Recent industry developments motivate the study of cross-market integration and the integrated firm’s sabotage activities, which often raise controversies and regulatory concerns due to the potential negative effects on competition and social welfare. When firms offering two complementary products integrate, the integrated firm has the capability to engage in multi-market sabotage, i.e., sabotage its rivals in both markets. But its incentive to do so and the corresponding impacts on competition and social welfare remain unclear, which are the focus of this paper. Interestingly, we find that the integrated firm may not have the incentive to engage in sabotage at all. We show that the integrated firm prefers to engage in sabotage (single-market or multi-market) only when it has cost advantages over its rivals in at least one of the markets. At the extreme, a certain level of sabotage actions could even force some product combinations out of the market and thus, there might be a need for regulatory intervention. A counter-intuitive result is that under certain market conditions, the integrated firm’s sabotage activities correspond to those that would optimize social welfare.

Keywords: Cross-market integration, sabotage, complementary markets

1. Introduction

From an economics perspective, sabotage includes a set of firm-specific, non-price related actions negatively influencing competitor’s outcomes (see Mandy 2000, Beard et al. 2001). An example of such an action is reflected in Comcast providing it’s customers in Houston, Oregon, and Southwest Washington state automatic increases in internet speeds...“if they subscribed to a package that includes cable television service and internet,...” through Comcast.\(^1\) Obviously such a sabotage action would enhance customer’s perception of the

ISP service provided by Comcast vis-a-vis the same service provide by competing firms (such as AT&T).

There are also a large number of potential sabotage options available to integrated firms in direct competition with their non-integrated rivals. For example,

When Google acquired YouTube in 2006, a keyword search for YouTube videos provided better results when using Google Chrome as compared to Microsoft Bing. In addition, within its own search process, Google favors YouTube video links over Vimeo links.\(^2\)

After the 2011 merger of Comcast and NBCUniversal resulted, certain exclusive content on NBC Universal was only offered to Comcast subscribers.\(^3\).

After Microsoft’s acquisition of LinkedIn in 2016, it was observed that LinkedIn’s app integrated directly with Windows 10 while this was not the case with other OS, and Microsoft’s mobile operating system did not support Facebook integration while that was not the case for LinkedIn.\(^4\)

Sabotage is even more likely to occur after a merger of firm’s providing complementary services. Although we focus primarily on actions undertaken by merged firms, the analysis and resulting insights also hold for setting where firms across two complementary markets are exploring alliances to better serve their customers. Alliances stem from two or more companies agreeing to pool their resources to form a combined force in the marketplace. Thus, each participant in the alliance retains their individual entity but choose to compete against competitors as a unified business force. For example, consider Apple Pay and MasterCard who at first glance are competitors (see http://smallbusiness.chron.com/examples-successful-strategic-alliances-13859.html, accessed June 27 2018). However, Apple collaborated with the second largest credit card provider in the world, MasterCard, to gain credibility in the merchant services and processing arena. While Apple Pay gets the benefit of MasterCard’s reputation, MasterCard gets the cache of being the first to be an Apple Pay authorized option. The experience of MasterCard helps Apple as it works out potential bugs and issues as Apple Pay gains acceptability. In such settings, it is also possible for


\(^3\) “Xfinity TV will offer NBCUniversal’s Olympic content live and on-demand, across multiple digital, mobile and tablet platforms, and for the first time ever, the Games will be available in 3D.” “We are excited to bring our Xfinity TV customers NBCUniversal’s coverage of every minute of every medal on every screen of the 2012 London Olympics,” said Matt Strauss, Senior Vice President, Digital and Emerging Platforms, Comcast Cable. “Through multiplatform Olympic-themed search, tools and personalized features created to help our customers view and experience the events, we are providing a virtual passport to NBCUniversal’s comprehensive 2012 London Games programming.” (see https://corporate.comcast.com/news-information/news-feed/comcasts-xfinity-tv-brings-customers-nbcuniversals-coverage-of-2012-london-summer-olympic-games-july-25-august-12, accessed June 27, 2018)

the allied firms (in this case Apple Pay and MasterCard) to engage in sabotage actions against customers choosing either another Pay App (such as Square) or other credit card services (such as Visa and American Express).

Although sabotage could be viewed as anti-competitive by regulators, standards and criteria used by such regulators have evolved over time. A market argument advocated by proponents of mergers and/or acquisitions is that fear of exclusion is not necessarily a reflector of anti-competitive effects (see Krattenmaker and Salop 1986). Instead market arguments being made to regulators is that: As long as actions by integrated firms stem from efficient behavior and do not harm competitors more severely than habitual, unilateral independent decisions by the individual firms in the supply chain, such actions should not be construed as being anti-competitive. The premise is that integration reflecting efficient behavior and, if successful in increasing market shares, is to be encouraged.

These aspects motivate the focus of this paper. More specifically, we study an integrated firm’s incentive to engage in sabotage actions. Our general research question is: What is the optimal sabotage strategy for an integrated firm serving two complementary markets – no sabotage, single-market sabotage, or multi-market sabotage? Related questions we also address are: What are the key drivers of these sabotage choices? Which market(s) would be chosen for sabotage by the integrated firm? And finally, how would a social planner’s sabotage choices differ from those of the integrated firm?

Prior work in this domain focuses primarily on vertical integration. Since downstream buyers rely on upstream suppliers’ input, the upstream integrated firm’s sabotage activities impact downstream buyers in a single market. It is also worth noting that the majority of prior work has focused on cost-side impacts of an integrated firm’s sabotage activities, i.e., if the integrated upstream firm chooses to sabotage, it is reflected in increased costs for the competing downstream non-integrated firm. Our focus differs on two important dimensions.

First, the setting we investigate is one in which the integrated firm could engage in either single-market sabotage (i.e., sabotage its non-integrated rivals in a single market) or multi-market sabotage (i.e., sabotage its non-integrated rivals in both markets). Returning to the earlier example of the 2016 Comcast-NBCUniversal merger, the integrated firm competes with non-integrated firms in two markets (e.g., AT&T as an ISP and CBS as a content
provider). Thus, the integrated firm could undertake sabotage actions directed at either the ISP market, or the content provider market, or both markets.

Second, rather than focus on cost-side effects of sabotage undertaken by the integrated firm, we instead consider demand-reducing sabotage with product valuation effects. The two reasons driving this choice are: (a) a product valuation-sabotage link in our setting captures user effects of sabotage; and (b) the insights using a valuation-sabotage link also hold for the cost-sabotage linkages except that the under the latter setting, the integrated firm is more likely to engage in sabotage.

The key contributions and insights we offer are as follows. We find that the integrated firm’s optimal sabotage strategy is strongly dependent on a firm’s relative cost advantage in both markets. This relative cost advantage increases as the integrated firm’s marginal cost is lower than that of its non-integrated rivals and decreases in the degree of product differentiation in the two markets. The integrated firm will engage in multi-market sabotage when the integrated firm’s overall relative cost advantage is high; it will engage in single-market sabotage when the relative cost advantage is moderate; and will not pursue sabotage as an option when the relative cost advantage in both markets is small or non-existent. We also find that if the integrated firm chooses to engage in sabotage, it will experience demand increases for its combined product offering but will also incur reduced demand for the mixed product combinations. Single-market sabotage enables the integrated firm to increase prices in the sabotaged market, but it has to reduce prices in the other market. Thus, sabotage is a double-edged sword and has countervailing effects on the integrated firm’s demands and profit margins.

Our findings also have some relevance for the net neutrality debate from the perspective of firm integration and sabotage. Net neutrality is a multi-faceted worldwide debate that’s been going on for more than a decade. This paper does not attempt to provide any definitive solution on whether to enforce net neutrality or not. Instead, this paper offers additional insights for this debate from the unique perspective of cross-market integration and sabotage. For example, our findings suggest that cross-market integration and the integrated firm’s potential sabotage activities could in extreme situations force certain product combinations out of the market. On the other hand, we also find that under certain other conditions, sabotage actions undertaken by the merged firm could be socially optimal.
Finally, from a policy perspective, we provide some unique insights. In a Stackelberg leader-follower setting with the integrated firm as the market leader, sabotage actions to optimize integrated firm profits tend to result in a loss of social welfare. Investigating optimal sabotage levels from the perspective of the regulator (i.e., those that optimize social welfare), we find that in certain “regions” (defined by the relative cost advantage for the integrated firm as compared to the non-integrated firms) both the regulator and integrated firm will choose the same sabotage strategy. This insight (i.e., identical optimal sabotage decisions from the perspective of the regulator and integrated firm) leads to the paradoxical result that sabotage as an option is not always detrimental to social welfare.

The remainder of this paper is organized as follows. In the next section, we review the related literature. In Section 3, we present the modeling framework of cross-market integration and analyze the no-integration case as a benchmark. Following that, in Section 4, we analyze the equilibrium results of cross-market integration with and without the sabotage option. Section 5 provides a social welfare analysis and discusses policy implications of our analysis. Section 6 analyzes two extensions of the main model – the simultaneous pricing game and the game with incomplete information. Finally, conclusions and insights are discussed in Section 7.

2. Literature Review

This paper draws upon and is related to prior literature in the areas of integration, sabotage, and bundling. In the area of sabotage, the focus is to investigate whether an upstream monopolist should sabotage the actions of downstream firms (i.e., a vertically integrated supply chain setting). Our focus is on a few key papers in this stream of work (for a recent overview, the reader is referred to Mandy et al. (2016)). Economides (1998) finds that an upstream monopolist always has an incentive to raise downstream rivals’ costs through sabotage activities while Sibley and Weisman (1998) shows that a regulated upstream monopolist may not always prefer to sabotage its downstream rivals and instead might prefer to lower rivals’ costs. Mandy (2000) finds that the upstream monopolist may refrain from sabotage when its downstream rivals are more cost efficient and its upstream profit margin is sizable. The setting investigated by Beard et al. (2001) is of a dominant firm and a competitive fringe in the upstream market and two downstream firms providing differentiated products engaging in price competition. The key finding is that the incentive for
vertical integration always exists but the integrated firm will sabotage the downstream rival only when there is an input price regulation in the upstream market. Finally, Sappington and Weisman (2005) study a vertically-integrated producer’s incentives to self-sabotage and show that under certain market conditions, the vertically-integrated producer has the incentive and the ability to disadvantage its downstream rivals differentially through symmetric cost increases or quality reductions for all rivals.

