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Working Paper

The Limits of Media See-Saws: Ad-Funded Platform Mergers Can Harm Both Sides

CESifo Working Paper, No. 11768

Provided in Cooperation with:

Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

Suggested Citation: Shekhar, Shiva; Shopova, Radostina (2025) : The Limits of Media See-Saws: Ad-Funded Platform Mergers Can Harm Both Sides, CESifo Working Paper, No. 11768, CESifo GmbH, Munich

This Version is available at:

<https://hdl.handle.net/10419/316882>

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Impressum:

CESifo Working Papers

ISSN 2364-1428 (electronic version)

Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH

The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute

Poschingerstr. 5, 81679 Munich, Germany

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Editor: Clemens Fuest

<https://www.cesifo.org/en/wp>

An electronic version of the paper may be downloaded

- from the SSRN website: www.SSRN.com
- from the RePEc website: www.RePEc.org
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Abstract

We study the welfare effects of a merger between ad-funded platforms facing elastic consumer demand. We show that advertising fees as well as quality investment levels by the platforms fall post-merger. Interestingly, despite the lower advertising fees, advertisers may be worse off when their value of interacting with consumers is high enough. The intuition for this result is that the decrease in quality investments post-merger reduces overall consumer participation. Thus, studying innovation incentives is important in these ad-funded markets as the well-known surplus see-saw result may not hold making both sides of the markets worse while the merged entity emerges as the sole winner.

JEL-Codes: D420, D430, L120, L130, L220, L860.

Keywords: ad-funded platforms, two-sided markets, horizontal mergers, innovation, quality.

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1. Introduction

Competition in platform markets, characterized by network effects, is far and few due to the well-known "winner-takes-all" phenomenon (Caillaud and Jullien (2003), Dubé et al. (2010), Cennamo and Santalo (2013)). Consequently, mergers in these markets undergo more intense scrutiny from regulators.¹² In addition, innovation incentives have become an increasingly important consideration in merger reviews, a trend recently emphasized by Draghi (2024), who advocates for an innovation defense in competition policy.

The multi-sided nature of ad-funded markets, involving both advertisers and consumers, complicates merger impact assessments. In ad-funded markets, consumers usually do not face direct prices (*i.e.*, they pay zero access prices), which often leads to traditional merger assessment tools to fail (Evans (2011)). Despite this, platforms can still manipulate exchange terms to their advantage and harm consumers (OECD (2018a), p. 14), for instance by controlling the experience of consumers through the number of ads and operational quality. Indeed, advertising intensity can serve as a competitive tool to measure the impact on consumer welfare (OECD (2018a), para 61). However, a merger affects more than just consumers; advertisers' welfare is closely tied to consumer participation, as higher engagement translates into greater revenue opportunities. Therefore, understanding merger effects requires accounting for these multi-sided dynamics and their impact on all platform participants.

In this paper, we model a non-consolidated merger between two ad-funded platforms that invest in operational quality to attract consumers with elastic demand. Our main contribution is to show that such mergers not only harm consumers but can also negatively impact advertisers. As in the literature on horizontal mergers between ad-funded platforms (Anderson and Coate (2005), Baranes et al. (2014), Anderson and Peitz (2020), Ambrus et al. (2016), Anderson et al. (2018)) we confirm that a merged entity has the incentive to decrease prices for advertisers post-merger, leading to harm to consumers and benefits for advertisers.³ Anderson and Peitz (2020) corner the term "media see-saws" as they generalize that an overall increase in concentration in the platform market leads to a shift of surplus from consumers to advertisers and vice versa. However, we show that if one accounts for quality investment by two-sided ad-funded platforms, the "see-saw" may not hold. By translating the results derived for mergers in classic one-sided markets (Federico et al. (2017) Federico et al. (2018), also Lefouili and Madio (2025)) to the setting of two-sided platforms, we demonstrate that in both types of markets, a merger leads to a decrease in quality investment. Thus, consumers are harmed both by more ad nuisance and by lower quality, resulting in decreased overall consumer market participation. If advertisers highly value consumer interactions, the drop in consumer participation after the merger may outweigh the benefit of lower ad prices, leaving them worse off.

¹The Facebook/Instagram merger has sparked debate over its competitive impact (Gautier and Lamesch (2021), Argentesi et al. (2021)). More recently, TikTok has faced pressure to sell its U.S. branch, attracting interest from major competitors.

