

When does quality beat data? Gaining momentum in dynamic platform competition

Hanna Halaburda,^{*} Sarit Markovich[†] and Yaron Yehezkel[‡]

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Abstract

We consider a dynamic model with two horizontally differentiated platforms. In each period, platforms collect data from users that improves their services in future periods. The incumbent platform starts with a larger initial data base, while the entrant platform has a higher base quality. We find that when the value that users derive from accumulated data is low, the entrant enjoys positive momentum—gradually increasing its market share over time and eventually dominating the market. This occurs even if the entrant has an initial lower market share than the incumbent. When the value of data is high, the opposite occurs and the incumbent strengthens its position. We further find that greater product differentiation benefits the entrant, making it more likely for it to gain momentum and dominate the market. Finally, a policy that mandates reciprocal data sharing between platforms leads to long-run coexistence, with both platforms being active in the long run.

JEL Classification: L1

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^{*}Stern School of Management, New York University (hhalaburda@gmail.com)

[†]Kellogg School of Management, Northwestern University (s-markovich@kellogg.northwestern.edu)

[‡]The Haimovich Chair for Strategic Management, Coller School of Management, Tel Aviv University (yehezkel@tauex.tau.ac.il)

1 Introduction

In today’s digital economy, platforms increasingly rely on accumulated user data to enhance their services—through personalization, algorithmic refinement, and predictive features. Unlike traditional network effects, where value arises from cross-user interactions, data accumulation can be leveraged across users and over time, even after users leave. This distinction introduces a novel source of competitive advantage: platforms with a larger user base accumulate more data, which improves service quality and attracts more users in subsequent periods.

Recent trends, however, suggest that this advantage is not inevitable. For example, in 2025, the market share of large generative AI chatbots, ChatGPT and Gemini *fell* by roughly 5%, while smaller entrants like Perplexity and ClaudeAI gained market share.¹ This runs counter to the intuition that incumbents’ data advantage should reinforce their lead. These patterns motivate us to revisit the classic, yet still timely, question—under what conditions does accumulated data secure an incumbent’s advantage, and when can superior base quality allow an entrant to catch up and potentially ultimately dominate?—but take a different angle. Specifically, we provide a primitives-driven characterization of market dynamics and ask how core market parameters determine short-run momentum—defined as whether a platform’s share rises or falls over time—and how that momentum selects the long-run market structure.

To study these questions, we develop a model in which the market shares of two horizontally differentiated platforms evolve over time. Each period, platforms improve quality by accumulating user data, but this data depreciates over time. Thus, the value of a platform’s service at any point of time reflects not only its base quality but also the stock of user data it has acquired—even if those users are no longer with the platform. In that way, data acts as a persistent asset that can increase the platform’s future appeal, thereby altering competitive dynamics. We focus on a non-trivial scenario where an entrant with higher base quality faces an incumbent with more accumulated data.

Our model explicitly assumes that platforms do not charge users a price—a realistic feature of many major platform data markets, such as search engines (e.g., Google), generative AI chatbots (e.g., ChatGPT, Gemini), and social media (e.g., Facebook, Instagram). In these markets, end-users typically enjoy services without direct monetary costs, while platforms monetize indirectly, primarily through advertising or data

¹See: <https://firstpagesage.com/reports/top-generative-ai-chatbots/>

commercialization. By abstracting from user pricing, our model isolates the role data accumulation and product-quality differences play in determining platform success, particularly in environments where user expectations constrain platforms to provide services free of charge. This approach allows us to identify the conditions under which an entrant’s superior base quality can overcome an incumbent’s initial data advantage.

A key feature of our analysis is the notion of momentum: the tendency of a platform’s market share to grow over time because its advantage (quality or data) compounds with use. Momentum is positive when a platform’s share increases each period, negative when it declines, and absent when shares remain stable. This concept allows us to connect short-run dynamics to long-run dominance.

