.63**	**$6.63**	**$2.52**
		Anthem and Cigna Are Not Close Substitutes	Insurer Departure Rate	10%	30%	50%	90%
			Diversion	20%	20%	20%	20%
			Diverted Diversion	60%	60%	60%	60%
			Insurer Margin	$30.00	$25.00	$20.00	$15.00
			Provider Margin	$800.00	$900.00	$1,000.00	$1,100.00
			Predicted Changes				
			Provider Price	**$0.28**	**($0.05)**	**($0.53)**	**($1.76)**
			Premium	**$3.10**	**$2.40**	**$1.63**	**$0.53**

Note: For all market scenarios, we assume that the pass-through rate is 50%, the provider and insurer have equal bargaining power, and the merger results in a $0.80 per-enrollee-per-month decrease in the insurers' marginal costs and no change in the provider's marginal cost. The insurer margin is shown as a per-enrollee-per-month value, and the provider margin is shown as a per-inpatient-day value.

competitors, we assume that diversion between Anthem and Cigna is 20 percent and that the diverted diversion from Anthem and Cigna to other insurers is 60 percent.[58]

We also assume that Anthem and Cigna are symmetric in the following sense: the diversion from Anthem to Cigna is the same as the diversion from Cigna to Anthem; the diverted diversion from Anthem to other insurers is the same as the diverted diversion from Cigna to other insurers; and the percentage reduction in Anthem's enrollment if Anthem does not contract with an individual provider is the same as the percentage reduction in Cigna's enrollment if Cigna does not contract with an individual provider.[59] We also assume that Anthem's and Cigna's pre-merger margins and operating cost reductions are the same. Finally, we assume that the remaining parameters of the model are the same across all market-structure scenarios. Specifically, we assume that the insurer's pass-through rate is 50 percent,[60] that the insurer's relative bargaining power is 50 percent, that each insurer's variable-cost savings from the merger is $0.80 per enrollee per month,[61] and that providers' variable cost savings from the merger are zero.

We now consider the predictions of our model in (1) highly competitive provider markets, (2) moderately competitive provider markets, (3) less competitive provider markets, and (4) monopoly provider markets.

A. HIGHLY COMPETITIVE PROVIDER MARKETS

Our model predicts that in highly competitive provider markets, the Anthem-Cigna merger would have increased premiums. In highly competitive provider markets, individual providers would not have had much bargaining leverage with Anthem and Cigna, so the merger would not have resulted in

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[58] These assumptions are placeholders. In practice, these assumptions would be based on empirical evidence on the closeness of competition. The overall results are not sensitive to these specific assumptions.

[59] The assumption that Anthem and Cigna are symmetric simplifies the expressions for the predicted changes in the negotiated input prices and premiums. It is also possible to use our model to estimate the predicted effects if Anthem and Cigna are not symmetric, by solving the system of equations shown in equations (2a), (2b), (3a), and (3b) above. We focus on the symmetric case to illustrate how different market structures affect the predicted outcomes.

[60] The pass-through rate affects the magnitude of the change in the output price, but not the direction of the change. That is, if the change in the output price is positive, a higher pass-through rate implies a larger increase in output price. If the change in the output price is negative, a higher pass-through rate implies a larger decrease in output price. *See infra* Appendix A, Tables A1 & A2.

[61] We estimate variable-cost savings of approximately $0.80 per enrollee per month based on the variable-cost savings claimed by Anthem and Cigna, $515 million, divided by the total number of people insured by Anthem and Cigna, 53 million: $515,000,000 / (53,000,000 / 12) = ~$0.80 per enrollee per month. *See* United States v. Anthem, Inc., 236 F. Supp. 3d 171, 235 (D.D.C.), *aff'd*, 855 F.3d 345 (D.C. Cir.), *cert. dismissed*, 137 U.S. 2250 (2017).

much of a shift in bargaining leverage from providers to Anthem-Cigna. Thus, absent significant operational efficiencies, the merger would have created upward pressure on Anthem's and Cigna's premiums.

B. MODERATELY COMPETITIVE PROVIDER MARKETS

Our model predicts that in moderately competitive provider markets, the Anthem-Cigna merger would have decreased provider prices and increased premiums. In moderately competitive provider markets, individual providers would have had some bargaining leverage with Anthem and Cigna, so the merger would have resulted in some shift in bargaining leverage from providers to Anthem-Cigna. Our model predicts, however, that this shift in bargaining leverage from providers to Anthem-Cigna would not have been large enough to fully offset the upward pressure on Anthem's and Cigna's premiums, so premiums would have increased.

C. LESS COMPETITIVE PROVIDER MARKETS

Our model predicts that in less competitive provider markets, the Anthem-Cigna merger would have decreased provider prices and increased premiums. In less competitive provider markets, the merger would have resulted in a larger shift in bargaining leverage from providers to Anthem-Cigna. Our model predicts that this larger shift in bargaining leverage from providers to Anthem-Cigna would have significantly but not fully offset the upward pressure on Anthem's and Cigna's premiums, so premiums would have increased.