²See the report by Long et al. (2025), which highlights increased regulatory scrutiny on big tech in 2024 compared to 2023.

³See Jullien and Sand-Zantman (2021), Calvano and Polo (2021) for an overview of platform mergers.

2. The Model

Consider two competing ad-funded platforms, $i \in \{1, 2\}$, offering differentiated "free" (zero-price) services to consumers. They generate revenue by charging advertisers for access to their users while consumers view ads as a nuisance.

Consumers. There is mass 1 of homogeneous consumers that maximize their utility by choosing how to divide their attention x_i between the two platforms. The utility function is a modified version of Spence (1976):

$$U(x_1, x_2, v_1, v_2, A_1^e, A_2^e) = \sum_{i=1}^2 \underbrace{(1 + v_i - \gamma A_i^e)}_{W_i(v_i, A_i^e)} x_i - \frac{\sum_{i=1}^2 x_i^2}{2} - \beta x_1 x_2. \quad (1)$$

Here $W_i(\cdot)$ represents a consumer's overall value from interacting with platform $i = 1, 2$. This value consists of three different components. The first two are the stand-alone value normalized to 1 and an operating quality v_i that each platform offers to consumers. The third term γA_i^e reflects the fact that consumers find ads on the platform a nuisance, reducing their value W_i by the cross-side network effect $\gamma > 0$ for each ad A_i^e they expect to encounter.⁴ Further, consumers view platforms as substitutes, captured by the parameter $\beta \in [0, 1]$, where β close to 0 denotes weak substitutability, and β close to 1 represents strong substitutability.

Advertisers. Advertisers are heterogeneous in their ad campaign costs k distributed uniformly on the unit interval — i.e., $k \sim \mathcal{U}[0, 1]$. At platform $i = 1, 2$, an advertiser benefits $\phi > 0$ per consumer interaction. For an ad campaign on platform $i = 1, 2$ an advertiser pays an access fee p_i . Thus, an advertiser joins a platform if its payoff is non-negative, *i.e.*:

$$\pi_i(k, p_i, D_i^e) = \phi D_i^e - p_i - k \geq 0,$$

where D_i^e is the expected level of consumer interactions at platform i . Thus, the mass of advertisers joining platform $i = 1, 2$ is $A_i(p_i, D_i^e) = k_i(p_i, D_i^e) \triangleq \phi D_i^e - p_i$.

Platforms. Platforms $i = 1, 2$ generate revenue exclusively from advertisers through the access price p_i . Each platform $i = 1, 2$ invests in its operating quality v_i at cost $I(v_i) = \frac{v_i^2}{2}$. The objective function of a platform is

$$\max_{p_i, v_i} \Pi_i = p_i \cdot A_i(\cdot) - I(v_i).$$

The following assumption guarantees that profits remain concave $\forall \beta \in [0, 1]$.

Assumption 1. $\gamma(2\gamma - \phi)(2 + \gamma\phi) > 1$ with $\gamma > 0$ and $\phi > 0$.

Timing. Stage 1: platform owners choose their quality v_i and set prices p_i to advertisers simultaneously. Stage 2: advertisers and consumers form expectations on the mass of cross-side participation on each platform and then decide simultaneously which platform to join. We

⁴OECD (2018a) pg. 6., OECD (2018b) discuss the overall negative impact of advertising on consumers. CMA (2020) suggests that an increase in advertising is perceived as a degraded quality of the platform.

assume players in this game have rational expectations and we apply the solution concept of a Perfect Bayesian Equilibrium.

Stage 2: Consumers' and advertisers' participation. By backward induction, starting from the second stage, the two sides of the market take prices and quality as given. Thus, we can derive the subgame equilibrium of this stage jointly for both the pre- and post-merger cases. When deciding whether to join platform $i = 1, 2$, advertisers form expectations about consumer participation, D_i^e , while consumers anticipate the level of advertising, A_i^e . Following Belleflamme and Peitz (2018), consumers and advertisers base their decisions on the perceived network value derived from the platform based on the price p_i and the operational quality v_i . Under rational expectations, these beliefs must be correct. Let us denote equilibrium participation on both sides by \hat{A}_i and $\hat{D}_i = \hat{x}_i$.⁵ Thus, imposing $A_i^e = \hat{A}_i = A_i(\cdot)$ and $D_i^e = \hat{x}_i = x_i(\cdot)$ determines demand as a function of the platforms' prices and quality:

