Unveiling Bargaining Impacts of Mergers and Divestitures*

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Job Market Paper

January 25, 2025

Abstract

Merger and divestiture policies influence bargaining power in vertical relationships, a commonly underestimated factor. I develop a Nash-bargaining model with endogenous bargaining weights. Next, I present a novel empirical framework to identify bounds on the upstream bargaining weights between manufacturers and retailers at the brand level and solve bias due to endogenous selection of divestiture packages. I analyze a landmark U.S. merger, approved conditional on divestiture, and its effect on bargaining power, final prices, and consumer surplus. Compared to a no-merger scenario, I estimate an increase in bargaining weights associated with divested brands and a decrease related to the brands of the merged entity. This shift contributes to an overall increase in the consumer surplus. In addition, I show that it is profitable for the merged firms to select a divestiture package so that the prices of the divested brands increase.

Keywords: Merger, Divestiture, Market Power, Bargaining Power, Vertical Contracts

*I thank Emilio Calvano, Giacomo Calzolari and Russell Cooper for their support throughout this project. I thank Sam Altmann, Gianluca Antonecchia, Nano Barahona, Matthew Backus, Ozlem Bedre-Defolie, Claire Chambolle, Christopher Conlon, Tomaso Duso, Alon Eizenberg, Matteo Escude, Andrea Ichino, Vardges Levonyan, Leslie Marx, Andrea Matozzi, Hugo Molina, Alex Monge-Naranjo, Umberto Muratori, Jo Seldeslachts, Ce Matthew Shi, Steve Tadelis, Emanuele Tarantino, participants at UC Berkeley IO workshop 2023, DIW Berlin 2023, JEI Bilbao 2023, LUISS 2024, MACCI 2024, IIOC Boston 2024, EAYE Paris 2024, CRESSE 2024, Zurich Market Power workshop 2024 and various EUI venues for helpful comments and suggestions. All estimates and analyses in this paper based on Information Resources Inc. data are by the author and not by Information Resources Inc. Any errors or omissions are my own.

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1 Motivation

Over the past decade, a large body of the economic literature, ranging from industrial organization to macroeconomics, has argued that antitrust enforcement has been too lax (Kwoka (2014), Philippon (2019), Nocke and Whinston (2022)). In this context, some scholars such as Morton (2019) claimed that "*antitrust enforcers should be more aggressive in challenging mergers*". It is often suggested that the most effective approaches to challenging anticompetitive mergers are either to block them outright or to approve them subject to divestiture (Kwoka Jr and Waller (2021)).

In this article, I show that antitrust authorities may induce anticompetitive effects through upstream divestitures, while upstream mergers result in procompetitive effects that have not been previously examined. To do so I develop and estimate a Nash-bargaining model, featuring endogenous bargaining weights, in a vertical market structure.

In vertical markets, an upstream divestiture directly affects wholesale prices. The effect of an upstream divestiture on final prices is indirect and depends on the distribution of bargaining power. Existing research on upstream merger and divestiture in vertical markets has focused on modeling firm-specific upstream bargaining power that is unaffected by changes in ownership to explain the price effects of merger and divestiture. These modelling assumptions cannot address two key issues relevant for divestiture policy. First, a retailer might be limited in its ability to exert bargaining power if the negotiated brand is highly requested by final customers.[1] Second, after a divestiture new agents are introduced to the negotiation of the divested brands. The merged entities have a new organizational structure and some agents previously involved in negotiations may leave or occupy new positions. Thus agents are likely to have different ex-post bargaining abilities, as consequence the effects of the divestiture and merger may be positive or negative. Despite the importance of these features of bargaining power, the literature on divestiture in vertical market has failed to develop approaches allowing to study them empirically.[2]

This article develops a novel empirical framework to study whether divestiture affects bargaining power and how. There are two key elements in my analysis. The first is to construct an empirical framework suitable to study how divestiture affects bargaining power. To do this, I in-

[1]This type of argument is often encountered in merger cases. A first example is present in the merger case Sara Lee/Unilever. In the merger report it is stated that "If, [...], retailers are not in a position to switch to sufficient alternatives or delist because some of the supplier's products are 'must-have', that is, the retailers must keep on the shelves in order not to lose substantial sales, it is unlikely that countervailing buyer power will counteract anticompetitive effects of the merger." Url (Accessed 25 July, 2023): `https://ec.europa.eu/competition/mergers/cases/decisions/m5658_20101117_20600_2193231_EN.pdf?cv=1`. Another example can be found in the merger case DEMB/Mondelez (2015). See page 75, section 9.5.1.4.

[2]For example, Bhattacharya et al. (2024) study the price effects of a large sample of U.S. mergers and they state that "An interesting question is whether these mergers affect the split of surplus between manufacturers and retailers. We cannot answer it, as we do not observe the contracts between these parties. As part of our selection process, we have encountered many deals without product market overlap. This question may be connected to the prevalence of such deals, as they may alter the bargaining positions of manufacturers."

troduce a tractable methodology to quantify bargaining power at the brand-level allowing also to cope with potential bias due to endogenous selection of divestiture packages by the merger. The approach uses cost restrictions implied by a Nash-bargaining model to compute bounds on product-level bargaining weights in all periods. Next, I derive a structural error term from the model that allows to create moment conditions to identify changes in bargaining weights. The second element of my analysis examine the impact of changes in bargaining weights under varying scenarios through the study of a landmark merger in the U.S. deodorant market. I estimate and use the model to simulate the upstream bargaining weights in the absence of a merger. Next, by comparing the estimated upstream bargaining weights based on the observed merger and divestiture to this counterfactual benchmark, I am able to quantify the extent to which merger and divestiture affect bargaining power and derive policy implications for merger policy.

Specifically, I exploit the variation in brand ownership caused by the landmark merger between Procter & Gamble and Gillette (2005), cleared conditional on a divestiture in the U.S. deodorant market, to quantify the extent to which divestitures affect bargaining power. This merger and industry are particularly relevant to study bargaining. First, executives from Procter & Gamble and Gillette argued that the merger would give them a bargaining advantage against mass-market retailers.[3] Second, bargaining is viewed as a key feature of the deodorant industry.[4,5] Last, the merger has a unique feature allowing to make progress on the identification of changes in bargaining weights caused by merger and divestiture. The merger is global because Procter & Gamble and Gillette operate in both Europe and the United States. However, negotiations between manufacturers and retailers take place at the national level. Exploiting this feature, I create instruments that isolate the variation in EU merger control regulation which I argue affect the decision to merge and divest globally, but which are orthogonal to unobserved bargaining shocks at the U.S level.

[3]See. https://www.wsj.com/articles/SB110693197048439468

[4]In another recent approved merger between Sara Lee and Unilever in the deodorant market, the parties criticized the standard merger simulation model used by the antitrust authorities arguing that to correctly predict price effects of the merger a Nash-bargaining model should be used. See. page 40 in the merger case Sara Lee/Unilever (2010) in which the parties argue that a standard merger simulation model's "limitation in describing the vertical relationship between retailers and producers reduces its capability of predicting the price effects of the merger". See. also page 377: "To support their claim that the Commissions analysis is likely to overstate the likely price increase from the merger, the Parties draw attention to the theoretical model by Horn and Wolinsky (1988)."

[5]The interactions between Procter & Gamble and retailers are also used as textbook example of market interactions better described by bargaining rather than price-setting. For instance in Lee et al. (2021), page 2, it is stated: "As a motivating example, consider the market for consumer packaged goods. A small number of retailers that include Walmart, Target, and Amazon have large market shares and exhibit some degree of market power over consumers. Some manufacturers of these goods, which include large conglomerates such as Proctor & Gamble (P&G) and Unilever, possess established brand names and hence also possess a degree of market power. The interactions between these retailers and the manufacturers are not properly described by price-setting or price-taking behavior."

Results I obtain four main findings. First, the results show large heterogeneity across brands within the distribution of bargaining weights and within manufacturers' portfolio. This suggest that the relevant level of analysis of bargaining power is at the brand-level rather than firm-level. Second, I provide event study evidences on the price effects of the divestiture in my sample. I find that relative to prices of rivals not directly involved in the merger or divestiture, the prices of some divested products increased up to 7% whereas the prices of others decreased up to 8%. I show that economic mechanisms in standard Nash-Bertrand models or Nash-bargaining models with fixed bargaining weights cannot rationalise the observed pattern of prices. Third, I find that after a divestiture, on average the upstream bargaining weights associated with the divested products increased. The upstream bargaining weights associated with the merger decreased. The changes in bargaining weights that I identify explain why observed post-divestiture prices follow this pattern. These results show that a divestiture does not necessarily lead to less bargaining power and a merger to more bargaining power.[6] Furthermore, I show that the increase in bargaining power found for the divested brands increases the profits of the merged firms. Thus, to the extent that divestiture packages are chosen by the merged firms, divestitures are likely to have anticompetitive effects. Fourth, using the estimated model and counterfactual simulations I find that a smaller divestiture package would have been consumer welfare-enhancing. I also provide a new measure linking the merger induced changes in costs identified in previous literature (e.g. Nocke and Whinston (2022)) to the changes in bargaining weights presented in this article: the changes in downstream bargaining power such as prices are unaffected by a merger.

Literature The empirical framework I present is relevant to many fields estimating Nash bargaining models to study a range of topics (Lee et al. (2021)). The model I take to the data share similarities with Gowrisankaran et al. (2015), Crawford et al. (2018) and Grennan (2013). My approach has three key differences. First, I explicitly model the bargaining weights thereby allowing to simulate counterfactual distribution of product-level bargaining weights. Previous works on mergers tend to estimate a limited number of bargaining weights that are unaffected by changes in ownership (merger and/or divestiture) and assume that weights are manufacturer-specific or retailer-specific rather than product-specific.[7] For instance, Gowrisankaran et al.

[6] In the model in section 2, the bargaining weights are called bargaining power and are assumed to capture heterogeneous bargaining abilities. Bargaining outcomes are also influenced by the size of the disagreement payoff but this channel is termed 'bargaining leverage'. Larger manufacturers have more 'bargaining leverage' but not necessarily more bargaining power. Therefore, the net impact on bargaining is ambiguous.

[7] The fact that mergers might affect the bargaining weights find support in previous theoretical or empirical works. In a recent theory contribution Loertscher and Marx (2022) do study how changes in bargaining weights might affect social surplus in a model of incomplete information. Empirically, based on a structural model with perfect information, Sheu and Taragin (2021) show that different calibrated values of the bargaining weights can have large effects on consumer, retailer and manufacturer surplus (See. for instance, their Figure 6). In contrast

(2015) studies the effects of hospital mergers on final prices using a Nash-bargaining model of negotiation between hospitals and managed care organizations (MCO). Their main specification estimates three bargaining weights that are assumed to be MCO-specific.[8] By contrast, the approach I use in this article is well-suited to study how bargaining weights change in response to divestiture. Second, I allow changes in ownership to affect bargaining outcomes through another channel than the disagreement payoffs. As explained in Goetz (2019), "incorporating size effects into workhorse multilateral bargaining frameworks is still a necessary further step" for future research on mergers in vertical markets. Indeed, previous models mechanically impose that merged firms obtain better bargaining outcomes through the size of the disagreement payoffs. In my model merged firms obtain larger disagreement payoffs which lead to better outcomes but bargaining power interpreted as bargaining ability can increase or decrease. Third, previous approaches require to estimate simultaneously the bargaining weights and a cost function depending on observed cost shifters (Grennan (2013), Barrette et al. (2022)).[9] Differently, my approach does not require observing costs or cost shifters. Thus it is easier for competition authorities to use the approach developed in this article in actual merger cases.[10] Finally, my work is also related to the industrial organization literature studying the effect of merger remedies on prices and welfare (Asker and Nocke (2021)). Friberg and Romahn (2015) study an upstream divestiture in the Swedish beer market. They found that after the divestiture the prices of the divested brands fall. They show that these results can be rationalised by a Nash-Bertrand model of price competition. Delaprez and Guignard (2024) investigate an upstream merger with divestiture in the French coffee market. The authors find that the price of the divested brand decreases. Differently, I find evidences that after the divestiture, the prices of some products increase whereas others decrease. I extend the empirical framework in Gowrisankaran et al. (2015) to provide one way to unify what may seem like contradictory findings and derive policy recommendations on the choice of the divested brands. I provide evidences that after

with Sheu and Taragin (2021), in this article I estimate (rather than calibrate) bargaining weights that are explicitly affected by mergers and divestitures which allow to simulate counterfactual distribution of weights.

[8] See Table 5. Specification 2 in Gowrisankaran et al. (2015). Delaprez and Guignard (2024) estimate a model similar as Gowrisankaran et al. (2015), they assume that the bargaining weights are manufacturer-specific, fixed over time and they estimate 6 bargaining weights.

[9] Grennan (2013) estimates a Nash-bargaining model with negotiations between a single manufacturer and multiple hospitals to study price discrimination. A distribution of bargaining weight is recovered by assuming that the bargaining weights are affected by random shocks. By contrast, I assume multiple upstream manufacturers. Another comparative advantage of my approach is to disentangle changes in bargaining weights caused by the policy under study from unobserved bargaining shocks. In the context of mergers and divestitures, I find that ignoring the correlation between changes in ownership caused by merger and unobserved bargaining shock leads to estimates biased upward.

[10] Note that in Sheu and Taragin (2021) the bargaining weights are set to arbitrary values. Then they can recover costs as percentage of margins. Marginal costs are also assumed to be constant pre- and post-merger. See. page 607, section 5, first bullet point. Also the bargaining weights are the same for a given manufacturer-retailer pair. By contrast, in my approach, costs vary over time. Moreover, cost restrictions are derived directly from the model.

a divestiture the upstream bargaining weights, modeled as bargaining ability, are affected. On average, the upstream bargaining weights of the divested products increased. Crucially, I show that it leads to higher profits for the merged firms. Since divestiture packages are selected endogenously, an upstream divestiture is likely to have anticompetitive effects. The upstream bargaining weights of the merger decreased. Contrary to common wisdom, larger manufacturers do not have necessarily more bargaining power. Last, I use counterfactual simulation to show that a divestiture to the same buyer, but including less divested brands, would have delivered more welfare to consumers. This results complement Friberg and Romahn (2015) who suggest that divestiture packages with a large number of divested brands are likely to dampen adverse post-merger outcomes. In this article, I show that in vertical markets, this policy recommendation may not hold.

The article is structured as follows. Section 2 presents the model and methodology to identify changes in bargaining weights. Section 3 provides details on the antitrust case, the data and descriptive statistics. In Section 4, I show descriptive evidences on the price effects of the merger and divestiture in the deodorant market. Section 5 discusses demand and supply results. Robustness checks on the methodology are also shown. Section 6 shows how the divestiture affected bargaining power, derives implications for merger policy and a new measure linking the merger induced changes in costs identified in previous literature to the changes in bargaining weights presented in this article. Section 7 contains the conclusion.

2 Methodology: Computing Bounds on Product-level Bargaining Weights

I extend the Nash-bargaining model in Gowrisankaran et al. (2015) by adding endogenous bargaining weights. Next, I develop an approach to identify the model. Readers familiar with the workhorse Nash-bargaining model with simultaneous timing may proceed directly to Equation (13).

2.1 Nash-Bargaining Model

Denote Θ^M_{mt} the set of products owned by the manufacturer M at time t in geographic market m and Θ^R_{mt} the set of products sold by the retailer R at time t in geographic market m.[11]

[11] These sets are assumed to be given. After a merger and divestiture the set of products owned by the merged firms and the buyer of the divested brands are larger.

The profit of retailer R in geographic market m at time t is given by:

$$\Pi^R_{mt}(p_{mt}) = \sum_{j\in\Theta^R_{mt}} (p_{jmt} - w_{jmt} - mc^R_{jmt})\mathcal{M}_{mt}s_{jmt}(p_{mt}), \tag{1}$$

with $s_{jmt}(p_{mt})$ the market share of product j, $\mathcal{M}_{mt}$ is the total market size, p_{jmt} the retail price, w_{jmt} the wholesale price, mc^R_{jmt} the retail marginal cost of distributing the product j at time t in geographic market m.

The profit of manufacturer M in geographic market m at time t is given by:

$$\Pi^M_{mt}(p_{mt}) = \sum_{j\in\Theta^M_{mt}} (w_{jmt} - mc^M_{jmt})\mathcal{M}_{mt}s_{jmt}(p_{mt}), \tag{2}$$

with mc^M_{jmt} the manufacturer marginal cost of producing the product j in geographic market m at time t.

Next, I assume that in the downstream market retailers compete in prices in each geographic market m and period t. In the upstream market, retailers bargain bilaterally and secretly with manufacturers over each wholesale price w_{jmt} in each geographic market m and period t according to an asymmetric Nash-in-Nash bargaining model à la Horn and Wolinsky (1988).[12] In line with previous studies such as Draganska et al. (2010), Gowrisankaran et al. (2015) or Crawford et al. (2018)), I assume that competition (in retail prices) in the downstream market and bargaining over the wholesale prices in the upstream market take place simultaneously.[13]

Downstream Market

In the downstream market, retail prices are determined by competition in prices à la Bertrand. The maximization problem of retailer r in geographic market m at time t is given by:

$$\max_{\{p_{jmt}\in\Theta^R_{mt}\}} \Pi^R_{mt}(p_{mt}) = \sum_{j\in\Theta^R_{mt}} (p_{jmt} - w_{jmt} - mc^R_{jmt})\mathcal{M}_{mt}s_{jmt}(p_{mt}), \tag{3}$$

The first-order condition is given by:

$$s_{jmt}(p_{mt}) + \sum_{k\in\Theta^R_{mt}} (p_{kmt} - w_{kmt} - mc^R_{kmt})\frac{\partial s_{kmt}(p_{mt})}{\partial p_{jmt}} = 0, \forall j \in \Theta^R_{mt}. \tag{4}$$

[12] Therefore, negotiation occurs product by product.

[13] This assumption is widely used in the literature. For instance, a simultaneous timing is assumed in Crawford et al. (2018). It implies that $\frac{\partial \pi^R_{jmt}}{\partial w_{jmt}} = -s_{jmt}$ and $\frac{\partial \pi^M_{jmt}}{\partial w_{jmt}} = s_{jmt}$. I use it to obtain product-level bargaining weights in equation (14). An alternative assumption is a sequential timing in which retailers set retail prices after observing wholesale prices. See. Crawford and Yurukoglu (2012) for Nash-bargaining models in which a sequential timing is assumed.