D. MONOPOLY PROVIDER MARKETS

Our model predicts that in monopoly provider markets, the Anthem-Cigna merger would have decreased provider prices; whether it would have increased or decreased premiums would depend on the structure of the insurer market. In more competitive insurer markets in which Anthem and Cigna are not close substitutes, the merger would have decreased provider prices and premiums. In less competitive insurer markets or insurer markets in which Anthem and Cigna are close substitutes, the merger would have decreased provider prices and increased premiums. In more competitive insurer markets in which Anthem and Cigna are not close substitutes, there is less upward pressure on premiums, and Anthem-Cigna's increased bargaining leverage would have more than offset the upward pressure on premiums. In less competitive insurer markets, the increase in Anthem-Cigna's bargaining leverage would have been smaller and the upward pressure on their premiums would have been greater, so the increased bargaining leverage would not have fully offset the upward pressure on premiums. In markets in which Anthem and Cigna are close substitutes, the increase in Anthem-Cigna's bargaining leverage and the upward pressure on premiums would have been greater, but the

increased bargaining leverage would not have fully offset the upward pressure on premiums.

In sum, our analysis finds that the merger of Anthem and Cigna likely would have increased premiums in all of the markets contested by the government. The increase in the merged company's upstream bargaining leverage might have been enough to offset the upward pressure on their premiums only in areas where there is very little provider competition, yet the insurer market is sufficiently competitive.

IV. CONCLUSION

The ill-fated Anthem-Cigna merger has reignited a discussion about consolidation of market intermediaries. The same factors that may allow powerful intermediaries to increase prices in downstream output markets may also allow them to negotiate lower prices in upstream input markets. The net effect of a merger on downstream pricing and consumer welfare therefore requires closer analysis.

Combining bargaining and upward pricing pressure models, we have developed a framework for evaluating these merger effects. The framework uses data that would normally be available in discovery in a merger case. Indeed, our analysis relies on the same data used in other bargaining and upward pricing pressure models: data on profit margins, substitution patterns, and operational efficiencies. Thus, our framework should be readily accessible for future merger analyses.

We find that how market power is distributed along the supply chain before a merger is an important predictor of an intermediary merger's effects. All else equal, an intermediary merger is more likely to result in lower output prices if the upstream input market is not very competitive and the downstream market is competitive. We also find that an intermediary merger is more likely to result in lower output prices if the diversion between the merging intermediaries is low and the diverted diversion from the merging intermediaries to non-merging intermediaries is low. Thus, an intermediary merger is more likely to result in lower output prices if the input market is not very competitive, the intermediary market is competitive, the diversion between the merging intermediaries is low, and the diverted diversion from the merging intermediaries to non-merging intermediaries is low. These conditions are likely to be rare, because where the intermediary market is competitive and diversion between the merging intermediaries is low, diverted diversion from the merging intermediaries to non-merging intermediaries is likely to be high.

APPENDIX

This Appendix has four parts:

Appendix A includes the derivation of the all-or-nothing bargaining model that we use in the main text to calculate the predicted effects of the Anthem-Cigna merger.

Appendix B includes the derivation of the model we use to simulate Anthem's and Cigna's separate negotiations with providers after the merger. We show that, absent any reduction in an intermediary's operational costs or a reduction in a supplier's marginal cost, the output price increases and the input price decreases following the merger.

Appendix C includes the predicted effects of the Anthem-Cigna merger under alternative assumptions about the rate at which changes in insurer's costs are passed through to consumers' premiums.

Appendix D provides the sources of the margin values used in the Anthem-Cigna merger model.

A. ALL-OR-NOTHING BARGAINING MODEL

Intermediary A's gross surplus from reaching a supply agreement with S is:

$$D_A^S = (p_A - c_A)q_A - \widetilde{\Pi}_A, \tag{A1}$$

where $\widetilde{\Pi}_A$ is A's profit if it does not reach a supply agreement with S. A can earn a profit by selling products using inputs from other suppliers. We refer to D_A^S as A's "gross surplus" because it excludes the negotiated input price that A pays S.

Equation (A1) shows in mathematical notation the idea that if A reaches a supply agreement with S, A will use S's input to make a product that A sells to consumers. By doing so, A will earn a certain amount of gross profit.[62] Alternatively, if A does not reach a supply agreement with S, A will make and sell its product without S's input and will earn a certain amount of profit (which we call A's disagreement profit). The difference between A's gross profit and A's disagreement profit is A's gross surplus from contracting with S.

Likewise, S's gross surplus from reaching a supply agreement with A is:

$$U_S^A = -w_S^A q_A - (q_A - \tilde{q}_A)\delta_{AB} m_{SB} - (q_A - \tilde{q}_A)\delta_{AC} m_{SC}, \tag{A2}$$

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[62] We use the term "gross profit" because $(p_A - c_A)q_A$ is gross of the negotiated input price that A pays S.

where w_S^A is *S*'s per unit cost to supply *A*, m_{SB} and m_{SC} are *S*'s margins on sales to *B* and *C*, $(q_A - \tilde{q}_A)$ is the reduction in *A*'s sales if *A* fails to reach a supply agreement with *S*, and δ_{AB} and δ_{AC} are the diversion ratios from *A* to *B* and *A* to *C*, respectively. Thus, together, $(q_A - \tilde{q}_A)\delta_{AB}$ are the additional units that *S* sells to *B* as a result of a breakdown in negotiations with *A*. Similarly, $(q_A - \tilde{q}_A)\delta_{AC}$ are the additional units that *S* sells to *C* as a result of a breakdown in negotiations with *A*. If *A* does not purchase from *S*, *A*'s product is not as attractive to some consumers; these consumers purchase from *B* or *C* instead. This substitution increases *S*'s sales to *B* and *C*.