$$\hat{x}_i(p_i, p_{-i}, v_i, v_{-i}) = \frac{(1 + \gamma\phi)(1 + v_i + \gamma p_i) - \beta(1 + v_{-i} + \gamma p_{-i})}{(1 + \gamma\phi)^2 - \beta^2}, \quad (2)$$

$$\hat{A}_i(p_i, p_{-i}, v_i, v_{-i}) = \phi \hat{x}_i(\cdot) - p_i. \quad (3)$$

Lemma 1. *A unilateral increase in advertising price by platform i affects market demands in the following way:*

$$\frac{\partial \hat{x}_i(\cdot)}{\partial p_i} > 0, \quad \frac{\partial \hat{x}_{-i}(\cdot)}{\partial p_i} < 0, \quad \frac{\partial \hat{A}_i(\cdot)}{\partial p_i} < 0, \quad \frac{\partial \hat{A}_{-i}(\cdot)}{\partial p_i} < 0.$$

An increase in operating quality v_i affects market demands in the following way:

$$\frac{\partial \hat{x}_i(\cdot)}{\partial v_i} > 0, \quad \frac{\partial \hat{x}_{-i}(\cdot)}{\partial v_i} < 0, \quad \frac{\partial \hat{A}_i(\cdot)}{\partial v_i} > 0, \quad \frac{\partial \hat{A}_{-i}(\cdot)}{\partial v_i} < 0.$$

Proof. The results follow straight from the expressions (2) and (3). □

The comparative statics highlight the role of network effects. A higher ad price p_i at platform i not only reduces advertiser participation there but also lowers advertisement at the rival platform $-i$. This happens because fewer advertisers on platform i make it more attractive to consumers, drawing users away from platform $-i$. With fewer consumers, platform $-i$ becomes less appealing to advertisers with some leaving the platform. Thus, due to network effects, ad-funded platforms set prices as strategic substitutes, unlike the strategic complements seen in classic differentiated oligopolies.

In contrast, changes in quality investment affect competing platforms like traditional markets. An increase in the operational quality v_i at platform i attracts more consumers away from platform $-i$, which results in an increased/decreased participation of advertisers on platform $i/-i$.

⁵Since there is mass one of homogeneous consumers in their utility(1), platform $i = 1, 2$'s total attention and demand are $D_i = x_i$.

3. Competition between ad-funded platforms

Both platforms $i = 1, 2$ simultaneously set their advertising price and operation quality to maximize profits:

$$\max_{p_i, v_i} \hat{\Pi}_i(p_i, p_{-i}, v_i, v_{-i}) = p_i \hat{A}_i(p_i, p_{-i}, v_i, v_{-i}) - I(v_i). \quad (4)$$

Differentiating (4) w.r.t. p_i yields

$$\frac{\partial \Pi_i(\cdot)}{\partial p_i} = \underbrace{\hat{A}_i(\cdot)}_{\text{Margin effect (+)}} + \underbrace{p_i \frac{\partial A_i(\cdot)}{\partial p_i}}_{\text{Volume effect (-)}} + \underbrace{p_i \frac{\partial A_i(\cdot)}{\partial D_i^e} \frac{\partial \hat{x}_i(\cdot)}{\partial p_i}}_{\text{Consumer Volume effect (+)}} = 0, \text{ for } i \in \{1, 2\}.$$

The first two terms capture the classic margin-volume trade-off — a higher price decreases participation but increases revenues from the remaining advertisers. The last positive term captures how ad prices shape advertiser value through network effects. A higher price deters advertisers, reducing nuisance for consumers and attracting more users. This user boost then raises advertiser profits, softening the platform's losses and reinforcing and even higher p_i .

Differentiating (4) w.r.t. v_i yields

$$\frac{\partial \Pi_i(\cdot)}{\partial v_i} = \underbrace{p_i \frac{\partial A_i(\cdot)}{\partial D_i^e} \frac{\partial \hat{x}_i(\cdot)}{\partial v_i}}_{\text{Consumer Volume effect (+)}} - \underbrace{\frac{\partial I(v_i)}{\partial v_i}}_{\text{Marginal cost}} = 0, \text{ for } i \in \{1, 2\}.$$

Classically, higher marginal gains should balance increased investment costs. The gain comes from greater consumer participation boosting advertisers' expected benefits by enhancing interaction value.