Product bundling strategies have been studied extensively in economics and marketing. Stremersch and Tellis (2002) and Venkatesh and Mahajan (2009) provide excellent overall reviews of the bundling literature. Most of the literature in this stream examines a monopoly firm’s bundling strategy in light of its own products offerings by comparing pure components, pure bundling, or mixed bundling pricing strategies to identify conditions when mixed bundling or pure bundling is optimal (Adams and Yellen 1976, Whinston 1990, Armstrong 1999, Fang and Norman 2006, Bhargava 2013). These results show that firms can use bundling discounts as a price-discrimination tool. Research in bundling which has analyzed a similar setting to ours are those by Matutes and Regibeau (1992), Gans and King (2006), Mialon (2014). Matutes and Regibeau (1992) studied duopoly competition in two product markets and show that mixed bundling is mutually unprofitable for the duopoly firms. Their focus was studying the bundling decisions of two integrated firms in each product market. Gans and King (2006) comparing bundling decisions of a co-branded firms in two unrelated product markets with that of an integrated firm, find that bundling is profitable only when one pair of firms integrate competing with a non-integrated pair, and if both pairs of firms integrate they will not offer bundled-discount due to intense price competition. Mialon (2014) investigated whether firms will choose to integrate or form a strategic alliance and whether they will bundle their products. Their key result is that mixed bundling is not profitable and firms can do better with pure bundling.

If we consider an integrated firm in a two-product complementary market, the key conceptual difference between bundling and sabotage actions is that in the former, the integrated firm discounts its own product combination offering while sabotage actions represent disincentives for consumers to purchase the non-integrated firms product in combination with that of the integrated product. From an operational perspective, this leads to two distinct settings where under bundling, the discounting factor not only impacts sales of the integrated firm’s products but also its profit margin, while under sabotage, only
sales of the integrated firm’s products are impacted. Hence, sabotage as the focal point of this research, is a completely different strategy choice from bundling.

Our paper is related to these streams of work in the following ways. First, the sabotage literature investigates a vertically integrated setting and thus, sabotage actions are directed at a single market. Since there are also firm integrations across complementary product markets, we shift our focus to such a setting. In such a market setting, the integrated firm’s choices for sabotage encompass more than one market. Second, in the existing literature, the integrated firm’s sabotage activities are modeled in one of two ways – demand-reducing sabotage (Crémer et al. 2000, Laffont and Tirole 2010, Rubinfeld and Singer 2001, Sappington and Weisman 2005, Mandy and Sappington 2007) and cost-increasing sabotage (Economides 1998, Sibley and Weisman 1998, Mandy 2000, Beard et al. 2001, Weisman and Kang 2001, Sappington and Weisman 2005, Mandy and Sappington 2007, Mandy et al. 2016). When firms compete with each other through prices as modeled in our paper, demand-reducing sabotage has been shown to be often unprofitable while cost-increasing sabotage has been shown to be profitable (Mandy and Sappington 2007). In our paper, we adopt the more conservative approach of modeling the integrated firm’s sabotage activities as demand-reducing sabotage. Specifically, the integrated firm may reduce the valuation of the product combination involving a rival’s product. This allows us to identify market conditions under which demand-reducing sabotage is profitable for the integrated firm. Third, we follow the general approach adopted in prior research on bundling and sabotage (see for example, Economides (1998), Gans and King (2006), Mandy and Sappington (2007), Mandy et al. (2016)) by analyzing a Stackelberg leader-follower game setting reflecting cases where the integrated firm commands greater market power than it non-integrated rivals. We also extend our analysis to a simultaneous game setting to analyze cases where market power differences between the integrated firm and its rivals are small or non-existent.

In the next section, we present our modeling framework and analytically characterize our benchmark setting with no integration.

3. **Modeling Framework**

3.1. **Preliminaries**

We consider a stylized setting to analyze cross-market integration and sabotage. There are two complementary products $A$ and $B$ (e.g., Internet access services and online content;
and mobile devices and carrier services) and consumers need to consume both to derive any utility. In each product market, there are two competing firms, denoted by $A_0$ and $A_1$ ($B_0$ and $B_1$), both offering product $A$ (product $B$). Since products $A$ and $B$ are complements, there are four product combination choices that consumers can choose from – $A_0B_0$, $A_0B_1$, $A_1B_0$, and $A_1B_1$.\(^5\) In this setting, cross-market integration refers to the case when one firm from market $A$ and one firm from market $B$ integrate.

Consumers are heterogeneous in terms of their preferences for the two individual products within a product combination. We capture this consumer heterogeneity using a two-dimensional Hotelling model. In each market, the two competing firms’ products are located at the end points of a unit line, with $A_0$ ($B_0$) at point 0 and $A_1$ ($B_1$) at point 1; consumers are uniformly distributed along the unit line and incur a unit misfit cost $t$.\(^6\) Hence, consumers’ overall preferences for product combinations can be specified as a uniform distribution on a unit square. These unit misfit cost $t$ can also be interpreted as the degree of product differentiation, i.e., a higher $t$ implies greater differentiation with less intense competition.

Consumers are assumed to have a unit demand and share a common gross valuation $v$ for a product combination. Following prior research using a Hotelling framework, we assume that consumers’ common gross valuation $v$ is high enough such that the market is fully covered, i.e., all consumers purchase a unit of product in each market. This results in complete market coverage and enables us to eliminate the impact of market expansion on firms’ pricing and sabotage decisions, and instead focus on the effect of firm competition.

When all four firms operate independently (i.e., no integration), each firm (indexed by $ij$ for $i = A, B$ and $j = 0, 1$) incurs a variable production cost of $c_{ij}$ and charges a price $p_{ij}$. The two firms in each market are asymmetric in terms of their marginal costs $c_{ij}$.\(^7\) We define $\Delta c_A = c_{A_1} - c_{A_0}$ and $\Delta c_B = c_{B_1} - c_{B_0}$ as firms’ cost asymmetry within markets.

---

\(^5\)Consumer price for a product combination purchased is the sum of prices for the individual product offerings. This is distinct from the bundling literature where the firm offering the bundled product could enjoy a distinct price advantage over a firm offering the individual products.

\(^6\)Our assumption is that consumer preferences on both product offerings are symmetric and this is captured by this common unit misfit cost $t$ on both dimensions. If however, we consider an asymmetric misfit cost $t_A$ and $t_B$, then: (a) the structural characterization of optimal sabotage strategies is intractable; and (b) under certain parametric settings for these asymmetric misfit costs, the general insights on single-market, multi-market, and no sabotage strategies we present in this paper still hold.

\(^7\)In this paper, we capture firms’ efficiency asymmetry through their different marginal costs. Alternative model choices such as different consumer valuations of the competing firms generate similar results.
A and B respectively. Under cross-market integration, we consider that firms A0 and B0 integrate, i.e., the two firms located at point 0 (i.e., A0 and B0) integrate. Thus, under cross-market integration, $\Delta c_A$ and $\Delta c_B$ represent the integrated firm’s cost (dis)advantage in market A and B respectively. When $\Delta c_A$ or $\Delta c_B$ is positive, the integrated firm has a cost advantage over its rival in the corresponding market. Furthermore, a higher $\Delta c_A$ or $\Delta c_B$ indicates a higher cost advantage for the integrated firm. When $\Delta c_A$ or $\Delta c_B$ is negative, the integrated firm has a cost disadvantage in the corresponding market.

Within the assumed market structure, the degree of product differentiation ($t$) and the integrated firm’s cost advantage ($\Delta c_A$ and $\Delta c_B$) capture different market characteristics. While the degree of product differentiation captures the competitiveness of the market (higher $t$ indicating lower competition), the cost advantage captures the degree of firms’ efficiency asymmetry within a given market. In order to capture the relative strength of these two market characteristics, we define $r_A = \frac{\Delta c_A}{t}$ and $r_B = \frac{\Delta c_B}{t}$ as firms’ relative cost asymmetry within markets A and B respectively. Under cross-market integration of A0 and B0, $r_A$ and $r_B$ represent the integrated firm’s relative cost (dis)advantage in markets A and B respectively, which indicate the integrated firm’s cost advantage over its rival within a product market relative to the competitiveness of the market. A higher cost advantage (i.e., a larger positive $\Delta c_A$ or $\Delta c_B$) and a more competitive market (i.e., lower $t$) imply a higher relative cost advantage. As will be seen later, firms’ pricing and sabotage decisions critically depend on these parameters. All notation is summarized in Table 1.