The negotiated input price determines how *A* and *S* split the combined surplus generated by the supply agreement. The equilibrium negotiated input price is[63]:

$$t_A = (1-\beta)[(p_A - c_A) - \tilde{\pi}_A] - \beta[-w_S^A - \eta_A \delta_{AB} m_{SB} - \eta_A \delta_{AC} m_{SC}], \quad \text{(A3)}$$

where $\tilde{\pi}_A = \tilde{\Pi}_A / q_A$, $\eta_A = (q_A - \tilde{q}_A)/q_A$, is the percentage change in *A*'s unit sales given a disagreement with *S*, and β is a parameter that ranges from zero to one and reflects *A*'s relative bargaining power when negotiating with *S*.[64]

The first bracketed term of equation (A3) is *A*'s gross surplus per unit from contracting with *S*. The negotiated input price is higher if *A*'s gross surplus is larger.[65] The second term of equation (A3) is *S*'s gross surplus from contracting with *A*. The negotiated input price is lower if *S*'s gross surplus is larger (less negative).[66]

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[63] Formally, the negotiated price is the Nash bargaining solution where *A* and *S* maximize a weighted geometric average of their surpluses.

[64] Bargaining power reflects the relative ability of an intermediary to earn a large fraction of the gross surplus generated from an agreement with the supplier. The parameter β equals one when *A* has all the bargaining power and zero when *S* has all the bargaining power. Bargaining power is not the same thing as bargaining leverage. Bargaining power reflects how much of the surplus generated from the agreement an intermediary or supplier will earn, whereas bargaining leverage reflects the relative sizes of the intermediary's and supplier's surpluses. An intermediary has relatively more bargaining leverage if it has a relatively smaller surplus compared to the supplier. *See* Gregory Vistnes & Yianis Sarafidis, *Cross-Market Hospital Mergers: A Holistic Approach,* 79 ANTITRUST L.J. 253, 257 n.20 (2013); *see also* Dov Rothman & David Toniatti, *A Primer on Bargaining: How Mergers May Affect Negotiated Prices*, ANTITRUST SOURCE (Apr. 2018), www.americanbar.org/content/dam/aba/administrative/antitrust_law/leadership/resources/publication_resources/apr18_rothman_4_18f.authcheckdam.pdf.

[65] When *A*'s gross surplus is higher, *S* has more bargaining leverage and so is able to negotiate a higher input price. *A*'s gross surplus is higher if *A*'s gross profit margin is higher and *A*'s disagreement payoff is lower.

[66] *S*'s gross surplus is lower (more negative) if *S* is able to recapture more sales through intermediaries *B* and *C* in the event of a disagreement with *A*. *S*'s gross surplus also is lower (more negative) if *S*'s marginal cost of supplying *A* is higher.

We now consider how the negotiated input price changes if *A* and *B* merge. In what follows, we assume that, post-merger, *A* and *B* negotiate with *S* on an all-or-nothing basis. If *S* fails to reach a supply agreement with *A*, then *S* may not reach a supply agreement with *B* and therefore can sell only to *C*.[67]

Post-merger, *A*'s gross surplus, D'^{S}_{A}, is:

$$D'^{S}_{A} = (p'_A - c'_A)q_A - \widetilde{\Pi}'_A - (q_A - \tilde{q}_A)\delta_{AB}(1 - \tilde{\delta}_{BC})\widetilde{m}_A, \qquad \text{(A4)}$$

where $\widetilde{m}_A$ is *A*'s profit margin if *A* does not contract with *S*. We will refer to $\widetilde{m}_A$ as *A*'s "disagreement margin." The parameter $\widetilde{\Pi}'_A$ is *A*'s post-merger profit if it does not reach a supply agreement with *S*. The parameter $\tilde{\delta}_{BC}$ is the fraction of *A*'s sales that would be diverted to *B* before the merger if *A* did not contract with *S* that would be diverted to *C* after the merger if *A* and *B* did not contract with *S*. Thus, for *A*'s sales that would be diverted to *B* before the merger if *A* did not contract with *S*, $(1 - \tilde{\delta}_{BC})$ is the fraction of those sales that would remain with *A* after the merger if *A* and *B* did not contract with *S*. We can think of $\tilde{\delta}_{BC}$ as the "diverted diversion," and as $(1 - \tilde{\delta}_{BC})$ as *A*'s "recaptured diversion" and *S*'s "lost recapture."

A's gross surplus from contracting with *S* is higher post-merger if *A*'s output price is higher and/or *A*'s marginal cost is lower. Increases in *A*'s gross surplus increase *S*'s bargaining leverage and put upward pressure on the input price that *A* and *S* negotiate. At the same time, *A*'s recaptured diversion reduces the number of sales that *A* loses if it does not contract with *S*, and this effect reduces *A*'s gross surplus from contracting with *S*. This decrease in *A*'s gross surplus decreases *S*'s bargaining leverage. That decrease, in turn, puts downward pressure on the input price that *A* and *S* negotiate.

S's post-merger gross surplus, U'^{A}_{S}, is:

$$U'^{A}_{S} = -w'^{A}_{S}q_A - (q_A - \tilde{q}_A)\big(\delta_{AC} + \delta_{AB}\tilde{\delta}_{BC}\big)m_{SC}. \qquad \text{(A5)}$$

S's gross surplus is higher post-merger if its marginal cost of selling to *A* is lower. *S*'s gross surplus also changes in two other ways. First, *S* no longer makes some of the additional sales to *B* that it would have made pre-merger if it did not reach a supply agreement with *A* (*S*'s lost recapture). Second, *S* potentially makes some additional sales to *C* (*S*'s diverted diversion). *S*'s lost recapture increases its surplus from contracting with *A*, and this effect increases *A*'s bargaining leverage. The increase in *S*'s surplus from the lost recapture and the corresponding increase in *A*'s bargaining leverage will be greater if *S*'s margins on sales to *B* are higher pre-merger. A takeaway is that

[67] In the next part of the Appendix, we consider the case in which, post-merger, *A* and *B* continue to negotiate with *S* separately.

a merger of intermediaries will result in a larger shift in bargaining leverage when the input suppliers' margins are high before the merger.