Our findings show that a larger market share and greater data collection do not guarantee positive momentum. Instead, whether a platform’s share expands or erodes depends on the interaction of base quality, accumulated data, and product differentiation. We identify a threshold in the user benefit from data: below this cutoff, the entrant’s quality advantage generates momentum and allows it to grow, while above it, the incumbent’s data advantage reinforces its lead. At the threshold itself, market shares remain stable, though the incumbent holds the larger share. Greater horizontal differentiation makes it easier for the entrant with quality advantage to gain momentum.

In the long run, these dynamics can converge to three outcomes: the incumbent dominates, the entrant dominates, or the two coexist. The short-run dynamics serves as an equilibrium selection mechanism. When users’ benefit from data is high, the market converges to the long-run equilibrium in which the incumbent dominates the market. The opposite case occurs when users’ benefit from data is low.

Our model also yields policy insights. In particular, a one-time data transfer at entry removes incumbents’ initial advantage, ensuring that the higher-quality platform eventually prevails, though not necessarily maximizing welfare – as users with stronger preferences for one of the platforms are served by the other one. Continuous reciprocal data sharing, by contrast, sustains coexistence and yields the welfare-maximizing outcome, with the higher-quality entrant holding the larger share.

Our results reframe scale and market share as a means rather than an end. The early-2000s “get-big-fast” playbook treated building a large user base as sufficient for dominance. In data-driven markets, that logic is incomplete: what a new user contributes depends on how market primitives, quality, and data interact. A large installed base can sit below the momentum threshold and thus be on a losing trajectory, while

a smaller, higher-quality rival can accumulate data and pull ahead. One-time transfers and continuous pooling shift momentum—not just levels—changing which long-run structure is selected.

2 Related Literature

Our model integrates persistent yet depreciating data, heterogeneous user preferences, and horizontal product differentiation into a unified dynamic framework. We contribute to a growing body of work that examines how accumulated user data improves platform quality over time and drives learning. Hagiu and Wright (2023) develop a model of data-enabled learning with homogeneous users and all-or-nothing competition. They find that an increase in the strength of network effects reduces the incumbent advantage because entrants can catch up more quickly. Our model departs from theirs by incorporating heterogeneous users and horizontal differentiation, allowing for interior equilibria in which both platforms survive or in which either the entrant or the incumbent can gain momentum. Moreover, we find that in contrast to the case where competition is all-or-nothing, when users are heterogeneous and data persists beyond user participation, an increase in the strength of network effects strengthens the incumbent’s grip.

Our analysis connects to the broader literature on platform competition with network effects (Katz and Shapiro, 1985; Farrell and Saloner, 1985; see Jullien et al., 2021, for a review of the literature). Hałaburda and Yehezkel (2013; 2016; 2019), and Markovich and Yehezkel (2022; 2024) consider platform competition and coordination in the context of a static game. Hałaburda et al. (2020), and Biglaiser and Crémer (2020) consider dynamic competition. This literature shows that because of network effects, there are multiple equilibria, depending on users’ beliefs regarding the decisions of other users to which platform to join. A key difference between this literature and our paper is that in our setting with data accumulation, users’ value from the platform depends not only on its current user base but also on data from past users even if they are no longer on the platform. We contribute to this literature by showing how dynamics and the platforms’ momentum over time serve as an equilibrium selection. In particular, while we find that in the long-run there are multiple steady-state equilibria, our analysis of the short-run dynamics and platforms’ momentum shows that the market converges to a unique long-run steady state.

Our momentum results contribute to the literature on dynamic competition with

switching and learning (Cabral, 2011) and connect to prior work on market tipping and path dependence. Markovich (2008) examines dynamic competition in differentiated markets and shows how market structure can evolve toward monopoly or coexistence depending on switching costs and network effects. Similar to that work, we focus on dynamic trajectories and thresholds that determine whether an entrant can overcome an incumbent’s advantage; however, our model replaces switching costs with persistent data-driven advantages.