The equilibrium advertising price and operation quality levels are

$$p^* = \frac{\phi((1 + \gamma\phi)^2 - \beta^2)}{2(1 - \beta)(1 + \beta)^2 + (4 - \beta)(1 + \beta)\gamma\phi - \phi^2 + (2 + \beta)\gamma^2\phi^2 - \gamma\phi^3}, \quad (5)$$

$$v^* = \frac{p^*\phi(1 + \gamma\phi)}{((1 + \gamma\phi)^2 - \beta^2)}. \quad (6)$$

leading to participation levels $x_i^* \triangleq \frac{1 + v^* + \gamma p^*}{1 + \beta + \gamma\phi}$ and $A_i^* \triangleq \frac{(1 + v^*)\phi - (1 - \beta)p^*}{1 + \beta + \gamma\phi}$. In the model, consumer demand for each platform x_i^E rises as platforms become more differentiated ($\beta \rightarrow 0$). With less overlap in user types, each platform captures a distinct, larger audience. For instance, LinkedIn and TikTok serve different markets, unlike TikTok and Instagram, which heavily overlap (β near 1).

The equilibrium platform profit and consumer surplus are

$$\Pi_i^* = \frac{\phi^2((1 + \gamma\phi)^2(2 + 2\gamma\phi - \phi^2) - 2\beta^2(1 + \gamma\phi)(2 + \gamma\phi) + 2\beta^4)}{2(2(1 - \beta)(1 + \beta)^2 + (4 - \beta)(1 + \beta)\gamma\phi - \phi^2 + (2 + \beta)\gamma^2\phi^2 - \gamma\phi^3)^2}, \quad (7)$$

and

$$U^* = \frac{(1 + \beta)((1 + \gamma\phi)(2 + \gamma\phi) - 2\beta^2)^2}{(2(1 - \beta)(1 + \beta)^2 + (4 - \beta)(1 + \beta)\gamma\phi - \phi^2 + (2 + \beta)\gamma^2\phi^2 - \gamma\phi^3)^2}. \quad (8)$$

Advertisers' surplus $PS^* = 2 \int_0^{A_i^*} (\phi x_i^* - p^* - k) dk$ is

$$PS^* = \frac{\phi^2(1 + \gamma\phi - \beta^2)^2}{(2(1 - \beta)(1 + \beta)^2 + (4 - \beta)(1 + \beta)\gamma\phi - \phi^2 + (2 + \beta)\gamma^2\phi^2 - \gamma\phi^3)^2}. \quad (9)$$

4. Merger between competing platforms

We now assume that the two platforms are owned by a single entity which maximizes its profit.

$$\max_{p_1, p_2, v_1, v_2} \Pi_M(p_1, p_2, v_i, v_{-i}) = p_1 \hat{A}_1(\cdot) + p_2 \hat{A}_2 - I(v_1) - I(v_2). \quad (10)$$

The optimal price for platform i solves the following F.O.C.

$$\frac{\partial \Pi_M}{\partial p_i} = \hat{A}_i + p_i \frac{\partial A_i}{\partial p_i} + p_i \frac{\partial A_i}{\partial D_i^e} \frac{\partial \hat{x}_i}{\partial p_i} + \underbrace{p_{-i} \frac{\partial A_{-i}}{\partial D_{-i}^e} \frac{\partial \hat{x}_{-i}(\cdot)}{\partial p_i}}_{\text{Competition internalization } (-)} = 0 \text{ for } i \in \{1, 2\}.$$

Compared to the case with two competing platforms, we observe an additional effect that pushes for lower prices for advertisers. Specifically, the merged entity internalizes competition effects between the two platforms. Setting a higher price on platform i leads to a negative externality on the profits collected through platform $-i$. This internalization of the negative externality post-merger results in lower prices for advertisers.