To ensure that all firms capture a positive market share in equilibrium in the no-integration case, we assume that $-3t < \Delta c_A < 3t$ and $-3t < \Delta c_B < 3t$, i.e., $-3 < r_A < 3$ and $-3 < r_B < 3$. This allows us to capture the fact that when firms operate independently, each firm is always able to serve some loyal customers who prefer its product, i.e., no firm is forced out of the market. In the next subsection, we structurally characterize the benchmark setting for analysis.
### Table 1: Summary of Notation

<table>
<thead>
<tr>
<th>Notation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>( A0 ) and ( A1 )</td>
<td>Two competing firms producing product ( A )</td>
</tr>
<tr>
<td>( B0 ) and ( B1 )</td>
<td>Two competing firms producing product ( B )</td>
</tr>
<tr>
<td>( A0B0, A0B1, A1B0, ) and ( A1B1 )</td>
<td>Four product combination choices for consumers</td>
</tr>
<tr>
<td>( A0-B0 )</td>
<td>Integrated firm</td>
</tr>
<tr>
<td>( t )</td>
<td>Unit misfit cost (or degree of product differentiation)</td>
</tr>
<tr>
<td>( c_{ij} )</td>
<td>Marginal cost of firm ( ij ), where ( i = A, B ) and ( j = 0,1 )</td>
</tr>
<tr>
<td>( \Delta c_A ) and ( \Delta c_B )</td>
<td>Firms’ cost asymmetry under no integration or the integrated firm’s cost (dis)advantage under cross-market integration in markets ( A ) and ( B ) respectively; ( \Delta c_A = c_{A1} - c_{A0} ) and ( \Delta c_B = c_{B1} - c_{B0} )</td>
</tr>
<tr>
<td>( r_A ) and ( r_B )</td>
<td>Firms’ relative cost asymmetry under no integration or the integrated firm’s relative cost (dis)advantage under cross-market integration in markets ( A ) and ( B ) respectively; ( r_A = \frac{\Delta c_A}{t} ) and ( r_B = \frac{\Delta c_B}{t} )</td>
</tr>
<tr>
<td>( p_{ij} ) and ( P_{ij} )</td>
<td>Price charged by firm ( ij ) under no integration and under cross-market integration respectively</td>
</tr>
<tr>
<td>( v )</td>
<td>Consumers’ gross valuation for a unit of product ( A ) and product ( B )</td>
</tr>
<tr>
<td>( (x,y) )</td>
<td>Representative consumer whose ideal choice is ( x ) for product ( A ) and ( y ) for product ( B ), where ( 0 \leq x \leq 1 ) and ( 0 \leq y \leq 1 )</td>
</tr>
<tr>
<td>( u(x,y) ) \ and ( U(x,y) )</td>
<td>Utility of the representative consumer under no integration and under cross-market integration respectively</td>
</tr>
<tr>
<td>( \hat{x} )</td>
<td>Indifferent consumer for product ( A ) under no integration or under cross-market integration but no sabotage</td>
</tr>
<tr>
<td>( \hat{y} )</td>
<td>Indifferent consumer for product ( B ) under no integration or under cross-market integration but no sabotage</td>
</tr>
<tr>
<td>( y_{A0} )</td>
<td>Indifferent consumer between product combinations of ( A0B0 ) and ( A0B1 ) under cross-market integration with sabotage</td>
</tr>
<tr>
<td>( y_{A1} )</td>
<td>Indifferent consumer between product combinations of ( A1B0 ) and ( A1B1 ) under cross-market integration with sabotage</td>
</tr>
<tr>
<td>( x_{B0} )</td>
<td>Indifferent consumer between product combinations of ( A0B0 ) and ( A1B0 ) under cross-market integration with sabotage</td>
</tr>
<tr>
<td>( x_{B1} )</td>
<td>Indifferent consumer between product combinations of ( A0B1 ) and ( A1B1 ) under cross-market integration with sabotage</td>
</tr>
<tr>
<td>( \sigma_A ) and ( \sigma_B )</td>
<td>Sabotage level in markets ( A ) and ( B ) respectively</td>
</tr>
<tr>
<td>( d ) \ and ( D )</td>
<td>Demand of product combinations under no integration and under cross-market integration respectively</td>
</tr>
<tr>
<td>( \pi_{ij} ) \ and ( \Pi_{ij} )</td>
<td>Profit of firm ( ij ) under no integration and under cross-market integration respectively</td>
</tr>
<tr>
<td>( \Pi_I )</td>
<td>Profit of the integrated firm</td>
</tr>
<tr>
<td>( CS )</td>
<td>Consumer surplus</td>
</tr>
<tr>
<td>( SW )</td>
<td>Social welfare</td>
</tr>
<tr>
<td>( \alpha )</td>
<td>Information asymmetry parameter</td>
</tr>
</tbody>
</table>
3.2. No integration – Benchmark setting

Given the market setting described above, a representative consumer located at \((x, y)\) obtains the following net utilities for each product combination:

\[
\begin{align*}
    u_{A0B0}(x, y) &= v - tx - ty - p_{A0} - p_{B0} \\
    u_{A0B1}(x, y) &= v - tx - t(1 - y) - p_{A0} - p_{B1} \\
    u_{A1B0}(x, y) &= v - t(1 - x) - ty - p_{A1} - p_{B0} \\
    u_{A1B1}(x, y) &= v - t(1 - x) - t(1 - y) - p_{A1} - p_{B1}
\end{align*}
\] (1)

Pairwise comparisons of the net utilities for the four product combinations yield the following indifference points:

\[
\begin{align*}
    \hat{x} &= \frac{1}{2} + \frac{p_{A1} - p_{A0}}{2t} \\
    \hat{y} &= \frac{1}{2} + \frac{p_{B1} - p_{B0}}{2t}
\end{align*}
\] (2)

The market demands based on these indifference points are illustrated in Figure 1.

---

**Figure 1**  Market demand for each product combination in the no-integration case

Notes: Figure 1 illustrates the indifferent consumers (\(\hat{x}\) and \(\hat{y}\)) and the corresponding demands for a representative set of parameter values. The locations of \(\hat{x}\) and \(\hat{y}\) may be different for different parameter values.

Consumers who prefer \(A0\)'s product are located to the left of \(\hat{x}\) and consumers to the right of \(\hat{x}\) will choose \(A1\). Similarly, consumers who prefer \(B0\)'s product are located to the bottom of \(\hat{y}\) and consumers to the top of \(\hat{y}\) will choose \(B1\). This leads to the demands for the four product combinations shown in Figure 1. The demand for each product combination can
be determined as $d_{A0B0} = \hat{x}\hat{y}$, $d_{A0B1} = \hat{x}(1 - \hat{y})$, $d_{A1B0} = (1 - \hat{x})\hat{y}$, and $d_{A1B1} = (1 - \hat{x})(1 - \hat{y})$ respectively. Accordingly, the demand for each firm is $d_{A0} = \hat{x}$, $d_{A1} = 1 - \hat{x}$, $d_{B0} = \hat{y}$, and $d_{B1} = 1 - \hat{y}$. Each firm chooses its price $p_{ij}$ to maximize its profit $\pi_{ij} = (p_{ij} - c_{ij})d_{ij}$, and this leads to the results stated in Lemma 1. The proofs of all lemmas and propositions are relegated to the appendix.

**Lemma 1 (Equilibrium of the no-integration game).** When all four firms operate independently (i.e., no integration), the equilibrium prices are $p_{A0} = c_{A0} + t + \frac{\Delta c_A}{3}$, $p_{A1} = c_{A1} + t - \frac{\Delta c_A}{3}$, $p_{B0} = c_{B0} + t + \frac{\Delta c_B}{3}$, and $p_{B1} = c_{B1} + t - \frac{\Delta c_B}{3}$. The corresponding firm profits are $\pi_{A0} = \frac{(3t + \Delta c_A)^2}{18t}$, $\pi_{A1} = \frac{(3t - \Delta c_A)^2}{18t}$, $\pi_{B0} = \frac{(3t + \Delta c_B)^2}{18t}$, and $\pi_{B1} = \frac{(3t - \Delta c_B)^2}{18t}$.

Lemma 1 indicates that a firm’s price increases not only in its own marginal cost but also in its rival’s marginal cost. In each market, the efficient firm (with lower marginal cost) charges a lower price but earns a higher profit margin, gains a higher market share, and realizes a higher profit in equilibrium. When products offered in each market are more differentiated (i.e., higher $t$), consumers become more loyal to their preferred products. For the efficient firm, winning the rival’s customers through a lower price becomes less effective. Consequently, both firms in the market increase their prices and focus more on their own customers. Therefore, price competition is relaxed for a higher degree of product differentiation. In both markets, through offering a competitive price, the efficient firms can obtain some of their rivals’ less loyal customers who opt for price savings at the expense of incurring a higher misfit cost. As firms’ cost asymmetry increases (i.e., higher $|\Delta c_A|$ or $|\Delta c_B|$), the inefficient firm reduces its price to compete, whereas the efficient firm increases its price and is still competitive as some consumers who prefer inefficient firms’ products will switch to efficient firms’ products instead. Overall, firms’ relative cost asymmetry (i.e., $r_A$ and $r_B$) is the ratio of firms’ cost asymmetry to the degree of product differentiation, which serves as an indicator of the relative strength of these two key market competition parameters.

With this characterization of the benchmark no-integration setting, the focus now shifts to the analysis of integration with and without the sabotage option. To start, note that there are four possible integration scenarios:

- the *Efficient-Efficient* integration: the integrated firm has a cost advantage in both markets, i.e., $0 \leq \Delta c_A < 3t$ and $0 \leq \Delta c_B < 3t$ (or $0 \leq r_A < 3$ and $0 \leq r_B < 3$);
• the Efficient-Inefficient integration: the integrated firm has a cost advantage in the market for product A and a cost disadvantage in the market for product B, i.e., 
\[ 0 \leq \Delta c_A < 3t \text{ and } -3t < \Delta c_B < 0 \text{ (or } 0 \leq r_A < 3 \text{ and } -3 < r_B < 0 \); 
• the Inefficient-Efficient integration: the integrated firm has a cost disadvantage in the market for product A and a cost advantage in the market for product B, i.e., 
\[ -3t < \Delta c_A < 0 \text{ and } 0 \leq \Delta c_B < 3t \text{ (or } -3 < r_A < 0 \text{ and } 0 \leq r_B < 3 \); and 
• the Inefficient-Inefficient integration: the integrated firm has a cost disadvantage in both markets, i.e., 
\[ -3t < \Delta c_A < 0 \text{ and } -3t < \Delta c_B < 0 \text{ (or } -3 < r_A < 0 \text{ and } -3 < r_B < 0 \).