3 The Model

Consider a dynamic game between two horizontally differentiated platforms, platforms A and B , and heterogeneous users. Given that we want our analysis to take the entrant’s point of view, we denote the entrant with its advanced quality as platform A , and the incumbent with its data advantage as platform B . The two platforms operate for an infinite number of discrete periods, $t = 0, 1, \dots, \infty$. In each period, users decide which platform to join in the current period. Suppose that in each period users can join only one of the platforms and can switch platforms at no cost.

Platforms A and B offer users initial base qualities $Q_A = Q + v$ and $Q_B = Q + 1$, where $2 > v \geq 1$ measures the quality advantage of platform A . We assume that Q is sufficiently large such that the market is fully covered, i.e., all users join a platform. In addition to their initial base qualities, the platforms can collect data from users that enables them to enhance the quality of their services in the current period and in future periods.² Platforms accumulate data over time, but old data depreciates in future periods. When platform $i = A, B$ served $n_{i,0}, n_{i,1}, \dots, n_{i,\tilde{t}}$ users in periods $t = 0, 1, \dots, \tilde{t}$, respectively, its total amount of data accumulation in period $\tilde{t}$ is $D_{i,\tilde{t}} = n_{i,\tilde{t}} + \gamma n_{i,\tilde{t}-1} + \gamma^2 n_{i,\tilde{t}-2}, \dots, \gamma^{\tilde{t}} n_{i,0}$, where γ ($0 < \gamma < 1$) is the data-depreciation factor. By accumulating data $D_{i,t}$ in period t , the platform can provide users services of value $\beta D_{i,t}$. The parameter β measures the marginal value to a user from data generated by other users. Empirically, β could be proxied by the performance gain per unit of additional user data, holding capacity constant. For instance, in generative AI markets, one can compare quality improvements across entrants with smaller vs. larger training sets, or estimate the slope of performance with respect to user base size. More generally, β corresponds to the elasticity of service quality with respect to accumulated user data. Notice that

²In Section 7, we assume that platforms can commercialize data; i.e., sell data to advertisers.

while β seems equivalent to network effects, it incorporates the feature that a user's data benefits other users even after the user left the platform, because the user's data remains the platform's property. For this reason, $D_{i,t}$ is different from installed base of users, because users do not necessarily stay with the same platform.

Users are heterogeneous in their preferences for the two platforms. Suppose that users are uniformly distributed along the Hotelling line, where $x \in [0, 1]$ denotes user x 's location. Platform A (B) is located at point 0 (1), and user x incurs the costs θx ($\theta(1 - x)$) from joining platform A (B). The parameter θ measures the degree of differentiation between the two platforms. To ensure the stability of the equilibrium in the short-run, we restrict the parameter space to $\beta < \theta$.³

We therefore have that a user's utilities from joining platforms A or B in period t are:

$$U_{A,t} = Q + v + \beta D_{A,t} - \theta x, \quad U_{B,t} = Q + 1 + \beta D_{B,t} - \theta(1 - x).$$

In order to identify the incumbency advantage of data collection, suppose that platform B entered the market before the advanced-quality platform A . With a slight abuse of notations, we can define the period in which platform A entered as time $t = 1$. By the time platform A entered, platform B already accumulated data D_0 . The size of D_0 depends on the number of periods in which platform B was a monopoly and on platform B 's market coverage in these periods. Instead of solving for D_0 given arbitrary number of periods and market share, we solve the model given D_0 , that measures the data-driven incumbency advantage.⁴ We restrict attention to the interesting case where $D_0 < \frac{1}{(1-\gamma)}$, such that the entering platform A can gain a positive market share.⁵ We assume that platforms provide their services for free and compete to attract market share. In the background of the model, platforms collect and commercialize *anonymous* user data, which does not inflict a disutility on them. Hence, platforms' profits increase with their market share and their goal is to achieve as large a share of the market as possible. In Section 6, we allow platforms to make a strategic decision on whether, and to what extent, to commercialize personal data, where such commercializing imposes privacy costs on users.

