Evaluating Horizontal Mergers in the Presence of Price Promotions

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Abstract

In this paper, I investigate the impact of a horizontal merger between firms that use price promotions. I find that after the merger, the merged firms increase their prices, but coordinate the promotions by never discounting their products simultaneously. The non-merged firm responds with a more aggressive pricing strategy, offering deeper and more frequent discounts. The changes in the firms' profits and the consumer surplus are negligible. These conclusions are not affected by the size of the change in market concentration or by the degree of substitutability between the merging products. Thus, the use of price promotions by the merging firms should be viewed as a mitigating factor by the antitrust authorities.

Keywords: horizontal mergers; price promotions; consumer welfare; product line pricing

JEL Classification: D21; D43; K21; L13; L41; M31

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1 Introduction

One of the central questions posed when evaluating a proposed merger is its projected impact on market prices. In their latest Horizontal Merger Guidelines (the "U.S. Guidelines"), the U.S. Department of Justice and the Federal Trade Commission proclaim that a merger which "is likely to encourage one or more firms to raise prices" should not be permitted (U.S. DOJ/FTC 2010, pg. 2). Similarly, the European Commission's Guidelines on the assessment of horizontal mergers (the "EU Guidelines") specify that the Commission should prevent mergers that would likely cause "one or more firms to profitably increase prices" (European Commission 2004, pg. 5). These Guidelines as well as the academic literature studying mergers only consider the possibility of each firm charging a single price. Whereas this is a reasonable approach in some situations, many markets are characterized by frequent changes in prices due to temporary price reductions (sales). It is, then, important to incorporate sales into the pricing strategies of the firms. How should pricing managers of merged and non-merged firms adjust their promotions after a merger? What effect does a merger have on firms' profits and on consumer welfare when firms use price promotions? How does this effect depend on the size of the change in market concentration or on the degree of substitutability between the merging products. The current paper addresses these questions.

I will examine the effect of a horizontal merger in a market with differentiated products and price competition.[1] The seminal result for such mergers is provided by Deneckere and Davidson (1985) who work with linear demands and symmetric product differentiation. They find that mergers increase the prices and profits of all firms. The merged firms increase their prices more

[1] In order to isolate the competitive implications of a merger, I assume it produces no efficiency gains.

than the non-merged firms, but the non-merged firms earn a larger profit. Further work in this area examined localized, spatial competition between firms located on a circle (Levy and Reitzes 1992, Brito 2003, Posada and Straume 2004). The paper that considers the demand structure most similar to the one I use is Werden and Froeb (1994). They study logit demands and allow for asymmetric firms. Federgruen and Pierson (2011) further generalize the setting to a large subset of supermodular games. A common result in all papers in this literature is that the prices and profits of all firms increase after a merger. This implies that horizontal mergers in markets with differentiated products should not be permitted unless they are accompanied by substantial efficiency gains that are sufficient to prevent price increases.

However, neither the papers studying horizontal mergers in markets with price competition and differentiated products nor the literature on horizontal mergers in various other settings (see Whinston 2007 for a recent review of this literature) allow for the presence of sales. My work fills this gap by examining the effects of a merger in an industry in which firms use price promotions.

In my base model, there are three firms, each producing one product. Every firm has a share of loyal consumers who either buy from their preferred firm or choose not to purchase at all. The remaining consumers are switchers with heterogeneous preferences for the three products. To maintain consistency with the established empirical practice of estimating demand for differentiated products, I model consumer demand as logit.

I solve for the Nash equilibrium in prices. In the pre-merger state, each firm sets its price strategy independently from the rivals. Having loyal consumers in the model ensures that for a sufficiently homogeneous population of switchers, the equilibrium is in mixed strategies. Hence, instead of solving for the single optimal price, I solve for the price distribution. The firms assign

probabilities to various prices, which has been traditionally interpreted as the occurrence of price promotions or sales (Varian 1980, Narasimhan 1988).

A merger between two firms leads to them coordinating their promotional strategies in order to maximize the joint profit. I find that when the merged firms use price promotions, they discount only one product at a time in order to avoid cannibalization. The promoted product is used to compete for the switching cohort with the non-merged firm while the product sold at a regular price is aimed at extracting a large surplus from the loyal consumers. In comparison with the pre-merger state, in which the firms do not use the regular price often, the merged firms always charge the regular price for at least one of their products. This leads to a sharp increase in the expected price of the merged firms. This result is consistent with the existing theoretical literature which also concludes that the prices of the merged firms increase after a merger.

Moreover, my finding that the merged firms charge a low price for one product in order to compete with the non-merged firm and leave the price of another product high is supported by the empirical literature. Ashenfelter and Hosken (2010) examined the impact of mergers in several industries: motor oil, feminine hygiene products, RTE cereal, and distilled spirits. They report that "in the four mergers, for which we find substantial evidence of a price increase, manufacturers did not increase all of their prices uniformly. Instead, the merged firm chose to increase the price of one of its products (or a set of products) while holding the other prices more or less fixed" (pg. 439).

The fact that the merged firms never promote their products simultaneously implies that the non-merged firm has to compete for the switchers with at most one discounted product. In contrast, in the per-merger state, it is often the case that both rivals discount their products at

the same time, leaving the third firm to compete with two products. Thus, after the merger, the switchers become more lucrative for the non-merged firm, and it tries to capture them by using a more aggressive pricing strategy. The non-merged firm shifts more probability towards deep discounts, leaving less probability on the regular price and shallow discounts. This leads to the expected price of the non-merged firm dropping below the pre-merger level. This result is in contrast to the existing theoretical literature which finds that the prices of non-merged firms increase.

The outcome of non-merged firms decreasing their prices has been observed in practice. Michel (2016) reports that after the 1993 Post and Nabisco merger, the prices of non-merged competitor General Mills went down significantly. According to Table 6 in the online appendix of Michel (2016), in months 13-25 after the merger, the wholesale prices of all eight General Mills brands studied in the paper went down, with an average decline of 9.3%.[2] The author hypothesizes that this could be due to an exogenous negative demand shock, but the analysis in my paper suggests that this is consistent with a competitive response to a merger by a non-merged firm.

The effect of the merger on the firms' profits and the consumer surplus depends on the level of consumer heterogeneity. When the consumers are sufficiently heterogeneous so that the non-merged firm does not use promotions after the merger, the profits of all firms increase. The profit of the non-merged firm increases more than the profits of the merged firm. Correspondingly, the consumer surplus declines after the merger. These results are consistent with the findings in Deneckere and Davidson's (1985) single-price case.

If the switching cohort is sufficiently homogeneous, all firms use promotions after the merger.

[2] The findings for other non-merged firms were mixed. For Kellogg's, prices of four brands went down while prices of five brands went up. All three Ralston brands increased their prices, and both Quaker brands decreased theirs.

The merged firms set higher prices and coordinate their promotions, but their expected share of the switching cohort declines. The non-merged firm captures more switchers in comparison to the pre-merger state, but does so at the expense of a more aggressive pricing strategy with deeper and more frequent promotions. Although the profit of the non-merged firm remains higher than the profit of the merger firms, these profits are very similar and are close to their pre-merger level. Thus, the impact of the merger on the profits of all firms is negligible.

There are two ways in which the changes in the firms' pricing strategies impact the consumer surplus. First, the post-merger change in the expected prices negatively impacts the consumer surplus since two merged firms increase their expected prices whereas only one non-merged firm decreases its expected price (the size of the expected price increase by each merged firm is either comparable to or larger than the size of the expected price decrease by the non-merged firm). However, this effect is offset by the post-merger coordination of price promotions by the merged firms. Before the merger, the promotions of all three firms were independent. Therefore, the outcomes with all three products sold at the regular prices or with all three products sold on sale were relatively frequent. After the merger, the merged firms almost always promote one product at a time, placing very little probability on the price pair containing the regular prices for both products. The non-merged firm increases its probability of charging the sale prices. As a result, the probability of outcomes with one or two products on sale increases. Because consumers' marginal utility from having an additional product promoted decreases in the number of products that are already on sale, the consumer surplus increases when the probability shifts from the outcomes with zero or three products on sale to the outcomes with one or two products on sale. The two effects described above almost offset each other, and the post-merger consumer surplus

decreases only slightly in comparison with the pre-merger state. Therefore, it is enough for such mergers to generate just a modest efficiency gain in order to alleviate the antitrust concerns.

I also examine two extensions of the basic model incorporating specific industry features that both the U.S. and the EU Guidelines deem important for merger evaluations. One extension considers an asymmetry in the brand strength that leads to different mergers causing different changes in market concentration. The second extension allows for asymmetric substitution patterns between different pairs of products. I find that neither the size of the change in concentration ratio nor the degree of substitutability between the merging products has a significant impact on the effects of a horizontal merger between the firms that use price promotions.

2 Model

There are three firms (1, 2, and 3), each producing one product. The firms compete in prices. The marginal cost of all firms is constant and is normalized to zero. The set of consumers has measure 1. They are divided into loyals and switchers. Each firm has a share α of loyal consumers, and the remaining $1 - 3\alpha$ consumers are the switchers.

The goal of this paper is to analyze the impact of a merger for the types of demand functions that are typically estimated in real life. Thus, consistent with the prevailing empirical practice, I model the switchers' preferences using the multinomial logit specification. The switching consumer s has the following utility from purchasing product i ($i \in \{1, 2, 3\}$):

$$U_{si} = \delta_i - p_i + \varepsilon_{si}, \tag{1}$$

where δ_i is the base utility of product i, p_i is its price, and ε_{si} are independently and identically Gumbel distributed with scale parameter μ.