In the next section, we conduct the equilibrium analysis for all of these integration scenarios.

4. Equilibrium Analysis of Integration

Merger and acquisition negotiations are usually confidential (even though one or both firms involved in such an activity might reveal the possibility within financial markets) and integration occurs provided both firms conclude negotiations successfully. In this paper, we assume that this is the case and, without loss of generality, firms \( A_0 \) and \( B_0 \) have decided to integrate. For each of the four possible integration scenarios, we use similar notation as before except that all lowercase letters for key variables are now replaced by uppercase letters.

It is likely that given the confidentiality of the merger and acquisition process, firms that decide to integrate will also make strategic decisions including those on prices and sabotage activities, prior to publicly announcing the integration. This leads us to adopt a Stackelberg setting where the integrated firm (i.e., \( A_0-B_0 \)) is the first mover with the non-integrated competing firms (i.e., \( A_1 \) and \( B_1 \)) as followers. Although a Stackelberg setting might be construed as one where the integrated firm has a significant advantage over its independent competitors, this is not always the case. For example, Gal-Or (1985), Tirole (1988), and Jiang and Katsamakas (2010) show that a firm in a Stackelberg pricing game often earns a higher profit when it acts as the second mover rather than as the first mover. Thus, our assumed Stackelberg setting is driven by the fact that it reflects practice rather than provides a competitive advantage to the integrated firm. For completeness, analysis for the simultaneous (rather than Stackelberg) pricing game is presented in Section 6.

In the next two subsections, we analyze the integration game first without the sabotage option and then with the sabotage option.
4.1. Integration without the sabotage option

For a representative consumer \((x, y)\), her net utilities for the four product combinations are the same as those for the benchmark no-integration case:

\[
\begin{align*}
U_{A0B0}(x, y) &= v - tx - ty - P_{A0} - P_{B0} \\
U_{A0B1}(x, y) &= v - tx - t(1 - y) - P_{A0} - P_{B1} \\
U_{A1B0}(x, y) &= v - t(1 - x) - ty - P_{A1} - P_{B0} \\
U_{A1B1}(x, y) &= v - t(1 - x) - t(1 - y) - P_{A1} - P_{B1}
\end{align*}
\]  

(3)

Thus, the resulting demands for the four product combinations are \(D_{A0B0} = \hat{x}\hat{y}, D_{A0B1} = \hat{x}(1 - \hat{y}), D_{A1B0} = (1 - \hat{x})\hat{y},\) and \(D_{A1B1} = (1 - \hat{x})(1 - \hat{y})\) respectively, where \(\hat{x} = \frac{1}{2} + \frac{P_{A0} - P_{A1}}{2t}\) and \(\hat{y} = \frac{1}{2} + \frac{P_{B0} - P_{B1}}{2t}\) representing the respective indifference points in \(A\) and \(B\) markets. Note that since the net utilities take the same form in the integration-without-sabotage case as those in the no-integration case, the indifference points \((\hat{x} \text{ and } \hat{y})\) also take the same form.

When \(A0\) and \(B0\) integrate, in the first stage, the integrated firm chooses its prices \(P_{A0}\) and \(P_{B0}\) to maximize its profit \(\Pi_I = (P_{A0} - c_{A0})(D_{A0B0} + D_{A0B1}) + (P_{B0} - c_{B0})(D_{A0B0} + D_{A1B0}).\) In the second stage, independent firms \(A1\) and \(B1\) choose their prices \(P_{A1}\) and \(P_{B1}\) separately to maximize their respective profit \(\Pi_{A1} = (P_{A1} - c_{A1})(D_{A1B0} + D_{A1B1})\) and \(\Pi_{B1} = (P_{B1} - c_{B1})(D_{A0B1} + D_{A1B1}).\) The equilibrium results for this case are summarized in Lemma 2.

**Lemma 2 (Equilibrium of integration without the sabotage option).** When the integrated firm acts as the price leader in a Stackelberg pricing game without the sabotage option, there is always incentive for integration and the equilibrium prices are \(P_{A0} = c_{A0} + \frac{3t + \Delta c_{A}}{2}, P_{A1} = c_{A1} + \frac{5t - \Delta c_{A}}{4}, P_{B0} = c_{B0} + \frac{3t + \Delta c_{B}}{2},\) and \(P_{B1} = c_{B1} + \frac{5t - \Delta c_{B}}{4}.\) The corresponding firm profits are \(\Pi_I = \frac{\Delta c_{A}^{2} + \Delta c_{B}^{2}}{16t} + 6t(\Delta c_{A} + \Delta c_{B}) + 18t^{2},\) \(\Pi_{A1} = \frac{(5t - \Delta c_{A})^{2}}{32t},\) and \(\Pi_{B1} = \frac{(5t - \Delta c_{B})^{2}}{32t}.\)

Lemma 2 shows that as expected, the integrated firm (i.e., the leader) charges a higher price than in the no-integration case. In response to the integrated firm’s higher prices, independent firms (i.e., the followers) in both markets also increase their prices. In other words, price competition is dampened. However, the relative price increase for the followers is less than that for the leader. Not only is the total profit of the integrated firm higher
than the sum of the two firms’ profits before integration, the independent firms also realize a higher profit. Thus, if the integrated firm can act as the price leader and engage in a Stackelberg pricing game with other firms, there is always an incentive for integration. Consequently, consumers are subject to higher prices after integration.

In the next subsection, we study the case in which the integrated firm makes both pricing and sabotage decisions.

4.2. Integration with the sabotage option

If the integrated firm chooses to engage in sabotage, it is assumed that this will reduce consumers’ valuation for a mixed product combination which includes one of the integrated firm’s products and one of the competing non-integrated firms’ products, i.e., product combinations $A1B0$ or $A0B1$. Integrated firm $A0-B0$ has the option of either engaging in sabotage in the market for product $A$, or the market for product $B$, or both markets. Following prior studies in sabotage (Economides 1998, Sibley and Weisman 1998, Mandy 2000, Beard et al. 2001), we assume that sabotage does not accrue any direct costs. For a representative consumer located at $(x, y)$, her net utilities for the four product combinations are:

$$U_{A0B0}(x, y) = v - tx - ty - PA0 - PB0$$
$$U_{A0B1}(x, y) = v - sB - tx - t(1 - y) - PA0 - PB1$$
$$U_{A1B0}(x, y) = v - sA - t(1 - x) - ty - PA1 - PB0$$
$$U_{A1B1}(x, y) = v - t(1 - x) - t(1 - y) - PA1 - PB1$$

8 The reason for integrating the impact of sabotage as a value-reduction action rather than a cost-reduction action is two fold. First, cost-increasing sabotage has no direct impact on market demand and instead forces rivals to increase prices and put them in an correspondingly disadvantaged position. In comparison, demand-reducing sabotage has a more nuanced impact on all firms’ demands and prices, including the integrated firm, and may not even be a profitable strategy because of such complexities. Thus, as noted by Mandy and Sappington (2007), demand-reducing sabotage has been shown to be often unprofitable while cost-increasing sabotage has been shown to be profitable. Second, through an analysis of the integrated firm’s optimal sabotage strategy from a cost-increasing perspective, we observe that cost-increasing sabotage would lead to the extreme outcome in which the integrated firm captures the entire market. Hence, our approach is more conservative in comparison.

9 In this paper, we focus on examining the integrated firm’s incentive to engage in sabotage and do not consider its cost of undertaking such sabotage activities. Introducing sabotage cost in the form of fixed cost, or marginal cost, or both will simply reduce the parameter regions under which the integrated firm will sabotage and will not change our fundamental results.
Pairwise comparisons of the net utilities for the four product combinations yield the following indifference points:

\[
\begin{align*}
\hat{x}_B &= \hat{x} + \frac{s_A}{2t} \\
\hat{x}_B &= \hat{x} - \frac{s_B}{2t} \\
y_A &= \hat{y} + \frac{s_B}{2t} \\
y_A &= \hat{y} - \frac{s_A}{2t}
\end{align*}
\]  

(5)

where \( \hat{x} \) and \( \hat{y} \) are the indifferent consumers in the integration-without-sabotage case.

Figure 2 Demands and direct effect of sabotage on demands

Notes: Single arrows indicate the impact of increasing \( s_A \); double arrows indicate the impact of increasing \( s_B \). Figure 2 illustrates the indifferent consumers (\( x_{B0}, x_{B1}, y_{A0}, \) and \( y_{A1} \)) and the corresponding demands for a representative set of parameter values. The locations of \( x_{B0}, x_{B1}, y_{A0}, \) and \( y_{A1} \) may be different for different parameter values.

The resulting demand for each product combination is shown in Figure 2 and given by \( D_{A0B0} = x_{B0}y_{A0} - \frac{(x_{B0} - x_{B1})(y_{A0} - y_{A1})}{2} \), \( D_{A0B1} = x_{B1}(1 - y_{A0}) \), \( D_{A1B0} = (1 - x_{B0})y_{A1} \), and \( D_{A1B1} = (1 - x_{B1})(1 - y_{A1}) - \frac{(x_{B0} - x_{B1})(y_{A0} - y_{A1})}{2} \). Accordingly, the demand for each firm is \( D_A = D_{A0B0} + D_{A0B1} \), \( D_{A1} = D_{A1B0} + D_{A1B1} \), \( D_B = D_{A0B0} + D_{A1B0} \), and \( D_{B1} = D_{A0B1} + D_{A1B1} \).