The equilibrium post-merger negotiated input price is:

$$t'_A = (1-\beta)\left[(p'_A - c'_A) - \eta_A \delta_{AB}\left(1-\tilde{\delta}_{BC}\right)\widetilde{m}_A - \tilde{\pi}'_A\right] + \beta\left[\eta_A\left(\delta_{AC} + \delta_{AB}\tilde{\delta}_{BC}\right)m_{SC} + w_S^{A\prime}\right], \tag{A6}$$

where $\tilde{\pi}'_A = \widetilde{\Pi}'_A / q_A$. We assume that *A*'s post-merger profits if it does reach an agreement with *S* increase by the change in its output price applied to the quantity sold. That is, $\widetilde{\Pi}'_A = \widetilde{\Pi}_A + \tilde{q}_A \Delta p'_A$, so the per-unit disagreement payoff is: $\tilde{\pi}'_A = \tilde{\pi}_A + (1-\eta_A)\Delta p'_A$. When we apply this substitution and subtract *A*'s pre-merger negotiated input price from *A*'s post-merger negotiated input price, the change in *A*'s negotiated input price becomes:

$$\Delta t_A = (1-\beta)[\eta_A \Delta p_A - \Delta c_A] - \eta_A \delta_{AB}\left[(1-\beta)\left(1-\tilde{\delta}_{BC}\right)\widetilde{m}_A - \beta\left(\tilde{\delta}_{BC} m_{SC} - m_{SB}\right)\right] + \beta \Delta w_S^A. \tag{A7}$$

The analogous expression for the change in *B*'s negotiated input price is:

$$\Delta t_B = (1-\beta)[\eta_B \Delta p_B - \Delta c_B] - \eta_B \delta_{BA}\left[(1-\beta)\left(1-\tilde{\delta}_{AC}\right)\widetilde{m}_B - \beta\left(\tilde{\delta}_{AC} m_{SC} - m_{SA}\right)\right] + \beta \Delta w_S^B, \tag{A8}$$

where β is a parameter that ranges from zero to one and reflects the intermediary's relative bargaining power when negotiating with the supplier,[68] η_A is the percentage change in *A*'s unit sales if *A* does not reach an agreement with the *S*, δ_{AB} is the fraction of the sales *A* loses if it does not reach an agreement with *S* that would be diverted to *B*, $\tilde{\delta}_{BC}$ is the fraction of the sales *A* would lose to *B* if *A* did not reach an agreement with *S* that would be diverted to other intermediaries *C* if *A* and *B* both did not reach an agreement with *S*, $\widetilde{m}_A$ is *A*'s margin if it does not reach an agreement with *S*,[69] m_{SB} is *S*'s margin on sales to *B*, and m_{SC} is *S*'s margin on sales to *C*.

Given the above, $\eta_A \delta_{AB}(1-\tilde{\delta}_{BC})$ are the sales *A* would lose if *A* does not reach an agreement with *S* that *A* no longer loses if *A* and *B* both do not reach agreements with *S*. These are also the sales that *S* would recapture if *S* did not reach an agreement with *A* that *S* no longer recaptures if *S* does not reach agreements with *A* or *B*.

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[68] The parameter β equals one if the intermediary has all the bargaining power and zero if the supplier has all the bargaining power.

[69] There are analogous definitions for η_B, δ_{BA}, $\tilde{\delta}_{AC}$, and $\widetilde{m}_B$.

The expressions for the changes in output prices and negotiated input prices in equations (2a), (2b), (A7), and (A8) are a system of equations; they are all determined jointly. When we apply the assumption that the intermediaries are symmetric and we solve this system, the changes in *A*'s input and output prices can be expressed as:[70]

$$\Delta p = \gamma[\Delta^1 p + \alpha(1-\delta)\Delta^1 t] \tag{A9}$$

$$\Delta t = \gamma[(1-\beta)\eta\Delta^1 p + (1-\alpha\delta)\Delta^1 t], \tag{A10}$$

where $\gamma = \frac{1}{(1-\alpha\delta)-\alpha(1-\beta)(1-\delta)\eta}$.[71]

In equations (A9) and (A10), the term $\Delta^1 p$ is the first-round effect on the output prices holding fixed the input prices.[72] We call this term a first-round effect because it does not account for the effect of changes in the merging intermediary's input price or changes in the other merging intermediary's margin that result from changes in the other merging intermediary's output price or input price. The first-round effect depends on the diversion between the merging intermediaries, the merging intermediaries' pre-merger margin, the change in the merging intermediaries' marginal cost gross of the input price, and the merging intermediaries' pre-merger pass-through rate. The first-round effect on the output price will be smaller if diversion between the merging intermediaries is low and the merging intermediaries' pre-merger margin is low. An implication is that an intermediary merger will create less upward pressure on output price if the merging intermediaries are not close substitutes and the intermediary market is highly competitive.

The second term $\Delta^1 T$ is the first-round effect on the input price, holding the output price fixed.[73] As above, we call this term a first-round effect because it

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[70] The assumption that intermediaries are symmetric implies that the diversion from *A* to *B* is the same as the diversion from *B* to *A*, the diverted diversion from *A* to other intermediaries is the same as the diverted diversion from *B* to other intermediaries, and the percentage reduction in *A*'s enrollment if *A* does not contract with an individual provider is the same as the percentage reduction in *B*'s enrollment if *B* does not contract with *S*.