The random term ε_{si} measures the unobserved preference of consumer s for product i. When the variance of this term is large, the consumers' tastes for the different products are more dispersed. Since μ is proportional to the variance, it serves as a measure of consumer heterogeneity. In addition, there is an outside good that gives utility $U_{s0} = \delta_0 - p_0 + \varepsilon_{s0}$. In the empirical literature, the outside good often represents a no-purchase option with its utility normalized to zero. The utility formulation from (1) results in the following probability of a switching consumer purchasing product i:

$$Ps_i = \frac{e^{(\delta_i - p_i)/\mu}}{\sum_{j=0}^{3} e^{(\delta_j - p_j)/\mu}}. \tag{2}$$

The loyal consumers consider purchasing a product only from their preferred firm. The preferences of the loyals are also modeled using the logit specification. The loyal consumer l who considers buying only product i has the following utility from purchasing it:

$$U_{li} = \delta_i - p_i + \varepsilon_{li}, \tag{3}$$

where ε_{li} are independently and identically Gumbel distributed with scale parameter μ_l. Similar to the switchers, they also have a choice of not buying the product at all and switching to the outside option that gives utility $U_{l0} = \delta_0 - p_0 + \varepsilon_{l0}$. The consumers loyal to product i choose only between their preferred product and the outside option; thus, their purchase probability is

$$Pl_i = \frac{e^{(\delta_i - p_i)/\mu_l}}{e^{(\delta_i - p_i)/\mu_l} + e^{(\delta_0 - p_0)/\mu_l}}. \tag{4}$$

With the choice probabilities given by (2) and (4), the profit function of firm i is

$$\pi_i = p_i \left(\alpha Pl_i + (1 - 3\alpha) Ps_i\right). \tag{5}$$

Before the merger, each of the three firms maximizes its profit function independently. We can find the firms' best reply functions by setting the derivative of (5) with respect to p_i to be

equal to zero. Then, we solve the resulting system of three equations with three unknowns to find the Nash equilibrium (NE) pre-merger prices of the firms.

As I show in the next section, when consumer heterogeneity μ is low, a pure-strategy NE does not exist, and it is necessary to search for equilibria in mixed strategies. The pricing strategies in these latter equilibria are commonly interpreted as temporary price promotions, and, thus, the main focus of the paper will be on mixed-strategy equilibria.

Sinitsyn (2008a) showed that for a large class of continuous demand functions that includes multinomial logit, the support of the mixed-strategy equilibrium is finite.[3] This implies that in equilibrium, firm i uses prices $\{p_{i,k}\}_{k=1}^{K_i}$ charged with corresponding probabilities $\{\gamma_{i,k}\}_{k=1}^{K_i}$, where K_i is the number of prices used by firm i. These strategies are found by solving the standard system of equations that specify for each firm that the values of its profit function at each price within the support are identical and that the profit function is maximized at these prices. In the absence of analytical solutions to these systems of equations, I solve for the equilibrium strategies numerically. A detailed description of the solution procedure for the case of duopoly can be found in Sinitsyn (2008b and 2009).

For the post-merger analysis, I consider a merger of firms 1 and 2. To isolate the effect on prices from this modification of the market structure, I assume that there are no efficiency gains from the merger, i.e., the marginal costs of the merged firms do not change. Then, the profit function of the merged firms becomes

$$\pi_M = p_1 \left(\alpha Pl_1 + (1-3\alpha)Ps_1\right) + p_2 \left(\alpha Pl_2 + (1-3\alpha)Ps_2\right), \tag{6}$$

while the profit function of the non-merged firm, π_{NM} remains the same as in (5). In the post-

[3] This is in contrast to the atomless mixed strategies in Varian (1980) and subsequent papers that work with discontinuous demands.

merger mixed strategy equilibrium, the non-merged firm uses prices $\{p_{NM,k}\}_{k=1}^{K_{NM}}$ charged with corresponding probabilities $\{\gamma_{NM,k}\}_{k=1}^{K_{NM}}$, while the merged firms use price pairs $\{p_{M1,k}; p_{M2,k}\}_{k=1}^{K_M}$ charged with corresponding probabilities $\{\gamma_{M,k}\}_{k=1}^{K_M}$. Basically, the merged firms act as a single multiproduct firm producing two substitute goods 1 and 2. The analysis of mixed strategies for symmetric multiproduct firms is available separately for the case of complements (Sinitsyn 2012) and for the case of substitutes (Sinitsyn 2016). In this paper, the post-merger equilibrium strategies are analyzed for an asymmetric industry structure with the non-merged firm selling one product and the merged firms selling two products. The system of equations the solution to which gives the optimal post-merger prices is similar to the one from the pre-merger state.

In the next section, I will describe the equilibrium strategies of the firms and examine the effect of a merger on price promotions, profits, and consumer welfare.

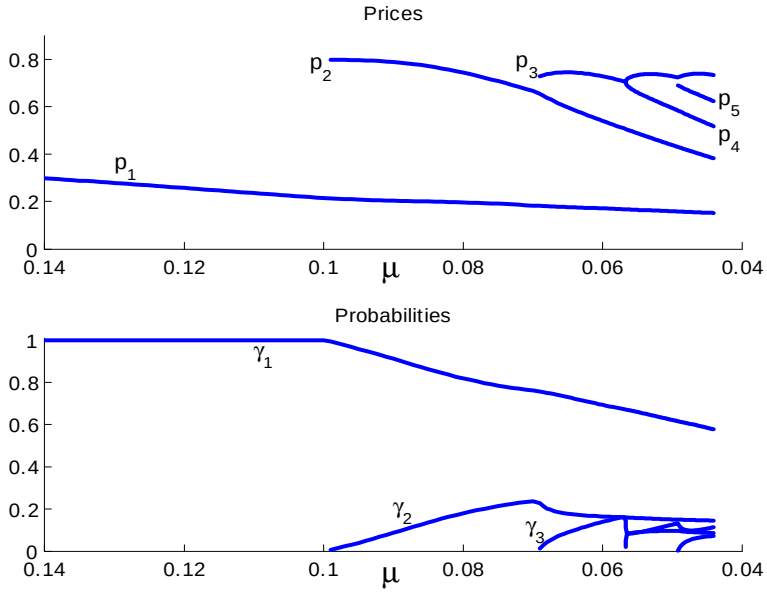
3 Comparison of Pre- and Post-Merger Pricing Strategies

First, I examine the pre-merger pricing strategies of the firms. To illustrate the structure of the equilibria, I will study how prices respond to changes in consumer heterogeneity μ while keeping the rest of the demand parameters fixed ($\alpha = 0.1$; $\delta_i = 0$; $\mu_l = 0.1$; $p_0 = 1$).[4] For these parameters, the optimal price that the firms would charge if they were only serving their loyal consumers is 0.805.

I start with a high value of consumer heterogeneity, for which a pure strategy equilibrium exists. When μ is large, the consumer preferences for the products are quite dispersed. Therefore, a decrease in price does not capture many additional consumers, which means that the demands

[4] Throughout the paper, I use the term "consumer heterogeneity" to refer to μ – the level of heterogeneity of the switching cohort.

Figure 1: Pre-Merger Pricing Strategies



are relatively inelastic. The incentives to undercut the rivals are small, and the firms charge high prices in a pure strategy NE. For example, when $\mu = 0.5$, all firms charge 0.79, which is very close to the price that maximizes the profit from the loyals.

For smaller values of consumer heterogeneity, a decrease in price allows the firms to capture a larger share of the switchers. This intensifies the price competition and leads to a decline in equilibrium prices. For example, when μ reaches 0.14, the firms charge 0.3. Figure 1 shows the change in the pricing strategies as μ drops below 0.14.

The top panel of Figure 1 shows the equilibrium prices, and the bottom panel shows the corresponding probabilities with which these prices are charged. For example, for the values of μ above 0.1, the firms use only one price p_1, which is charged with probability $\gamma_1 = 1$. This price declines with a decrease in μ until it becomes so low that the firms find it more profitable to

deviate to charging a high price that extracts more profit from their loyals. Because of this possible deviation, a pure-strategy equilibrium does not exist, and the firms switch to the equilibrium in mixed strategies. In this equilibrium, most of the probability, γ_1, is assigned to the low (sale) price p_1, while the high (regular) price p_2 is charged with the remaining probability $\gamma_2 = 1 - \gamma_1$.[5]

As μ keeps decreasing, both the regular and the sale prices decrease while the probability of charging the regular price increases. Eventually, these prices become low enough so that the firms again have a profitable deviation to a high price. At this point, a new price is "added" to the mixed-strategy equilibrium. In this equilibrium, regular price p_3 is charged with probability γ_3, and the firms use two different discount levels: shallow promotion p_2 that occurs with probability γ_2, and deep promotion p_1 that occurs with probability γ_1.[6] As Figure 1 illustrates, a similar pattern repeats for further decreases in μ. The firms use more prices as μ decreases, and the new prices added to the equilibria are set to undercut regular price p_3. The probability of using the lowest sale price p_1 decreases, but it remains the most frequently charged price.