In the first stage, the integrated firm sets the sabotage levels (\( s_A \) and \( s_B \)) and product prices (\( P_{A0} \) and \( P_{B0} \)) to maximize its own profit:

\[
\Pi_I = (P_{A0} - c_{A0})(D_{A0B0} + D_{A0B1}) + (P_{B0} - c_{B0})(D_{A0B0} + D_{A1B0})
\]

subject to: \( s_A \geq 0, s_B \geq 0, P_{A0} \geq c_{A0}, P_{B0} \geq c_{B0}, 0 \leq x_{B0}, x_{B1}, y_{A0}, y_{A1} \leq 1 \)  

(6)
Subsequently, independent firms $A1$ and $B1$ set their prices $P_{A1}$ and $P_{B1}$ to maximize their respective profits:

$$\Pi_{A1} = (P_{A1} - c_{A1})(D_{A1B0} + D_{A1B1}) \quad \text{subject to: } P_{A1} \geq c_{A1}, 0 \leq x_{B0}, x_{B1}, y_{A0}, y_{A1} \leq 1$$

$$\Pi_{B1} = (P_{B1} - c_{B1})(D_{A0B1} + D_{A1B1}) \quad \text{subject to: } P_{B1} \geq c_{B1}, 0 \leq x_{B0}, x_{B1}, y_{A0}, y_{A1} \leq 1$$

(7)

To better understand the tradeoffs in making sabotage decisions by the integrated firm, we explore various effects of sabotage in the next three lemmas. Lemma 3 summarizes the direct effects of the integrated firm’s sabotage levels on demands.

**Lemma 3 (Direct effect of sabotage on demands).** When the integrated firm sabotages its rival in market $A$ ($B$), the direct effect of sabotage on its demands is two folds: gaining new consumers in market $A$ ($B$) but losing some existing consumers in market $B$ ($A$), i.e., 

$$\frac{\partial D_{A0}(s_{A}, s_{B}, P_{A0}, P_{B0})}{\partial s_{A}} > 0, \quad \frac{\partial D_{B0}(s_{A}, s_{B}, P_{A0}, P_{B0})}{\partial s_{A}} < 0, \quad \frac{\partial D_{A0}(s_{A}, s_{B}, P_{A0}, P_{B0})}{\partial s_{B}} < 0, \quad \frac{\partial D_{B0}(s_{A}, s_{B}, P_{A0}, P_{B0})}{\partial s_{B}} > 0,$$

and

As shown in Figure 2, the change in the indifference point for each product combination indicates the direct impact of sabotage. When the integrated firm sabotages its rival in market $A$, i.e., sabotaging $A1$ through $s_{A}$, there are two direct effects on its demands. First, among consumers who prefer $B0$’s product, their valuation of product combination $A1B0$ reduces by $s_{A}$, making it less attractive than product combination $A0B0$. Consequently, the indifference point for choosing between $A0B0$ and $A1B0$ is now $x_{B0}$ such that some of $A1$’s consumers in $[\hat{x}, x_{B0}]$ will now choose $A0B0$ instead. As a result, the demand for product combination $A0B0$ increases, leading to a higher demand in market $A$ for the integrated firm. Second, as product combination $A1B0$ becomes less attractive due to $s_{A}$, among consumers who prefer $A1$, the new indifference point is $y_{A1}$ such that some of $B0$’s consumers in $[y_{A1}, \hat{y}]$ will now choose $A1B1$ instead. As indicated by single arrows in Figure 2, the demand for product combination $A1B0$ decreases, leading to a lower demand in market $B$ for the integrated firm. Since the integrated firm operates in both markets, sabotaging product $A1$ helps the integrated firm sell more $A0$ among consumers who like $B0$, but at the same time reduces its sales of $B0$ among consumers who like $A1$. Similarly, when the integrated firm sabotages product $B1$ by reducing consumers’ valuation on product combination $A0B1$ through $s_{B}$, it will obtain some of $B1$’s customers in $[\hat{y}, y_{A0}]$ who will now choose $A0B0$, but at the same time it will lose sales on $A0$ as some of $B1$’s customers in $[x_{B1}, \hat{x}]$ will now switch from $A0B1$ to $A1B1$. 
To summarize, the integrated firm’s sabotaging behavior has countervailing effects: sabotaging rivals’ products may help the integrated firm increase sale of its own product combination \( A0B0 \), but at the same time reduce sales of its own products \( A0 \) and \( B0 \) as sales of the mixed product combinations \( A0B1 \) and \( A1B0 \) decreases. Another interesting observation is that sabotaging in both markets through \( s_A \) and \( s_B \) inevitably increases the market share of the independent firms’ product combination \( A1B1 \).

In addition to the direct effect on demands, sabotage also affects firms’ prices indirectly in an intricate way, which is summarized in Lemma 4.

**Lemma 4 (Indirect effect of sabotage on prices).** The indirect effect of sabotage on prices has the following properties:

- when the integrated firm’s sabotage level in market \( A \) (or \( B \)) increases,
  - the price of the integrated firm’s \( A \) (or \( B \)) product increases, i.e., \( \frac{\partial P_{A0}(s_A,s_B)}{\partial s_A} > 0 \)
    
    (or \( \frac{\partial P_{B0}(s_A,s_B)}{\partial s_B} > 0 \));
  - the price of the integrated firm’s \( B \) (or \( A \)) product decreases, i.e., \( \frac{\partial P_{B0}(s_A,s_B)}{\partial s_A} < 0 \)
    
    (or \( \frac{\partial P_{A0}(s_A,s_B)}{\partial s_B} < 0 \));
  - the combined price of the integrated firm’s products \( A \) and \( B \) decreases,
    
    i.e., \( \frac{\partial P_{A0}(s_A,s_B)}{\partial s_A} + \frac{\partial P_{B0}(s_A,s_B)}{\partial s_B} = \frac{\partial P_{A0}(s_A,s_B)}{\partial s_A} + \frac{\partial P_{B0}(s_A,s_B)}{\partial s_B} < 0 \).

- when both \( s_A \) and \( s_B \) increase, the price decreasing effect is stronger than the price increasing effect, i.e., \( \frac{\partial P_{A0}(s_A,s_B)}{\partial s_A} + \frac{\partial P_{B0}(s_A,s_B)}{\partial s_B} < 0 \) and \( \frac{\partial P_{B0}(s_A,s_B)}{\partial s_A} + \frac{\partial P_{B0}(s_A,s_B)}{\partial s_B} < 0 \).

Therefore, both \( P_{A0} \) and \( P_{B0} \) decrease.

As shown in Lemma 4, when the integrated firm sabotages its rival in market \( A \), i.e., sabotaging \( A1 \) through \( s_A \), product combination \( A1B0 \) becomes less attractive relative to \( A0B0 \) and hence provides room for the integrated firm to increase its price \( P_{A0} \). However, \( s_A \) also makes product combination \( A1B0 \) less attractive relative to \( A1B1 \), reducing sales of the integrated firm’s product \( B0 \). Thus, the integrated firm is under pressure to reduce \( P_{B0} \) to counterbalance this unintended demand-reducing effect of \( s_A \). As a result, sabotaging \( A1 \) through \( s_A \) has both a price-increasing effect on \( P_{A0} \) and a price-decreasing effect on \( P_{B0} \). In addition, while sabotage \( s_A \) gives the integrated firm power to increase \( P_{A0} \), its incentive of increasing \( P_{A0} \) is lessened because increasing \( P_{A0} \) makes product combination \( A0B1 \) less attractive relative to \( A1B1 \) and hence leads to declining sales of the integrated firm’s product \( A0 \), even though \( A0B1 \) is not the intended sabotage target of \( s_A \). Similarly,
sabotaging $B_1$ through $s_B$ has both a price-increasing effect on $P_{B_0}$ and a price-decreasing effect on $P_{A_0}$, and the price-increasing effect on $P_{B_0}$ is lessened due to competition from $A_1B_1$. Because the integrated firm operates in both markets, it has to consider the impact of sabotage on the combined price for both products $A$ and $B$. As shown in Lemma 4, the combined price decreases when the integrated firm sabotages in one of the markets (either $A$ or $B$).

When the integrated firm engages in multi-market sabotage, i.e., sabotage $A1B0$ through $s_A$ and sabotage $A0B1$ through $s_B$ simultaneously, the integrated firm gains power to increase prices in both markets but also faces pressure to reduce prices in both markets at the same time. In the end, the price-decreasing effect dominates due to competition, leading to a price decrease in both markets. The countervailing effect of sabotage indicates that sabotage is a double-edged sword and has both positive and negative effects on the integrated firm’s demands and profit margins.

While Lemma 3 characterizes the direct effect of sabotage on the individual product demands without considering the impact on prices, Lemma 5 details the full effect of sabotage on the integrated firm’s combined demand from both markets considering the impact on prices.

**Lemma 5 (Full effect of sabotage on the combined demand).** Factoring in the indirect effects of sabotage on prices, the full effect of sabotage on the integrated firm’s combined demand from products $A$ and $B$ can be either positive or negative depending on the integrated firm’s overall relative cost advantage $r_A + r_B$, i.e.,

$$\frac{\partial D_{A0}(s_A, s_B)}{\partial s_A} + \frac{\partial D_{B0}(s_A, s_B)}{\partial s_B} = \frac{t[(r_A + r_B + 2)}{8(\frac{4}{n} + 2)^2},$$

which is positive when $r_A + r_B > -2$ and negative otherwise.