[71] By the symmetry assumption, the changes in the merging intermediaries' negotiated input prices (Δt) and output prices (Δp) are the same. The symmetry assumption also implies that the merging intermediaries have the same pre-merger margin (m_I), the same diversion to each other (δ), the same diverted diversion ($\tilde{\delta}$), and the same change in marginal cost gross of the negotiated input price (Δc).

[72] $\Delta^1 p = \alpha[\delta(m_I - \Delta c) + \Delta c]$.

[73] $\Delta^1 t = -(1-\beta)\Delta c - \eta\delta\left[(1-\beta)\left(1-\tilde{\delta}\right)\tilde{m}_I + \beta(1-\tilde{\delta})m_S\right] + \beta\Delta w_S$.

does not account for the effect of changes in the output price on the input price. The first-round effect depends on the percentage reduction in an intermediary's sales if the intermediary does not contract with the supplier, the diversion between the merging intermediaries, the diverted diversion from the merging intermediaries to other intermediaries, the supplier's pre-merger margin, the change in the merging intermediaries' operational costs, and the change in the supplier's marginal cost. The first-round effect on the input price will be larger if the intermediary loses more sales if it does not contract with the supplier (i.e., if the intermediary is more dependent on the supplier), diversion between the merging intermediaries is high, diverted diversion from the merging intermediaries to other intermediaries is low, and the supplier's pre-merger margin is high.[74]

B. SEPARATE-BARGAINING MODEL

This Appendix shows the derivation of our model in which intermediaries continue to negotiate separately with a supplier after a merger. We show that, absent a reduction in the supplier's marginal cost or a reduction in the intermediaries' operational costs, a merger of intermediaries results in an increase in output prices and a decrease in input prices.

Intermediary A's gross surplus from reaching a supply agreement with S is:

$$D_A^S = (p_A - c_A)q_A - \widetilde{\Pi}_A, \tag{B1}$$

where $\widetilde{\Pi}_A$ is A's profit if it does not reach a supply agreement with S.

Likewise, S's gross surplus from reaching a supply agreement with A is:

$$U_S^A = -w_S^A q_A - (q_A - \tilde{q}_A)\delta_{AB} m_{SB} - (q_A - \tilde{q}_A)\delta_{AC} m_{SC}, \tag{B2}$$

where w_S^A is S's per unit cost to supply A, m_{SB} and m_{SC} are S's margins on sales to B and C, $(q_A - \tilde{q}_A)$ is the reduction in A's sales if A fails to reach a supply agreement with S, and δ_{AB} and δ_{AC} are the diversion ratios from A to B and from A to C, respectively.

The negotiated input price determines how A and S split the combined surplus generated by the supply agreement. The equilibrium negotiated input price is:[75]

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[74] A reduction in the merging intermediaries' operational costs creates upward pressure on the negotiated input price. The reduction in the merging intermediaries' operational costs increases the merging intermediaries' margin, which increases the gross surplus from contracting with the supplier. A reduction in the supplier's marginal cost creates downward pressure on the negotiated input price.

[75] Formally, the negotiated price is the Nash bargaining solution where A and S maximize a weighted geometric average of their surpluses.

$$t_A = (1-\beta)[(p_A - c_A) - \tilde{\pi}_A] - \beta[-w_S^A - \eta_A \delta_{AB} m_{SB} - \eta_A \delta_{AC} m_{SC}], \tag{B3}$$

where $\tilde{\pi}_A = \widetilde{\Pi}_A / q_A$, $\eta_A = (q_A - \tilde{q}_A)/q_A$ is the percentage change in A's unit sales given a disagreement with S, and β is a parameter that ranges from zero to one and reflects A's relative bargaining power when negotiating with S.[76]

An intermediary merger affects the negotiated input price by changing each merging intermediary's gross surplus from contracting with the supplier and increasing the supplier's gross surplus from contracting with the merging intermediaries.

Post-merger, A's gross surplus, D'^S_A, is:

$$D'^S_A = (p'_A - c'_A) q_A - \widetilde{\Pi}'_A - (q_A - \tilde{q}_A) \delta_{AB} m'_B, \tag{B4}$$

where m'_B is B's post-merger profit margin. The merging intermediary's gross surplus depends on the intermediary's margin gross of the input price, its disagreement payoff related to sales of A if it does not contract with the supplier, the amount of diversion between the merging intermediaries, and the other merging intermediary's margin.

S's gross surplus from reaching a supply agreement with A is:

$$U'^A_S = -w'^A_S q_A - (q_A - \tilde{q}_A) \delta_{AB} m'_{SB} - (q_A - \tilde{q}_A) \delta_{AC} m'_{SC}, \tag{B5}$$

where w'^A_S is S's post-merger per unit cost to supply A, and m'_{SB} and m'_{SC} are S's post-merger margins on sales to B and C. The intermediary merger increases the supplier's gross surplus from contracting with the merging intermediaries by reducing its margin on sales to the other merging intermediary. The supplier's margin on sales to the other merging intermediary will be lower if the other merging intermediary is able to negotiate a low input price.

The negotiated input price determines how A and S split the combined surplus generated by the supply agreement. The equilibrium negotiated input price is:[77]

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[76] Bargaining power reflects the relative ability of an intermediary to earn a large fraction of the gross surplus generated from an agreement with the supplier. The parameter β equals one when A has all the bargaining power and zero when S has all the bargaining power.