The equilibrium strategies are similar for the other values of consumer loyalty α. Figure 2 presents the regions containing mixed-strategy equilibria with various number of prices used by the firms for the different values of α and μ.[7]

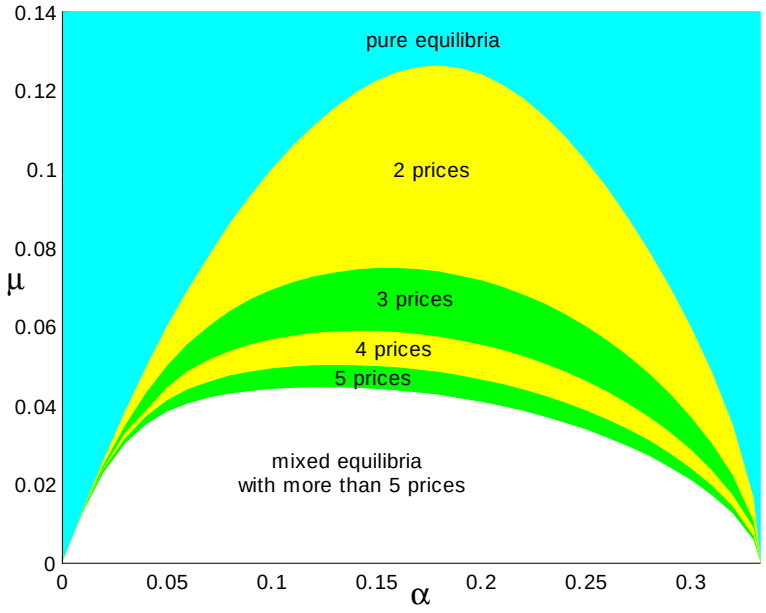
Now, I will examine how the pricing strategies change after firms 1 and 2 merge. In this setting, the merged firms set their prices jointly while competing with non-merged firm 3. Similar to the previous exposition, I start with a high value of μ and examine how the pricing strategies

[5] The finding that high prices are charged with a relatively low probability and most of the probability falls on sale prices is a standard result in the literature on price promotions as outcomes of mixed strategies when the number of firms is small. As the number of firms increases, the probability of charging high prices also increases (Rosenthal 1980).

[6] For example, when $\mu = 0.06$, the firms use regular price $p_3 = 0.73$ charged with probability 0.14, shallow promotion $p_2 = 0.54$ charged with probability 0.17, and deep promotion $p_1 = 0.17$ charged with probability 0.69.

[7] These equilibria were computed for the values of α between 0.01 and 0.33 with a step of 0.01.

Figure 2: Regions with Various Mixed-Strategy Nash Equilibria

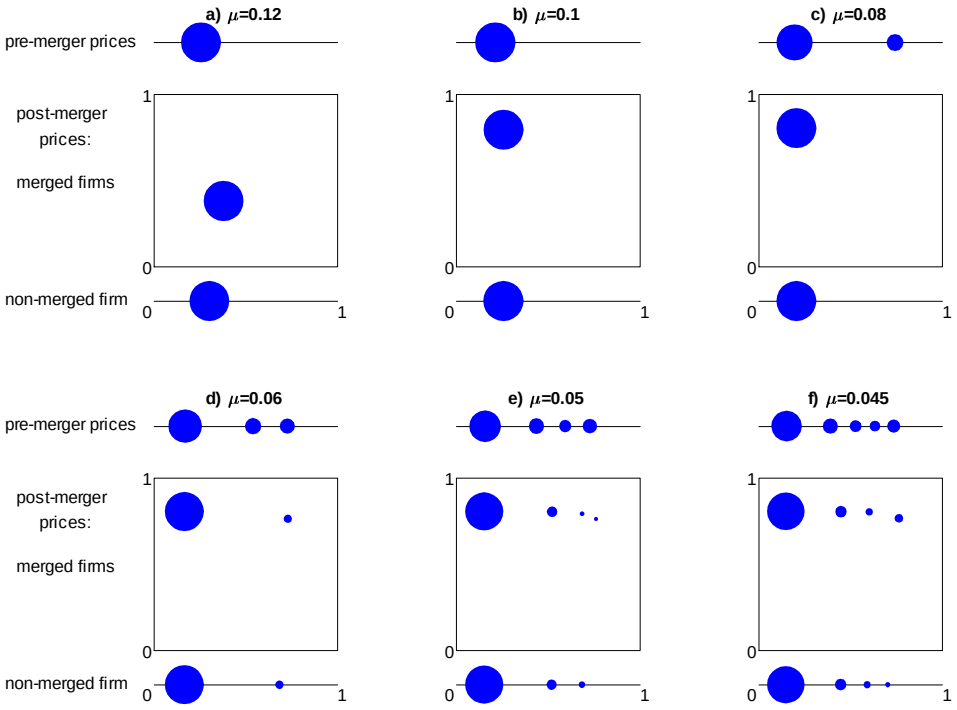


change when μ decreases. For a large subset of the demand parameters, the optimal strategy of the merged firms involves using price pairs that contain different prices. Therefore, it is difficult to informatively present the response of the equilibrium prices to continuous changes in μ in a manner similar to Figure 1. Instead, I will use the bubble graphs to illustrate the snapshots of the strategies for a few specific values of μ.[8] Figure 3 compares the pre- and post-merger pricing strategies. Each subfigure of Figure 3 shows the pre-merger prices of all firms in the top $[0;1]$ domain, the post-merger prices of the merged firms in the middle $[0;1] \times [0;1]$ domain, and the post-merger prices of the non-merged firm in the bottom $[0;1]$ domain.

For the relatively high values of μ, the firms use pure strategies before and after the merger. Consistent with the findings in Deneckere and Davidson (1985), the prices of all firms increase

[8] The size of each bubble is proportional to the probability with which a corresponding price or a price pair is charged.

Figure 3: Pre- and Post-Merger Prices



in comparison with the pre-merger state, and the prices of the merged firms increase by a larger amount. For example, when $\mu = 0.12$, the pre-merger prices of all firms are 0.26. After the merger, the price charged by both merged firms becomes 0.38, and the price charged by the non-merged firm becomes 0.3 (Figure 3a). At these prices, the merged firms jointly sell to about half of the switchers, and the non-merged firm sells to the remaining half. Thus, the profits of all firms increase, but the non-merged firm benefits the most. This finding is also consistent with Deneckere and Davidson (1985). The conclusions change, however, when the firms start using mixed strategies.

The prices of all firms decline with a decrease in μ. Recall that at the equilibrium prices, the merged firms capture about half of the switchers. Thus, the profit from the switchers goes

down. At the same time, the profit from the loyals also decreases as the prices decline. Finally, the total profit becomes low enough that the merged firms respond by switching to a different strategy. They offer one product on a deep discount, charging price p_{M1} to match the price of the non-merged firm. This price is designed to compete for the switchers with the non-merged firm. The other product is sold at a high price p_{M2} that is designed to extract a large profit from the loyals.

Note that at this point, there is a continuum of possible equilibria. Because of the symmetry between the merged firms' products, instead of using price pair (p_{M1}, p_{M2}), they could use (p_{M2}, p_{M1}) or a mixed strategy, in which probability γ is placed on $(p_{M1}$,$p_{M2})$ and the remaining probability $1-\gamma$ on (p_{M2}, p_{M1}). There is no meaningful distinction between any of these equilibria; thus, for expositional purposes, I chose to present the symmetric equilibrium, in which both of the price pairs are charged with the same probability 50%.[9]

The non-merged firm continues to use one price with certainty. It competes for the switching cohort and charges a price that is similar to the discounted price of the merged firms. For example, for $\mu = 0.1$, the merged firms set the discounted price of one product at 0.29 while charging the regular price of 0.78 for another product. Hence, the expected observed price for the products of the merged firms is 0.535. Note that there is a sharp increase in the expected price of the merged firms' products when they shift to the strategy of discounting one product and keeping the price of another product high. The non-merged firm always charges 0.29 (Figure 3b). For this value of μ, the pre-merger price is 0.24, which means that the pre-merger prices remain lower than the post-merger prices of all firms.

[9] In the remainder of this section, I follow the same approach for the equilibria, in which the merged firms use multiple price pairs. If the firms use price pair (p_{M1}, p_{M2}) with a certain probability, I split this probability equally between (p_{M1}, p_{M2}) and (p_{M2}, p_{M1}).

As μ decreases further, mixed strategies appear in the pre-merger state whereas in the post-merger state, the non-merged firm still uses only one price (Figure 3c). For example, when $\mu = 0.08$, the merged firms charge the sale price 0.21 for one of their products and the regular price 0.8 for the other product while the non-merged firm always charges 0.21. The pre-merger strategies involve offering the discounted price 0.2 with probability 0.82 and the regular price 0.74 with probability 0.18. This means that the expected pre-merger price, 0.3, is higher than the post-merger price of the non-merged firm. Thus, while the expected price of the merged firms remains above the pre-merger level, the price of the non-merged firm falls below it. This is in contrast to our finding for the larger values of μ that the prices of all firms increase after the merger.

For the lower values of μ, the non-merged firm also starts using mixed strategies (Figure 3d). As μ keeps decreasing, more prices are added to the mixed equilibria by all firms in both the pre- and post-merger states (Figures 3e) and f). A comparison of the firms' pricing strategies before and after the merger reveals that the expected price of the merged firms is above the expected price in the pre-merger state. This happens because before the merger, the firms aggressively compete for the switchers and do not put much weight on the regular price. Instead, most of the probability falls onto the sale prices. In contrast, the merged firms promote only one of the products while keeping the price of the other product high.[10] Thus, half of the time, each product of the merged firms is sold at the regular price, which drives their expected post-merger prices up.