Re-writing equation (4) in vector notation one can obtain:

$$s_{mt}(p_{mt}) + (I_{mt}^R \odot \Omega_{mt}(p_{mt}))(p_{mt} - w_{mt} - mc_{mt}^R) = 0,$$

where $\Omega_{mt}(p_{mt})$ is a $J \times J$ block-diagonal matrix. The (j,k)-element of $\Omega_{mt}(p_{mt})$ is defined as $\frac{\partial s_{kmt}(p_{mt})}{\partial p_{jmt}}$. The block-diagonal matrix I_{mt}^R is of dimension $J \times J$. The (j,k)-element of I_{mt}^R is defined as:

$$I_{jkmt}^R = \begin{cases} 1 & \text{if } j \text{ and } k \text{ are sold by the same retailer} \\ 0 & \text{otherwise.} \end{cases} \tag{5}$$

We can invert the following expression to obtain the retail margins:

$$\gamma_{mt} \equiv -(I_{mt}^R \odot \Omega_{mt}(p_{mt}))^{-1} s_{mt}(p_{mt}). \tag{6}$$

UPSTREAM MARKET

The equilibrium wholesale price of the bilateral negotiation is the argument that maximizes the following equation:

$$\max_{w_{jmt}} [\pi_{jmt}^R(w_{jmt}, p_{mt}) - d_{jmt}^R(\backslash j)]^{\lambda_{jmt}} \times [\pi_{jmt}^M(w_{jmt}, p_{mt}) - d_{jmt}^M(\backslash j)]^{(1-\lambda_{jmt})}, \tag{7}$$

where λ_{jmt} (resp. $1 - \lambda_{jmt}$) is a bargaining weight for the retailer (resp. for the manufacturer) measuring the relative bargaining power of the retailer (resp. the manufacturer). π_{jmt}^R and π_{jmt}^M denote the profit of retailer R and manufacturer M obtained from product j. d_{jmt}^R and d_{jmt}^M are the disagreement payoffs realized if the manufacturer-retailer pair fails to reach an agreement on product j. It corresponds to the incremental profits made on all other products. As in Draganska et al. (2010) or Crawford et al. (2018), I assume that it is given by the following equations:

$$d_{jmt}^R(\backslash j) = \sum_{k \in \Theta_{mt}^R \backslash j} (p_{kmt} - w_{kmt} - mc_{kmt}^R) M_t \Delta s_{kmt}(\backslash j) \tag{8}$$

$$d_{jmt}^M(\backslash j) = \sum_{k \in \Theta_{mt}^M \backslash j} (w_{kmt} - mc_{kmt}^M) M_t \Delta s_{kmt}(\backslash j), \tag{9}$$

where $\Delta s_{kmt}(\backslash j)$ is the difference in market shares of product *k* that occurs when the product j is no longer sold by retailer r.

Larger disagreement payoffs lead to lower gains from trade and thus more 'bargaining leverage'. In this model, a merger (resp. divestiture) increase (resp. decrease) thus bargaining leverage. In the remaining part of the article, I refer to λ_{jmt} as downstream bargaining power and $1 - \lambda_{jmt}$ as upstream bargaining power which is different from the bargaining leverage mechanism through the disagreement payoffs.

The first-order conditions of the optimisation problem in Equation (7) can be written in vector notations as follows:

$$(I^M_{mt} \odot \mathcal{S}_{mt})\Gamma_{mt} = (\frac{1-\lambda_{mt}}{\lambda_{mt}})(I^R_{mt} \odot \mathcal{S}_{mt})\gamma_{mt}. \tag{10}$$

The matrix $\mathcal{S}_{mt}$ is the disagreement share matrix of size $(J \times J)$ defined as follows:

$$\mathcal{S}_{mt} = \begin{pmatrix} s_{1mt} & -\Delta s_{2mt}(\backslash 1) & \dots & -\Delta s_{Jmt}(\backslash 1) \\ -\Delta s_{1mt}(\backslash 2) & s_{2mt} & \dots & -\Delta s_{Jmt}(\backslash 2) \\ \vdots & \vdots & \ddots & \vdots \\ -\Delta s_{1mt}(\backslash J) & -\Delta s_{2mt}(\backslash J) & \dots & s_{Jmt} \end{pmatrix}.$$

The block-diagonal matrix I^M_{mt} is of dimension $J \times J$. The (j,k)-element of I^M_{mt} is defined as:

$$I^M_{jkmt} = \begin{cases} 1 & \text{if } j \text{ and } k \text{ are sold by the same manufacturer} \\ 0 & \text{otherwise.} \end{cases} \tag{11}$$

We can invert (10) to obtain the manufacturer margins:

$$\Gamma_{mt} \equiv (\frac{1-\lambda_{mt}}{\lambda_{mt}})(I^M_{mt} \odot \mathcal{S}_{mt})^{-1}(I^R_{mt} \odot \mathcal{S}_{mt})\gamma_{mt}(p_{mt}) = (\frac{1-\lambda_{mt}}{\lambda_{mt}})A_{mt}(p_{mt}) = w_{mt} - mc^M_{mt}, \tag{12}$$

where $A_{mt}(p_{mt})$ denotes the $(j \times 1)$ vector $(I^M_{mt} \odot \mathcal{S}_{mt})^{-1}(I^R_{mt} \odot \mathcal{S}_{mt})\gamma_{mt}(p_{mt})$.

Next, using vector notation, adding and subtracting the manufacturer marginal costs mc^M_{mt} in the retailer first order condition defined in equation (4), I obtain:

$$\begin{aligned} p_{mt} - \gamma_{mt}(p_{mt}) = w_{mt} + mc^R_{mt} &= (w_{mt} - mc^M_{mt}) + (mc^R_{mt} + mc^M_{mt}) \\ &= \Gamma_{mt}(\lambda_{mt}) + mc^R_{mt} + mc^M_{mt} \\ &= \frac{1-\lambda_{mt}}{\lambda_{mt}}A_{mt} + mc^R_{mt} + mc^M_{mt}. \end{aligned} \tag{13}$$

To compute product-level bargaining weights, I solve for λ_{mt} in (13). The downstream bargaining weight of a product j is given by:

$$\lambda_{jmt} = \frac{A_{jmt}(p_{mt})}{A_{jmt}(p_{mt}) + p_{jmt} - \gamma_{jmt}(p_{mt}) - mc^R_{jmt} - mc^M_{jmt}}. \tag{14}$$

The upstream bargaining weight of a product j is given by:

$$1 - \lambda_{jmt} = 1 - \frac{A_{jmt}(p_{mt})}{A_{jmt}(p_{mt}) + p_{jmt} - \gamma_{jmt}(p_{mt}) - mc^R_{jmt} - mc^M_{jmt}}. \tag{15}$$

Bargaining Power According to equation (15), upstream bargaining power is the variation in retail prices left unexplained by the model. Therefore, I will now explicitly model upstream bargaining power as bargaining ability. The purpose is twofold. First, it allows to simulate the distribution of bargaining weights under counterfactual scenarios. Second, the approach allows to assess whether the bargaining weights are mostly explained by the brands or by the buyer of the divested brands, which are two central questions in divestiture policy.

Formally, I assume that the bargaining power of a manufacturer M negotiating over the wholesale price of product j is given by:

$$BP_{jmt}^{M} = \nu_j + \nu_1 \mathbb{1}_{\text{Merger}_{jmt}^{M}} + \nu_2 \mathbb{1}_{\text{Divestiture}_{jmt}^{M}} + X_{jmt}\beta + \tau_{jmt}^{M}, \quad (16)$$

where $\mathbb{1}_{\text{Merger}_{jmt}^{M}}$ is an indicator variable equal to 1 if product j is owned by the merged firms and t is in the post-divestiture period and $\mathbb{1}_{\text{Divestiture}_{jmt}^{M}}$ is an indicator variable equal to 1 if j is owned by the buyer of the divested brand and t is in the post-divestiture period. These variables account for the fact that after a change in ownership (a merger or divestiture) new agents are introduced to the negotiations and agents already participating in negotiations ex-ante face new incentives. ν_j is a product specific term and τ_{jmt}^{M} is an i.i.d. type I extreme value distributed error capturing idiosyncratic bargaining ability of manufacturer M that is unobserved by the researcher. Last, X is a matrix containing control variables. This delivers the following bargaining power functions:

$$1 - \lambda_{jmt}(\mathbb{1}_{\text{Merger}_{jmt}^{M}}, \mathbb{1}_{\text{Divestiture}_{jmt}^{M}}) = \frac{exp(\nu_j + \nu_1 \mathbb{1}_{\text{Merger}_{jmt}^{M}} + \nu_2 \mathbb{1}_{\text{Divestiture}_{jmt}^{M}} + X_{jmt}\beta)}{1 + exp(\nu_j + \nu_1 \mathbb{1}_{\text{Merger}_{jmt}^{M}} + \nu_2 \mathbb{1}_{\text{Divestiture}_{jmt}^{M}} + X_{jmt}\beta)}$$

and

$$\lambda_{jmt}(\mathbb{1}_{\text{Merger}_{jmt}^{M}}, \mathbb{1}_{\text{Divestiture}_{jmt}^{M}}) = \frac{1}{1 + exp(\nu_j + \nu_1 \mathbb{1}_{\text{Merger}_{jmt}^{M}} + \nu_2 \mathbb{1}_{\text{Divestiture}_{jmt}^{M}} + X_{jmt}\beta)}.$$

Last, to close the model the upstream bargaining weights $1-\lambda_{jmt}$ defined by equation (15) must equate the upstream bargaining power function $1 - \lambda_{jmt}(\mathbb{1}_{\text{Merger}_{jmt}^{M}}, \mathbb{1}_{\text{Divestiture}_{jmt}^{M}})$ at each period t in each geographic market m:

$$1 - \frac{A_{jmt}(p_{mt})}{A_{jmt}(p_{mt}) + p_{jmt} - \gamma_{jmt}(p_{mt}) - mc_{jmt}^{R} - mc_{jmt}^{M}} = \frac{exp(\nu_j + \nu_1 \mathbb{1}_{\text{Merger}_{jmt}^{M}} + \nu_2 \mathbb{1}_{\text{Divestiture}_{jmt}^{M}} + X_{jmt}\beta)}{1 + exp(\nu_j + \nu_1 \mathbb{1}_{\text{Merger}_{jmt}^{M}} + \nu_2 \mathbb{1}_{\text{Divestiture}_{jmt}^{M}} + X_{jmt}\beta)}. \quad (17)$$

The effect of the merger (resp. divestiture) on upstream bargaining power is thus determined by the parameter ν_1 (resp. ν_2), which can be positive or negative. Notice also that high ν_j suggest that brand j is regarded as a 'must-have' to some extent, which restricts the retailer's ability to exert bargaining power in negotiations. I will now discuss how to identify these parameters.

2.2 Identification

I identify the parameters of the supply model taking as given the demand parameters following standard practice in the empirical industrial organization literature. I proceed in two steps. First, I use restrictions imposed by the model to identify bounds on costs thereby bargaining weights. Second, I construct a structural error term as functions of the parameters that can be estimated using generalized method of moments.

Step 1: Bounds on the bargaining weights To take the model to the data one needs to compute the bargaining weights defined by equations (14) or (15). Based on these equations one can compute the entire distribution of bargaining weights in each geographic market m and period t provided that $mc^R_{jmt} + mc^M_{jmt}$ is observed. However, in most applications, total costs are unobserved.[14] To overcome this challenge, I need to make an assumption and exploit cost restrictions implied by the model.[15]

Assumption 1. *Total costs are equal within the set* Ψ_{mt}*:*

$$mc^R_{j,mt} + mc^M_{j,mt} = mc^R_{mt} + mc^M_{mt} \quad \forall j \in \Psi_{mt}, \tag{18}$$

where Ψ_{mt} is the set of products assumed to have equal costs within a given market and time.

Proposition 1. *The costs are bounded*

$$0 \leq mc^R_{mt} + mc^M_{mt} < min\{p_{jmt} - \gamma_{jmt}, ..., p_{Jmt} - \gamma_{Jmt}\} \quad \forall j \in \Psi_{mt}$$

Proof. Using the retailers' first order condition and assumption 1, we have:

$$mc^R_{mt} + mc^M_{mt} = p_{j,mt} - \gamma_{j,mt}(p_{j,mt}) - \Gamma_{j,mt} \quad \forall j \in \Psi_{mt}, \tag{19}$$

where $\Gamma_{j,mt} > 0 \quad \forall j$. Therefore:

$$mc^R_{mt} + mc^M_{mt} < p_{j,mt} - \gamma_{j,mt}(p_{j,mt}) \quad \forall j \in \Psi_{mt} \tag{20}$$

□

Bounds on the costs imply bounds on the upstream bargaining weights. There is a trade-off between attributing the observed price variation to costs or upstream bargaining power. The maximum (resp. minimum) that can be attributed to the costs is given by the upper bound $min\{p_{jmt} - \gamma_{jmt}, ..., p_{Jmt} - \gamma_{Jmt}\} \quad \forall j \in \Psi_{mt}$ (resp. lower bound given by zero) and this gives the minimum (resp. maximum) that can be attributed to upstream bargaining power $1 - \lambda(min\{p_{jmt} - \gamma_{jmt}, ..., p_{Jmt} - \gamma_{Jmt}\})$ (resp. $1 - \lambda(0)$). This provides intuition for the following corollary.

[14] Notice that in equation (15) the vector of retail prices, p_{mt}, is observed by the researcher. $A_{jmt}(p_{mt})$ and $\gamma_{jmt}(p_{mt})$ depend on the preference parameters and observed variables like retail prices or product characteristics and can be computed given a demand function is estimated.

[15] In the empirical application presented in this article, I carefully verify this assumption in section 5.2.

Corollary 1. *The bargaining weights are bounded*

$$1 - \frac{A_{jmt}(p_{mt})}{A_{jmt}(p_{mt})+p_{jmt}-\gamma_{jmt}(p_{mt})-(min\{p_{jmt}-\gamma_{jmt},\ldots,p_{Jmt}-\gamma_{Jmt}\})} < 1-\lambda_{jmt} \leq 1 - \frac{A_{jmt}(p_{mt})}{A_{jmt}(p_{mt})+p_{jmt}-\gamma_{jmt}(p_{mt})} \; \forall j \in \Psi_{mt}.$$

Proof. This follows from the fact that $\lambda_{j,mt}$ is monotonically increasing in $mc^R_{j,mt} + mc^M_{j,mt}$ on the interval $[0, (p_{jmt} - \gamma_{jmt})]$. □

Point identification One can exploit the presence of private labels (denoted $j \equiv PL$) in most consumer product markets to narrow the bounds or obtain point identification.[16]

Lemma 1. *The total costs of private labels can be computed as follows:*

$$p_{PL,mt} - \gamma_{PL,mt}(p_{PL,mt}) = mc^R_{PL,mt} + mc^M_{PL,mt}. \tag{21}$$

Proof. Direct using $\lambda_{PL,mt} = 1$ and $\Gamma_{PL,mt}(1) = 0$ in the corresponding equation in the system defined by (13).[17] □

Next, the following assumption can be made to narrow the bounds on upstream bargaining weights or to obtain point estimates.

Assumption 2. *Total costs of private labels are smaller or equal than the costs of national brands:*

$$mc^R_{PL,mt} + mc^M_{PL,mt} \leq mc^R_{j,mt} + mc^M_{j,mt}. \tag{22}$$

This assumption is in line with the literature on the economics of private labels and is also supported by some business analysts.[18] Combining assumption 1 and 2, the bounds on the bargaining weights are as follows:

Corollary 2.

$$1 - \frac{A_{jmt}(p_{mt})}{A_{jmt}(p_{mt}) + p_{jmt} - \gamma_{jmt}(p_{mt}) - \min\{p_{jmt}-\gamma_{jmt},\ldots,p_{Jmt}-\gamma_{Jmt}\}} < 1 - \lambda_{jmt} \leq$$
$$1 - \frac{A_{jmt}(p_{mt})}{A_{jmt}(p_{mt}) + p_{jmt} - \gamma_{jmt}(p_{mt}) - mc^R_{PL,mt} - mc^M_{PL,mt}} \quad \forall j \in \Psi_{mt}.$$

[16]For instance, Döpper et al. (2021) study markups in 133 product categories in the U.S. between 2006 and 2019. In their sample, private labels represents about 16% of market shares (See. Table 1. in Döpper et al. (2021)).

[17]In other words, I assume that retailers are vertically integrated and produce private labels in-house. In reality, however, private labels are often manufactured by third-party producers. This assumption is reasonable, given that retailers typically demand large quantities, and there are generally many potential manufacturers capable of producing private labels.

[18]According to Berges-Sennou et al. (2004) two assumptions regarding costs are made in the literature of the economics of private labels. Either it is assumed that the costs of private labels and national brands are the same or it is assumed that the costs of national brands are larger due to higher quality. Last, according to the specialized press "A private label product with feature and quality parity to big brands may cost retailers 40% or even 50% less to manufacture and distribute to customers".

In summary, this step allows one to compute bounds on the bargaining weights. Under stricter assumption point identification can be achieved.[19] Easily computing a value for these weights is key to using Nash bargaining models in actual merger cases. The bounds have two important characteristics. First, the bounds depend only on elements that are often already computed in actual merger cases such as a demand function and Bertrand markups. Second, the bounds can be computed even in the situation faced by policymakers where post-merger data are not available.[20] In contrast, researchers often have post-merger data. I will now discuss identifying changes in bargaining power for applied research.

Step 2: Changes in bargaining power

In order to estimate the structural parameters of the upstream bargaining power function, I need to solve the following equation for each product j in geographic market m and time t:

$$1-\lambda_{jmt} = \frac{exp(\nu_j + \nu_1 \mathbb{1}_{\text{Merger}_{jmt}^M} + \nu_2 \mathbb{1}_{\text{Divestiture}_{jmt}^M} + X_{jmt}\beta)}{1 + exp(\nu_j + \nu_1 \mathbb{1}_{\text{Merger}_{jmt}^M} + \nu_2 \mathbb{1}_{\text{Divestiture}_{jmt}^M} + X_{jmt}\beta)}. \tag{23}$$

The system of equations states that the computed bargaining residuals must equate the bargaining functions for all products j in all geographic markets m and period t. In other words, what is left unexplained by the model is rationalised by heterogeneous bargaining ability.
Notice that the downstream bargaining power function is given by:

$$\lambda_{jmt} = \frac{1}{1 + exp(\nu_j + \nu_1 \mathbb{1}_{\text{Merger}_{jmt}^M} + \nu_2 \mathbb{1}_{\text{Divestiture}_{jmt}^M} + X_{jmt}\beta)}. \tag{24}$$

Next, I divide equation (23) by (24), take the logarithm and define the following structural error term:

$$\zeta_{jmt}(N) \equiv log(\frac{1-\lambda_{jmt}}{\lambda_{jmt}}) - \nu_j - \nu_1 \mathbb{1}_{\text{Merger}_{jmt}^M} - \nu_2 \mathbb{1}_{\text{Divestiture}_{jmt}^M} - X_{jmt}\beta. \tag{25}$$

Where the vector $N = (\nu_j, \nu_1, \nu_2, \beta)$ contains the structural parameters to be estimated. The parameters ν_1 and ν_2 are the main parameters of interests measuring the impact of the merger and divestiture on bargaining power. In the data, the source of variation needed to identify these parameters is a change in ownership. This change in ownership may not be orthogonal to ζ_{jmt}. The choice of the divestiture package by the merged firms might be correlated with unobserved positive bargaining shocks. If this is the case, one needs at least two instrumental variables that are valid and relevant to identify the model.