Similarly, differentiating (10) w.r.t. v_i yields

$$\frac{\partial \Pi_M}{\partial v_i} = p_i \frac{\partial A_i}{\partial D_i^e} \frac{\partial \hat{x}_i}{\partial v_i} + \underbrace{p_{-i} \frac{\partial A_{-i}}{\partial D_{-i}^e} \frac{\partial \hat{x}_{-i}(\cdot)}{\partial v_i}}_{\text{Competition internalization } (-)} - \frac{\partial I(v_i)}{\partial v_i} = 0 \text{ for } i \in \{1, 2\}.$$

Analogously, an increase in the operational quality of platform i steers consumers away from platform $-i$, leading to profit losses from advertisers for the latter. Thus, the platforms' owner has a limited incentive to costly invest in operational quality, as the gain from more advertisers on one platform is mitigated by the loss of others on the other platform. Thus, competition internalization pushes for degraded quality.

The equilibrium price and operation quality as

$$p^M = \frac{\phi(1 + \gamma\phi + \beta)}{2(1 + \beta)(1 + \gamma\phi + \beta) - \phi^2}, \quad (11)$$

$$v^M = \frac{\phi^2}{2(1 + \beta)(1 + \gamma\phi + \beta) - \phi^2}. \quad (12)$$

In contrast to the pre-merger case in (6), an increase in substitutability β between the two

platforms lowers their innovation levels in (12). This is because an increase in β increases the negative impact of the *competition internalization effect* at a faster rate than the positive impact on own demand (see the F.O.C. above) — i.e., $|\frac{\partial^2 \hat{x}_{-i}}{\partial v_i \partial \beta}| > \frac{\partial^2 \hat{x}_i}{\partial v_i \partial \beta} > 0$.

The corresponding participation levels on both market sides are given by $x_i^M = \frac{1 + v^M + \gamma p^M}{1 + \beta + \gamma \phi}$ and $A_i^M \triangleq \frac{(1 + v^M)\phi - (1 - \beta)p^M}{1 + \beta + \gamma \phi}$.

Platforms' profit and the utility of consumers are respectively

$$\Pi_M^* = \frac{\phi^2}{2(1 + \beta)^2 - 2(1 + \beta)\gamma\phi - \phi^2} \quad (13)$$

$$U^M = \frac{(1 + \beta)(2 + \gamma\phi + 2\beta)^2}{(2(1 + \beta)^2 - 2(1 + \beta)\gamma\phi - \phi^2)^2}. \quad (14)$$

Advertisers' surplus is

$$PS^M = 2 \int_0^{A_i^M} (\phi x_i^M - p^M - k) dk = \frac{\phi^2(1 + \beta)^2}{(2(1 + \beta)^2 - 2(1 + \beta)\gamma\phi - \phi^2)^2}. \quad (15)$$

5. Welfare Implications of a Merger

Proposition 1. *The advertising price and quality investment fall after the merger. As a result, consumers are always worse off after a merger between two competing platforms.*

The drop in advertiser prices stems from the *competition internalization effect* and is aligned with earlier results in the literature. Since revenue comes only from advertisers, the merged platform admits more of them to boost profits. This contrasts with the upward pricing pressure reminiscent of one-sided markets, as advertiser prices here are strategic substitutes, driving prices down. Moreover, an advertiser-biased platform model (Choi and Jeon (2023)) leads to cuts in quality on both platforms, that, along with increased ad nuisance, further harms consumers post-merger.

Proposition 2. *The merged platforms' owner profit is higher than the sum of profits of the two separate competing platforms.*

Following the *competition internalization effect* the platform extracts more profits from advertisers, while reducing costly investments. Though the business model favors advertisers, the platform owner's interests don't fully align with theirs:

Proposition 3. *Advertisers are worse off after the merger if and only if $\phi \geq (1 + \beta)\gamma$. Otherwise, they are better off.*

Despite lower ad prices, advertisers can still be worse off post-merger. While prior literature highlights the direct benefit of lower prices, it overlooks the role of innovation incentives. The merged platform reduces operational quality, further discouraging consumer engagement and diminishing the value of advertising campaigns. If consumer interaction is crucial to advertisers ($\phi \geq (1 + \beta)\gamma$), the drop in participation can outweigh price reductions, harming advertisers. Moreover, this effect depends on platform substitutability (β). When platforms are more

differentiated (lower β), price reductions are smaller, but the decline in quality further weakens consumer engagement, increasing the risk of advertiser losses.

In conclusion, accounting for innovation incentives by two-sided ad-funded platforms brings a novel insight into the effects of platform mergers. While previous studies have shown that the advertising side gains when competition between platforms is decreased, this study shows that the welfare effects of a horizontal merger between ad-funded platforms can be similar to a horizontal merger in one-sided markets by only benefiting the merged entity and harming all other market participants involved in the market.