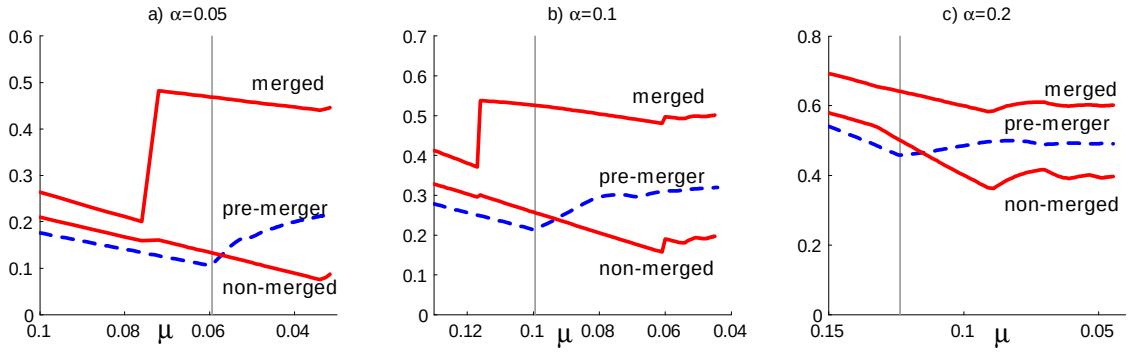
On the other hand, the expected price of the non-merged firm is below the expected price in the

[10] With a small probability, the merged firms charge the regular price for both products.

pre-merger case. The non-merged firm uses sales more aggressively and puts a large probability on the lowest sale price. The intuition for this finding is as follows. In symmetric models with mixed strategy price equilibria, a decrease in the number of independent firms leads to lower prices for all firms (Rosenthal 1980, Stahl 1989). This happens because as the number of firms goes down, the probability of having the lowest price, and, therefore, capturing most of the switchers, increases exponentially. The firms, then, have more incentives to compete for the switching cohort, and they shift more probability to lower prices. By contrast, a merger does not change the number of firms in my model, and the merged firms actually increase their expected prices by coordination their promotions. However, this change in the pricing strategies of the merged firms produces a similar effect on the pricing strategy of the non-merged firm. Before the merger, the strategies of the firms were independent. Therefore, firm 3 often encountered both firms 1 and 2 setting low prices to compete for the switchers. Since after the merger, the merged firms promote only one product at a time, the non-merged firm never faces two low prices from the rivals. This makes the switching segment relatively more attractive to the non-merged firm, and it responds by pricing more aggressively.

Figure 4 shows how the expected pre- and post-merger prices change with consumer heterogeneity for the different levels of consumer loyalty. We can observe that the general relationship between the expected prices is conserved for the small and the large levels of consumer loyalty ($\alpha = 0.05$ in Figure 4a and $\alpha = 0.2$ in Figure 4c). The expected price of the merged firms always exceeds the expected pre-merger price. The relationship between the expected price of the non-merged firm and the expected pre-merger price depends on the pricing strategy in the pre-merger state. A vertical line in each subfigure of Figure 4 separates the region in which the

Figure 4: Expected Prices for Different Levels of Consumer Loyalty



firms were using a single price in the pre-merger state (to the left of the line) from the region in which the firms were using price promotions (to the right of the line). If the firms were using one price before the merger, the non-merged firm's price is higher than the pre-merger price. If the firms were using price promotions in the pre-merger state, the post-merger expected price of the non-merged firm is almost always lower than the expected pre-merger price.

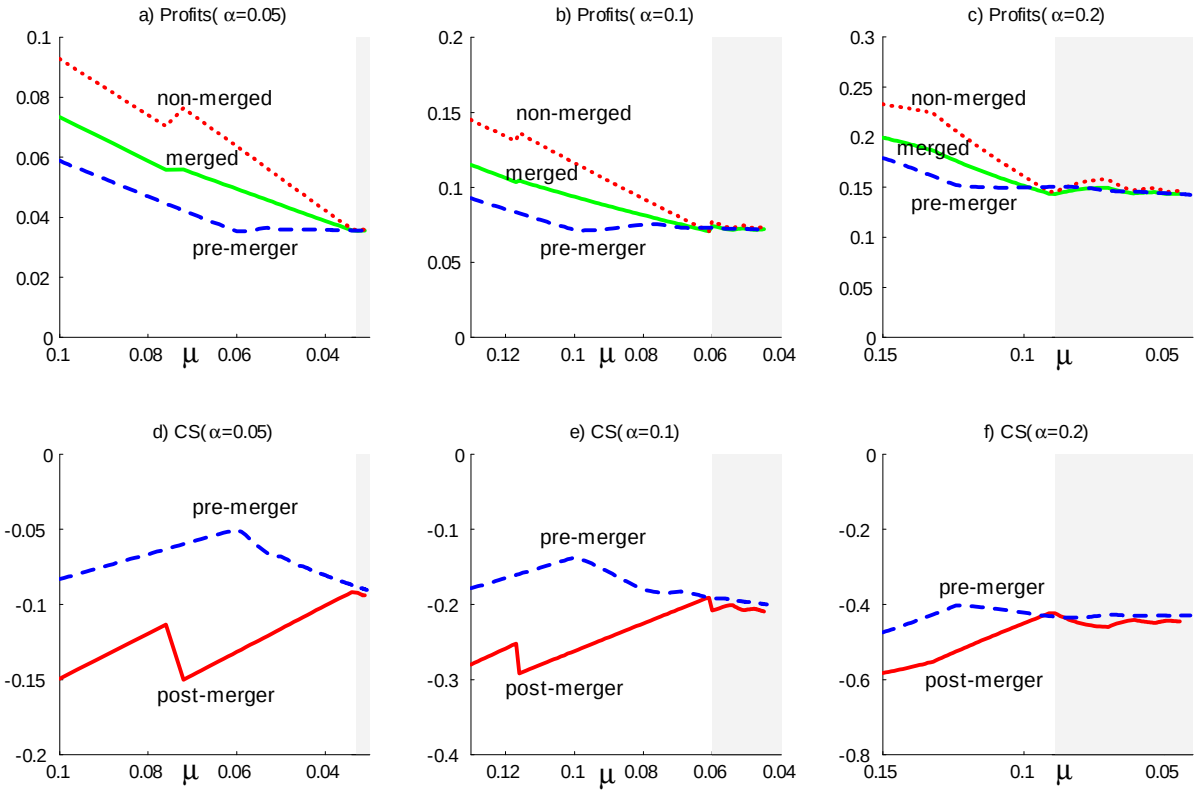
In summary, the major change in the structure of the pricing strategies of the firms after the merger is that the merged firms coordinate the promotions of their products by never promoting them together. The expected price of the merged firms is higher than the expected pre-merger price. The expected price of the non-merged firm is higher than the pre-merger price if there were no sales in the pre-merger state and is generally lower than the expected pre-merger price if the firms were using promotions in the pre-merger state.

Finally, I will examine the effects of the merger on the expected profits of the firms and the expected consumer surplus.[11] Figure 5 presents them for the different levels of consumer loyalty.

[11] The expected consumer surplus is computed by taking a weighted average of the values of consumer surplus at all possible outcomes of the mixed strategies. For any price combination, the consumer surplus of the switchers is $CS_s = \mu \ln\left(\sum_{j=0}^{3} e^{U_{sj}/\mu}\right)$ while the consumer surplus of the segment loyal to product i is $CS_{li} = \mu_l \ln\left(\sum_{j\in\{0;i\}} e^{U_{lj}/\mu_l}\right)$

The shaded area in each subfigure of Figure 5 shows the region in which all firms before and after the merger use price promotions.

Figure 5: Pre- and Post-Merger Profits and Consumer Surplus



The effect of the merger on the profits and the consumer surplus depends on the level of consumer heterogeneity. For the high levels of heterogeneity (unshaded regions in Figure 5), the profits of all firms increase after the merger, and the non-merged firm benefits the most. This result is consistent with the findings in Deneckere and Davidson (1985). We can observe from Figures 5a), b), and c) that as consumer heterogeneity decreases, the difference between the pre-

(Small and Rosen 1981). The total consumer surplus is $CS_s + \sum_{i=1}^{3} CS_{li}$.

and post-merger profits of all firms declines. This difference basically disappears in the shaded region, which is characterized by all firms using price promotions after the merger. In this region, in comparison to the pre-merger state, the merged firms charge higher prices and coordinate their promotions, but capture fewer switching consumers. The non-merged firm sells to more switchers, but does so at the expense of lower prices. As a result, for the low levels of consumer heterogeneity, the profits of all firms remain very similar to their pre-merger levels.

The change in the consumer surplus is similarly affected by consumer heterogeneity. For the large values of μ, the prices of all firms go up after the merger, leading to a large decrease in the consumer surplus. This decrease is more substantial (in percentage terms) for the smaller levels of consumer loyalty.

For the small values of μ, the change in the pricing strategies of the firms impacts the consumer surplus in several ways. First, the expected prices of the merged firms increase. This effect is partially offset by a decrease in the expected price of the non-merged firm. The overall impact of a change in prices on the consumer surplus is still negative since there are two firms increasing their prices and only one firm which decreased its price. Also, as we can observe from Figure 4, the price increase of the merged firms is generally at least as large as the price decrease of the non-merged firm.

Additionally, the post-merger coordination of promotions by the merged firms has a positive effect on the consumer surplus. The reason for this is as follows. Before the merger, the promotions of all firms were independent. Thus, the outcomes with all three products sold at the regular prices or with all three products sold on sale were relatively frequent. After the merger, the merged firms never promote their products together and place very little probability on the price pair

containing the regular prices for both products. Thus, they almost always promote exactly one product. The non-merged firm increases its probability of charging the sale price. As a result, the probability of the outcomes with one or two products on sale increases while the probability of the outcomes with zero or three products on sale decreases. The largest increase in consumer surplus of the switchers from having an additional product on sale occurs when we shift from the outcome with no products on sale to the outcome with one product on sale. As more products are placed on sale, the marginal utility of each additional sale decreases.[12] Thus, the consumer surplus increases when the probability shifts from the outcomes with zero or three products on sale to the outcomes with one or two products on sale. This effect offsets the changes in the expected price levels, and the total effect of the merger on the consumer surplus is negligible.