[19] Under the strict assumption that the costs of all products j is equal to the costs of private labels $mc^R_{PL,mt} + mc^M_{PL,mt} = mc^R_{j,mt} + mc^M_{j,mt}$ the upstream bargaining weights are point identified.

[20] In Appendix A, I also provide a simpler method that policymakers can use in practice to quantify bargaining power in merger review using calibrated costs.

3 Antitrust Case

I use my approach to study the merger between Procter & Gamble and Gillette, cleared conditional on a divestiture in 2005 in the U.S. deodorant market. The objective of the application is to show that the approach developed in this article allows to present new evidences on the distribution of bargaining power (see. Section 5.2) and identify new mechanisms relevant to evaluate divestiture in vertical markets (see. Section 6). In this section, I describe key elements of the antitrust case and the data I use.

Procter & Gamble - Gillette merger In October 2005, the Federal Trade Commission (FTC) approved a merger between Procter & Gamble and Gillette.[21] The FTC didn't expect any cost efficiencies associated with the merger. Absent divestiture the merger was evaluated negatively by the FTC as it was expected to reduce significantly competition in the U.S. deodorant market "*by eliminating actual, direct, and substantial competition between Respondents Procter & Gamble and Gillette for the research, development, manufacture, distribution, and sale of* [...], *and men's antiperspirants/deodorants in the United States*".[22][23] A key feature of the deodorant industry that supports my model's assumptions is product-level bargaining between manufacturers and retailers. As noted in the merger review, 'most retailers do not consider broad categories, such as oral care or AP/DO, when deciding which products to stock and sell. Instead, they typically evaluate individual products.'[24] A last important feature of the institutional setting that is central to my analysis is that the decision to merge was global, generating merger reviews in both the European Union and the United States. However, negotiations between manufacturers and retailers take place at the national level.

Divestiture The merger is approved conditional on the divestitures of Dry Idea, Right Guard and Soft & Dri, three brands owned by Gillette.[25] The brands are divested to the Dial Corporation a subsidiary of Henkel for about $ 420 million in February 2006.[26] Henkel produces skin care products like hand soaps but does not produce deodorants in the U.S. The divested brands are thus sold to an entrant in the U.S. deodorant product category.

[21] Based on the S&P Capital IQ dataset on merger and acquisition, the merger is announced in January 2005.

[22] Url (Accessed, January 12, 2023): https://www.ftc.gov/sites/default/files/documents/cases/2005/12/050930cmp0510115.pdf

[23] While competition concerns where raised in the deodorant market, Procter & Gamble and Gillette are present in other product markets such as the shampoo market for which the merger was not expected to harm consumers. The focus of my empirical analysis will thus be on the US deodorant market.

[24] URL (Accessed December 2, 2024): https://www.ftc.gov/news-events/news/press-releases/2005/09/ftc-consent-order-remedies-likely-anticompetitive-effects-procter-gambles-acquisition-gillette

[25] In the merger case, these brands are referred as the "APDO Assets"

[26] Url (Accessed, January 9, 2023): https://www.bizjournals.com/boston/stories/2006/02/20/daily11.html

3.1 Data

I combine several data sources.

Sales data I use the IRI Academic Database (Bronnenberg et al. (2008)) on sales of deodorant in the geographic market Hartford, New York and Philadelphia from 2004 to 2006 for grocery stores. In the dataset, one row provides information on total unit and dollar sales for a product during a week at a given store. The information on the announcement date of the merger is extracted from the S&P Capital IQ dataset. The information on the timing on the approval of the merger and the divestiture are obtained from the antitrust case report. The dataset I use have two limitations common to most empirical studies on bargaining. First, I do not observe wholesale prices. Second, retail prices are observed for bargaining interactions that didn't failed and reached an agreement.[27] However, these limitations are actually present in most merger cases in which sales data are used.[28] I follow standard practice in empirical industrial organization and define a market as a month in a year in a geographic market. A product is defined as a brand-form-size-retailer combination.[29] Therefore, I aggregated the raw data over the time dimension: I study monthly sales rather than weekly sales.[30] I drop the observations for which a temporary price reduction greater than 5% or more is observed. In the dataset it comprises all observations for which the variable PR is equal to 1. Last, I deflate prices using the Consumer Price Index taking 2004 dollars as reference.[31]

Consumer demographics In order to estimate demand, I complement sales data from the IRI database with data on consumer income from the the American Community Survey (ACS) Public Use Microdata Sample (PUMS) for the period from 2004 to 2006.[32] I follow the approach taken by Miller and Weinberg (2017). I randomly draw 500 households per IRI market and year.

Instruments for endogenous divestiture package In order to estimate supply, I construct instrumental variables using data on the stringency of merger control in the European Union

[27] A noticeable exception is Backus et al. (2020) in which they observe negotiation offers and outcomes for 25 million listings from eBay's Best Offer platform including offers made when negotiation failed.

[28] Sara Lee/Unilever (2010) or Demb/Mondelez (2015) are two examples of cases in which either the antitrust authority or the parties used sales data to run a standard merger simulation model.

[29] For instance, Bjornerstedt and Verboven (2016) studies a merger in the Swedish market for analgesics and define a product as brand, form, package size, and dose. In this study I introduce a retailer dimension in the definition of a product to take into account the vertical structure of the market.

[30] It is standard in the empirical industrial organization literature. See. for instance Miller and Weinberg (2017) that use the same dataset but a different product category.

[31] CPI indexes are obtained at the following link:`https://fred.stlouisfed.org/series/CPIAUCSL#0`

[32] For the year 2004, the data are available at the following link: `www2.census.gov/programs-surveys/acs/data/pums`. For the year 2005 and 2006 the data can be downloaded at the following link: `data.census.gov`.

from the EU Merger Control Database (Affeldt et al. (2018)) from 2004 to 2006.[33]

3.2 Sample Selection

I limit the sample to the top 8 deodorant manufacturers: Gillette, Procter & Gamble, Unilever, Church & Dwight, Colgate Palmolive, Henkel group, Revlon INC, Kao. The sample comprises the top 12 retail chains and an aggregate of private labels.[34] In the merger case a distinction is made between the male and female U.S. deodorant categories. I classify the brands as targeted for men or women following a similar approach as Bhatia et al. (2022). For each brand, I extract manually gender categorization from the website `wallgreens.com`. The male brands I analyse are Axe, Gillette, Mennen Men, Mitchum Men, Old Spice and Right Guard. The female or unisex brands are Arrid, Arm & Hammer, Ban, Degree, Dove, Dry idea, Mennen Women, Mitchum Women, Secret, Soft & Dri, Suave and an aggregate of private labels. Within these two categories, I study deodorants labeled as gel, roll on, spray or stick. Finally, I create four size categories based on the weights of the deodorant measured in ounce. The deodorants I study have weights in [0,2), [2,4), [4,6) or [6,10].[35]

3.3 Descriptive Statistics

Table 1 shows the average prices before the merger and after the merger and divestiture for each brand. Before the merger and divestiture, the divested brands Soft & Dri, Dry Idea and Right are owned by Gillette that is also producing the brand Gillette. In the pre-merger period Procter & Gamble owns Old Spice and Secret. Thus, after the merger and divestiture, the merged firms have a product portfolio made of Gillette (the brand), Old Spice and Secret. The table shows that the average prices of Soft & Dri decrease from \$3.43 to \$3.24, the average prices of Dry Idea increase from \$3.47 to \$3.59 and the prices of Right Guards are almost unchanged. Finally the prices of brands owned by the merged firms (Gillette, Old Spice and Secret) decreased after the merger and divestiture. Now, to gain further insights on whether these price changes are due to the merger and divestitures or to confounding factors, I will examine event study evidences.

[33]Details on the data used are discussed in Table 14 of Appendix B

[34]These retailers are present in all the time period studied.

[35]Therefore, a brand-form with a small change in size, within the bounds of the interval, is not interpreted as a new product. However, a brand-form with a large change in size, for instance from 2.5 to 5 oz, is interpreted as a new product.

Table 1. Deodorant Market - Average Prices Pre- and Post-Merger/Divestiture Period By Brand

		Pre		Post	
Manufacturer	Brand	mean	s.d	mean	s.d
Gillette	Gillette	3.03	0.09	2.99	0.08
	Soft & Dri	3.43	0.16		
	Dry Idea	3.47	0.14		
	Right Guard	3.49	0.11		
Procter & Gamble	Old Spice	3.20	0.13	3.10	0.09
	Secret	3.36	0.08	3.39	0.08
Henkel	Soft & Dri			3.24	0.18
	Dry Idea			3.59	0.15
	Right Guard			3.50	0.09
Unilever	Degree	3.25	0.09	3.32	0.10
	Dove	3.32	0.09	3.32	0.06
	Suave	2.53	0.07	2.47	0.04
	Axe	4.34	0.26	4.20	0.14
Colgate	Mennem Women	2.61	0.08	2.72	0.09
	Mennen Men	2.80	0.13	3.12	0.13
Church & Dwight	Arm & Hammer	2.92	0.11	2.83	0.09
	Arrid	3.46	0.13	3.35	0.10
Revlon	Mitchum Women	3.57	0.08	3.54	0.06
	Mitchum Men	3.70	0.07	3.67	0.07
Kao	Ban	3.02	0.07	3.08	0.09
Private Labels		2.14	0.08	2.83	0.38

Note: The table reports the average (across regions and time periods) retail prices before the merger and after the divestiture for the deodorant data.

4 The Effect of the Merger and Divestitures on Prices

I study the extent to which the merger and divestiture affected retail prices paid by final consumers in the deodorant market based on panel event studies. I have chosen to focus on prices because it is the outcome of Nash-bargaining models. Therefore, comparing the observed price effects with the model-based price effects reveals whether the model delivers realistic outcomes. The equation I estimate, omitting the leads and lags, is the following:

$$\begin{aligned} log(p_{jmt}) = K + \alpha_j + \alpha_{mt} + \delta_1 \mathbb{1}_{\text{Soft \& Dri}} \times \mathbb{1}_{\text{Post}} \\ + \delta_2 \mathbb{1}_{\text{Dry Idea}} \times \mathbb{1}_{\text{Post}} + \delta_3 \mathbb{1}_{\text{Right Guard}} \times \mathbb{1}_{\text{Post}} + \delta_4 \mathbb{1}_{\text{Procter \& Gamble}} \times \mathbb{1}_{\text{Post}} + u_{jmt}, \end{aligned} \quad (26)$$

where p_{jmt} is the price of product j in geographic market m at time t, α_j is a product specific term and α_{mt} is a geographic market-period specific term. $\mathbb{1}_{\text{Post}}$ equal to 1 in the post-merger period, otherwise it is equal to 0. $\mathbb{1}_{\text{Procter \& Gamble}}$ is an indicator variable equal to 1 for products owned by the merged firms. The regression also includes an indicator variable equal to 1 for the divested brands in the post-merger period: $\mathbb{1}_{\text{Right Guard}} \times \mathbb{1}_{\text{Post}}$, $\mathbb{1}_{\text{Dry Idea}} \times \mathbb{1}_{\text{Post}}$ and $\mathbb{1}_{\text{Soft \& Dri}} \times \mathbb{1}_{\text{Post}}$. The identification strategy compares the prices of the divested products and products owned by the merged firms to prices of products not directly involved in the merger nor divestiture around the time of the merger. My identification strategy allows to overcome two potential threats present in standard difference-in-differences analysis. First, the event studies approach allows to graphically verify the presence of any differential pre-trends in log prices across merging and control manufacturers. Second, it also permits to check anticipated effects of the merger. For instance, the merger announcement could already affect the market before the approval of the merger.

Results In Figure 1 the panels 1.1, 1.2 and 1.3 show the event studies for each divested brand. Panel 1.4 is the event study for the products of the merged firms. All event studies are based on the difference-in-differences specification in Equation (26). The point estimates as well as the bounds of the confidence intervals are shown in Appendix C. Each panel is shown for a period of 28 months with 14 months both before and after the exact approval of the merger by the FTC (October 2005).[36] The first vertical line corresponds to February 2005, the time of announcement of the merger. The second vertical line corresponds to September 2005, one month before the approval of the merger. The last vertical line is located at the time of the divestiture in February 2006.

Panel 1.1 shows strong evidence that the price of the divested brand Soft & Dri decreased after the divestiture. Prices decreased up to -8%, relative to rivals not directly involved in the merger and divestiture. By contrast, Panel 1.2 reveals large evidence that the prices of the divested

[36] It corresponds to the largest time span in my sample for which I could obtain a symmetric period before and after.

brand Dry Idea increased after the divestiture. Relative to rivals not directly involved in the merger and divestiture, prices of Dry Idea increased up to 7%. According to the main models used in the literature, prices are expected to fall after divestiture.[37] Before the merger the brand is in a product portfolio that is relatively larger compared to after the divestiture. In a model of Nash-Bertrand competition with differentiated products, the price of the divested brand is expected to drop. In a model of Nash bargaining with exogenous bargaining weights, the price of the divested brand is also expected to decrease as the buyer of the divested brand has less bargaining leverage. However, based on the same reasoning observing a price increase for Dry Idea is unexpected. Indeed, the divestitures imposed by the DOJ are supposed to restore competition whereas through the divestiture of Dry Idea anti-competitive effects are introduced.[38] In Section 6, I show that the model I take to the data allows to explain why these price effects might be observed.

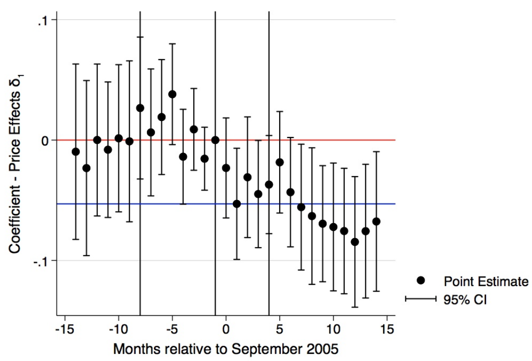
In Panel 1.3, I cannot rule out zero effect for the prices of the brand Right Guard. Zero is systematically within the bounds of the confidence interval. This suggest that a countervailing force is eliminating the expected price drop. In section 6 I do identify an increase in upstream bargaining weight as the likely countervailing force. Panel 1.4 provides limited evidence of price effects of the merger. There are some statistically significant price drops after the divestiture but the effect is not lasting over time.

Note that based on this identification strategy, I do not claim recovering causal estimates. The objective of this section is to make transparent the source of variation I use to identify the structural parameters of my model and show the extent to which the predictions of the estimated model are realistic. There are two remaining threats to the identification strategy that cannot be ruled out. First, in merger analysis a standard challenge to estimate the causal impact of a divestiture on final prices is the presence of likely spillover between treated and untreated units (Ashenfelter and Hosken (2010)). In particular, it is likely that rivals respond to any changes in prices by the merged firms or buyer of the divested brand. For example, if prices are strategic complements, untreated rivals are likely to increase (resp. decrease) their prices after an increase (resp. decrease) in prices by the buyer of the divested brand. This would suggest that the observed price effects are likely underestimated. Finally, another threat to identification of the price effects could be the presence of other time-varying shocks that I do not control for. To limit this issue, I study a short period of time after the merger.

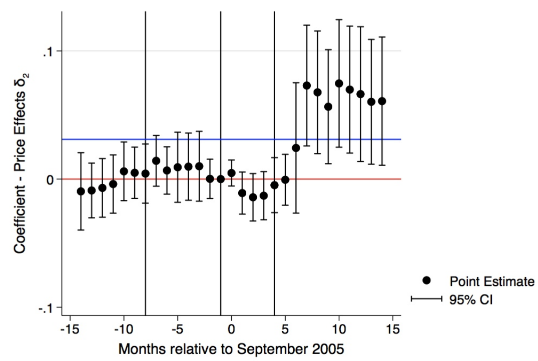
[37] This pattern is observed by Friberg and Romahn (2015) studying a divestiture in the Swedish beer market, for instance.

[38] A price increase for a divested brand is also estimated in Delaprez (2024) or Wang et al. (2023) in which two separate divestitures have been examined in the U.S. beer market.

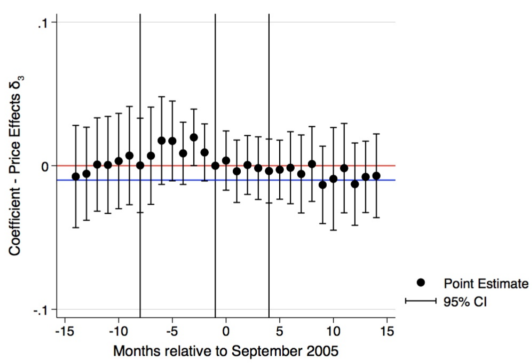
Figure 1. Divestiture and Merger Treatment Effects - Event Studies



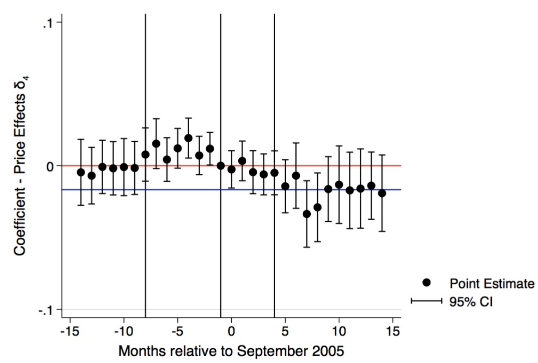
1.1 Soft &. Dri (Divested)



1.2 Dry Idea (Divested)



1.3 Right Guard (Divested)



1.4 Merged Firms

Notes: Figure depicts estimates from event study of specification 26 for the divested brands and the brands of the merged firms. Dots represent point estimate for each month with bars around points indicating 95% confidence interval with standard errors clustered at product level. Control group comprises products of rivals not directly involved in the merger nor divestiture. Private labels are excluded from the sample. The horizontal blue lines represent the point estimates of specification 26 for the divested brands and the brands of the merged firm.