[77] Formally, the negotiated price is the Nash bargaining solution where A and S maximize a weighted geometric average of their surpluses.

$$t'_A = (1-\beta)[(p'_A - c'_A) - \tilde{\pi}'_A - \eta_A \delta_{AB} m'_B] + \beta\left[w_S^{A\prime} + \eta_A \delta_{AB} m'_{SB} + \eta_A \delta_{AC} m'_{SC}\right]. \quad \text{(B6)}$$

We can express the post-merger margins as the pre-merger margins plus any changes in the output price and input price: $p'_B - c'_B - t'_B = m_B + \Delta p_B - \Delta c_B - \Delta t_B$, $m'_{SB} = m_{SB} + \Delta t_B$, $m'_{SC} = m_{SC}$, and $\tilde{\pi}'_A = \tilde{\pi}_A + (1-\eta_A)\Delta p_A$.

By substituting these terms and subtracting *A*'s pre-merger negotiated input price from *A*'s post-merger negotiated input price, the change in *A*'s negotiated input price is:

$$\Delta t_A = (1-\beta)[\Delta p_A - \Delta c_A - (1-\eta_A)\Delta p_A - \eta_A \delta_{AB}(m_B + \Delta p_B - \Delta c_B)] + \beta \Delta w_S^A + \eta_A \delta_{AB} \Delta t_B. \quad \text{(B7)}$$

The analogous expression for the change in *B*'s negotiated input price is:

$$\Delta t_B = (1-\beta)[\eta_B \Delta p_B - \Delta c_B - (1-\eta_B)\Delta p_B - \eta_B \delta_{BA}(m_A + \Delta p_A - \Delta c_A)] + \beta \Delta w_S^B + \eta_B \delta_{BA} \Delta t_A. \quad \text{(B8)}$$

The change in the merging intermediary's output price increases its gross surplus from contracting with the supplier. This change puts upward pressure on the merging intermediary's negotiated input price. The internalized diversion to the other merging intermediary decreases the merging intermediary's gross surplus from contracting with the supplier. This change puts downward pressure on the merging intermediary's negotiated input price. The decrease in the merging intermediary's gross surplus will be larger if diversion to the other merging intermediary is high, the other merging intermediary's pre-merger margin is high, and the change in the other merging intermediary's margin is high.

Assuming that all intermediaries are symmetric, we can write the system of equations as:

$$\Delta p_A = \alpha[\delta(m_I + \Delta p_B - \Delta t - \Delta c_B) + \Delta t + \Delta c_A] \quad \text{(B9)}$$

$$\Delta p_B = \alpha[\delta(m_I + \Delta p_A - \Delta t - \Delta c_A) + \Delta t + \Delta c_B] \quad \text{(B10)}$$

$$\Delta t_A = (1-\beta)[\Delta p_A - \Delta c - (1-\eta)\Delta p_A - \eta\delta(m_I + \Delta p_B - \Delta c)] + \beta \Delta w_S + \eta\delta \Delta t_B \quad \text{(B11)}$$

$$\Delta t_B = (1-\beta)[\Delta p_B - \Delta c - (1-\eta)\Delta p_B - \eta\delta(m_I + \Delta p_A - \Delta c)] + \beta\Delta w_S + \eta\delta\Delta t_A. \tag{B12}$$

The assumption that all intermediaries are symmetric implies that any changes in A's and B's input prices and output prices from the merger will also be equal (i.e., $\Delta p_A = \Delta p_B$ and $\Delta t_A = \Delta t_B$). The system above can be further simplified to two equations and two unknowns where the change in output price is denoted by Δp and the change in the input price is denoted by Δt:

$$\Delta p = \alpha[\delta(m_I + \Delta p - \Delta t - \Delta c) + \Delta t + \Delta c] \tag{B13}$$

$$\Delta t = (1-\beta)[\Delta p - \Delta c - (1-\eta)\Delta p - \eta\delta(m_I + \Delta p - \Delta c)] + \beta\Delta w_S + \eta\delta\Delta t \tag{B14}$$

After rearranging terms, we can express this system as:

$$\Delta p = \gamma[(1-\eta\delta)\Delta^1 p + \alpha(1-\delta)\Delta^1 t] \tag{B15}$$

$$\Delta t = \gamma[(1-\beta)(1-\delta)\eta\Delta^1 p + (1-\alpha\delta)\Delta^1 t], \tag{B16}$$

where $\gamma = \frac{1}{(1-\delta\eta)(1-\alpha\delta)-\alpha(1-\beta)(1-\delta)^2\eta}$ is positive.[78] The terms $\Delta^1 p$ and $\Delta^1 t$ are first-round effects.[79] If there are no reductions in the intermediary's or supplier's marginal cost, these expressions simplify to:

$$\Delta p = \gamma\alpha\delta\left(1-\eta\left(1-\beta(1-\delta)\right)\right)m_I \tag{B17}$$

$$\Delta t = -\gamma(1-\alpha)(1-\beta)\eta\delta m_I. \tag{B18}$$

Post-merger, absent any reduction in the intermediaries' operational costs or a reduction in the supplier's marginal cost, the output price increases and the input price decreases.[80] This result is different from the result in the all-or-nothing bargaining framework, in which the output price and input price can

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[78] To see that γ is positive, we can write the denominator as $\alpha(1-\delta)^2\eta\left(\left(\frac{\frac{1}{\eta}-\delta}{1-\delta}\right)\left(\frac{\frac{1}{\alpha}-\delta}{1-\delta}\right)-(1-\beta)\right)$. Because $\left(\frac{\frac{1}{\eta}-\delta}{1-\delta}\right)$ and $\left(\frac{\frac{1}{\alpha}-\delta}{1-\delta}\right)$ are greater than 1 and $(1-\beta)$ is between 0 and 1, this implies $\left(\left(\frac{\frac{1}{\eta}-\delta}{1-\delta}\right)\left(\frac{\frac{1}{\alpha}-\delta}{1-\delta}\right)-(1-\beta)\right)$ is positive.