To conclude, for the levels of consumer heterogeneity that are low enough so that all firms use price promotions before and after the merger, the impact of the merger on the firms' profits is slim. Similarly, the merger has only a very small effect on the consumer surplus. These results imply that even modest efficiency gains should mitigate the antitrust concerns about horizontal mergers between firms which are actively involved in price promotions.

In the remainder of the paper, I will examine how some of the market features listed in both Guidelines as being important for merger evaluations impact the pricing strategies of the merging firms in the presence of price promotions. The next section considers an asymmetry in the brand strength and Section 5 studies asymmetric substitution patterns.

[12] Formally, $CS_s = \mu \ln\left(\sum_{j=0}^{3} e^{U_{sj}/\mu}\right)$. Since ln is a concave function, an increase in CS_s from product j going on sale (and corresponding increase in U_{sj}) is larger when there are fewer other products on sale.

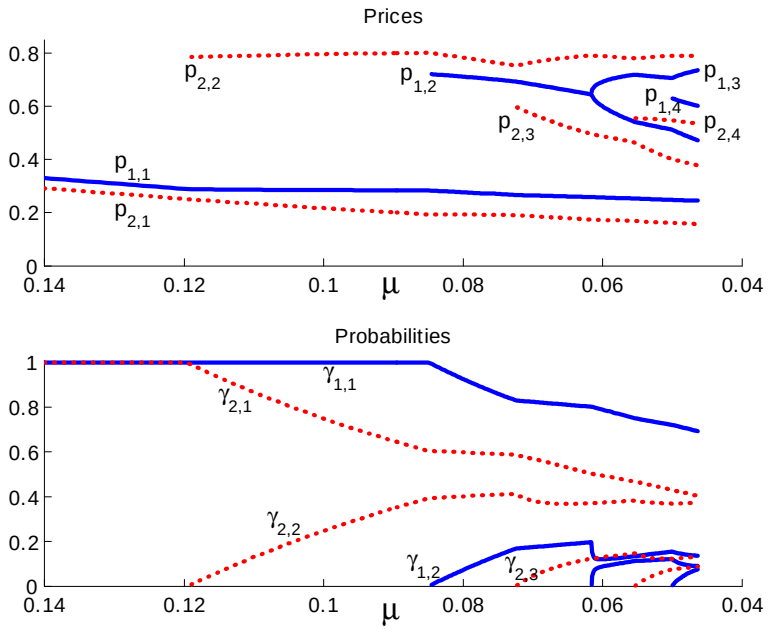
4 Extension I: Asymmetric Brand Strength

One of the important considerations in evaluating a horizontal merger is the change in market concentration it causes. Mergers that generate a larger increase in market concentration are more likely to receive additional scrutiny. The DOJ, the FTC, and the European Commission often employ the Herfindahl-Hirschman Index ("HHI") to measure the concentration. Both Guidelines outline the general standards for how the Agencies' competitive concerns about a merger depend on its effect on the HHI. For example, in the U.S., if a merger in a highly concentrated market (with HHI above 2500) increases the HHI by more than 200 points, it "will be presumed to be likely to enhance market power" (U.S. DOJ/FTC 2010, pg. 19). In the EU, horizontal competition concerns are likely to be present in mergers with post-merger HHI above 2000 and an increase in the HHI of more than 150 (European Commission, pg. 7). In this section, I study whether for the firms that use price promotions, mergers causing a larger increase in market concentration indeed lead to higher prices and lower consumer surplus.

In order to compare mergers that cause different changes in the HHI, the market shares of some firms have to differ. The U.S. Guidelines suggest that "a large market share tends to indicate low costs, an attractive product, or both" (U.S. DOJ/FTC 2010, pg. 15). Thus, I introduce an asymmetry into the market shares of the firms by changing the attractiveness or strength of one of the products, i.e., by changing δ. Specifically, I hold δ_2 and δ_3 constant at zero while allowing δ_1 to be positive. This results in firm 1 being a relatively strong firm with a larger market share. It is possible then to compare the outcome of the merger between firm 1 and firm 2 to the outcome of the merger between two weak firms—firms 2 and 3. Since the former merger leads to a larger increase in the HHI, the Guidelines imply that its anticompetitive effects are likely to be stronger.

First, I illustrate the pre-merger strategies of the firms with asymmetric brand strength. I keep all the model parameters the same as in the previous section, but change δ_1 to be 0.1. Figure 6 shows how the firms' equilibrium strategies change as the level of consumer heterogeneity decreases.[13] When μ is relatively large, there exists a pure-strategy equilibrium with the first firm charging price $p_{1,1}$ and firms 2 and 3 each charging price $p_{2,1}$. The strong firm is able to charge a higher price than its competitors. For example, when $\mu = 0.12$, firm 1 charges 0.29 while firms 2 and 3 charge 0.25. At these prices, firm 1 captures about 45% of the switchers, and firms 2 and 3 split the remaining 55%.[14] When we account for the loyal segments, the first firm has a total market share of 42% whereas firms 2 and 3 have a market share of 29% each.

Figure 6: Pre-Merger Pricing Strategies ($\delta_1 = 0.1$; $\delta_2 = \delta_3 = 0$)



Similar to the findings from the previous section, as consumer heterogeneity μ decreases, the

[13] The prices and probabilities of firm 1 are given by the solid lines while the prices and probabilities of firms 2 and 3 are given by the dotted lines.

[14] At such low prices, the share of the outside good is negligible.

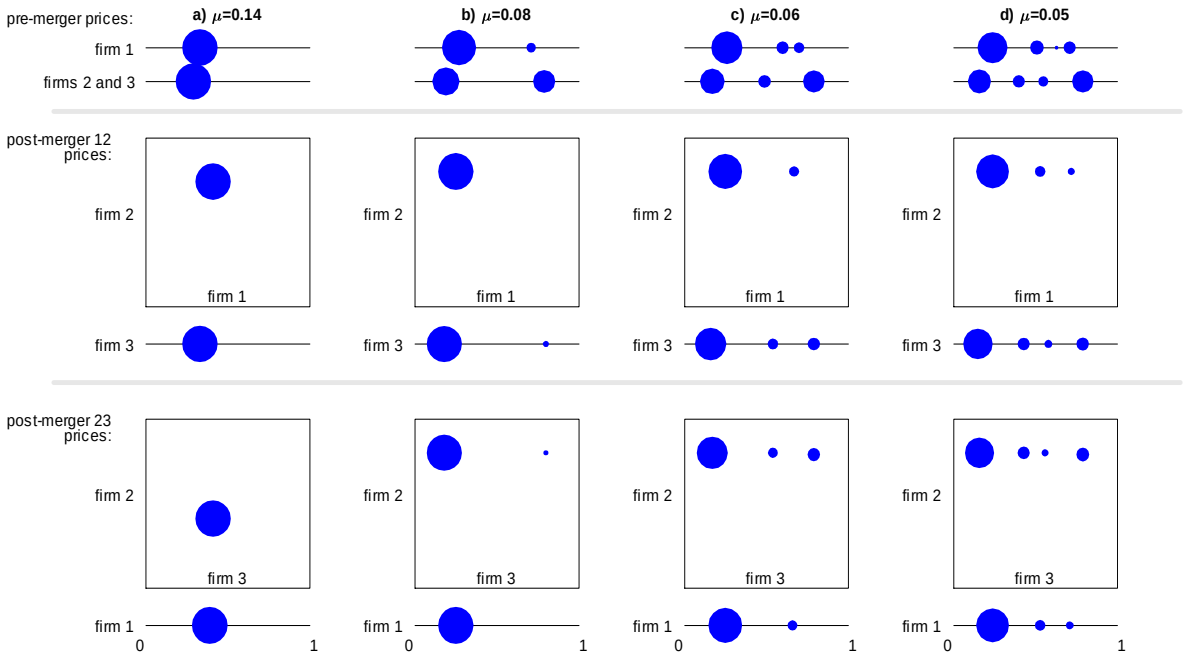
prices of all firms go down, and, eventually, the firms start using mixed strategies. Since firms 2 and 3 set lower prices than firm 1, they lose more from undercharging their loyal segments as their prices decrease. Therefore, these firms are the first ones to add a high regular price to their strategies. In this equilibrium, the first firm uses only one low price $p_{1,1}$ while its competitors charge either regular price $p_{2,2}$ or sale price $p_{2,1}$ that undercuts $p_{1,1}$.

With a further decrease in μ, the probability of firms 2 and 3 charging the regular price increases. This leads to firm 1 eventually adding its own regular price $p_{1,2}$ that is set to undercut the regular price of the rivals. This process repeats with the firms alternating in introducing the new prices to their strategies as shown in Figure 6.

Next, I will examine how the firms' pricing strategies change after both types of mergers. Figure 7 presents the bubble graphs of the pre-merger prices (top panel), the prices after the merger of firms 1 and 2 (middle panel), and the prices after the merger of firms 2 and 3 (bottom panel) for several values of μ.

When μ is high (Figure 7a), the firms use pure strategies both before and after a merger. Consistent with the existing literature and with the findings in the previous section, after both types of mergers, all firms increase their prices, and the increase is larger for the merged firms. There is, however, a difference between the two merger situations. When two weak firms (firms 2 and 3) merge, both of them keep their prices relatively low. When the strong firm (firm 1) merges with one of the weak firms (firm 2), they find it more profitable to use only firm 1 in competition for the switchers. Since firm 2 offers a less attractive product, in order for it to effectively compete for the switching cohort, it would have to lower its price below the price of firm 1, which would decrease the profit from its loyals and cannibalize the sales of firm 1. Thus,

Figure 7: Pre- and Post-Merger Prices ($\delta_1 = 0.1$; $\delta_2 = \delta_3 = 0$)



firm 2 does not target the switchers, but instead focuses on its loyal segment. Then, the optimal strategy of these merged firms is for firm 1 to set its price at a low level close to the price of firm 3 and for firm 2 to increase its price to the level that maximizes the profit from the loyals.