5 Empirical Results and Identification

In this section, I apply the empirical framework developed in Section 2 to investigate the potential economic mechanisms driving the observed prices and derive policy recommendations.

5.1 Demand Model

I estimate a model of demand for deodorant that features flexible substitution patterns based on a one-level Random Coefficient Nested Logit (RCNL). A key advantage of the random coefficient nested logit model is to include various demand models as specific cases (Grigolon and Verboven (2014)).[39] This choice is also guided by the presence of market segmentation along one key discrete dimension: gender. Consumers can choose products j, defined as a brand-form-size-retailer combination in two groups: male or non-male (female and unisex) deodorants. Consumers can also choose not to consume and select the outside good.[40] A given brand of deodorant can be sold under four forms: gel, spray, stick or roll on. For instance, one can buy the brand Right Guard as gel, spray or stick.

In the model a consumer i in geographic market m at time t has the following indirect utility for product j:

$$U_{ijmt} = K_i - \alpha_i p_{jmt} + \beta_0 \times size_{jmt} + \beta_{\text{brand-form-size}} + \beta_r + \beta_m + \beta_t + \xi_{jmt} + \zeta_{ig} + (1-\rho)\epsilon_{ijmt}, \quad (27)$$

where K_i is an individual specific constant, p_{jmt} is the price of product j in geographic market m at time t, $size_{jmt}$ is the average weight of product j in geographic market m at time t, $\beta_{\text{brand-form-size}}$ captures brand-form-size-specific valuations, β_r represents retailer-specific terms, β_m represents valuations that are specific to each geographic market m and β_t is period-specific term. I assume that α_i is given by the following equation:

$$\alpha_i = \alpha + \sigma_1 v_i + \pi_1 d_i, \quad (28)$$

and

$$K_i = K + \sigma_2 v_i + \pi_2 d_i, \quad (29)$$

where v_i are random variables from the standard normal distribution, d_i are consumer income, σ_1 (resp. σ_2) can be interpreted as the standard deviation across consumers of the mean valuation of p_{jmt} (resp. the outside good) and π_1 (resp. π_2) captures how taste varies with incomes.[41]

[39] Random coefficient nested logit has been previously used to estimate Nash-bargaining models in Grennan (2013) or Donna et al. (2022).

[40] Note that this modeling assumptions together with the nested logit demand are in line with analysis made by practitioners in other merger case in deodorant market. For instance, in Europe in Sara Lee/Unilever (Case No COMP/M.5658), a one-level nested logit model with male or non-male deodorants as segments is estimated.

[41] I follow a similar approach as Miller and Weinberg (2017) and draw 500 households for each IRI market and year from the American Community Survey (ACS) Public Use Microdata Sample (PUMS).

I estimate an individual specific constant to flexibly capture heterogeneity in the valuation of the outside good. To simplify the exposition, re-write equation (30) as:

$$U_{ijmt} = \delta_{jmt} + \mu_{ijmt} + \xi_{jmt} + \zeta_{ig} + (1-\rho)\epsilon_{ijmt}, \tag{30}$$

where $\delta_{jmt} = K - \alpha p_{jmt} + \beta_0 \times size_{jmt} + \beta_{\text{brand-form-size}} + \beta_r + \beta_m + \beta_t$, $\mu_{ijmt} = (\sigma_1 v_i + \pi_1 d_i) \times p_{jmt} + (\sigma_2 v_i + \pi_2 d_i)$ and $\zeta_{ig} + (1-\rho)\epsilon_{ijmt}$ is an i.i.d random variable following an extreme value distribution. The nesting parameter ρ is such that $0 \leq \rho \leq 1$. This leads to various demand functions as specific cases. $\rho = 0$ corresponds to the standard random coefficient logit. $\rho = 1$ corresponds to a situation in which consumers value all products belonging to the same group (male or non-male deodorants) as perfect substitutes. $\sigma_1 = \pi_1 = \sigma_2 = \pi_2 = 0$ gives the nested logit. The distributional assumption of the nested logit on the random term ϵ_{ijmt} allows to derive the random coefficient nested logit individual shares for each j in geographic market m at time t. The market share of product j for consumer i in geographic market m at time t is given by:

$$s_{ijmt}(\delta_{jmt}, \mu_{ijmt}, \rho) = s_{ijmt|g} s_{igmt} = \frac{exp(\frac{\delta_{jmt}+\mu_{ijmt}}{1-\rho})}{exp(\frac{I_{igmt}}{1-\rho})} \times \frac{exp(I_{igmt})}{exp(I_{imt})}, \tag{31}$$

where $I_{igmt} \equiv (1-\rho)log(\sum_{j=1}^{J_{gmt}} exp(\frac{\delta_{jmt}+\mu_{ijmt}}{1-\rho}))$ and $I_{imt} \equiv log(\sum_{g=0}^{G} exp(I_{igmt}))$. The aggregate market share of product j is given by:

$$s_{jmt}(\delta_{jmt}, \rho, \sigma, \pi) = \int s_{ijmt}(\delta_{jmt}, \mu_{ijmt}, \rho) f(v) dv, \tag{32}$$

where $f(.)$ is the density of the normal distribution.

Estimation Denote q_{jmt} the observed quantity of product j and q_{0mt} the quantity of the outside good.[42] The observed market share of product j is equal to $s_{jmt} = \frac{q_{jmt}}{\sum_j q_{jmt} + q_{0mt}}$. The system of market shares is defined by the following equation in each geographic market m at time t:

$$s_{mt}(\delta_j, \rho, \sigma, \pi) = s_{mt}. \tag{33}$$

To solve this market share system, I use the modified version of Berry et al. (1995)'s contraction mapping proposed by Grigolon and Verboven (2014). I define the structural error term, $\xi_{jmt} \equiv g_{jmt}(\theta^d)$, as the variation in observed market shares not explained by the model and build the following generalized method of moments objective function:

$$\underset{\theta^d}{argmin}\; g(\theta^d)' Z W Z' g(\theta^d), \tag{34}$$

where W is a weighting matrix that I set to $(Z'Z)^{-1}$ and Z is a vector of instruments. The vector θ^d contains the estimated preference parameters: α, ρ, σ_1, π_1, σ_2, π_2, β_0, 89 brand-form-size specific parameters, 12 retailer-specific parameters, 2 parameters corresponding to β_m, 35 parameters corresponding to β_t.

[42] I follow Miller and Weinberg (2017) and assume that the market sizes are 50% greater than the maximum observed unit sales in each geographic markets.

Identification There are two endogenous variables: the conditional market share in logarithm $log(s_{jmt|g}(p_{jmt}))$ and the price p_{jmt}. These variables are likely to be positively correlated with the unobserved demand error term. A positive error would lead to higher conditional market shares and prices. Ignoring the endogeneity of these variables is likely to deliver an estimate of α biased toward zero and an estimate of ρ biased upward. Additionally, estimating a random coefficient nested logit model requires to identify the nonlinear parameters σ_1, σ_2, π_1 and π_2.
I circumvent these challenges by using instrumental variables. I use 5 BLP-type of instruments that are widely used in the literature estimating nested Logit demand (e.g. Duch-Brown et al. (2017)): the counts of the number of products, the counts of the products by group (male and female), the counts of rivals' product in the male segment by manufacturer and counts of the number of rivals' product in the female segment by manufacturer.[43] These variables are likely to influence the degree of competition in the market but unlikely to be correlated with the unobserved demand term thereby valid. Next, I use two instruments exploiting the change in product portfolio implied by the merger and divestiture. Precisely, I use an indicator variable equal to 1 for the products of the merged firms and the buyer of the divested brands in the post-divestiture period. These instruments are in line with identification strategy previously used in Miller and Weinberg (2017). They are likely to be relevant as variation in product portfolio leads to variation in markup. These instruments are assumed to be orthogonal to the demand error term.

Results In Table 2, I show the estimated preference parameters corresponding to the utility function in (30). In column (i) and (ii) I estimate a simple nested logit model with and without instrumenting for the endogenous variables. In column (iii) I estimate the more flexible random coefficient nested logit model. In column (i), it is shown that not instrumenting for the endogenous variables, the demand function is flat with an estimate associated with price close to zero. The nesting parameter is equal to 1. By contrast, in column (ii) and column (iii) I show that after using instruments the coefficient associated with prices has the expected negative sign and is statistically significant. The nesting parameter is consistent with random utility maximisation as it lies between zero and 1. Its magnitude decreases relative to the OLS estimates.[44] The comparison of the estimates in column (i) and (ii) indicates thus that the instruments used mitigate the endogeneity issue. In column (iii) the mean valuation associated with prices is larger and statistically significant at any conventional levels. The standard deviation associated with prices is also significant at any conventional levels indicating that there is heterogeneity in the valuation of prices. By contrast, the interaction term with income is small and not estimated precisely.
Next, I study the relevance condition formally. The first-stage regressions of the NL model asso-

[43] See. for example page 41 in Duch-Brown et al. (2017).
[44] Note that all the estimated dummies are shown in Table 25 and 27 of Appendix D.

ciated with both endogenous variables show that the relevance condition is satisfied. In Table 23 of Appendix D I report the estimate for the conditional market share $log(s_{jmt|g})$, the F-test of excluded instruments is equal to 17.36. In Table 24 of Appendix D, I report the results for p_{jmt}, the F-test of excluded instruments is equal to 10.50.

Last, the estimated demand model delivers an average own-price elasticity in line with previous studies estimating a demand model for deodorant. The estimates in column (ii) of Table 2 show that the nested logit delivers an average own-price elasticity equal to -4.122. The minimum own-price elasticity is equal to -6.284 whereas the maximum elasticity is -1.924 based on the nested logit model. These statistics for the nested logit can be compared with average own-price elasticity presented in the merger case Sara Lee/Unilever (Case No COMP/M.5658) where a similar demand model for deodorant is estimated. The estimates presented for the average own-price elasticity range from -9.1 to -1.2.[45] The average own-price elasticity implied by the more flexible random coefficient nested logit model falls also within this range as it leads to an average own-price elasticity of demand equal to -4.917. Based on this model the minimum own-price elasticity is equal to -5.910 whereas the maximum elasticity is -0.620.[46]

[45]I refer here to the average own-price elasticity associated with different specifications. I do not refer to the minimum and maximum own-price elasticity for a given specification. In Table 29, I show the estimates presented in Sara Lee/Unilever (Case No COMP/M.5658).

[46]The average outside good diversion is 0.077.

Table 2. Demand Parameter Estimates

Demand Model:		NL	NL	RCNL
Variable	parameter	(i)	(ii)	(iii)
p_{jmt}	α	0.006	-0.290	-0.496
		(0.000)	(0.098)	(0.079)
$log(s_{jmt\|g})$	ρ	0.999	0.771	0.763
		(0.000)	(0.025)	(0.013)
$size_{jmt}$	β_0	0.007	0.207	0.252
		(0.001)	(0.038)	(0.010)
$p_{jmt} \times v_i$	σ_1			0.014
				(0.002)
$p_{jmt} \times Income$	π_1			0.001
				(0.016)
$Constant \times v_i$	σ_2			0.000
				(0.000)
$Constant \times Income$	π_2			-0.007
				(0.006)
Brand-form-size dummies		✓	✓	✓
Retailer dummies		✓	✓	✓
Geographic FE		✓	✓	✓
Time FE		✓	✓	✓
Instruments			✓	✓
N		38150	38150	38150
Mean own-price elasticity			-4.122	-4.917

Notes: The table reports the estimated demand parameters based on the Nested Logit (NL) and Random Coefficient Nested Logit (RCNL) demand corresponding to the utility function in (30). There are 38150 observations for the period 2004 to 2006. Private labels included in the sample. Specifications include 89 brand-form-size dummies, 12 retailer dummies, 2 geographic market dummies and 35 period dummies. Robust standard errors in parentheses. Brand-form-size, retailer, geographic market and period dummies are displayed in Table 25 and 27 of Appendix D for the NL model. First stage regressions are displayed in Table 23 and 24 of Appendix D for the NL model.

5.2 Supply Model

In order to identify changes in brand-level bargaining weights I take as given the demand parameters and implied retail markups. I use Assumption 1 and restrictions imposed by the model to identify bounds on costs thereby bargaining residuals. Next, I construct a structural error term as functions of the parameters that I estimate using generalized method of moments and valid instruments. I will now explain how to calculate an upper and lower bound on the costs.

Computation and identification of costs In the deodorant market I observe four forms of deodorants: gel, roll on, spray and stick that are present in 13 size categories.[47] Guided by the merger review, I assume that all deodorants of the same form-size, owned by the same manufacturer, have the same total costs of production and distribution in all geographic markets.[48] This assumption is driven by the information in the merger review as well as the industry background associated with deodorant production and distribution. I allow the costs of different form-size of deodorants to differ because the same production lines cannot be used to produce deodorant of different forms.[49] On the other hand, within a form-size I assume that costs do not differ as the production technology used by a manufacturer to produce various brands of deodorant of the same form is likely very similar. Moreover, it is common for a given manufacturer to use similar ingredients or standardized inputs for various products of the same format.[50] The information provided in the merger case (Federal Trade Commission (2006)) support this assumption. To be precise, it is argued that the divested brands Soft & Dry and Dry Idea "utilize several of the formulations and innovations featured in Right Guard".[51] Next, I will discuss the computed costs and discuss the robustness of the assumption on costs.

Costs results In Table 3, I show summary statistics of the average total marginal costs computed for each bound by form. The columns 'Lower bound' and 'Upper bound' comes from Proposition 1. The lower bound on costs is computed as $mc^R_{PL,t} + mc^M_{PL,t}$ for all manufacturer-form-size combinations. The upper bound on costs is computed as $min\{p_{jt} - \gamma_{jt}, ..., p_{Jt} - \gamma_{Jt}\} \quad \forall j \in \overline{\Psi}_{\text{manufacturer-form-size},t}$ for all manufacturer-form-size combinations. The results can be interpreted as follows. On average, marginal costs of deodorants in gel form lie between

[47] I do not observe spray deodorants with weight between 0 and 2 oz. Also I do not observe roll on deodorants with weight between 4 and 6 or 6 and 10 oz.

[48] Following the notation in section 2.2 I assume $\overline{\psi}_{manufacturer,form,size,t}$.

[49] For example, industry background information on the deodorant production is provided in Sara Lee/Unilever (2010): "the production processes for deodorants of different formats are quite different and therefore production lines for one deodorant format cannot be used for another type of deodorant format." Url (Accessed, July 25, 2023): https://ec.europa.eu/competition/mergers/cases/decisions/m5658_20101117_20600_2193231_EN.pdf.

[50] An example of likely standardized input is roller ball included in deodorants in the roll-on format.

[51] Url (Accessed 25 July 2023): https://www.ftc.gov/sites/default/files/documents/cases/2006/02/060224pandgpet0510115.pdf.

1.305$ and 1.763$. Marginal costs of deodorants in spray form radiate between 1.976$ and 2.460$. Marginal costs of deodorant in roll on form are between 1.401$ and 2.571$ whereas costs of deodorant in stick form are between 1.130$ and 1.589$. Next, I evaluate the extent to which the bounds I computed for the costs are in line with estimated costs obtained applying a similar approach as in Gowrisankaran et al. (2015).[52] In column 'robustness', I show the average total marginal costs estimated by form.[53] The key differences is that the estimated costs are not symmetric within a manufacturer-form-size-period combination. The results show that on average the estimated costs fall between the bounds computed based on the model presented in this article. On average estimated costs are equal to $1.816 whereas the computed costs lie between $1.358 and $1.901. It suggests that the restrictions I imposed on costs, guided by the industrial setting of deodorant production and distribution, are realistic. Next, I discuss the associated bargaining weights.

Table 3. Summary Statistics of Costs ($ per deodorant)

	Deodorant		
	Lower Bound	Upper Bound	Robustness
Form			
Gel	1.305 (0.370)	1.763 (0.370)	1.664 (0.668)
Spray	1.976 (0.396)	2.460 (0.414)	2.320 (0.612)
Roll on	1.401 (0.184)	2.571 (0.424)	2.442 (0.624)
Stick	1.130 (0.527)	1.589 (0.527)	1.539 (0.804)
All	1.358 (0.529)	1.901 (0.603)	1.816 (0.802)

Notes: The table depicts average total marginal costs by deodorant form. The column 'estimated' corresponds to total costs estimated using the same approach as in Gowrisankaran et al. (2015). In columns 'Lower bound' and 'Upper bound' standard deviations in parenthesis relate to variation across time periods, manufacturers, form and sizes. In columns 'robustness' standard deviations in parenthesis relate to variation across time periods and products.

[52] However, this approach allows me to estimate a limited number of bargaining weights.

[53] I provide details on the exact specification estimated and the estimates in Appendix F.

The distribution of bargaining power and importance of brand effects A key issue relevant for divestiture policy is to assess whether bargaining power is mainly explained by brands or by the buyer of the divested brands. To conduct this evaluation, I first regress $log(\frac{1-\lambda_{jmt}}{\lambda_{jmt}})$ on product fixed effects only. The results shown in column (i) and (ii) of Table 5 indicates that most of the explanatory power comes from the brands. Indeed the adjusted R^2 associated with such regression lies between 0.75 to 0.83. To further investigate the importance of brands, I study the variation within the distribution of bargaining power. I compute bounds for the upstream bargaining weights using the computed costs.[54] In Table 4, I show the average upstream bargaining power associated with each brand based on the lower ('lower bound') and upper bounds ('upper bound'). The column labeled 'zero costs' shows the average upstream bargaining weight for the most conservative upper bound possible corresponding to assume that total costs are equal to zero.[55] The results in Table 4 show large heterogeneity within the distribution of bargaining weights but also within the product portfolio of a given manufacturer. This can be seen, for instance, by studying the results for Unilever. Unilever has on average more bargaining power than manufacturers for all brands except Suave. Indeed, except for Suave the lower bound is greater than 0.5. By contrast, 0.5 is in the interval of the upstream bargaining weights for Suave, hence one cannot rule out the possibility that bargaining power in negotiations for this brand is symmetric. A legitimate question about the reported heterogeneity is the extent to which it is is driven by costs. To address potential concerns, in the column labeled "zero cost", I report the bargaining weights obtained by assuming zero costs for all brands. Even in this extreme case, the results still reveal important heterogeneity. For example, the bargaining weights of brands owned by Unilever, such as Suave, are 0.74, while they are 0.88 for Axe. In the context of merger and divestiture policy, heterogeneity in bargaining weights within a manufacturer's product portfolio has important implications. It suggests that policy recommendations related to the choice of divested brands based on bargaining power may deserve more attention than the choice of buyer.