The model introduces a tradeoff between platform B 's data-driven incumbency ad-

³If $\beta > \theta$, in the short-run all users join the same platform.

⁴For micro-foundation, if the incumbent served a fraction λ of users in T_0 pre-entry periods, then with depreciation γ the expected stock is $D_0 = \sum_{s=0}^{T_0-1} \gamma^s \lambda = \lambda \frac{1-\gamma^{T_0}}{1-\gamma}$.

⁵In Proposition 2 below we show that at the equilibrium in which no platform gains momentum, platform A gains a positive market share if and only if $D_0 < \frac{1}{(1-\gamma)}$.

vantage and platform A 's quality advantage. This tradeoff raises the question of how the market evolves over time.

4 Short-run equilibrium

In this section we solve for the equilibrium allocation of users between the two platforms after a finite number of periods (we consider the long-run steady-state in the next section). The main conclusion of this section is that the market can be characterized by increased momentum of platform $i = A, B$, where platform i increases its market share over time, or no momentum, where market shares remain constant over time.

Consider a certain period after entry, $t > 1$. If both platforms have positive market share and the market is fully covered, there is an indifferent users, x_t , such that users with $x \in [0, x_t]$ join the entrant platform A while users with $x \in [x_t, 1]$ join platform B , where

$$v - \theta x_t + \beta(x_t + \gamma D_{A,t-1}) = 1 - \theta(1 - x_t) + \beta(1 - x_t + \gamma D_{B,t-1}), \quad (1)$$

hence:

$$x_t = \frac{1}{2} + \frac{v - 1}{2(\theta - \beta)} - \frac{\beta\gamma(D_{B,t-1} - D_{A,t-1})}{2(\theta - \beta)}. \quad (2)$$

Intuitively, platform A gains a higher market share than platform B ($x_t > 1/2$), if its relative quality advantage, $v - 1$, is large and platform B 's relative data-advantage, $D_{B,t-1} - D_{A,t-1}$, is low. Given x_t , in period $t + 1$, the indifferent user, x_{t+1} solves:

$$\begin{aligned} v - \theta x_{t+1} + \beta(x_{t+1} + \gamma x_t + \gamma^2 D_{A,t-1}) \\ = 1 - \theta(1 - x_{t+1}) + \beta(1 - x_{t+1} + \gamma(1 - x_t) + \gamma^2 D_{B,t-1}), \end{aligned} \quad (3)$$

hence,

$$x_{t+1} = \frac{1}{2} + \frac{(v - 1)(\theta - \beta(1 - \gamma))}{2(\theta - \beta)^2} - \frac{\beta\gamma^2\theta(D_{B,t-1} - D_{A,t-1})}{2(\theta - \beta)^2}. \quad (4)$$

We say that the entrant platform A enjoys positive momentum between periods t and $t + 1$ if its market share increases, $x_{t+1} > x_t$. Platform B has positive momentum — meaning that platform A has negative momentum — when $x_{t+1} < x_t$. If $x_{t+1} = x_t$, the market is stable between periods. We use $\mu_t \equiv x_{t+1} - x_t$ as a measure of platform A 's momentum.

The following proposition shows that either platform A has a positive momentum

in all periods, platform B has a positive momentum in all periods, or the market share is stable across periods. The proposition further shows how the market's parameters affect the momentum.

Proposition 1. *Suppose that:*

$$0 < \frac{v-1}{\gamma\theta} < D_0 < \frac{1}{(1-\gamma)}. \quad (5)$$

Then, there exists a momentum threshold, $\bar{\beta} \in (0, \theta)$, where

$$\bar{\beta} = \frac{v-1}{D_0} + \theta(1-\gamma), \quad (6)$$

such that for all $t \geq 1$,

- (i) *If $\beta < \bar{\beta}$, then $\mu_t > 0$ for all t (entrant A has positive momentum each period).*
- (ii) *If $\beta > \bar{\beta}$, then $\mu_t < 0$ for all t (entrant A has negative momentum, and incumbent B has positive momentum each period).*
- (iii) *If $\beta = \bar{\beta}$, then $\mu_t = 0$ for all t (market shares are constant period-to-period).*

Proposition 2. *Moreover, μ_t obeys the law of motion*

$$\mu_{t+1} = \frac{\gamma\theta}{\theta - \beta} \mu_t$$

so that $|\mu_t|$ increases if $\beta > (1-\gamma)\theta$, decreases if $\beta < (1-\gamma)\theta$, and is constant in magnitude when $\beta = (1-\gamma)\theta$.