In summary, while both mergers cause the prices of all firms to increase, after the merger of two weak firms, all prices stay relatively low as all three firms compete for the switchers. However, after the merger of the strong firm with a weak one, only the strong firm and the non-merged firm keep their prices low and compete for the switchers. The weak merged firm increases its price sharply to maximize the profit from its loyals. Thus, overall prices rise more after the merger of firms 1 and 2. These findings confirm the Guidelines' competitive concerns about mergers that cause a larger increase in the HHI. As the following analysis shows, the outcome is different for

the smaller levels of consumer heterogeneity.

A major change in the structure of equilibrium strategies occurs for firms 2 and 3 after their merger. For the high values of μ, both merged firms compete for the switchers with the non-merged strong firm. They charge higher prices than the non-merged firm as they internalize the negative externality that a lower price of one firm has on the demand for another firm's product. As μ decreases, the prices and profits of all firms also decline. At the same time, the profit that each firm can obtain from its loyal segment if it were to charge a high price remains the same. Hence, when μ becomes sufficiently small, the merged firms find it more profitable to designate one firm to compete for the switchers while allowing the other firm to charge a large price that maximizes the profit from its loyal segment. Without loss of generality, I assume that firm 2 charges a high price and firm 3 competes for the switchers.[15] In order to effectively compete for the switchers with the strong firm, firm 3 drops its price below the price of firm 1. Overall, the firms' post-merger prices now have the same structure as the firms' prices after the merger of firms 1 and 2. That is, firms 1 and 3 charge low prices and compete for the switchers whereas firm 2 charges a high price that targets its loyals.

As μ keeps decreasing, firms 1 and 3 start using mixed strategies after both types of mergers, adding more prices to the support of their strategies (Figures 7b), c) and d). The comparison of each firm's strategies between the two merger situations reveals that they are practically identical. In general, the strategies are as follows. Firm 2 never promotes and only charges the high price that targets its loyals. Firms 1 and 3 compete for the switchers using various levels of promotion depth. Since firm 1 offers a more attractive product, firm 3 has to counteract with a lower price.

[15] Since the firms are symmetric, if in the equilibrium, they use a pure strategy (p_i, p_j), a mixed strategy that splits 100% in any way between (p_i, p_j) and (p_j, p_i) is also an equilibrium strategy.

Thus, the deepest discount offered by firm 3 is larger than the deepest discount offered by firm 1. On the other hand, such a deep discount results in a large foregone profit from the loyals. Thus, in comparison with firm 1, firm 3 offers its deepest discount less often, and shifts more probability to the regular price and shallower discounts.

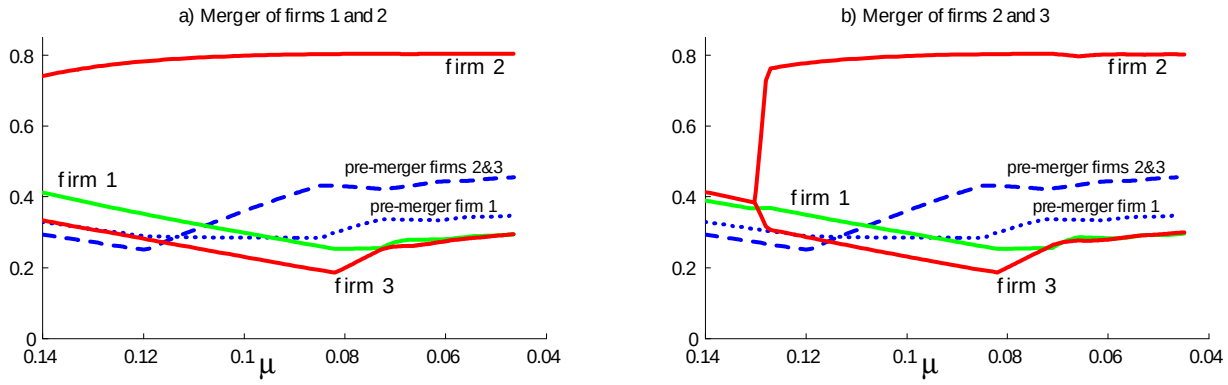
Notably, these strategies are not affected by whether firm 2 merged with firm 1 or with firm 3. The intuition for this finding is as follows. A merger allows the merged firms to coordinate their strategies. One of the firms competes for the switchers by offering promotions while another firm targets its loyals with a high price. Since firms 2 and 3 are identical, if they merge, it does not matter which firm competes for the switchers, so without loss of generality, I assume that firm 2 keeps its price high. If firms 1 and 2 merge, it is advantageous for them to let the strong firm 1 to compete for the switchers. A non-merged firm after either merger competes for the switchers. Thus, regardless of which merger took place, firm 1 is competing for the switchers with one of the weak firms (firm 3) while the remaining weak firm (firm 2) charges a high price.

For the lower levels of consumer heterogeneity, the demand is more elastic. This means that even for the relatively small difference in prices, the firm with a lower price will capture almost all switchers. Therefore, firm 2, which only charges a high price, almost never competes for the switchers.[16] Hence, it is possible to consider the competition for the switchers between firms 1 and 3 independently from the pricing of firm 2. Then, even after the merger of firms 1 and 2, firm 1's promotional strategy is predominantly set to effectively compete with firm 3 for the switchers without much adjustment for the effect of its strategy on the profits of the second firm. Thus, the pricing strategy of the strong firm is not affected much by whether it merged with one of

[16] Firm 2 captures a significant portion of the switchers only when both other firms also charge their regular prices, which happens very rarely.

the weak firms or its competitors merged. The same argument applies to the strategy of firm 3. Figure 8 illustrates the firms' expected prices before and after a merger.

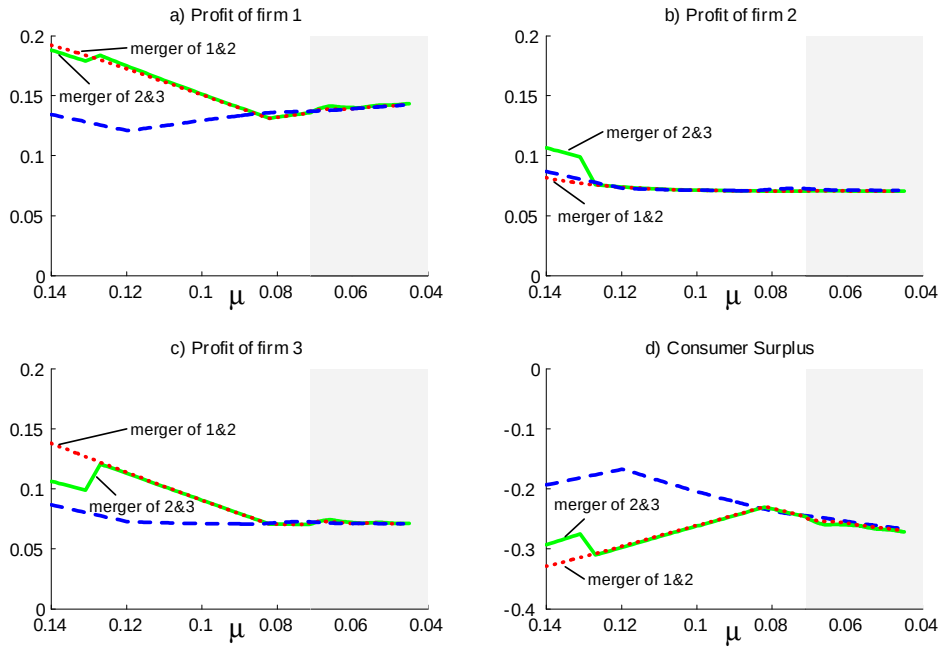
Figure 8: Expected Pre- and Post-Merger Prices ($\delta_1 = 0.1$; $\delta_2 = \delta_3 = 0$)



The expected prices after the merger of firms 1 and 2 (Figure 8a) significantly differ from the expected prices after the merger of firms 2 and 3 (Figure 8b) only in the region with relatively high consumer heterogeneity ($\mu > 0.127$). In the region with smaller levels of heterogeneity, the expected prices do not change differently depending on which merger took place. Correspondingly, we expect that in this region, the consumer surplus and the firms' profits are also not affected by whether firm 2 merged with firm 1 or with firm 3. Figure 9 confirms this.

From Figure 9, we observe that the two mergers have a different effect on the firms' profits and the consumer surplus only for the high levels of consumer heterogeneity. For the lower levels of heterogeneity, even in the case where all firms use pure strategies before and after a merger, the profits and the consumer surplus respond almost identically to both mergers. Note that when the firms use price promotions before and after a merger (shaded regions in Figure 9), neither merger has a significant effect on either the profits or the consumer surplus. This confirms the findings from the previous section.

Figure 9: Pre- and Post-Merger Profits and Consumer Surplus ($\delta_1 = 0.1$; $\delta_2 = \delta_3 = 0$)



In conclusion, the Agencies' increased competitive concerns regarding the mergers causing a larger increase in market concentration are confirmed for the high levels of consumer heterogeneity and relatively inelastic demands. For the lower levels of heterogeneity, the effects of a merger on the profits and the consumer surplus remain the same regardless of which merger took place. If, in addition, the consumer heterogeneity is low enough so that the firms use price promotions before and after a merger, neither merger has a noticeable anticompetitive effect.