Identification of changes in upstream bargaining weights I now study whether merger and divestiture impact the bargaining weights. To do this, I first explain how changes in bargaining weights are identified in this setting. Using the stacked vector of structural errors in equation (25), identification is based on the population moment condition $E[Z'\zeta(\nu_j, \nu_1, \nu_2)] = 0$ with Z a matrix of instruments containing excluded instruments. The variables $\mathbb{1}_{\text{Merger}_{jmt}^M}$ and $\mathbb{1}_{\text{Divestiture}_{jmt}^M}$ are endogenous because the merged firms chooses the divestiture package which may be the best fit from its perspective. If I ignore this, I might incorrectly attribute change in upstream bargaining power to the merger, when it is driven by unobserved positive bargaining

[54] Note that I study upstream bargaining weights $(1-\lambda)$ as I analyse an upstream merger and divestiture. I could equivalently show directly the computed downstream bargaining weights (λ).

[55] Note that this upper bound can be used by practitioners in cases in which private labels are unobserved.

Table 4. Average Upstream Bargaining Weights

	Bargaining weights		
Brand	Lower Bound	Upper Bound	Zero costs
Merged Firms			
Gillette	0.551	0.658	0.785
Old spice	0.515	0.642	0.797
Secret	0.524	0.673	0.804
Divested Brands			
Dry Idea	0.562	0.742	0.843
Soft & Dri	0.601	0.705	0.837
Right Guard	0.549	0.672	0.820
Unilever			
Degree	0.607	0.698	0.798
Dove	0.578	0.708	0.796
Suave	0.391	0.582	0.744
Axe	0.823	0.848	0.880
Colgate			
Mennen men	0.454	0.609	0.775
Mennen women	0.439	0.621	0.784
Church & Dwight			
Arm & Hammer	0.523	0.670	0.818
Arrid	0.573	0.718	0.843
Mitchum women	0.560	0.691	0.857
Mitchum men	0.555	0.694	0.853
Kao			
Ban	0.520	0.698	0.821

Notes: The table shows the average (across products of the same brand and time periods) upstream bargaining weights for each bound. The column 'upper bound' corresponds to weights obtained using costs of private labels as costs. The column 'zero costs' corresponds to weights obtained assuming costs are equal to zero and corresponds to the highest upper bound one can obtain in this model.

shocks. To address this challenge, I take advantage of the fact that the merger happened globally, while negotiations happen at the national level. Based on this idea I construct instrumental variables that capture the degree to which merger control is strict in the European Union using the database described in Affeldt et al. (2018). These variables are the average percentage of mergers in which the parties proposed remedies to solve competition concerns raised by the EU antitrust authority; the average percentage of mergers where the authority raised vertical concerns in each month covered by my data. I also include the average number of mergers that were cleared unconditionally in second phase investigations (Phase 2) and the average number of mergers that were cleared conditionally on remedies in second phase investigations (Phase 2). I interact these variables with distance from headquarters to obtain variation at the firm level. These instruments are relevant because the merger decision is global. Indeed, Procter & Gamble and Gillette operate in both the European Union and the United States. Therefore, it is likely that these companies took into account the EU regulatory environment in which they operate when merging and choosing the buyer of the divested brands. However, negotiations and pricing policies take place at the national level.[56] Hence, these instruments are likely to be orthogonal to unobserved US-level bargaining shocks thereby valid.

Results of upstream bargaining weights In Table 5, I show the estimated bargaining parameters for the lower and upper bounds of the upstream bargaining weights with and without instrumenting for $\mathbb{1}_{\text{Merger}^M_{jmt}}$ and $\mathbb{1}_{\text{Divestiture}^M_{jmt}}$.[57] Naive OLS regressions presented in columns (iii) and (iv) shows that after the merger, on average, the bargaining ability of the manufacturer relative to the retailers decreased in negotiations for the products of the merged firms. Once instruments are used, this effect is still significant but more negative as shown in columns (v) and (vi). A possible reason may be the difficulty to integrate managers from two different corporate cultures. In the business press, there are evidences that several top managers considered as key for the success of Gillette left the company after the merger.[58][59] Various former executives also argued that the merger was unsuccessful.[60] By contrast, the bargaining ability of

[56] The EU version of the merger case states that "European retailers still negotiate on a national level with the national sales representatives of their respective suppliers. Even bigger retailers do not negotiate with suppliers from another Member State." Url (Accessed, August 1, 2024): https://ec.europa.eu/competition/mergers/cases/decisions/m3732_20050715_20212_en.pdf

[57] Guided by the event study evidences in section 4 I also control for the period between the announcement of the merger and the conditional approval; and the transitory period between the conditional approval decision and finalisation of the merger with the divestiture.

[58] See. Url (Accessed 26 July 2023): https://adage.com/article/news/p-g-struggles-hang-top-gillette-talent/116933.

[59] Note also that in 2007, P & G restructured its Gillette business unit which suggest that the integration was not entirely satisfactory.

[60] For instance a former executive claimed that "The Gillette acquisition by P&G has not been good for the shareholders, not good for the majority of Gillette employees and not good for the brands." See. url (Accessed 3

the manufacturer relative to the retailers increased in negotiations for the divested brands. The effect remains significant but goes down after instrumenting. This provides a possible explanation on why Henkel bought the divested brands.[61] As evaluated by the Federal Trade Commission (2006), they may have internalized the fact that their employees have the relevant bargaining ability to negotiate terms for the divested brands. Overall the results show thus that upstream bargaining power and manufacturer size are not always positively correlated.[62] A merger does not necessarily lead to more bargaining power and a divestiture does not imply mechanically less bargaining power for the divested brands. This is in line with Chipty and Snyder (1999) finding that larger buyers may have less bargaining power. Another important finding is that not instrumenting for merger and divestiture choices leads to an upward bias in the estimated changes in upstream bargaining weights. This suggests that merger and buyer choices are driven by positive unobserved shocks.

April 2024): https://www.linkedin.com/pulse/bleeding-edge-mike-mccombs

[61] Henkel divestiture policy is meant to "reap the benefits of both earnings and cost synergies". See. url (August 9, 2024):https://www.henkel.com/investors-and-analysts/strategy-and-facts/acquisitions-divestments.

[62] Recall also that in the model there are two bargaining forces: bargaining leverage and bargaining power. After merging the merged firms obtains more bargaining leverage caused by larger disagreement payoffs.

Table 5. Bargaining Ability Parameter Estimates

Upstream Bargaining Power	LB OLS (i)	UB OLS (ii)	LB OLS (iii)	UB OLS (iv)	LB GMM (v)	UB GMM (vi)
$\mathbb{1}_{\text{Merger}^M_{jmt}}$			-0.10***	-0.089***	-0.24***	-0.14***
			(0.021)	(0.012)	(0.023)	(0.012)
$\mathbb{1}_{\text{Divestiture}^M_{jmt}}$			0.12***	0.097***	0.11***	0.092***
			(0.023)	(0.013)	(0.023)	(0.013)
Controls			✓	✓	✓	✓
Product FE	✓	✓	✓	✓	✓	✓
Period FE			✓	✓	✓	✓
Region FE			✓	✓	✓	✓
Instruments					✓	✓
adj. R^2	0.75	0.83	0.76	0.84	0.75	0.84
N	37852	37852	37852	37852	37852	37852

Notes: The table reports the estimated bargaining ability parameters in equation (16) for the lower bound (LB) and upper bound (UB) of the upstream bargaining weight. There are 37852 observations for the period 2004 to 2006. Private labels are excluded from the sample. Specifications in column (i) and (ii) include product fixed effects only. Specifications in column (iii), (iv), (v) and (vi) include products, region, period dummies (month) as well as dummies controlling for the announcement and the transitory periods. Columns (iii) and (iv) are estimated by OLS. Columns (v) and (vi) are estimated by GMM with excluded instruments. Standard errors are clustered at the product-level.

6 Economic Mechanisms and Policy Implication

6.1 Challenge with Usual Mechanisms

Next, I show that, absent changes in bargaining weights, the main models used to study mergers fail to explain the observed effects. In Table 6, I simulate a merger without divestiture (columns labeled 'No divestiture') or a merger with divestiture (columns labeled 'Divestiture') under two separate modeling assumptions. I either assume that manufacturers directly sell to the consumers (Bjornerstedt and Verboven (2016)) or a vertical market structure in line with Gowrisankaran et al. (2015). In all simulations I use data for the month prior to the merger.[63] Next, I solve for the new associated vector of equilibrium prices. Column (i) and (ii) show the simulations for a Nash-Bertrand model. Column (iii), (iv), (v) and (vi) display the results for a vertical market. Columns (iii) and (iv) (resp. (v) and (vi)) are based on the computed lower (resp. upper) bound on the upstream bargaining power. Based on a Nash-Bertrand model, the prices of the products owned by the merger (excluding the divested brands) are predicted to increase by about 4.33% absent divestiture (column (i)).[64] Prices are predicted to increase less if a merger with divestiture is simulated: the prices of the merged firms are predicted to increase by about 0.798% (column (ii)). The prices of all divested brands are predicted to increase when a merger without divestiture is simulated. By contrast, prices are expected to drop if a merger with divestiture is simulated. Recall that I observe that the price of Dry Idea increased after the divestiture. Combining these two facts together reveal the limit of the Nash-Bertrand model. Indeed, the model is not able to rationalise a price increase for a divested brand. The results further show that a standard Nash-bargaining model is also failing to predict a price increase for a divested brand. In column (iii) and (iv) (resp. (v) and (vi)) I simulate a merger without and with divestiture in a vertical market for the lower (resp. upper) bound of the upstream bargaining power. Simulating a merger with divestiture (column (iv) and (vi)), prices of all divested brands are predicted to decrease. Overall, comparing the predictions from a Nash-Bertrand model to the predictions of the Nash-bargaining model, the qualitative results are aligned. Both models associate a brand reallocation to a relatively smaller product portfolio with pro-competitive effects, which explains why all prices for the divested brands are predicted to fall. There are at least two candidate mechanisms for adding nuance to the mechanisms in these models. The first one is changes in costs, which has already been identified in articles such as Miller and Weinberg (2017). The second is changes in bargaining weights caused by

[63] It is also the approach taken previously in the literature evaluating mergers in horizontal market (Bjornerstedt and Verboven (2016)).

[64] The effect on consumer surplus is unsurprisingly negative with a drop equal to 1.44%, and its magnitude finds echoes in the results presented in Miller and Weinberg (2017), where it is estimated that the merger they study decreases consumer surplus by about 2.1% based on a Nash-Bertrand model without cost efficiencies and demand estimated using random coefficient nested logit.

the merger and divestiture, for which identification based on actual data variation is new.[65] In next section, I study the role of changes in costs and bargaining weights.

Table 6. Comparison Price Effects

	Nash-Bertrand		Nash-bargaining			
			Lower Bound		Upper Bound	
	no divestiture (i)	divestiture (ii)	no divestiture (iii)	divestiture (iv)	no divestiture (v)	divestiture (vi)
Change in Prices (%)						
Divested Brands						
Dry Idea	4.56 (1.07)	-0.08 (0.02)	5.02 (0.78)	-0.21 (0.08)	10.8 (2.92)	-0.49 (0.14)
Soft & Dri	4.62 (1.16)	-0.08 (0.02)	6.60 (2.07)	-0.25 (0.20)	9.87 (4.11)	-0.03 (1.71)
Right Guard	5.77 (1.35)	-1.17 (0.27)	6.02 (2.37)	-1.59 (0.80)	8.52 (2.63)	-2.20 (0.96)
Merged Firms	4.33 (2.56)	0.79 (0.81)	4.61 (3.20)	0.64 (1.07)	6.36 (4.39)	0.96 (1.80)
Rivals	0.35 (0.34)	0.01 (0.023)	0.21 (0.43)	-0.21 (0.28)	0.66 (0.78)	-0.25 (0.36)
ΔCS (%)	-1.4407	-0.0607	-1.2323	0.2312	-1.9650	0.2126

Notes: The table reports the average percentage changes in prices and consumer surplus for different scenarios. The simulations are based on the RCNL demand estimates presented in Table 2 and supply estimates presented in Table 3 and 4. Pre-merger data for September 2005 are used as in Bjornerstedt and Verboven (2016). Standard deviations in parenthesis relate to variation across geographic markets and products. 'Lower bound' (resp. 'Upper bound') refers to bound on upstream bargaining weights. No changes in costs or bargaining weights are assumed. Details on the computation of the change in consumer surplus are provided in appendix K.

6.2 Changes in Upstream Bargaining Power and Costs

Up to this point, I assumed as previous studies on divestiture that bargaining power is fixed over time. In line with the evaluation of the DOJ, I also assumed no changes in costs. I will now study the extent to which upstream bargaining power as well as costs are affected by the merger and divestiture.

Changes in upstream bargaining weights To quantify the effect of the merger and divestiture on the upstream bargaining weights I compute the upstream bargaining weights in a counterfactual situation in which no merger occurred. Next, I compute the difference between the upstream weights estimated based on actual data and the upstream weights in the 'no merger' situation.[66] In Figure 2, I plot these bargaining weights over time. The red dotted lines show the upstream weights estimated based on actual data in the post divestiture period and the black

[65]See. for instance the discussion in Bhattacharya et al. (2024): "An interesting question is whether these mergers affect the split of surplus between manufacturers and retailers. We cannot answer it, as we do not observe the contracts between these parties. As part of our selection process, we have encountered many deals without product market overlap. This question may be connected to the prevalence of such deals, as they may alter the bargaining positions of manufacturers."

[66]To compute the upstream bargaining weights I use a slightly more general version of equation (25) allowing each divested brands to have a specific estimate. The estimates are shown in Appendix G.

black lines display the upstream weights in the 'no merger' scenario for the entire period. The differences between the red and black lines gives thus the model-based impact of the merger and divestiture. Panel 2.1, 2.2 and 2.3 are for the divested brands. The results show that the bargaining power associated with Soft & Dry is almost unaffected by the divestiture whereas the bargaining power associated with Dry Idea and Right Guard increased.[67] This provides one way to rationalise why the price of Dry Idea increased after the divestiture but also why the event studies in Section 4 do not reveal statistically significant prices drop for Right Guard. Indeed, absent changes in bargaining weights the workhorse Nash-bargaining model attributes less bargaining leverage to the buyer of the divested brands which lead to a predicted price drop for all divested brands as shown in Section 6.1. Once the model is flexible enough to incorporate changes in bargaining weights, there are strong evidences that the changes in bargaining weights for the divested brands work as an anti-competitive force. In Section 6.4 I will quantify the importance of this effect. Last, Panel 2.4 shows the average upstream weights of the merged firms. The plot shows that the bargaining weights associated with the merger decreased with the merger. The changes in bargaining weight associated with the products of the merger constitute a pro-competitive force.

Changes in costs In Table 7, I show the average percentage changes in costs for the lower and upper bound of the computed costs.[68] I do find evidences of cost savings for the divested brands. On average the costs of Dry Idea decreased by about 1.2 to 2.5%; the costs of Soft & Dri dropped by about 3.5 to 4.8% and the costs of Right Guard decreased by about 6.6 to 8.3%. It provides another potential justification for why Henkel may have decided to buy the divested brands and supports the evaluation of the suitability of the buyer by the FTC.[69] Notice, that these findings are also in line with results in Delaprez and Guignard (2024) in which the authors found that divestiture may lead to cost savings. Note also that cost efficiencies for the merger ranges from 5.4 to 8%. This is in line with the Procter & Gamble 2005 annual report in which P&G CEO

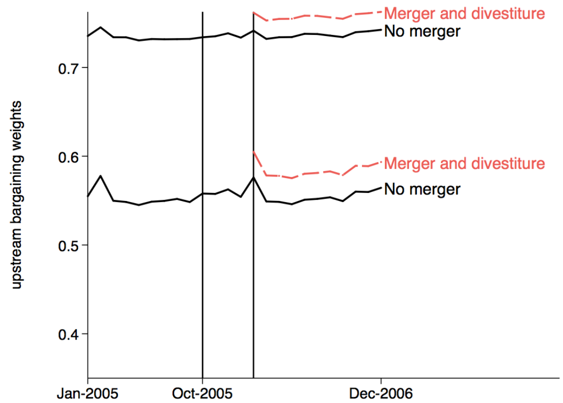
[67]Observing a similar pattern for both Right Guard and Dry Idea but not Soft & Dri is consistent with the observed strategy of the company in the long run. Indeed, in 2021 Henkel has sold Right Guard and Dry Idea together which suggest that both brands share similarities in term of Henkel strategy. Url (Accessed 15 August 2024: https://www.henkel.com/press-and-media/press-releases-and-kits/2021-06-10-henkel-completes-sale-of-right-guard-and-dry-idea-brands-1232976).

[68]In Appendix H , I provide further details.

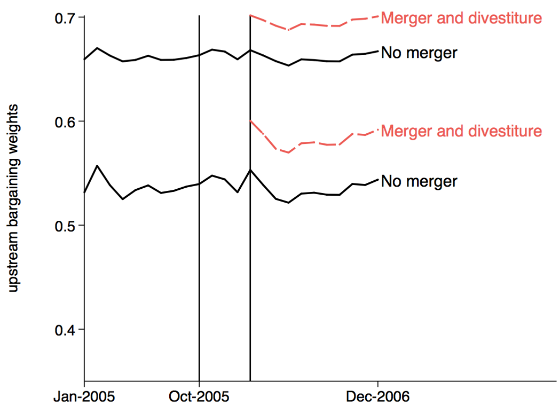
[69]Indeed, in the merger report (Federal Trade Commission (2006)), it is stated that "given their ability to add manufacturing and promotional scale, and the limited investment required to support the brands, Soft & Dri and Dry Idea are efficient contributors to the portfolio's top- and bottom-lines" of the buyer of the divested brand. It is also stated that "it is not anticipated that this acquisition wil generate a need for substantial capital to develop the APDO Assets in the near term" but also that Henkel "will be acquiring an established business requiring no additional management expertise". Url (Accessed 25 July 2023): https://www.ftc.gov/sites/default/files/documents/cases/2006/02/060224pandgpet0510115.pdf.