Lemma 5 shows that for the integrated firm, sabotaging $A1$ through $s_A$ and sabotaging $B1$ through $s_B$ have the same full effect on the integrated firm’s combined demand, and sabotage not necessarily leads to an increase in the integrated firm’s combined demand. In fact, sabotage will help increase the integrated firm’s combined demand from both markets only when the integrated firm’s overall relative cost advantage $r_A + r_B$ is greater than a threshold of -2. More importantly, this combined-demand-increasing effect of sabotage increases in the integrated firm’s overall relative cost advantage $r_A + r_B$. Hence, this combined-demand-increasing effect is at its highest when the integrated firm has the highest overall relative cost advantage and sabotages in both markets.
Since the integrated firm competes in both A and B markets, it will maximize its total profit from both markets. This implies that there is a need to consider simultaneously the total sabotage level and the allocation of the total sabotage across the two markets. Thus, we can transform the integrated firm’s sabotage decisions on $s_A$ and $s_B$ into its decisions on the total sabotage level ($s_A + s_B$) and the difference of sabotage levels between the two markets ($s_B - s_A$). Because the combined-demand-increasing effect of sabotage in both markets depends on the integrated firm’s overall relative cost advantages in both markets, i.e., $r_A + r_B$, as shown in Lemma 5, the integrated firm’s sabotage decision will depend on its overall relative cost advantage in both markets ($r_A + r_B$) as well. In addition, the allocation of sabotage between markets depends on the difference of its relative cost advantages between the two markets ($r_B - r_A$). The importance of this transformation can be illustrated by the profit function of the integrated firm: $\Pi_I = \left(1 - \frac{h}{t}\right) t^4 \left(2 - \frac{h}{t}\right)^2 \left(k + \frac{r_B - r_A}{2}\right)^2 + \left(\frac{h+1}{t+1}\right) \left(\frac{2h+3}{t+1} + \frac{r_A + r_B}{2}\right)^2$, where $h = \frac{s_A + s_B}{2t}$ and $k = \frac{s_B - s_A}{2t}$. The details of this transformation are further illustrated in the proofs in the appendix. Proposition 1 summarizes the integrated firm’s equilibrium sabotage decisions.

**Proposition 1 (Equilibrium sabotage).** Under cross-market integration, the integrated firm will

- **engage in severe multi-market sabotage that drives product combinations A1B0 and A0B1 out of the market**, i.e., $s^*_A > 0$, $s^*_B > 0$, and $x^*_{B0} = y^*_{A0} = 1$, when $r_A + r_B \geq R_1(r_B - r_A)$;

- **engage in severe single-market sabotage that drives either product combination A1B0 or A0B1 out of the market**, i.e., $s^*_A > s^*_B = 0$ and $x^*_{B0} = 1$, or $s^*_B > s^*_A = 0$ and $y^*_{A0} = 1$, when $R_2(r_B - r_A) \leq r_A + r_B < R_1(r_B - r_A)$;

- **engage in moderate single-market sabotage**, i.e., $s^*_A > s^*_B = 0$ or $s^*_B > s^*_A = 0$, such that all four product combinations will have a positive market share, when $R_3(r_B - r_A) \leq r_A + r_B < R_2(r_B - r_A)$;

- **not engage in sabotage**, i.e., $s^*_A = s^*_B = 0$, otherwise.

Analytic formulas for equilibrium sabotage, prices, profits, and thresholds $R_1(r_B - r_A)$, $R_2(r_B - r_A)$ and $R_3(r_B - r_A)$ can be found in the appendix.

Proposition 1 shows that there are four possible equilibrium sabotage results and their separating criteria are defined by $r_A + r_B$ and $r_B - r_A$. The results of Proposition 1 are
Figure 3  Equilibrium sabotage

illustrated in Figure 3, where the horizontal axis is \( r_B - r_A \) and the vertical axis is \( r_A + r_B \).

Figure 3 summarizes the equilibrium results for all four integration scenarios. Specifically, the efficient-efficient quadrant corresponds to the market conditions of \( 0 \leq r_A < 3 \) and \( 0 \leq r_B < 3 \); the efficient-inefficient quadrant corresponds to \( 0 \leq r_A < 3 \) and \( -3 < r_B < 0 \); the inefficient-efficient quadrant corresponds to \( -3 < r_A < 0 \) and \( 0 \leq r_B < 3 \); and the inefficient-inefficient quadrant corresponds to \( -3 < r_A < 0 \) and \( -3 < r_B < 0 \).

As shown in the shaded regions in Figure 3, when the relative cost advantages of the two markets become more asymmetric (i.e., \( |r_B - r_A| \) increases), the integrated firm is more likely to engage in single-market sabotage. When the integrated firm’s overall relative cost advantage \( (r_A + r_B) \) decreases, its optimal sabotage decision transitions from severe multi-market sabotage \( \rightarrow \) severe single-market sabotage \( \rightarrow \) moderate single-market sabotage \( \rightarrow \) no sabotage. The equilibrium product combination demands under these distinct sabotage strategies are illustrated in Figure 4.

In the region above the curve \( R_1(r_B - r_A) \) in the efficient-efficient quadrant in Figure 3, the integrated firm has very large overall relative cost advantage \( r_A + r_B \). In both markets,
the integrated firm has large relative cost advantages over its rivals, either because of its large cost advantage in both markets (high $\Delta c_A$ and $\Delta c_B$) or because of intense competition (low degree of product differentiation $t$). Large cost advantages lead to attractive prices for consumers and high profit margins for the integrated firm, while low degree of product differentiation implies that customers are less loyal to their preferred products and sabotage is an effective way of attracting rivals’ customers. Because the combined-demand effect of sabotage increases in the integrated firm’s overall relative cost advantage $r_A + r_B$ (as shown in Lemma 5), in this region the combined-demand-increasing effect is high enough
to justify the combined-price-decreasing effect (as identified in Lemma 4). Consequently, sabotage in both markets is beneficial for the integrated firm, which will then sabotage to the maximum levels and gains substantial market shares in both markets, and severe multi-market sabotage is the optimal sabotage decision. Since the independent firms are cost-disadvantaged, they can only reduce prices to a degree to stay profitable. Thus, only customers who strongly prefer both $A_1$ and $B_1$ will stay with this product combination, and the rest of customers will choose the integrated firm’s offering, which means no one will choose product combinations $A_0B_1$ or $A_1B_0$ (as illustrated in Figure 4a).

The region in between the curves $R_1(r_B - r_A)$ and $R_2(r_B - r_A)$ in Figure 3 spans across three integration quadrants and represents markets with large values of $r_A + r_B$ such that the integrated firm’s combined demand increases in sabotage. This region can be further divided into two areas along the axis of $r_A + r_B$. The area to the left of the $r_A + r_B$ axis (corresponding to $r_B - r_A < 0$) represents markets in which the integrated firm has a higher cost advantage in the $A$ market and the area to the right of the $r_A + r_B$ axis (corresponding to $r_B - r_A > 0$) represents markets in which the integrated firm has a higher cost advantage in the $B$ market. Here, the integrated firm’s relative cost advantage asymmetry ($|r_B - r_A|$) in the two markets also influences its sabotage decisions because sabotaging in different markets has distinct effects on the integrated firm’s overall profit. Specifically, sabotaging in the market in which it has a small or no cost advantage will inevitably reduce both the integrated firm’s price and its sales in the other market in which it has a large cost advantage (i.e., high profit margin) whereas sabotaging in the market in which it has a large cost advantage will reduce both the integrated firm’s price and its sales in the other market in which it has a small or no cost advantage (i.e., low profit margin). Even though sabotaging in either market under these market conditions has similar combined-demand-increasing effects, one is accomplished with the side effect of reducing price and market share of the integrated firm’s high-margin product whereas the other is accomplished with the side effect of reducing price and market share of its low-margin product. Because the former option is more costly for the integrated firm, sabotaging in the market in which the integrated firm has a higher cost advantage is a superior option.

When the integrated firm’s relative cost advantage asymmetry in the two markets ($|r_B - r_A|$) is low, the difference between the negative effects of the two sabotage options is low. Hence, when the overall relative cost advantage ($r_A + r_B$) is very large (corresponding to the
region above R1), the combined-demand-increasing effect outweighs the price-decreasing effect even when the firm chooses the inferior sabotage option. Thus, severe multi-market sabotage is the optimal sabotage decision. However, when the firm’s relative cost advantage asymmetry in the two markets increases, the negative effect of the inferior sabotage option becomes stronger such that the firm will allocate all sabotage efforts to the market where it has a high relative cost advantage. Because the overall relative cost advantage is large, the firm will sabotage to the maximum level, forcing the targeted product combination out of the market, making severe single-market sabotage the optimal sabotage decision (as illustrated in Figure 4b for \( r_A > r_B \)).

As \( r_A + r_B \) decreases into the region in between the curves \( R_2(r_B - r_A) \) and \( R_3(r_B - r_A) \) in Figure 3, the integrated firm’s overall relative cost advantage \( r_A + r_B \) is small or even negative. This region can also be further divided into two areas along the axis of \( r_A + r_B \). Similar to the severe single-market case, the integrated firm will only sabotage in the market in which it has a high relative cost advantage (i.e., sabotage A1 in the area to the left of the axis and sabotage B1 in the area to the right of the axis). However, different from the severe single-market case, because such markets have a relatively lower \( r_A + r_B \), even though sabotage still has a combined-demand-increasing effect but it is not strong enough to justify the maximum level of sabotage. Therefore, the integrated firm will choose moderate single-market sabotage such that all four product combinations, including the targeted product combination, maintain some positive market shares (as illustrated in Figure 4c for \( r_A > r_B \)).

The intuition behind the results shown in Figure 4d for the no sabotage case is as follows. The region below the curve \( R_3(r_B - r_A) \) in Figure 3 spans across four integration quadrants and corresponds to markets with very small or even negative values of \( r_A + r_B \). In the efficient-efficient quadrant, this region represents markets where the integrated firm has a small cost advantage and/or a high degree of product differentiation. A small cost advantage implies a low price difference in each market, which means that there is little room to attract rival’s customers through competitive price. In the case of a high product differentiation, customers are more loyal to their preferred brands, making sabotage less effective in convincing rivals’ customers to switch. In this region, even though sabotaging in either market will have a combined-demand-increasing effect (since \( r_A + r_B > -2 \)), it is not high enough to justify the price-decreasing effect on the integrated firm’s combined price. Thus,
the integrated firm chooses not to sabotage in this region. In the other three quadrants, the integrated firm either has no cost advantage in both markets (the inefficient-inefficient quadrant) or only has a low cost advantage in one market but a high cost disadvantage in the other market (the efficient-inefficient and inefficient-efficient quadrants). Because the integrated firm’s overall relative cost advantage is very small and in some cases (when \( r_A + r_B < -2 \)) sabotage has negative effects on both the integrated firm’s combined price and demand, even though sabotage is costless, the integrated firm optimally choose not to engage in sabotage under these market conditions.