[79] $\Delta^1 p = \alpha[\delta(m_I - \Delta c) + \Delta c]$ and $\Delta^1 t = (1-\beta)[-\Delta c - \eta\delta(m_I - \Delta c)] + \beta\Delta w_S$.

[80] Note that γ is positive. If α, β, δ, and η are between zero and one, as assumed, then the output price is positive because $\left(1-\eta\left(1-\beta(1-\delta)\right)\right)$ is positive.

increase or decrease under certain market structures. In separate bargaining, the first-round effect on the output price is the same as in the all-or-nothing framework, but the first-round effect on the input price is smaller. The intermediary cannot negotiate as low an input price in separate bargaining if it cannot prohibit the supplier from reaching an agreement with the other merging intermediary. Because the downward pressure on the output price is not as strong, the upward pricing pressure dominates, and the merger results in an increase in the output price.

The input price decreases because the output price does not put as much upward pressure on the input price in separate bargaining as in all-or-nothing bargaining. An increase in the output price has the additional effect of decreasing the intermediary's gross surplus, because the intermediary earns more profits from higher margins on sales diverted to the other merging intermediary. The net result is a decrease in the input price.

C. ALTERNATIVE PASS-THROUGH RATES

The main text of this article presents estimates of the predicted effects of the Anthem-Cigna merger, assuming that 50% of the changes in insurers' costs are passed on to consumers. This part of the Appendix shows the predicted effects of the Anthem-Cigna merger under alternative assumptions about the pass-through rate. Table A1 shows predicted effects of the Anthem-Cigna merger if the pass-through rate is 25%, and Table A2 shows the predicted effects if the pass-through rate is 75%. As in the main text of the article, under these alternative assumptions, the Anthem-Cigna merger likely would have increased premiums in all of the markets contested by the government.

TABLE A1
PREDICTED EFFECTS OF ANTHEM-CIGNA MERGER:
PASS-THROUGH RATE = 25%

			Parameters	Provider Market Structure			
				Highly Competitive	Moderately Competitive	Less Competitive	Monopoly
Insurer Market Structure	Moderately Competitive	Anthem and Cigna Are Close Substitutes	Insurer Departure Rate	20%	70%	80%	90%
			Diversion	60%	60%	60%	60%
			Diverted Diversion	20%	20%	20%	20%
			Insurer Margin	$25.00	$20.00	$15.00	$10.00
			Provider Margin	$900.00	$1,000.00	$1,100.00	$1,200.00
			Predicted Changes				
			Provider Price	**($2.43)**	**($10.07)**	**($11.95)**	**($13.93)**
			Premium	**$4.03**	**$2.25**	**$1.15**	**$0.03**
		Anthem and Cigna Are Not Close Substitutes	Insurer Departure Rate	20%	70%	80%	90%
			Diversion	20%	20%	20%	20%
			Diverted Diversion	60%	60%	60%	60%
			Insurer Margin	$25.00	$20.00	$15.00	$10.00
			Provider Margin	$900.00	$1,000.00	$1,100.00	$1,200.00
			Predicted Changes				
			Provider Price	**($0.02)**	**($1.26)**	**($1.62)**	**($2.02)**
			Premium	**$1.14**	**$0.62**	**$0.28**	**($0.07)**
	Less Competitive	Anthem and Cigna Are Close Substitutes	Insurer Departure Rate	10%	30%	50%	90%
			Diversion	60%	60%	60%	60%
			Diverted Diversion	20%	20%	20%	20%
			Insurer Margin	$30.00	$25.00	$20.00	$15.00
			Provider Margin	$800.00	$900.00	$1,000.00	$1,100.00
			Predicted Changes				
			Provider Price	**($0.97)**	**($3.87)**	**($6.99)**	**($13.58)**
			Premium	**$5.09**	**$3.86**	**$2.61**	**$0.96**
		Anthem and Cigna Are Not Close Substitutes	Insurer Departure Rate	10%	30%	50%	90%
			Diversion	20%	20%	20%	20%
			Diverted Diversion	60%	60%	60%	60%
			Insurer Margin	$30.00	$25.00	$20.00	$15.00
			Provider Margin	$800.00	$900.00	$1,000.00	$1,100.00
			Predicted Changes				
			Provider Price	**$0.20**	**($0.24)**	**($0.76)**	**($1.90)**
			Premium	**$1.45**	**$1.10**	**$0.72**	**$0.22**

Note: For all market scenarios, we assume that the pass-through rate is 25%, the provider and insurer have equal bargaining power, and the merger results in a $0.80 per-enrollee-per-month decrease in the insurers' marginal costs and no change in the provider's marginal cost. The insurer margin is shown as a per-enrollee-per-month value, and the provider margin is shown as a per-inpatient-day value.