Figure 2. Counterfactual Upstream Bargaining Weights

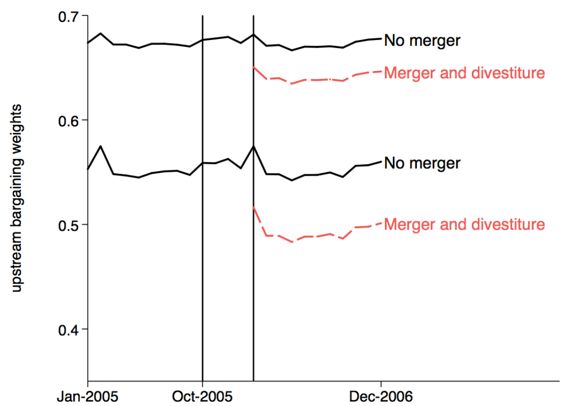
2.1 Soft & Dri (Divested)



2.2 Dry Idea (Divested)



2.3 Right Guard (Divested)



2.4 Merger

Notes: The figure plots the average upstream bargaining weights associated with the divested brands and the merger for the upper and lower bounds. The black upstream bargaining weights labeled 'No merger' are the weights computed in the 'No merger' scenario. The red upstream bargaining weights labeled 'Merger and Divestiture' are the estimated weights based on the observed changes in ownership: a merger and divestiture. The bargaining ability estimates are from specifications in column (iii) and (iv) of Table 31.

explains that the merger is expected to generate cost efficiencies.[70]

Table 7. Changes in Costs

	Costs	
	Lower bound	Upper bound
Dry Idea	-2.5%	-1.2%
Soft & Dri	-4.8%	-3.5%
Right Guard	-8.3%	-6.6%
Merged entity	-8%	-5.4%

Note: This Table shows average changes in costs. Changes in costs are computed based on estimates in Table 32. 'Lower bound' (resp. 'Upper bound') refers to bound on costs.

6.3 Candidate Mechanisms for Changes in Bargaining Weights

Before considering the policy implications, I offer two possible explanations for why the average upstream bargaining weights of the merged firms decreased while average bargaining weights of the buyer increased. However, I cannot disentangle these two explanations because I study a single merger case.

Endogenous divestiture package selection The finance literature has early established that sellers of divested assets choose both the buyer and the divested assets based on profit maximization (Kaplan and Weisbach (1992)). Based on this idea, a possible explanation for why the average bargaining weights associated with the divested brands increased is that the merged firm chose a divestiture package that increased its profits. To quantify this mechanism, I use the model to compute the profit of the merged firms in the absence of an increase in average bargaining weights associated with the divested brands. Next, I compare this profit to the actual profit. The results show that, the observed increase in bargaining weights for the divested brands Dry Idea and Right Guard increase the profit of the merged firms by about 1.17 to 1.65%. Next, to better evaluate the possible importance of this channel beyond this specific merger case. I compute what would have been the profit of the merged firms if the average bargaining weights associated with the divested brands would have increased by 15% relative to a situation where none of the weights are impacted by the merger and divestiture. The results show that relative to a situation without any changes in weights the profit of the merged firms would have

[70] On page 10 of the annual report P&G CEO states that the company "identified more than a billion dollars in cost synergy opportunities".

been by about 3.82 to 4.07 % higher. These results thus reveal a new anticompetitive channel associated with divestitures. However, this explanation alone has a limited ability to explain why the average bargaining weights of the merged firms decreased. I now propose another possible channel that could also drive these results.

Table 8. Profit Gains

Δ Bargaining Power - Buyer (%)	**Actual**		**15**	
	LB	UB	LB	UB
Δ Profit - Merger (%)	1.65	1.17	4.07	3.82

Notes: The table presents the change in merger profit caused by varying increases in the upstream bargaining power of the buyer of the divested brands. The column 'actual', compare actual profit to the profit without any increases in upstream bargaining power. The column '15', compare profit if the bargaining weights of the buyer of the divested would have increased by 15% to the profit without any increases in upstream bargaining power.

Allocation of control affects incentives to negotiate Stein (2002) argue that (small) firms where local managers have more control over decisions may perform better than centralized (large) firms for activities that rely on soft versus hard characteristics. Bargaining ability is typically a soft characteristic. The observed pattern of changes in bargaining weights may be explained by the arguments made by Stein (2002). I do not observe the extent to which people involved in negotiations have control over decisions. Thus I do not quantify directly this channel.

Recall, however, that a key advantage of the model developed in this article is that it breaks the mechanical link between changes in firm size and the competitive effect imposed on the data in previous models while remaining general. This generality allows me to examine the welfare consequences of the impact of merger control on bargaining power in a broad sense, rather than examining specific channels that may affect divestiture policy to different degrees.

6.4 The Impact of Changes in Costs and Bargaining Weights on Prices

I repeat the same exercise as in Section 6.1, assuming a vertical market structure, but I let the costs and bargaining weights change according to the estimated changes. The results are shown in Table 9. In column (i) (resp. (iv)), I simulate a merger with divestiture using the observed changes in costs for the lower bound (resp. upper bound) of the upstream bargaining weights. In column (ii) (resp. (v)), I simulate a merger with divestiture using the observed changes in bargaining weights for the lower bound (resp. upper bound) of the upstream bargaining weights. In column (iii) (resp. (vi)), I simulate a merger with divestiture using the observed changes in costs and bargaining weights for the lower bound (resp. upper bound) of the upstream bargaining weights.

The results reveal that the model correctly predicts the observed price effects only when both changes in costs and bargaining weights are allowed. Assuming a divestiture including only cost changes (column (i) and (iv)) wrongly predicts that the prices of all divested brands would decrease and the prices of the products owned by the merged firms would have increased. By contrast, simulating a divestiture including only changes in upstream bargaining weights correctly predicts the changes in prices for which a statistically significant effect is observed (Dry Idea, Soft & Dry and the merged firms) but wrongly predicts a price increase for Right Guard. Indeed, the prices of Dry Idea are predicted to increase by about 1.90% to 3.54%. The prices of Soft & Dri are expected to decrease by about 2.66% to 2.81%. Moreover, recall from Section 1 that I do not find evidences of significant price changes for Right Guard but prices slightly tend to decrease. Finally, once a divestiture is simulated including both changes in costs and bargaining weights all model-based price predictions are in line with the observed effects presented in Section 1. The prices of Dry Idea are predicted to increase; the prices of Soft & Dri; Right Guard and the products owned by the merged firms are predicted to decrease. Interestingly, consumer surplus is expected to increase by about 1.32% to 1.57%. In the appendix J, I also show that a merger without divestiture could have had a positive effect on consumers because the merger caused their bargaining weights to fall, which is a pro-competitive effect. This is the case for upstream bargaining weights that are low enough. I then seek to understand the extent to which this depends on the choice of brands divested.

Table 9. Price Effects with Changes in Costs and Bargaining Weights

	Lower Bound			Upper Bound		
	Costs	Bargaining	Costs +Bargaining	Costs	Bargaining	Costs +Bargaining
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Change in Prices (%)						
Divested Brands						
Dry Idea	-1.20 (0.86)	1.90 (0.28)	1.25 (0.33)	-1.50 (2.17)	3.54 (0.45)	2.71 (0.69)
Soft & Dri	-2.60 (1.22)	-2.81 (0.93)	-4.69 (0.51)	-2.75 (2.01)	-2.66 (1.35)	-4.59 (1.62)
Right Guard	-5.37 (0.89)	1.40 (0.35)	-2.31 (0.85)	-5.67 (1.45)	1.35 (0.42)	-2.24 (1.19)
Merged Firms	-2.66 (2.15)	-3.22 (1.39)	-5.72 (1.23)	-2.25 (2.79)	-2.40 (2.05)	-4.68 (2.15)
Rivals	-0.40 (1.34)	-0.44 (0.41)	-0.61 (0.54)	-0.50 (2.14)	-0.54 (0.46)	-0.77 (0.56)
ΔCS (%)	1.0170	0.9460	1.5794	0.8663	0.7866	1.3257

Notes: The table reports the average percentage changes in prices and consumer surplus for different scenarios. The simulations are based on the demand estimates presented in Table 2, cost estimates presented in Table 3 and changes in upstream bargaining weights presented in Table 7. Pre-merger data for September 2005 are used for the simulations. Standard deviations in parenthesis relate to variation across geographic markets and products. 'Lower bound' (resp. 'Upper bound') refers to bound on upstream bargaining weights. Details on the computation of the change in consumer surplus are provided in appendix K.

6.5 Choice of the Divested Brands: A Smaller Divestiture Package Does Not Always Mitigate Adverse Post-Merger Outcomes

Friberg and Romahn (2015) find that "*the competition authority's most effective means to dampen adverse post-merger outcomes are to aim for a small recipient firm and attain a large number of divested products*" in horizontal market. In this section, I study whether the recommendation to divest a large number of divested products holds in vertical markets in order to complement their results. Precisely, I examine whether a smaller divestiture package including less brands would have let consumer better off using counterfactual simulations. I simulate a merger with three smaller counterfactual divestiture packages. I compute the effect on the upstream bargaining weights and prices.

Counterfactual bargaining weights Recall from Table 7 that after the divestiture the bargaining weights of the merged firms decreased. The bargaining weights of Dry Idea and Right Guard increase whereas the ones of Soft & Dry slightly decrease.

In Table 10, I show the computed upstream weights for the three counterfactual packages. I show the results for a divestiture that would exclude from the actual package either Dry Idea (column (i)), Soft & Dri (column (ii)) or Right Guard (column (iii)). Not including Dry Idea (resp. Right Guard) in the divestiture package would have decreased its upstream bargaining weight by about 10.79 to 3.84% (11.22 to 4.91%). Removing Soft & Dry from the divestiture package would have decrease its upstream bargaining weights more than the actual small decrease. It would have decreased by about 4.30 to 9.75% whereas it actually decreased by about 1.7 to 4.1%.

Table 10. Choices of the Brands: Change in Upstream Bargaining Weights

	(i) Right Guard + Soft & Dri		(ii) Right Guard + Dry Idea		(iii) Soft & Dri Dry Idea	
	Bound					
	Lower	Upper	Lower	Upper	Lower	Upper
Change in Upstream Bargaining Power (%)						
Divested Brands						
Dry Idea	-10.79	-3.84	5.25	2.83	5.25	2.83
Soft & Dri	-4.10	-1.70	-9.75	-4.30	-4.10	-1.70
Right Guard	9.26	5.16	9.26	5.16	-11.22	-4.91
Merged Firms	-10.84	-4.74	-10.84	-4.74	-10.84	-4.74

Notes: This Table shows average changes in upstream bargaining weights for the lower and upper bounds in three counterfactual scenarios. In scenario (i) Dry Idea is removed from the divestiture package. In scenario (ii) Soft & Dry is removed from the divestiture package. In scenario (iii) Right Guard is removed from the divestiture package.

Price effects Without simulations, it is difficult to predict price effects. In fact, prices are the result of a trade-off. On the one hand, the brand remaining in the product portfolio of the merged firms leads to relatively higher disagreement payoffs, which push prices up. On the other hand, the merger reduces bargaining weights, which pushes prices down. Which of these two forces dominates is an empirical question that I now address. In Table 11, I show the price effects for the three counterfactual packages. Column (i) shows the results of the divestiture of Right Guard and Soft & Dri, column (ii) corresponds to the divestiture of Right Guard and Dry Idea and column (iii) displays the results for the divestiture of Soft & Dri and Dry Idea. The results show divestiture package (i) excluding Dry Idea would have increased consumer surplus by about 1.24 to 1.64%. By contrast, in Section 6.4, I evaluate that the actual divestiture likely increased consumer surplus by about 1.32 to 1.57%. Therefore, a smaller divestiture without Dry Idea would have likely deliver equal or more welfare to consumers. Note also that this result provides a somewhat conservative view of the potential problem. In fact, in several merger cases, the acquirer already owns some brands, making the anti competitive effects of the divestiture larger and thus making it even more likely that a smaller divestiture package will leave consumers better off.[71] Interestingly, in this setting all smaller divestiture packages would have benefited consumers. This raises the question of the extent to which the divestiture was necessary. I develop an approach to address this question formally in next section.

[71] To formally support this point, in Appendix L I show the results of a similar exercise for an alternative buyer.

Table 11. Counterfactual Choices of the Brands

	(i) Right Guard + Soft & Dri		(ii) Right Guard + Dry Idea		(iii) Soft & Dri Dry Idea	
	Bound					
	Lower	Upper	Lower	Upper	Lower	Upper
Change in Prices (%)						
Divested Brands						
Dry Idea	-2.87 (0.89)	2.16 (3.17)	0.476 (0.33)	1.32 (0.61)	1.23 (0.35)	2.82 (0.68)
Soft & Dri	-5.42 (0.81)	-5.52 (1.44)	-1.90 (1.57)	1.85 (4.08)	-5.05 (0.62)	-5.05 (1.55)
Right Guard	-2.16 (0.88)	-2.26 (1.19)	-2.19 (0.87)	-2.31 (1.17)	-0.46 (2.56)	2.38 (3.19)
Merged Firms	-5.44 (1.08)	-4.09 (1.97)	-5.35 (1.08)	-3.95 (1.93)	-2.87 (3.75)	-0.59 (5.45)
Rivals	-0.61 (0.53)	-0.71 (0.53)	-0.54 6 (0.49)	-0.60 (0.50)	-0.47 (0.49)	-0.40 (0.68)
ΔCS (%)	1.6475	1.2491	1.3750	0.8934	0.9868	0.3529

Notes: The table reports the average percentage changes in prices and consumer surplus for different scenarios. The simulations are based on the demand estimates presented in Table 2, cost estimates presented in Table 3 and changes in upstream bargaining weights presented in Table 10. Pre-merger data for September 2005 are used for the simulations. Standard deviations in parenthesis relate to variation across geographic markets and products. Details on the computation of the change in consumer surplus are provided in appendix K.

6.6 New Measure

Various studies in the literature on mergers in horizontal market compute the efficiency gains such that prices are unaffected by the merger (e.g., Nocke and Whinston (2022)).[72] In vertical markets, downstream bargaining power is an additional force constraining the exercise of upstream market power. My approach allows to compute the change in downstream bargaining power such that prices are unaffected after the merger as function of cost efficiencies.[73][74] This measure can be used in merger cases to complement the traditional efficiency arguments. Table 12 shows the average changes in downstream bargaining power needed to keep merger prices unchanged as a function of different efficiencies in percentage for both the lower and upper bounds of costs, using pre merger data. Formally, this measure complements the early work of Froeb and Werden (1998) who derive the cost efficiency necessary to restore pre-merger prices in a model of Cournot or more recently Nocke and Whinston (2022) in a model of Bertrand competition. Empirically, a striking results is that even with large cost efficiencies equal to 5% in this model an extra pro competitive force is needed to let prices unaffected: an increase in downstream bargaining power. In rows labeled 'merger', column (vi), it is shown that with 5% cost efficiencies between 7.43 to 14.5% of change in upstream bargaining power is needed to let

[72] See. page 20, Corollary 5. (i) in Nocke and Whinston (2022).
[73] See. Appendix M for analytical details.
[74] Note that here I no longer refer to $1 - \lambda$ but λ.

prices unaffected by the merged. Another interesting exercise is to quantify the extent to which divestiture may lower these numbers.

In rows labeled 'merger & divestiture', I compute the average change in downstream bargaining power needed to let prices of the merger unchanged when the actual divestiture is also applied. It is shown that for cost efficiencies of 5%, even if the merger would have led to anticompetitive effects in the form of a small increase in bargaining power, consumers could have been unaffected by the merger with divestiture.

Table 12. Minimum required $\Delta\lambda$

	$\bar{\Delta}\lambda$ (%)					
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Cost efficiency	0%	1%	2%	3%	4%	5%
$\lambda(mc^R_{PL,mt} + mc^M_{PL,mt})$						
Merger	18.5	17.7	16.9	16.1	15.3	14.5
Merger & Divestiture	2.76	2.08	1.41	0.757	0.112	-0.524
$\lambda(min\{p_{jmt} - \gamma_{jmt}, ..., p_{Jmt} - \gamma_{Jmt}\})$						
Merger	14.6	13.1	11.6	10.2	8.78	7.43
Merger & Divestiture	2.27	0.90	-0.44	-1.74	-2.99	-4.20

Notes: This table reports the average percentage change in downstream bargaining power such that prices are unaffected by the merger without divestiture (rows 'merger') or the merger with divestiture (rows 'merger & divestiture') for the lower and upper bounds on costs. The lower bound on costs is computed as the costs of private labels for all products. The upper bound on costs is computed as $min\{p_{jmt}-\gamma_{jmt}, ..., p_{Jmt}-\gamma_{Jmt}\} \quad \forall j \in \Psi_{mt}$. Pre-merger data for September 2005 are used for computations. In column (i), (ii), (iii), (iv) and (v) efficiency gains ranging from 0 to 5 % are assumed.

7 Conclusion

Existing research on mergers and divestitures in vertical markets has focused on using (i) firm-specific upstream bargaining weights that are (ii) unaffected by changes in ownership to explain the price effects of mergers and divestitures.

First, I extend a workhorse Nash bargaining model by adding bargaining weights that are endogenous to ownership changes. I then introduce a novel empirical framework that allows to quantify bargaining power, as embodied in bargaining weights, for all brands and time periods available in my sample. The approach uses cost restrictions implied by a Nash bargaining model to derive bounds on product-level bargaining weights. A key comparative advantage of this approach is to be easily implementable by competition authorities. Indeed, the bounds depends on variables already computed in most merger cases where standard merger simulation is implemented. Next, a structural error term is derived from the model to identify changes in bargaining weights using valid instruments. I find that ignoring the correlation between mergers and divestitures with unobserved bargaining shocks leads to estimates that are biased upward.

Using this framework, I show that there is large heterogeneity across brands in the distribution of bargaining weights and within the portfolio of manufacturers. This suggests that the relevant level of analysis for bargaining power is the brand level rather than the firm level. Next, I find that these weights are affected by merger and divestiture. I use the change in brand ownership caused by the landmark merger between Procter & Gamble and Gillette (2005), which was approved conditional on a divestiture in the U.S. deodorant market, to quantify the extent to which merger and divestiture affect bargaining power. I use the estimated model to simulate upstream bargaining weights in the absence of a merger. Relative to this benchmark, I find that, on average, the upstream bargaining power associated with the divested brands increased and the upstream bargaining power of the merged firms decreased.