In the next section, we analyze the integration game with the sabotage option from a social planner’s perspective.

5. Social Welfare Analysis
In this section, we first characterize the optimal sabotage decision from a social planner’s perspective. This is followed by a comparison between these decisions and those driven by the integrated firm with a view to provide policy implications.

5.1. Socially optimal sabotage
To analyze this scenario, we consider a three-stage process. In the first stage, the social planner chooses sabotage levels \( (s_A, s_B) \) to maximize overall social welfare which consists of consumer surplus plus the profits of the integrated firm and the two competing independent firms. In the second stage, the integrated firm sets its product prices \( (P_{A0}, P_{B0}) \) to maximize its own profit. Finally, in the third stage, the competing independent firms set their product prices \( (P_{A1}, P_{B1}) \) to maximize their own profits. The overall social welfare \( (SW) \) is defined as:

\[
SW = CS + \Pi_I + \Pi_{A1} + \Pi_{B1}
\]

where \( CS \) represents consumer surplus and is:

\[
CS = \int \int_{A0B0} U_{A0B0} \, dx \, dy + \int \int_{A0B1} U_{A0B1} \, dx \, dy + \int \int_{A1B0} U_{A1B0} \, dx \, dy + \int \int_{A1B1} U_{A1B1} \, dx \, dy
\]

Using backward induction, we solve for the socially optimal sabotage decisions. The results are summarized in Proposition 2 and illustrated in Figure 5.

**Proposition 2 (Socially optimal sabotage).** Under cross-market integration, the social planner will prefer
• severe multi-market sabotage \( (s^\text{social}_A > 0 \text{ and } s^\text{social}_B > 0) \), which drives product combinations \( A1B0 \) and \( A0B1 \) out of the market when \( r_A + r_B \geq R_4(r_B - r_A) \) or \( r_A + r_B \leq R_8(r_B - r_A) \), i.e., \( x^\text{social}_{B0} = y^\text{social}_{A0} = 1 \) for the former region and \( x^\text{social}_{B1} = y^\text{social}_{A1} = 0 \) for the latter region;

• severe single-market sabotage \( (s^\text{social}_A > s^\text{social}_B = 0 \text{ or } s^\text{social}_B > s^\text{social}_A = 0) \), which drives either product combination \( A1B0 \) or \( A0B1 \) out of the market when \( R_5(r_B - r_A) \leq r_A + r_B < R_4(r_B - r_A) \) or \( R_8(r_B - r_A) < r_A + r_B \leq R_7(r_B - r_A) \), i.e., \( x^\text{social}_{B0} = 1 \) or \( y^\text{social}_{A0} = 0 \) for the former region and \( y^\text{social}_{A1} = 0 \) or \( x^\text{social}_{B1} = 0 \) for the latter region;

• moderate single-market sabotage \( (s^\text{social}_A > s^\text{social}_B = 0 \text{ or } s^\text{social}_B > s^\text{social}_A = 0) \), under which all four product combinations have positive market shares, when \( R_6(r_B - r_A) \leq r_A + r_B < R_5(r_B - r_A) \);

• no sabotage \( (s^\text{social}_A = s^\text{social}_B = 0) \), otherwise.

The social welfare levels and the definitions of thresholds \( R_4(r_B - r_A), R_5(r_B - r_A), R_6(r_B - r_A), R_7(r_B - r_A), \) and \( R_8(r_B - r_A) \) can be found in the appendix.

As shown in Figure 5, when the integrated firm’s overall relative cost advantage \( (r_A + r_B > 0) \) or its overall relative cost disadvantage \( (r_A + r_B < 0) \) is large, the social planner
can strategically use sabotage, either in one or both markets, to improve social welfare. At the first look, it seems counterintuitive that the social planner prefers sabotage when two inefficient firms integrate. Under this inefficient-inefficient integration scenario, independent firms $A_1$ and $B_1$ are more cost efficient. As illustrated in Figure 2 and discussed after Lemma 3, sabotage in either market inevitably increases the market share of the independent firms’ product combination $A_1B_1$. In either case, sabotage leads to more consumption of the cost-efficient products, which is welfare enhancing as the total production cost decreases. However, since sabotage forces some consumers to switch to less favorable products, these consumers incur higher misfit costs. In addition, sabotage also reduces consumer valuation of the targeted product combinations. Therefore, the social planner will prefer sabotage only when the overall relative cost advantage or disadvantage is large since this would lead to higher consumption of the cost-efficient products and compensate for the increased misfit costs and reduced consumer valuations.

5.2. Policy implications

In order to provide policy implications, we start by comparing the equilibrium sabotage results from Section 4.2 and the socially optimal sabotage results from Section 5.1. The comparison results are summarized in Proposition 3 and illustrated in Figure 6.

**Proposition 3 (Comparison between equilibrium and socially optimal sabotage).**

The integrated firm’s sabotage decision coincides with the social planner’s in regions satisfying $r_A + r_B \geq R_4(r_B - r_A)$, or $R_5(r_B - r_A) \leq r_A + r_B < R_1(r_B - r_A)$, or $R_6(r_B - r_A) \leq r_A + r_B < R_2(r_B - r_A)$, or $R_7(r_B - r_A) \leq r_A + r_B < R_3(r_B - r_A)$; the integrated firm has the incentive to deviate from socially optimal sabotage choices in all other regions.

Figure 6 illustrates regions of alignment and conflict between the equilibrium and the socially optimal sabotage decisions (green areas correspond to regions of alignment and yellow areas correspond to regions of conflict). The regions of conflict are of special interest because they represent the market conditions for potential regulatory intervention. The integrated firm may overuse or underuse sabotage to maximize its own profit at the cost of reducing social welfare. For example, the integrated firm prefers to undertake moderate single-market sabotage under market conditions described by the curves $R_3(r_B - r_A)$ and $R_6(r_B - r_A)$ whereas the social planner prefers not to engage in sabotage in this region. When integration involves inefficient firm(s), the integrated firm’s optimal choice is no
The integrated firm has the incentive to deviate from socially optimal sabotage decisions.

*Figure 6* Compare equilibrium and socially optimal sabotage

Notes: Green and yellow areas correspond to regions of alignment and conflict between the equilibrium and the socially optimal sabotage decisions respectively.

sabotage under market conditions described by the region below $R_7(r_B - r_A)$ whereas the social planner prefers either severe single-market sabotage or severe multi-market sabotage.

From a policy perspective, these results indicate that social planners need to closely monitor sabotage activities stemming from cross-market integration. Instead of deploying uniform policy instruments for all integrations, it would be more appropriate to track changes in integrated firms’ operations vis-a-vis the non-integrated competitors and then evaluate whether such changes lead to a reduction of social welfare. This is also reflected in practice when European regulators investigated potential abusive search manipulation practices by Google through market tests, leading to Google being fined a significant amount for such practices (Cendrowicz 2010, Fiveash 2016).

In the next section of the paper, we discuss how these (and earlier) insights are moderated by examining two extensions.
6. Extensions

The focus of this section is to examine how the optimal sabotage decisions are moderated by: (a) analyzing a simultaneous game setting for cases where market power differences between the integrated firm and its rivals are small or non-existent; and (b) consumer information on sabotage actions of the integrated firm. Each of these aspects is discussed in the next two sub-sections.

6.1. Simultaneous Game Setting

The motivation for analyzing a simultaneous game setting stems from the fact that there might be situations where the differences in market power between the integrated firm and its rivals are not significant. The focus is to examining the extent of change in the prior insights derived for the the Stackelberg leader-follower game setting. The sequence of actions is: in stage 1, the integrated firm makes the sabotage decision; and in stage 2, all firms simultaneously set prices. Using backward induction, we start by solving the stage 2 problem for given levels of sabotage, and then using this characterization, we solve the stage 1 problem to determine optimal sabotage levels for the integrated firm. Proposition 4 summarizes the equilibrium results for the simultaneous pricing game.

**Proposition 4 (Equilibrium results of the simultaneous pricing game).**

When the integrated firm and the independent firms set their prices simultaneously,

- even if the integrated firm has the option to sabotage its rivals in both markets, it does not have any incentive to do so in either market;
- the equilibrium prices under cross-market integration are the same as those under no integration.

Proposition 4 shows that the integrated firm prefers not to sabotage its rivals in the simultaneous pricing game. The rationale behind this result lies in the effects sabotaging its rival in either market have on combined price and combined demand for the integrated firm. We find that sabotaging always leads to a lower combined price and sometimes leads to a higher combined demand. Furthermore, even in the presence of the combined-demand-increasing effect, the combined-price-decreasing effect dominates the combined-demand-increasing effect, leading to the no-sabotage decision for the integrated firm. Note that under the simultaneous game setting, the integrated firm’s optimal pricing decisions are the same as those when they operate independently. This implies that if the integrated
firm engages in a simultaneous pricing game with its competitors, there is no benefit or incentive to integrate.

How does the social planner’s perspective differ in this game setting? By analyzing the same setting as before except allowing for simultaneous pricing by all firms, the Proposition 5 details the social planner’s optimal choices to maximize social welfare.