5 Extension II: Asymmetric Substitution Patterns

Another important characteristic that is used to evaluate horizontal mergers is the degree of substitutability between the products sold by the merging firms. The FTC and the DOJ expect a

larger increase in prices when "the buyers of products sold by one merging firm consider products sold by the other merging firm to be their next choice" (U.S. DOJ/FTC 2010, pg. 20), i.e., when buyers substitute easily between the merging firms' products. At the same time, "a merger is unlikely to generate substantial unilateral price increases if non-merging parties offer very close substitutes for the products offered by the merging firms" (U.S. DOJ/FTC 2010, pg. 22). Similarly, the EU Guidelines state that "the higher the degree of substitutability between the merging firms' products, the more likely it is that merging firms will raise prices significantly." Meanwhile, "the merging firms' incentive to raise prices is more likely to be constrained when rival firms produce close substitutes to the products of the merging firms than whey they offer less close substitutes" (European Commission, pg. 8) In this section, I examine the effect of the degree of substitutability between the merging products on the post-merger increase in prices.

A simple way to introduce asymmetric substitution patterns between the products is to model the preferences of the switchers using the nested logit specification.[17] Figure 10 presents the nested structure that leads to the consumers switching more easily between the products of firm 1 and firm 2 than between any other pair of product. As an example, such preferences describe the market where firms 1 and 2 offer instant coffee and firm 3 sells ground coffee.

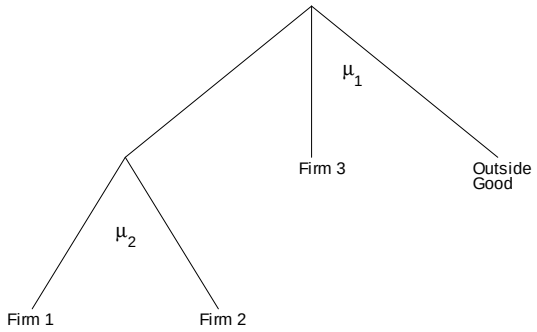
Formally, conditional on purchasing either product 1 or product 2, the switching consumer s has the following utility from purchasing product i ($i \in \{1, 2\}$):

$$U_{si} = \delta_i - p_i + \varepsilon_{si}, \tag{7}$$

where ε_{si} are independently and identically Gumbel distributed with scale parameter μ_2. With

[17] More flexible substitution patterns between differentiated products are estimated in the empirical literature using random coefficients models (Berry, Levinsohn and Pakes 1995, Nevo 2000).

Figure 10: Nested Logit Demand Specification



this specification, the conditional probability of a switching consumer purchasing product i is

$$P(i|\{1,2\}) = \frac{e^{(\delta_i - p_i)/\mu_2}}{e^{(\delta_1 - p_1)/\mu_2} + e^{(\delta_2 - p_2)/\mu_2}}. \tag{8}$$

In order to specify the choice in the upper model, I define the inclusive value of nest $\{1,2\}$, which, when multiplied by μ_2, reflects a switcher's utility from choosing this nest (Train 2009). It is equal to

$$I_{\{1,2\}} = \ln(e^{(\delta_1 - p_1)/\mu_2} + e^{(\delta_2 - p_2)/\mu_2}). \tag{9}$$

A switching consumer takes the value of $I_{\{1,2\}}$ into consideration when choosing between nest $\{1,2\}$, product 3, and the outside good in the upper model. This choice is also modeled as logit with the probability of choosing nest $\{1,2\}$ as

$$P(\{1,2\}) = \frac{e^{\left(\mu_2 I_{\{1,2\}}\right)/\mu_1}}{e^{\left(\mu_2 I_{\{1,2\}}\right)/\mu_1} + e^{(\delta_3 - p_3)/\mu_1} + e^{(\delta_0 - p_0)/\mu_1}}, \tag{10}$$

where μ_1 is the scale parameter of the random term in the upper model. The probability of choosing product j ($j \in \{0,3\}$) in the upper model is

$$P(j) = \frac{e^{(\delta_j - p_j)/\mu_1}}{e^{\left(\mu_2 I_{\{1,2\}}\right)/\mu_1} + e^{(\delta_3 - p_3)/\mu_1} + e^{(\delta_0 - p_0)/\mu_1}}. \tag{11}$$

In order to model the consumer preferences for products 1 and 2 to be more similar than

their preferences between any other pair of products, we set $\mu_1 > \mu_2$. Since products 1 and 2 are close substitutes, a merger between them should cause competitive concerns. On the other hand, a different merger, say between products 2 and 3, leaves a non-merging product 1 as a close substitute to one of the merging products, potentially restricting the merging firms' ability to increase their prices. Before examining whether this recommendation from the Guidelines holds in the setting with price promotions, I present the pre-merger strategies of the firms with asymmetric substitution patterns.

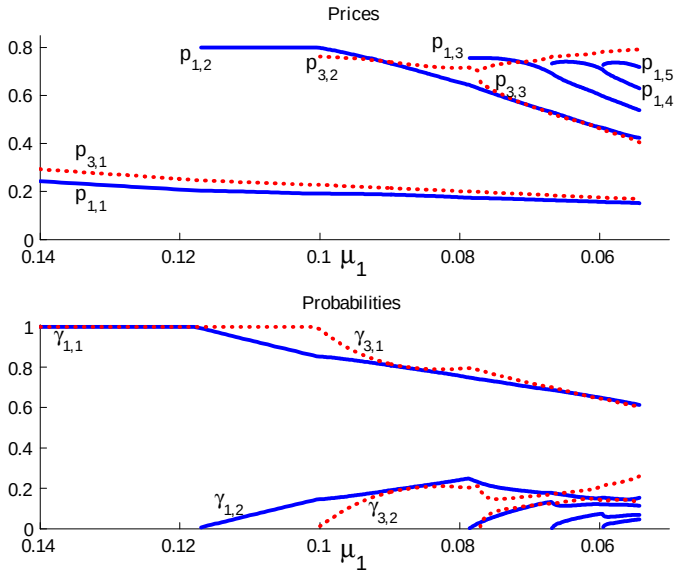
Similar to the presentation in the previous two sections, I will illustrate how the optimal prices and probabilities respond to a decrease in consumer heterogeneity. There are two measures of consumer heterogeneity in this version of the model, μ_1 and μ_2, and I decrease both while keeping their ratio constant ($\mu_2 = 0.75\mu_1$). The other model parameters are the same as in Section 3. Figure 11 presents the optimal strategies of the firms.[18]

The pricing strategies follow the pattern familiar from the previous sections. For the high levels of consumer heterogeneity, all firms use pure strategies. Since the consumers substitute more easily between the products of firm 1 and firm 2, these firms compete more aggressively for the switchers and charge the prices that are smaller than the price of firm 3. As the consumer heterogeneity declines, the firms add more prices to the support of their mixed strategies. Firms 1 and 2 continue to employ more aggressive strategies than firm 3 by using more sale prices and placing a larger probability on them.

Now, I will examine how different types of mergers impact the optimal prices of the firms. Figure 12 presents the bubble graphs of the pre-merger prices (top panel), the prices after the

[18] The prices and probabilities of firms 1 and 2 are given by the solid lines while the prices and probabilities of firm 3 are given by the dotted lines.

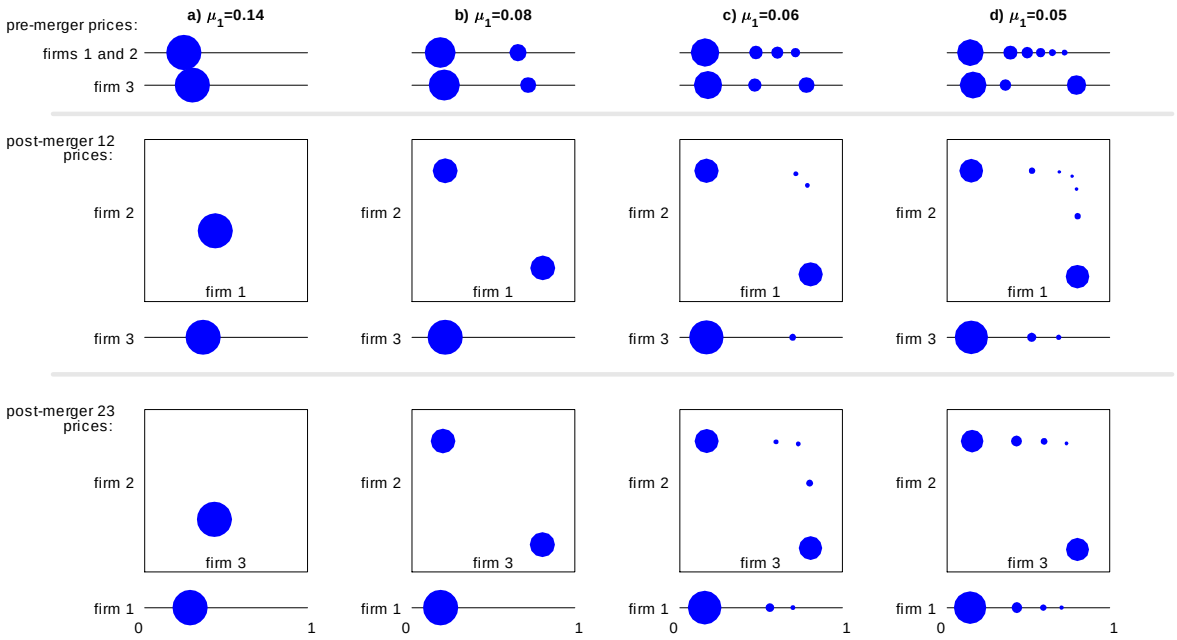
Figure 11: Pre-Merger Pricing Strategies ($\mu_2 = 0.75\mu_1$).



merger of firms 1 and 2 (middle panel), and the prices after the merger of firms 2 and 3 (bottom panel) for several values of μ_1.