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A. Appendix

Proof of Proposition 1 Comparing expressions in (5) and (11) simplifies to:

$$\begin{aligned}
 p^M < p^* &\Leftrightarrow \\
 (2(1-\beta)(1+\beta)^2 + (4-\beta)(1+\beta)\gamma\phi - \phi^2 + (2+\beta)\gamma^2\phi^2 - \gamma\phi^3) &< \\
 < (2(1+\beta)^2 + 2(1+\beta)\gamma\phi - \phi^2)(1-\beta + \gamma\phi) &\Leftrightarrow \\
 -\beta\phi(\phi + \gamma(1+\beta + \gamma\phi)) &< 0
 \end{aligned}$$

For the quality change comparing expressions in (6) and (12) simplifies to:

$$\begin{aligned}
 v^M < v^* &\Leftrightarrow \\
 (2(1-\beta)(1+\beta)^2 + (4-\beta)(1+\beta)\gamma\phi - \phi^2 + (2+\beta)\gamma^2\phi^2 - \gamma\phi^3) &< \\
 < (2(1+\beta)^2 + 2(1+\beta)\gamma\phi - \phi^2)(1 + \gamma\phi) &\Leftrightarrow \\
 -\beta(1+\beta + \gamma\phi)(2 + 2\beta + \gamma\phi) &< 0
 \end{aligned}$$

Comparing consumers' surplus in (8) and (14) yields

$$\begin{aligned}
 CS^M < CS^* &\Leftrightarrow \\
 (2 + 2\beta + \gamma\phi)(2(1-\beta)(1+\beta)^2 + (4-\beta)(1+\beta)\gamma\phi - \phi^2 + (2+\beta)\gamma^2\phi^2 - \gamma\phi^3) &< \\
 < (2(1+\beta)^2 + 2(1+\beta)\gamma\phi - \phi^2)((1+\gamma\phi)(2 + \gamma\phi) - 2\beta^2) &\Leftrightarrow \\
 -\beta\phi^2(2 + \gamma^2)(1 + \beta + \gamma\phi) &< 0
 \end{aligned}$$

All three inequalities are satisfied under Assumption 1.

Proof of Proposition 2. Comparing expressions in (7)(taken twice) and (13) simplifies to:

$$\begin{aligned} \Pi^M > \Pi^* &\Leftrightarrow \\ (2(1-\beta)(1+\beta)^2 + (4-\beta)(1+\beta)\gamma\phi - \phi^2 + (2+\beta)\gamma^2\phi^2 - \gamma\phi^3)^2 &> \\ > (2(1+\beta)^2 + 2(1+\beta)\gamma\phi - \phi^2)((1+\gamma\phi)^2(2+2\gamma\phi - \phi^2) - 2\beta^2(1+\gamma\phi)(2+\gamma\phi) + 2\beta^4) &\Leftrightarrow \\ \beta^2\phi^2(2+\gamma^2)(1+\beta+\gamma\phi)^2 &> 0 \end{aligned}$$

The above holds under Assumption 1.

Poof of Proposition 3. Comparing the advertisers' surplus in (9) before to the one in (15) after the merger yields the following condition:

$$\begin{aligned} PS^M < PS^* &\Leftrightarrow \\ (1+\beta)(2(1-\beta)(1+\beta)^2 + (4-\beta)(1+\beta)\gamma\phi - \phi^2 + (2+\beta)\gamma^2\phi^2 - \gamma\phi^3) &< \\ < (1+\gamma\phi - \beta^2)(2(1+\beta)^2 - 2(1+\beta)\gamma\phi - \phi^2) & \\ \Leftrightarrow \beta\phi(1+\beta+\gamma\phi)((1+\beta)\gamma - \phi) &< 0 \end{aligned}$$

As long as $\beta > 0$ and $\phi > (1+\beta)\gamma$, advertisers are worse off after the merger. This aligns with the conditions under Assumption 1. It is straightforward that for $\beta = 0$ $\phi > \gamma$ is admissible under Assumption 1. For $\beta = 1$ $\phi > 2\gamma$ is not admissible under Assumption 1. Thus, by continuity $\exists \beta : \phi > (1+\beta)\gamma \wedge \gamma(2\gamma - \phi)(2 + \gamma\phi) > 1$.