**Proposition 5 (Socially optimal sabotage in the simultaneous pricing game).**
Under cross-market integration in the simultaneous pricing game, the social planner will prefer

- **severe multi-market sabotage** (\(s^\text{social}_A > 0\) and \(s^\text{social}_B > 0\)), which drives product combinations \(A1B0\) and \(A0B1\) out of the market when \(r_A + r_B \geq R_9(r_B - r_A)\) or \(r_A + r_B \leq R_{13}(r_B - r_A)\), i.e., \(x^\text{social}_{B0} = y^\text{social}_{A0} = 1\) for the former region and \(x^\text{social}_{B1} = y^\text{social}_{A1} = 0\) for the latter region;
- **severe single-market sabotage** (\(s^\text{social}_A > s^\text{social}_B = 0\) or \(s^\text{social}_B > s^\text{social}_A = 0\)), which drives either product combination \(A1B0\) or \(A0B1\) out of the market when \(R_{10}(r_B - r_A) \leq r_A + r_B < R_9(r_B - r_A)\) or \(R_{13}(r_B - r_A) < r_A + r_B \leq R_{12}(r_B - r_A)\), i.e., \(x^\text{social}_{B0} = 1\) or \(y^\text{social}_{A0} = 1\) for the former region and \(y^\text{social}_{A1} = 0\) or \(x^\text{social}_{B1} = 0\) for the latter region;
- **moderate single-market sabotage** (\(s^\text{social}_A > s^\text{social}_B = 0\) or \(s^\text{social}_B > s^\text{social}_A = 0\)), under which all four product combinations have positive market shares, when \(R_{11}(r_B - r_A) \leq r_A + r_B < R_{10}(r_B - r_A)\);
- **no sabotage** (\(s^\text{social}_A = s^\text{social}_B = 0\)), otherwise.

The social welfare levels and the definitions of thresholds \(R_9(r_B - r_A)\), \(R_{10}(r_B - r_A)\), \(R_{11}(r_B - r_A)\), \(R_{12}(r_B - r_A)\), and \(R_{13}(r_B - r_A)\) can be found in the appendix.

Comparing the results of Propositions 4 and 5 (illustrated in Figure 7), we see that when firms engage in the simultaneous pricing game, the integrated firm tends to underuse sabotage to maximize its own profit at the cost of reduced social welfare. This misalignment happens when the integrated firm has either a high overall relative cost advantage or a high overall relative cost disadvantage. In such cases the social planner prefers to use sabotage as a tool to induce more consumption of cost-efficient products.

**6.2. Information Asymmetry**
This extension explores how our current findings and insights are impacted if the integrated firm’s sabotage actions are not fully visible to consumers. The rationale underlying such an
argument is that an integrated firm would not typically announce sabotage levels $s_A$ and $s_B$ and hence, consumers would not have complete information on such sabotage levels. In our setting, this would result in consumer valuations (dependent on these sabotage levels) and hence, net utilities for all product combinations being revised.

Our approach to examining the impact of such information asymmetries is as follows.\footnote{An alternative approach is to focus on a two-period model where in the first period, the integrated firm makes and executes sabotage decisions and consumers make their purchase decisions without knowing these decisions. In the second period, consumers become fully/partially aware of these sabotage decisions, and then make their second period purchase decisions.} Define $\alpha \in (0, 1]$ as a parameter representing information asymmetry with higher levels reflecting less asymmetry and vice versa. Based on this, given the integrated firm’s sabotage decisions $s_A$, and $s_B$, the revised consumer utilities for all product combinations are defined
as:

\[
U_{A0B0}(x, y) = v - tx - ty - P_{A0} - P_{B0} \\
U_{A0B1}(x, y) = v - \alpha s_B - tx - t(1 - y) - P_{A0} - P_{B1} \\
U_{A1B0}(x, y) = v - \alpha s_A - t(1 - x) - ty - P_{A1} - P_{B0} \\
U_{A1B1}(x, y) = v - t(1 - x) - t(1 - y) - P_{A1} - P_{B1}
\]  \hspace{1cm} (10)

Since information asymmetry in sabotage actions only leads to changes in consumer behavior without impacting the magnitude of integrated firm’s optimal profits, the revised optimal sabotage levels \( s^*_A(\alpha) \) and \( s^*_B(\alpha) \) from those stated in Proposition 1 are

\[s^*_A(\alpha) = \frac{s^*_A}{\alpha} \text{ and } s^*_B(\alpha) = \frac{s^*_B}{\alpha} \]

This is illustrated in Figure 8 below where we note that whenever the integrated firm engages in sabotage in equilibrium, regardless of the form of sabotage (multi-market or single-market), its sabotage levels decrease in \( \alpha \). In other words, the integrated firm increases (decreases) its sabotage levels \( s_A \) and \( s_B \) when consumers are less (more) informed of \( s_A \) and \( s_B \). The intuition behind this result is that when consumers have less information on sabotage levels, it forces the integrated firm to increase optimal sabotage levels in order to achieve the same profits.

**Figure 8a**: Severe multi-market sabotage
(with \( s_A = s_B > 0 \) for \( r_A = r_B = 2 \))

**Figure 8b**: Severe single-market sabotage
(with \( s_A > s_B = 0 \) for \( r_A = r_B = 1 \))

**Figure 8c**: Moderate single-market sabotage
(with \( s_A > s_B = 0 \) for \( r_A = r_B = 0.55 \))

**Figure 8**  \hspace{1cm} Impact of information asymmetry parameter \( \alpha \) on sabotage levels

### 7. Conclusions

Mergers and acquisitions of firms offering complementary products are well documented. Such cross-market integration raises regulatory concerns of the possibility of multi-market sabotage and its impacts on the competition in both markets and social welfare. This
paper examines the integrated firm’s incentive to engage in multi-market sabotage and its impacts. It extends prior findings in the sabotage literature and provides policy implications in terms of competition and social welfare.

We find that although the integrated firm has the ability to sabotage its rivals in both markets, it should not always do so. When the integrated firm has a cost disadvantage in both markets, it does not have any incentive to sabotage. Sabotage (either single-market or multi-market) is preferable only when the integrated firm’s overall relative cost advantage is higher than a threshold. When its overall relative cost advantage is sufficiently high, the integrated firm may undertake sabotage activities that force some product combinations out of the market, leading to reduced product variety for consumers. We also show that even when the integrated firm has the incentive to sabotage, it does not always prefer multi-market sabotage. Multi-market sabotage is optimal only when the integrated firm has cost advantage in both markets and its overall relative cost advantage is very large. When its overall relative cost advantage is not as large, the integrated firm prefers single-market sabotage. When the relative cost advantages of the two markets become more asymmetric, the integrated firm is more likely to engage in single-market sabotage and less likely to engage in multi-market sabotage. Under single-market sabotage, sabotaging the market in which the integrated firm has a higher cost advantage is preferable. For example, when an integrated firm sells both hardware and software, our results suggest that the integrated firm is more likely to sabotage the hardware market because the cost advantage for hardware is usually higher than that for software. In the case of Microsoft selling both Xbox (game console) and Halo (the flagship game for Xbox), our results help explain why Halo is exclusively offered on Microsoft’s Xbox and not available on Sony’s PlayStation.

From the social planner’s perspective, we show that sabotage does not always hurt social welfare. In fact, the social planner may even encourage sabotage when two efficient firms integrate because more consumers will choose products offered by the more efficient firm (i.e., the integrated firm) due to sabotage. However, when comparing the preferences of the integrated firm and the social planner, we find market conditions under which the integrated firm may undertake excessive sabotage, which leads to a reduction in social welfare.

This suggests that when evaluating mergers and/or acquisitions, the regulator needs to carefully examine market conditions such as the integrated firm’s cost advantage and the
Cross-Market Integration and Sabotage

intensity of competition in the two involved markets. Our findings suggest no concerns on sabotage when the integrated firm has cost disadvantage in both markets. When the integrated firm has a cost advantage in only one market, regulatory intervention to restrict potential single-market sabotage activities in that market would be required. When the integrated firm has a cost advantage in both markets and the markets are not sufficiently competitive, regulators should closely monitor the integrated firm to prevent over-sabotage even though the firm’s sabotage decision often times coincides with regulators.

There are several avenues for extending our research. We assume that rivals of the integrated firm choose not to integrate (i.e., remain independent). However, these rivals in response to the integrated firm’s decision, might also choose to integrate. It would be of interest to examine whether sabotage would be an effective strategy in such a setting. From the firms’ perspective, in this paper, we focus on analyzing the impact of various sabotage options (no sabotage, single-market sabotage, multi-market sabotage) on firms’ market shares and profitability. In certain cases, firms may consider other potential impacts related to sabotage. For example, not sabotaging may allow the integrated firm to test out their products so that a better integrated product can be offered later, e.g., delayed differentiation. Although we have explored the impact of information asymmetry in our analysis, it might be interesting to examine a two period setting where consumer decisions in the first period are made assuming no information on sabotage followed by a second period decision with full information on sabotage actions.

Another possibility is to extend our modeling framework to an oligopoly setting. Such an extension could provide different insights in the context of whether integration with sabotage is a preferred choice in the presence of more than two rival firms that do not pursue integration. Our analysis can also be extended to multiple complementary markets which will provide insights into the integrated firm’s incentive to engage in multilateral sabotage. It is worth noting that for markets that exhibit network externalities, the impact of sabotage activities for an integrated firm would still depend upon the complex trade-off between the increase in demand and the corresponding decrease in margins. In essence, network externalities will exacerbate both the positive and negative effect of sabotage and while our key results would still hold, the precise equilibrium regions will of course, be different. A final issue of interest would be to explore how asymmetric consumer preferences in each market drive the sabotage decision. Although such and analysis is structurally intractable,
it might be interesting to numerically explore how the sabotage strategy preference regions are moderated by the degree of asymmetry.

References


Mandy, D. M. 2000. Killing the goose that may have laid the golden egg: Only the data know whether sabotage pays. *Journal of Regulatory Economics* 17 (2), 157–172.