TABLE A2
PREDICTED EFFECTS OF ANTHEM-CIGNA MERGER:
PASS-THROUGH RATE = 75%

			Parameters	Provider Market Structure			
				Highly Competitive	Moderately Competitive	Less Competitive	Monopoly
Insurer Market Structure	Moderately Competitive	Anthem and Cigna Are Close Substitutes	Insurer Departure Rate	20%	70%	80%	90%
			Diversion	60%	60%	60%	60%
			Diverted Diversion	20%	20%	20%	20%
			Insurer Margin	$25.00	$20.00	$15.00	$10.00
			Provider Margin	$900.00	$1,000.00	$1,100.00	$1,200.00
			Predicted Changes				
			Provider Price	**($0.88)**	**($6.53)**	**($9.81)**	**($13.86)**
			Premium	**$19.54**	**$12.37**	**$6.48**	**$0.19**
		Anthem and Cigna Are Not Close Substitutes	Insurer Departure Rate	20%	70%	80%	90%
			Diversion	20%	20%	20%	20%
			Diverted Diversion	60%	60%	60%	60%
			Insurer Margin	$25.00	$20.00	$15.00	$10.00
			Provider Margin	$900.00	$1,000.00	$1,100.00	$1,200.00
			Predicted Changes				
			Provider Price	**$0.27**	**($0.58)**	**($1.26)**	**($2.13)**
			Premium	**$4.03**	**$2.55**	**$1.20**	**($0.30)**
	Less Competitive	Anthem and Cigna Are Close Substitutes	Insurer Departure Rate	10%	30%	50%	90%
			Diversion	60%	60%	60%	60%
			Diverted Diversion	20%	20%	20%	20%
			Insurer Margin	$30.00	$25.00	$20.00	$15.00
			Provider Margin	$800.00	$900.00	$1,000.00	$1,100.00
			Predicted Changes				
			Provider Price	**($0.02)**	**($1.57)**	**($4.24)**	**($11.50)**
			Premium	**$24.10**	**$19.16**	**$13.62**	**$5.56**
		Anthem and Cigna Are Not Close Substitutes	Insurer Departure Rate	10%	30%	50%	90%
			Diversion	20%	20%	20%	20%
			Diverted Diversion	60%	60%	60%	60%
			Insurer Margin	$30.00	$25.00	$20.00	$15.00
			Provider Margin	$800.00	$900.00	$1,000.00	$1,100.00
			Predicted Changes				
			Provider Price	**$0.38**	**$0.19**	**($0.24)**	**($1.56)**
			Premium	**$5.00**	**$3.98**	**$2.79**	**$0.98**

Note: For all market scenarios, we assume that the pass-through rate is 75%, the provider and insurer have equal bargaining power, and the merger results in a $0.80 per-enrollee-per-month decrease in the insurers' marginal costs and no change in the provider's marginal cost. The insurer margin is shown as a per-enrollee-per-month value, and the provider margin is shown as a per-inpatient-day value.

D. SOURCES FOR MARGIN VALUES IN MERGER SIMULATION

This Appendix provides more information on the sources and calculations of the margin-input values in the Anthem-Cigna merger-simulation model.

The insurer margin is based on Anthem's adjusted earned premium per enrollee per month in 2015, multiplied by its margin in the small-group segment: $363 x 0.055 = $19.97. In our model, the insurer margin ranges from $10 to $30 per enrollee per month, depending on the nature of competition in the insurer market and provider market.[81]

The provider margin is based on public estimates of average hospital expenses, frequency of patient visits, and payment-cost ratios. Hospital margins may vary by type of hospital (government, nonprofit, or for-profit), type of patient insurance (government or private), and geographic location. Calculating the hospital margin per patient and translating this value to an effective margin per insurer member per month requires several steps. We start with an estimate of the average hospital expense per inpatient day ($2,000). We then use an estimate of a hospital's profit percent margin (33%) to calculate the hospital's dollar margin per inpatient day ($1,000). In our model, the provider margin ranges from $800 to $1,200 per inpatient day, depending on the nature of competition in the insurer market and provider market. To express the provider margin in the same units used for the insurer margin, we multiply the provider margin by an estimate of the expected number of inpatient days per enrollee per month (0.047).[82]

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[81] In the *Anthem-Cigna* litigation, the DOJ identified large-group employers and national accounts as relevant product markets. Our simulation uses small-group margin estimates as a proxy because insurers are not required to disclose information about margins for large-group employers and national accounts. *See* Mark Farrah Associates, *Key Trends Within the Individual and Small Group Health Insurance Segments*, HEALTHCARE BUS. STRATEGY (May 26, 2016), www.markfarrah.com/uploaded/mfa-briefs/key-trends-within-the-individual-and-small-group-health-insurance-segments.pdf.; Mark Farrah Associates, *2015 Small Group Health Insurance Market*, HEALTHCARE BUS. STRATEGY (June 30, 2016), www.markfarrah.com/uploaded/mfa-briefs/2015-small-group-health-insurance-market.pdf.

[82] The estimates are based on national averages from different sources. For the average hospital expense per inpatient day, see Ayla Ellison, *200 Hospital Benchmarks*, BECKER'S HOSP. REV. (Sept. 29, 2015), www.beckershospitalreview.com/lists/200-hospital-benchmarks-2015.html. We use $2,000 based on Ellison's estimates for different types of hospitals. For the payment-to-cost ratio, see Am. Hosp. Ass'n, *Trendwatch Chartbook 2016: Trends in Hospital Financing* ch. 4, www.aha.org/system/files/research/reports/tw/chartbook/2016/chapter4.pdf. We use a 33% margin based on a price-to-cost ratio of 1.5. For the number of inpatient days per person per month, see Henry J. Kaiser Family Foundation, *Hospital Inpatient Days per 1,000 Population by Ownership Type*, www.kff.org/other/state-indicator/inpatient-days-by-ownership. This estimate is based on the United States average of the combined number of inpatient days per 1000 people for all hospital types in 2015: (566/1000) / 12 = 0.047.