Last, I examine the policy implications. I show that standard Nash-Bertrand models as well as Nash-bargaining models with fixed bargaining weights fail to predict an increase in the price of a divested brand. By contrast, my approach with bargaining weights affected by the merger and divestiture can explain the observed pattern of prices. Importantly, I find that divestitures are likely to deliver anti-competitive effects because it is profitable for the merged firms to select a divestiture package so that the prices of the divested brands increase. I also use the estimated model to simulate the effects of counterfactual divestiture packages on consumer surplus. Contrary to what existing policy recommendations suggest, a smaller divestiture package could have been consumer welfare-enhancing. Overall, my results highlight instances that support an alternative viewpoint on the fact that antitrust authorities may have been too lax: divestiture policies may have been ineffective.

Appendix to "Unveiling Bargaining Impact of Mergers and Divestitures"

A Simple Approach for Policymakers to Quantify Bargaining Power

A by-product of the method presented in this article is a simple way for policymakers to quantify bargaining power, which I present in this appendix.

Starting from equation (13), one can use that costs $(mc^R_{mt} + mc^M_{mt}) \in [0, p_{mt} - \gamma_{mt}(p_{mt})]$ and re-write $(mc^R_{mt} + mc^M_{mt}) = \kappa(p_{mt} - \gamma_{mt})$ with $\kappa \in [0,1]$. Solving for λ_{mt} in equation (13) and using $mc^R_{mt} + mc^M_{mt} = \kappa(p_{mt} - \gamma_{mt})$ one obtain the following equation for each retailer bargaining weight:

$$\lambda_{jmt} = \frac{A_{jmt}(p_{mt})}{A_{jmt}(p_{mt}) + (1-\kappa)(p_{jmt} - \gamma_{jmt}(p_{mt}))}. \tag{35}$$

Notice that except the parameter κ this equation depends only on elements that are often already computed in merger cases such as a demand function and Bertrand markups. The parameter κ can be set based on industry knowledge and allow to compute easily a value for the bargaining weights.

B Descriptive Statistics

Table 13. Deodorant Market - Market Shares Pre- and Post-Merger/Divestiture Period By Brand

		Pre		Post	
Manufacturer	Brand	Mean	S.D	Mean	S.D
Gillette	Gillette	4.05	0.78	3.81	0.73
	Soft & Dri	2.88	0.57		
	Dry Idea	2.68	0.35		
	Right Guard	11.69	1.65		
Procter & Gamble	Old Spice	11.27	2.21	12.46	1.81
	Secret	14.46	1.39	14.07	1.46
Henkel	Soft & Dri			2.84	1.41
	Dry Idea			2.45	0.32
	Right Guard			9.63	1.09
Unilever	Degree	6.62	0.79	8.34	0.95
	Dove	6.32	1.53	7.46	0.45
	Suave	2.69	0.37	2.64	0.31
	Axe	1.54	0.81	2.89	0.49
Colgate	Mennem Women	5.52	1.40	5.18	2.21
	Mennen Men	11.96	1.41	11.95	1.43
Church & Dwight	Arm & Hammer	3.02	0.94	2.82	0.58
	Arrid	5.22	1.10	4.71	0.86
Revlon	Mitchum Women	1.72	0.38	1.58	0.27
	Mitchum Men	3.33	0.67	3.01	0.56
	Ban	4.82	1.12	4.00	0.79
	Private Label	0.19	0.08	0.07	0.03

Note: The table reports the average (across regions and time periods) market shares before the merger and after the divestiture for the deodorant data.

Table 14. Summary Statistics - EU Merger Control Database

Variable	Obs	Mean	SD	Min	Max
ph2rem	37852	0.058	0.132	0	0.497
ph2clear	37852	0.009	0.032	0	0.155
remedies	37852	0.257	0.219	0	0.780
vertical	37852	0.247	0.139	0.007	0.592
distancehq	37852	1423.151	1906.314	0	6755

Notes: The table reports summary statistics for variables created from the EU Merger Control Database for the period 2004-2006. 'ph2rem' is the average number of mergers cleared in phase II conditional on remedies, 'ph2clear' the average number of mergers cleared unconditionally, 'remedies' the average number of time the parties proposed remedies to solve competition concerns, 'vertical' is the average number of merger for which the EU antitrust authority raised vertical concern. 'distancehq' is the distance from the headquarter in miles computed from the website `airmilescalculator`. Private labels excluded from sample.

C Event Studies: Estimates

Panel 1.1

Table 15. Estimates - Lead - δ_1

Lead	Lower Bound	Estimates	Upper Bound
1	0	0	0
2	-0.039	-0.013	0.011
3	-0.022	0.010	0.043
4	-0.051	-0.012	0.026
5	-0.001	0.039	0.081
6	-0.026	0.020	0.068
7	-0.044	0.008	0.060
8	-0.030	0.028	0.086
9	-0.065	0.000	0.067
10	-0.057	0.003	0.064
11	-0.062	-0.006	0.049
12	-0.061	0.001	0.064
13	-0.094	-0.021	0.050
14	-0.080	-0.008	0.064

Table 16. Estimates - Lag - δ_1

Lag	Lower Bound	Estimates	Upper Bound
0	-0.064	-0.023	0.018
1	-0.099	-0.053	-0.006
2	-0.081	-0.030	0.019
3	-0.089	-0.044	-0.000
4	-0.077	-0.037	0.003
5	-0.060	-0.018	0.023
6	-0.088	-0.043	0.002
7	-0.107	-0.055	-0.003
8	-0.119	-0.063	-0.006
9	-0.117	-0.069	-0.0211
10	-0.125	-0.072	-0.019
11	-0.127	-0.075	-0.023
12	-0.138	-0.084	-0.030
13	-0.131	-0.075	-0.020
14	-0.125	-0.067	-0.009

Panel 1.2

Table 17. Estimates - Lead - δ_2

Lead	Lower Bound	Estimates	Upper Bound
1	0	0	0
2	-0.009	0.000	0.010
3	-0.013	0.010	0.034
4	-0.013	0.009	0.033
5	-0.015	0.009	0.034
6	-0.009	0.006	0.022
7	-0.003	0.014	0.031
8	-0.017	0.004	0.026
9	-0.013	0.005	0.023
10	-0.015	0.006	0.027
11	-0.024	-0.003	0.017
12	-0.028	-0.006	0.015
13	-0.029	-0.008	0.012
14	-0.038	-0.009	0.020

Table 18. Estimates - Lag - δ_2

Lag	Lower Bound	Estimates	Upper Bound
0	-0.005	0.004	0.014
1	-0.027	-0.010	0.005
2	-0.032	-0.014	0.004
3	-0.031	-0.012	0.006
4	-0.026	-0.004	0.016
5	-0.020	-0.000	0.019
6	-0.026	0.024	0.075
7	0.025	0.073	0.120
8	0.020	0.067	0.115
9	0.012	0.056	0.101
10	0.025	0.074	0.124
11	0.020	0.069	0.119
12	0.013	0.066	0.118
13	0.011	0.060	0.109
14	0.010	0.060	0.110

Panel 1.3

Table 19. Estimates - Lead - δ_3

Lead	Lower Bound	Estimates	Upper Bound
1	0	0	0
2	-0.019	-0.004	0.010
3	-0.008	0.006	0.021
4	-0.021	-0.004	0.012
5	-0.017	0.003	0.024
6	-0.020	0.004	0.028
7	-0.034	-0.006	0.021
8	-0.041	-0.013	0.014
9	-0.035	-0.006	0.022
10	-0.038	-0.010	0.017
11	-0.041	-0.012	0.015
12	-0.039	-0.012	0.014
13	-0.046	-0.018	0.008
14	-0.052	-0.021	0.009

Table 20. Estimates - Lag - δ_3

Lag	Lower Bound	Estimates	Upper Bound
0	-0.017	0.003	0.024
1	-0.025	-0.003	0.017
2	-0.019	0.000	0.021
3	-0.023	-0.001	0.019
4	-0.025	-0.003	0.018
5	-0.023	-0.002	0.018
6	-0.026	-0.001	0.023
7	-0.032	-0.005	0.021
8	-0.024	0.001	0.027
9	-0.040	-0.013	0.0139
10	-0.044	-0.008	0.027
11	-0.032	-0.001	0.029
12	-0.041	-0.012	0.016
13	-0.032	-0.007	0.017
14	-0.035	-0.006	0.022

Panel 1.4

Table 21. Estimates - Lead - δ_4

Lead	Lower Bound	Estimates	Upper Bound
1	0	0	0
2	0.000	0.010	0.020
3	-0.006	0.005	0.017
4	0.004	0.017	0.030
5	-0.002	0.010	0.023
6	-0.011	0.002	0.017
7	-0.002	0.0140	0.030
8	-0.011	0.006	0.024
9	-0.020	-0.002	0.015
10	-0.021	-0.002	0.017
11	-0.020	-0.002	0.015
12	-0.020	-0.001	0.016
13	-0.027	-0.008	0.011
14	-0.028	-0.005	0.016

Table 22. Estimates - Lag - δ_4

Lag	Lower Bound	Estimates	Upper Bound
0	-0.015	-0.002	0.010
1	-0.010	0.003	0.017
2	-0.019	-0.004	0.010
3	-0.020	-0.006	0.008
4	-0.020	-0.005	0.010
5	-0.033	-0.014	0.003
6	-0.029	-0.007	0.015
7	-0.056	-0.033	-0.010
8	-0.052	-0.029	-0.005
9	-0.039	-0.016	0.006
10	-0.040	-0.013	0.013
11	-0.044	-0.017	0.009
12	-0.043	-0.016	0.011
13	-0.037	-0.014	0.009
14	-0.045	-0.019	0.007

D Demand Results

Table 23. First Stage Regression Nested-Logit

	$log(s_{jmt\|g})$
PG_{Post}	0.107 (0.033)
DIV_{Post}	-0.100 (0.050)
# Rivals' product female	0.002 (0.001)
# Rivals' product male	0.002 (0.002)
BLP	-0.009 (.001)
# products female by manufacturer	-0.000 (.001)
# products male by manufacturer	0.003 (.002)
size	0.469 (0.043)
Brand-form-size FE	✓
Retailer FE	✓
Geographic FE	✓
Period FE	✓
N	38150
F-Test of excluded instruments	17.36

Robust standard errors in parentheses

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 24. First Stage Regression Nested-Logit

	Price
PG_{Post}	-0.035 (.010)
DIV_{Post}	0.084 (.015)
# Rivals' product female	-0.001 (.000)
# Rivals' product male	-0.002 (.000)
BLP	-0.000 (.000)
# products female by manufacturer	-0.000 (.000)
# products male by manufacturer	-0.002 (.000)
Size	0.311 (.015)
Brand-form-size FE	✓
Retailer FE	✓
Geographic FE	✓
Period FE	✓
N	38150
F-Test of excluded instruments	10.50

Robust standard errors in parentheses

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 25. Brand-form-size dummies

Variable	Mean
Brand-form-size dummies	
Brand-form-size 1	-0.131 (0.007)
Brand-form-size 2	-0.169 (0.008)
Brand-form-size 3	-0.798 (0.043)
Brand-form-size 4	0.050 (0.002)
Brand-form-size 5	-0.212 (0.021)
Brand-form-size 6	-0.448 (0.013)
Brand-form-size 7	-1.509 (0.060)
Brand-form-size 8	0.108 (0.007)
Brand-form-size 9	0.071 (0.005)
Brand-form-size 10	-1.497 (0.040)
Brand-form-size 11	-0.173 (0.008)
Brand-form-size 12	-1.267 (0.060)
Brand-form-size 13	-0.797 (0.025)
Brand-form-size 14	-0.363 (0.021)
Brand-form-size 15	0.447 (0.025)
Brand-form-size 16	-1.102 (0.051)
Brand-form-size 17	-0.049 (0.015)
Brand-form-size 18	0.586 (0.020)
Brand-form-size 19	-0.473 (0.021)
Brand-form-size 20	-0.433 (0.038)
Brand-form-size 21	-0.382 (0.020)
Brand-form-size 22	0.325 (0.018)
Brand-form-size 23	0.052 (0.010)
Brand-form-size 24	0.758 (0.028)
Brand-form-size 25	-0.466 (0.033)
Brand-form-size 26	-0.286 (0.032)
Brand-form-size 27	-0.395 (0.037)
Brand-form-size 28	-0.382 (0.023)
Brand-form-size 29	0.009 (0.012)
Brand-form-size 30	0.570 (0.017)
Brand-form-size 31	-0.312 (0.034)
Brand-form-size 32	-0.621 (0.032)
Brand-form-size 33	0.289 (0.013)
Brand-form-size 34	0.115 (0.008)
Brand-form-size 35	0.519 (0.014)
Brand-form-size 36	-0.176 (0.064)
Brand-form-size 37	-0.665 (0.056)
Brand-form-size 38	-0.759 (0.054)
Brand-form-size 39	-0.280 (0.043)
Brand-form-size 40	-0.251 (0.031)
Brand-form-size 41	-0.145 (0.021)
Brand-form-size 42	-0.072 (0.037)
Brand-form-size 43	0.480 (0.060)
Brand-form-size 44	-0.045 (0.015)

Robust standard error in parentheses.

Variable	Mean
Brand-form-size dummies	
Brand-form-size 45	-0.686 (0.049)
Brand-form-size 46	-0.047 (0.017)
Brand-form-size 47	0.321 (0.006)
Brand-form-size 48	-0.411 (0.025)
Brand-form-size 49	0.025 (0.003)
Brand-form-size 50	-1.093 (0.054)
Brand-form-size 51	-1.047 (0.055)
Brand-form-size 52	-0.116 (0.009)
Brand-form-size 53	0.314 (0.019)
Brand-form-size 54	-1.079 (0.054)
Brand-form-size 55	-1.094 (0.041)
Brand-form-size 56	0.127 (0.006)
Brand-form-size 57	0.678 (0.039)
Brand-form-size 58	0.163 (0.006)
Brand-form-size 59	-0.437 (0.020)
Brand-form-size 60	0.102 (0.012)
Brand-form-size 61	0.069 (0.007)
Brand-form-size 62	-0.777 (0.057)
Brand-form-size 63	-0.375 (0.033)
Brand-form-size 64	-0.100 (0.020)
Brand-form-size 65	-0.193 (0.049)
Brand-form-size 66	0.2700 (0.001)
Brand-form-size 67	-0.033 (0.015)
Brand-form-size 68	-0.437 (0.050)
Brand-form-size 69	-0.216 (0.013)
Brand-form-size 70	0.148 (0.011)
Brand-form-size 71	-0.615 (0.041)
Brand-form-size 72	0.278 (0.003)
Brand-form-size 73	0.443 (0.013)
Brand-form-size 74	-0.611 (0.037)
Brand-form-size 75	0.271 (0.013)
Brand-form-size 76	0.272 (0.012)
Brand-form-size 77	0.137 (0.015)
Brand-form-size 78	0.327 (0.021)
Brand-form-size 79	-0.759 (0.035)
Brand-form-size 80	0.210 (0.016)
Brand-form-size 81	0.154 (0.053)
Brand-form-size 82	0.210 (0.014)
Brand-form-size 83	0.050 (0.044)
Brand-form-size 84	-2.149 (0.125)
Brand-form-size 85	-0.510 (0.035)
Brand-form-size 86	0.016 (0.011)
Brand-form-size 87	0.224 (0.003)
Brand-form-size 88	0.572 (0.064)
Brand-form-size 89	0.082 (0.008)

Table 27. Retailer, Geographic market and period dummies

Variable	Mean
Retailer dummies	
Retailer 1	-
Retailer 2	-0.043 (0.015)
Retailer 3	0.011 (0.007)
Retailer 4	0.136 (0.019)
Retailer 5	-0.366 (0.018)
Retailer 6	-0.176 (0.008)
Retailer 7	-0.316 (0.010)
Retailer 8	-0.333 (0.014)
Retailer 9	-0.191 (0.009)
Retailer 10	0.048 (0.007)
Retailer 11	-0.334 (0.014)
Retailer 12	0.180 (0.020)
Retailer 13	-0.197 (0.126)
Geographic market dummies	
Geographic market 1	-
Geographic market 2	-0.342 (0.075)
Geographic market 3	-0.243 (0.078)

Robust standard error in parentheses.

Variable	Mean
Period dummies	
Period 1	-
Period 2	-0.017 (0.009)
Period 3	0.012 (0.034)
Period 4	-0.019 (0.004)
Period 5	-0.076 (0.011)
Period 6	-0.028 (0.020)
Period 7	-0.013 (0.006)
Period 8	-0.028 (0.044)
Period 9	-0.023 (0.004)
Period 10	-0.035 (0.024)
Period 11	-0.010 (0.035)
Period 12	-0.045 (0.018)
Period 13	0.002 (0.062)
Period 14	-0.046 (0.031)
Period 15	-0.043 (0.021)
Period 16	-0.020 (0.043)
Period 17	-0.011 (0.060)
Period 18	-0.031 (0.028)
Period 19	-0.006 (0.055)
Period 20	-0.062 (0.019)
Period 21	-0.033 (0.059)
Period 22	-0.036 (0.062)
Period 23	-0.045 (0.057)
Period 24	-0.040 (0.032)
Period 25	-0.051 (0.024)
Period 26	-0.071 (0.009)
Period 27	-0.055 (0.035)
Period 28	-0.065 (0.060)
Period 29	-0.084 (0.030)
Period 30	-0.061 (0.036)
Period 31	-0.054 (0.011)
Period 32	-0.071 (0.021)
Period 33	-0.027 (0.070)
Period 34	-0.031 (0.059)
Period 35	-0.036 (0.041)
Period 36	-0.051 (0.052)

The formulas to compute the own and cross-price elasticity of the random coefficient nested logit, omitting the subscripts m and t, are as follows. The own-price elasticity is given by:

$$\frac{\partial S_j}{\partial p_j}\frac{p_j}{s_j} = -\frac{p_j}{s_j}\int \alpha_i(\frac{1}{1-\rho} - \frac{\rho}{1-\rho}s_{ij|g} - s_{ij})s_{ij}f(v)dv. \tag{36}$$

The cross-price elasticity of products in the same nest is:

$$\frac{\partial S_j}{\partial p_j}\frac{p_j}{s_k} = -\frac{p_j}{s_k}\int \alpha_i(\frac{\rho}{1-\rho}s_{ij|g} + s_{ij})s_{ik}f(v)dv. \tag{37}$$

The cross-price elasticity of products in different nest is:

$$\frac{\partial S_j}{\partial p_j}\frac{p_j}{s_k} = -\frac{p_j}{s_k}\int \alpha_i s_{ij}s_{ik}f(v)dv. \tag{38}$$

Table 29. Comparison Own-Price Elasticity with other studies

	Range Average Own-Price Elasticity
NL	-4.122
RCNL	-4.917
Sara Lee/Unilever (Case COMP/M.5658, 2010)	
Belgium	[-2.9; -2.2]
Netherlands	[-4.8; -2.1]
Spain	[-9.1; -3.4]
UK	[-3.5; -1.2]

E Lower Bounds for Costs

In the U.S. deodorant market from 2004 to 2006, there is a limited number of private labels. In particular, I do not observe private labels in the forms Gel and Stick. Therefore, I need to impute these costs. To do this, I assume that the width of the cost interval in forms in which private labels are unobserved is equal to the weighted average width of the cost intervals in which costs are observed.