For the high values of μ_1, all firms use pure strategies before and after a merger (Figure 12a). After the merger of firms 1 and 2, the prices of all firms go up, and the increase is larger for the merged firms. The change in prices is similar after the merger of firms 2 and 3. All prices increase as well. The price of non-merged firm 1 increases by the least amount, the price of firm 2 goes up by a larger amount, and the increase is the largest for the price of firm 3. This strategy of the merged firms is intuitive. They find it optimal to allocate one of them to compete for the switchers with the non-merged firm, and since the consumers substitute more easily between the products of firms 1 and 2, firm 2 can accomplish this task more effectively. Thus, firm 2 increases its price, but tries to keep it close to the price of firm 1, while the other merged firm increases its price by a larger amount. For $\mu_1 = 0.14$, the consumers still have relatively inelastic demands,

Figure 12: Pre- and Post-Merger Prices ($\mu_2 = 0.75\mu_1$)

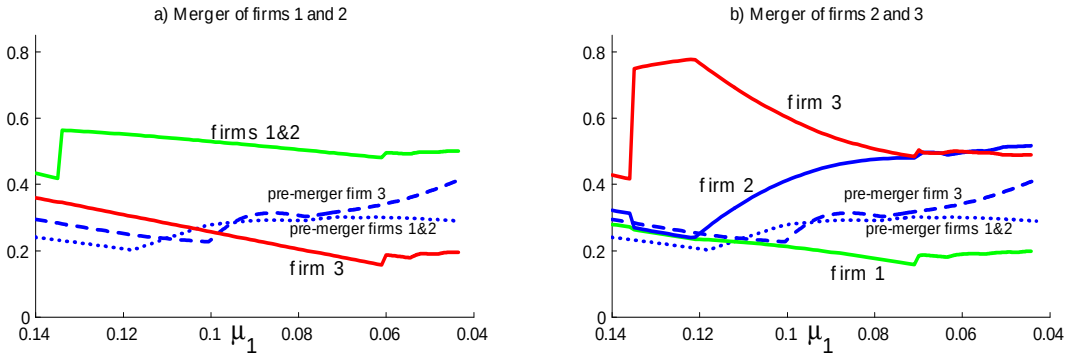


so firm 3 keeps its price comparatively low to capture the switchers who have a preference for its product. However, for the smaller values of μ_1 ($\mu_1 < 0.136$), firm 3 sharply increases its price to target its loyals. At that point, since firm 3 stops targeting the switching cohort, firm 2 drops its price to the level of firm 1 in order to more effectively compete for the switchers.

As μ_1 decreases, all pre-merger firms and the merged post-merger firms start using the mixed strategies (Figure 12b). The merged firms avoid joint promotions by setting only one of their prices low to compete for the switchers with the non-merged firm. The non-merged firm uses a single low price. For the smaller values of μ_1 (Figures 12c and d), all post-merger firms employ discounts. Figure 13 illustrates the firms' expected prices before and after each merger.

For the large values of μ_1, Figure 13 confirms the Agencies' concern about mergers involving

Figure 13: Expected Pre- and Post-Merger Prices ($\mu_2 = 0.75\mu_1$)



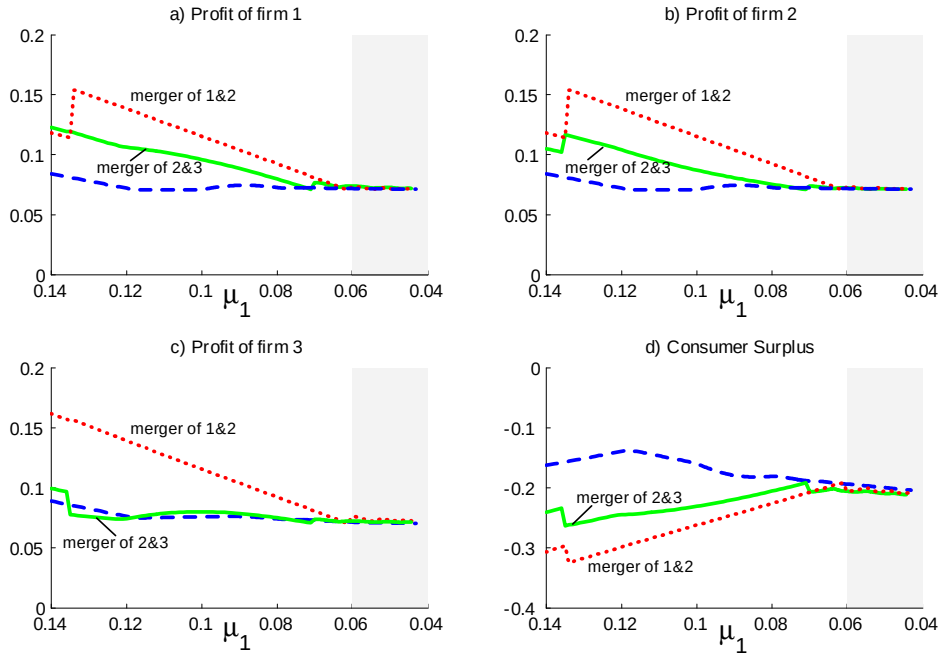
close substitutes. When all firms use pure strategies, the merger of firms 1 and 2 leads to a large increase in the prices of both merged firms and a small increase in the price of the non-merged firm. In contrast, the merger of firms 2 and 3 leads to a large increase in the price of only one merged firm (firm 3) while the prices of both firms 1 and 2 increase by a small amount. Thus, the overall price level increases more after the merger of firms 1 and 2.

For the small values of μ_1 ($\mu_1 < 0.06$), when all pre- and post-merger firms use price promotions, the patterns of the average prices become very similar for both types of mergers. After a merger, the merged firms discount one of their products while keeping the price of the other product high. Therefore, each merged firm offers a discount only 50% of the time. In contrast, before a merger, all firms were employing frequent discounts. Thus, the average price of the merged firms increases after both types of mergers. The non-merged firm faces a promotional price on one of its competitors' products with certainty. Hence, in order to compete for the switchers, it responds with an aggressive pricing strategy, placing a large weight on its deepest discount. The average price of the non-merged firm, then, decreases in comparison with the pre-merger level.

Figure 14 illustrates the pre- and post-merger profit levels and consumer surplus. For the

relatively large values of consumer heterogeneity, when the merged firms use the strategy of charging one low and one high price but the non-merged firm still charges a single price ($0.06 < \mu_1 < 0.136$), the merger of firms 1 and 2 benefits all firms more than the merger of firms 2 and 3.[19]

Figure 14: Pre- and Post-Merger Profits and Consumer Surplus ($\mu_2 = 0.75\mu_1$)



This is intuitive since high substitutability of products 1 and 2 leads to a fierce price competition between these firms. If they merge, the remaining competition is between the pairs of products with lower substitutability, so all firms benefit from charging higher prices. The merger of firms 2 and 3, on the other hand, retains the strong competition between firms 1 and 2, which leads to smaller profits for all firms. Correspondingly, the consumer surplus drops lower after the merger of firms 1 and 2.

[19] When $\mu_1 \geq 0.136$, firm 1 benefits more from the merger of firms 2 and 3. This is consistent with the existing research that shows that an outside firm benefits more from a merger than the merged firms.

However, the difference between the two types of mergers becomes negligible for the lower levels of consumer heterogeneity, at which all firms use promotions (shaded regions in Figure 14). For these values of consumer heterogeneity, the demands are very elastic and respond strongly to a promotion by any firm. Thus, all firms use aggressive promotional strategies regardless of which merger takes place. Moreover, neither merger has a sizeable effect on the firms' profits or the consumer surplus in comparison with the pre-merger state.

6 Concluding Remarks

This paper studies the competitive effects of a horizontal merger between firms that produce differentiated products. Consumers are divided into loyals, who purchase from their preferred firm, and heterogeneous switchers, who choose between all available products. When the switchers are sufficiently heterogenous so that each firm uses a single price, the results from the existing literature are confirmed. That is, after a merger, the prices and profits of all firms increase. The price increase is larger for the merged firms, and the profit increase is larger for the non-merged firm. Additionally, I find support for the competitive concerns expressed in the Guidelines with regard to the mergers that result in a larger increase in the concentration ratio and the mergers between close substitutes.

The main contribution of this paper is to show that the above results do not hold when the consumer heterogeneity is low enough so that the firms use price promotions before and after a merger. The firms' post-merger strategies have a different structure from the one in the high heterogeneity case. The merged firms increase their prices, but coordinate the promotions by never discounting their products simultaneously. The non-merged firm prices more aggressively,

using deeper and more frequent discounts. The impact of the merger on the firms' profits and the consumer surplus is negligible. Furthermore, this conclusion is not affected by either the size of the change in the concentration ratio or the degree of substitutability between the merging products. Therefore, even modest efficiency gains should be sufficient for a merger to have a positive impact on consumer welfare.

Various other factors can influence the effect of a merger on the firms' pricing strategies. The merging firms might decide to discontinue offering one of the products (Lommerud and Sørgard 1997) or to reposition their products (Gandhi et al. 2008). They could adjust their advertising strategies (Tenn et al. 2010) or alter the quality of their products (Brekke et al. 2014). All of these factors will have a direct effect on the consumer surplus as well as impacting it through a change in the promotional strategies.

The modeling of promotional strategies also might require additional considerations. For example, often price promotions occur in a vertical channel with a manufacturer and a retailer jointly setting the timing and size of discounts. Therefore, we can expect that both pre- and post-merger promotional strategies of all manufacturers are influenced by the goals of a retailer who manages the whole product category. With such structure, when two manufacturers merge, the changes in the retail prices faced by consumers might differ from the ones described in this paper.

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