F Costs: Comparison with Alternative Approach

An alternative approach is to estimate some bargaining weights using equation (13) to creates moment conditions. Assume that total marginal costs are as follows:

$$mc^R_{jmt} + mc^M_{jmt} = X_{jmt}\kappa + \eta_{jmt} \tag{39}$$

where η_{jmt} is an unobservable costs shock, X_{jmt} is the row jmt of a matrix X containing a constant, a dummy for each manufacturer-form-size-t combinations.
Recall that the retailer first order condition is given by:

$$p_{jmt} - \gamma_{jmt} = \Gamma_{jmt}(\lambda_{jmt}, p_{jmt}) + mc^R_{jmt} + mc^M_{jmt} \tag{40}$$

Plugging (3) in equation (40), one obtain:

$$p_{jmt} - \gamma_{jmt} = \Gamma_{jmt}(\lambda_{jmt}, p_{jmt}) + X_{jmt}\kappa + \eta_{jmt}. \tag{41}$$

It is likely that manufacturers and retailers observe the realisation of η_{jmt} when they set prices such that $\Gamma_{jmt}(\lambda_{jmt})$ is correlated with η_{jmt}. Therefore, one needs instruments satisfying $E[z'\eta(\theta^s)] = 0$ to disentangle the price variation caused by variation in cost from the one due to variation in markup. The number of instruments available limits the number of bargaining weight that one can estimate. I use three instruments. I use an indicator variable equal to 1 for (i) the divested products and (ii) products of the merged firms in the post-merger period. I use the number of products owned by rivals manufacturer (BLP-type) instruments. These instruments are relevant as they influence upstream markups. They are assumed to be orthogonal to the unobserved cost shocks. Constrained by these number of instruments, I estimate three upstream bargaining weights: one for the merged firms, one for the buyer of the divested brands and rivals. Next, one can define a structural error term as follows:

$$\eta_{jmt} = p_{jmt} - \gamma_{jmt} - \Gamma_{jmt}(\lambda_{jmt}, p_{jmt}) - X_{jmt}\kappa. \tag{42}$$

Denote $\theta^s = (\lambda, \kappa)$ such that θ^s is the vector of parameters minimizing the following Generalized Method of Moments objective function:

$$\underset{\theta^s}{argmin} \quad \eta(\theta^s)' Z W Z' \eta(\theta^s). \tag{43}$$

In total, I estimate 1724 parameters corresponding to the manufacturer-form-size-t combinations; a constant and 3 bargaining weights. The estimates are shown in Table 30.

Table 30. Supply Parameter Estimates

	Estimates
Bargaining weights (λ)	
Merger	0.345
Buyer Divested brand	0.313
Rivals	0.484
Cost Parameters	
Constant	✓
manufacturer-form-size-t dummies	✓
Observations	38150

Discussion

The estimation approach imposes some form of symmetry on the bargaining weights. The alternative approach I introduce in this article assumes some form of symmetry on the costs guided by the institutional setting. In the former, the estimated bargaining weights are not varying across time and geographic market. In the latter, the costs are symmetric for each firm-form-size combinations but may vary over time.

G Bargaining Ability Parameters with Brand Specific Effects

Table 31. Bargaining Ability Parameter Estimates with Brand-Specific Effects

Upstream Bargaining Power	LB	UB	LB	UB	LB	UB
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
$\mathbb{1}_{\text{Merger}}{}^{M}_{jmt}$	-0.10***	-0.089***	-0.24***	-0.14***		
	(0.021)	(0.012)	(0.023)	(0.012)		
$\mathbb{1}_{\text{Dry idea}}{}^{M}_{jmt}$	0.16*	0.13***	0.12+	0.11***		
	(0.068)	(0.035)	(0.062)	(0.032)		
$\mathbb{1}_{\text{Soft}}{}^{M}_{jmt}$	-0.098***	-0.059**	-0.10**	-0.057**		
	(0.029)	(0.018)	(0.033)	(0.020)		
$\mathbb{1}_{\text{Right}}{}^{M}_{jmt}$	0.22***	0.16***	0.20***	0.16***		
	(0.022)	(0.0091)	(0.023)	(0.0087)		
Controls	✓	✓	✓	✓		
Product FE	✓	✓	✓	✓	✓	✓
Period FE	✓	✓	✓	✓		
Region FE	✓	✓	✓	✓		
adj. R^2	0.76	0.84	0.76	0.84	0.75	0.83
N	37852	37852	37852	37852	37852	37852

Notes: The table reports the estimated bargaining ability parameters in equation (16) for the lower bound (LB) and upper bound (UB) of the upstream bargaining weight. There are 37852 observations for the period 2004 to 2006. Private labels are excluded from the sample. Specifications in column (i), (ii), (iii) and (iv) include products, region, period dummies (month) as well as dummies controlling for the announcement and the transitory periods. Columns (i) and (ii) are based on OLS. Columns (iii) and (iv) are based on GMM with excluded instruments. Standard errors clustered at the product level in parentheses. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

H Estimated Changes in Costs

In this appendix, I provide details on how I estimated the changes in costs in Table 7 and show standard errors.

I estimate a specification similar in spirit as previous approaches used to study changes in costs in merger analysis in horizontal market such as Bjornerstedt and Verboven (2016).[75] The difference is that I recover bounds on costs and estimate two equations. Precisely, I estimate the following specification for the upper and lower bounds on costs:

$$log(mc^R_{j,mt} + mc^M_{j,mt}) = K + \alpha_j + \mathbb{1}_{\text{Dry Idea}} \times \mathbb{1}_{\text{Post}} + \mathbb{1}_{\text{Soft \& Dry}} \times \mathbb{1}_{\text{Post}} + \mathbb{1}_{\text{Right Guard}} \times \mathbb{1}_{\text{Post}} + \mathbb{1}_{\text{Merger}} \times \mathbb{1}_{\text{Post}} + \epsilon_{jmt}, \quad (44)$$

where $mc^R_{j,mt} + mc^M_{j,mt}$ are either the lower or upper bounds on total costs from propositon 1. $\mathbb{1}_{\text{Dry Idea}} \times \mathbb{1}_{\text{Post}}$ is an indicator variable equal to 1 for the products of the brand Dry Idea in the post merger and divestiture period. $\mathbb{1}_{\text{Soft \& Dry}} \times \mathbb{1}_{\text{Post}}$ is an indicator variable equal to 1 for the products of the brand Soft & Dry in the post merger and divestiture period. $\mathbb{1}_{\text{Right Guard}} \times \mathbb{1}_{\text{Post}}$ is an indicator variable equal to 1 for the products of the brand Right Guard in the post merger and divestiture period. $\mathbb{1}_{\text{Merger}} \times \mathbb{1}_{\text{Post}}$ is an indicator variable equal to 1 for the products of the merged firms in the post merger and divestiture period.

[75] See. equation (12), page 154.

Table 32. Changes in Costs Estimates

Costs	Lower bound	Upper bound
	(i)	(ii)
$\mathbb{1}_{\text{Dry Idea}} \times \mathbb{1}_{\text{Post}}$	-0.025***	-0.012*
	(0.0062)	(0.0060)
$\mathbb{1}_{\text{Soft \& Dry}} \times \mathbb{1}_{\text{Post}}$	-0.048***	-0.035***
	(0.011)	(0.0073)
$\mathbb{1}_{\text{Right Guard}} \times \mathbb{1}_{\text{Post}}$	-0.083***	-0.066***
	(0.015)	(0.011)
$\mathbb{1}_{\text{Merger}} \times \mathbb{1}_{\text{Post}}$	-0.080***	-0.054***
	(0.017)	(0.012)
Product FE	✓	✓
N	37976	37976

Notes: The table reports the estimated changes in costs shown in Table (7). I use data for the full period 2004 to 2006. Private labels are included in the sample. Specifications include products dummies. Standard errors clustered at the product level in parentheses. + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

I Simulation Algorithm

In this appendix, I provide details on the simulation algorithm used in Section 6 to simulate the price effects of a merger and divestiture based on pre-merger data.

Combining equations 13 and 17, in a given market m, I obtain:

$$p_{mt} - \gamma_{mt}(p_{mt}) = \frac{1 - \lambda_{mt}(\mathbb{1}_{\text{Divestiture}}{}^{M}_{mt}, \mathbb{1}_{\text{Merger}}{}^{M}_{mt})}{\lambda_{mt}(\mathbb{1}_{\text{Divestiture}}{}^{M}_{mt}, \mathbb{1}_{\text{Merger}}{}^{M}_{mt})} A_{mt}(p_{mt}, I^M_{mt}) + mc^R_{mt} + mc^M_{mt}. \tag{45}$$

Denote $p_{m,pre}$ the vector of prices in the pre-merger period, $\lambda_{m,pre}$ the vector of bargaining weights in the pre-merger period, $\mathbb{1}_{\text{Divestiture}}{}^{M}_{mt}$ a vector containing indicator variables equal to 1 for divested products in the post-merger period and 0 otherwise, $\mathbb{1}_{\text{Merger}}{}^{M}_{mt}$ a vector containing indicator variables equal to 1 for products of the merged firms in the post-merger period and 0 otherwise, $I^M_{m,pre}$ (resp. $I^M_{m,post}$) the upstream ownership matrix in the pre-merger period (resp. post-merger and divestiture period) and $mc^R_{m,pre} + mc^M_{m,pre}$ the costs in the pre-merger period.

In Section 6.1, I study the price effects of a merger and divestiture with no changes in costs and bargaining weights. I change the upstream ownership matrix $I^M_{m,pre}$ to the new ownership matrix corresponding to either a merger with or without divestiture $I^M_{m,post}$ and solve the new vector of price $p_{m,post}$ from the following system of nonlinear equations in the month prior to the date of the merger:

$$p_{m,post} - \gamma_{mt}(p_{m,post}) = \frac{1-\lambda_{m,pre}}{\lambda_{m,pre}} A_{m,pre}(p_{m,post}, I^M_{m,post}) + mc^R_{m,pre} + mc^M_{m,pre}. \tag{46}$$

In Section 6.4, I study the price effects of a merger and divestiture with changes in costs and bargaining weights. I change the upstream ownership matrix $I^M_{m,pre}$ to the new ownership matrix corresponding to a merger with divestiture $I^M_{m,post}$; update the vector $\mathbb{1}_{\text{Merger}^M_{m,pre}}$ and $\mathbb{1}_{\text{Divestiture}^M_{m,pre}}$ to $\mathbb{1}_{\text{Merger}^M_{m,post}}$ and $\mathbb{1}_{\text{Divestiture}^M_{m,post}}$. Next, I solve for the new vector of bargaining weights in the month prior to the date of the merger using equation 17:

$$\lambda_{m,post} = \lambda_{m,pre}(\mathbb{1}_{\text{Divestiture}^M_{m,post}}, \mathbb{1}_{\text{Merger}^M_{m,post}}) \tag{47}$$

Last, I solve for the new vector of prices $p_{m,post}$ from the following system of nonlinear equations in the month prior to the date of the merger:

$$p_{m,post} - \gamma_{m,pre}(p_{m,post}) = \frac{1-\lambda_{m,post}}{\lambda_{m,post}} A_{m,pre}(p_{m,post}, I^M_{m,post}) + mc^R_{m,post} + mc^M_{m,post},$$

Where $mc^R_{m,post} + mc^M_{m,post}$ are computed as $mc^R_{m,post} + mc^M_{m,post} = (mc^R_{m,pre} + mc^M_{m,pre}) \times (1 + x_m)$ with x_m the change in costs shown in Table 7.

J Merger Without Divestiture

Table 33. Comparison Price Effects: Merger Without Divestiture

	Merger without divestiture	
	Lower Bound	Upper Bound
	(i)	(ii)
Change in Prices (%)		
Divested Brands		
Dry Idea	3.80 (1.23)	11.8 (4.41)
Soft & Dri	6.41 (3.60)	9.97 (6.13)
Right Guard	5.52 (3.96)	8.16 (4.51)
Merged Firms	-2.48 (2.90)	-0.268 (4.28)
Rivals	-0.239 (0.36)	0.0163 (0.56)
ΔCS (%)	0.0635	-0.7815

Notes: The table reports the average percentage changes in prices and consumer surplus for a merger without divestiture. The simulations are based on the RCNL demand estimates presented in Table 2 and supply estimates presented in Table 3 and 4. Pre-merger data for September 2005 are used as in Bjornerstedt and Verboven (2016). Standard deviations in parenthesis relate to variation across geographic markets and products. 'Lower bound' (resp. 'Upper bound') refers to bound on upstream bargaining weights.

K Consumer Surplus

The individual consumer surplus in a given market mt is computed based on the 'log-sum' formula provided by Anderson et al. (1992):

$$CS_i = \frac{1}{\alpha_i} log(1 + \sum_{g=1}^{G} (\sum_{j \in g} exp(\frac{\delta_j(p_j) + \mu_{ij}(p_j)}{1-\sigma}))^{1-\sigma}), \tag{48}$$

The consumer surplus is thus the individual consumer surplus integrated over the idiosyncratic shocks:

$$CS = \int \frac{1}{\alpha_i} log(1 + \sum_{g=1}^{G} (\sum_{j \in g} exp(\frac{\delta_j(p_j) + \mu_{ij}(p_j)}{1-\sigma}))^{1-\sigma}) f(v) dv. \tag{49}$$

Denote p_j^{pre} (resp. $p_j^{\star}$) the price of product j in the no merger scenario (resp. in a counterfactual scenario) such as:

$$CS^{\star} = \int \frac{1}{\alpha_i} log(1 + \sum_{g=1}^{G} (\sum_{j \in g} exp(\frac{\delta_j(p_j^{\star}) + \mu_{ij}(p_j^{\star})}{1-\sigma}))^{1-\sigma}) f(v) dv. \tag{50}$$

$$CS^{pre} = \int \frac{1}{\alpha_i} log(1 + \sum_{g=1}^{G} (\sum_{j \in g} exp(\frac{\delta_j(p_j^{pre}) + \mu_{ij}(p_j^{pre})}{1-\sigma}))^{1-\sigma}) f(v) dv. \tag{51}$$

In all tables I report the average (across markets) of the percentage change in consumer surplus where the change in consumer surplus is $CS^{\star} - CS^{pre}$.

L Counterfactual Choices of the Brands: Alternative Buyer

Table 34. Comparison Price Effects: Divestiture to Colgate

	Actual package		**Without Dry Idea**	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
	(i)	(ii)	(iii)	(iv)
Change in Prices (%)				
Divested Brands				
Dry Idea	3.51 (0.62)	7.09 (1.67)	-8.27 (0.46)	-10.0 (0.57)
Soft & Dri	-2.30 (0.42)	-1.29 (2.44)	-3.08 (0.27)	-2.38 (2.12)
Right Guard	1.60 (2.33)	2.64 (2.76)	1.54 (2.30)	2.56 (2.73)
Buyer: Colgate	1.48 (1.54)	3.76 (2.02)	1.10 (1.67)	3.16 (2.19)
Merged Firms	-8.01 (2.52)	-7.80 (3.89)	-8.12 (2.41)	-8.10 (3.65)
Rivals	-0.489 (0.45)	-0.499 (0.43)	-0.621 (0.58)	-0.831 (0.624)
ΔCS (%)	1.2404	0.5304	1.6889	1.2278

Notes: The table reports the average percentage changes in prices and consumer surplus for different scenarios. Column (i) and (ii) shows the price effects caused by the actual divestiture package sold to Colgate. Column (iii) and (iv) show the price effects caused by the actual divestiture package without Dry idea sold to Colgate. The simulations are based on the RCNL demand estimates presented in Table 2 and supply estimates presented in Table 3 and 4. Pre-merger data for September 2005 are used as in Bjornerstedt and Verboven (2016). Standard deviations in parenthesis relate to variation across geographic markets and products. 'Lower bound' (resp. 'Upper bound') refers to bound on upstream bargaining weights.

M New Measure: Computation

In this appendix I provide details on how to compute the change in downstream bargaining power such that prices are unaffected by the merger as in Section 6.6.

First, note that the downstream bargaining weight associated with a product j in m at t is given by:

$$\lambda_{jmt} = \frac{A_{jmt}(p_{mt}, I_{mt}^M)}{A_{jmt}(p_{mt}, I_{mt}^M) + p_{jmt} - \gamma_{jmt}(p_{mt}) - mc_{jmt}^R - mc_{jmt}^M}, \tag{52}$$

where $A_{jmt}(p_{mt}, I_{mt}^M) = (I_{mt}^M \odot \mathcal{S}_{mt})^{-1}(I_{mt}^R \odot \mathcal{S}_{mt})\gamma_{mt}(p_{mt})$.

Denote $p_{m,pre}$ the vector of prices and $I_{m,pre}^M$ (resp. $I_{m,post}^M$) the upstream ownership matrix in the pre-merger (resp. post-merger and divestiture) period defined as September 2005 (one month before the merger).

The bargaining weight such that an arbitrary product j (owned by the merged firms) leave all prices unchanged is given by:

$$\bar{\lambda}_{jm,pre} = \frac{A_{jmt}(p_{m,pre}, I^M_{m,post})}{A_{jmt}(p_{m,pre}, I^M_{m,post}) + p_{jm,pre} - \gamma_{jmt}(p_{m,pre}) - mc^R_{jm,pre} - mc^M_{jm,pre}}, \tag{53}$$

where $I^M_{m,post}$ is the new upstream ownership matrix implied by the merger.

In the pre-merger period, for j we have:

$$\lambda_{jm,pre} = \frac{A_{jm,pre}(p_{m,pre}, I^M_{m,pre})}{A_{jm,pre}(p_{m,pre}, I^M_{m,pre}) + p_{jm,pre} - \gamma_{jm,pre}(p_{m,pre}) - mc^R_{jm,pre} - mc^M_{jm,pre}}, \tag{54}$$

Combining (53) and (54), one can compute the percentage change in downstream bargaining weight such as prices are unaffected by the merger, for all products owned by the merged firms, as follows:

$$\frac{\bar{\lambda}_{jm,pre} - \lambda_{jm,pre}}{\lambda_{jm,pre}} \tag{55}$$

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