Importantly, Proposition 1 shows that the question of who enjoys positive momentum does not depend on t . If a platform had positive momentum between periods t and $t+1$, it will continue to do so in all future periods. Notice also that momentum is not tied to the initial market share.

Figure 1 illustrates the market shares of the two platforms as a function of β , for $t = 1, 2, 3$. While we only show the market shares in the first three periods after entry, by Proposition 1, the results follow to all t (until the market reaches corner solutions, on which we elaborate in the next section). Starting with the case of $\beta = 0$, the figure shows that the market remains constant over time, because accumulating data does not increase the users' utility. When β is lower than the momentum threshold $\bar{\beta}$, platform A

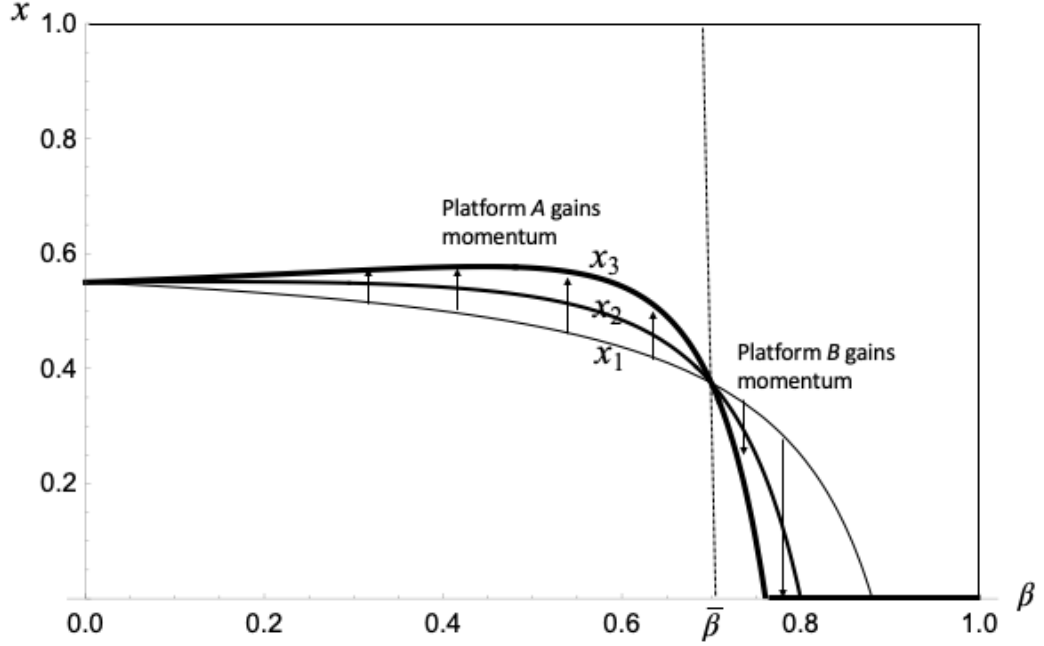


Figure 1: Market share of the two platforms ($v = 1.1$, $\gamma = 0.5$, $D_0 = 0.5$ and $\theta = 1$). A has momentum when $\beta < \bar{\beta}$; B when $\beta > \bar{\beta}$; stable at $\beta = \bar{\beta}$.

increases its market share over time. Even if platform A starts period $t = 1$ at a market share below $1/2$, whenever $\beta < \bar{\beta}$, platform A has momentum by increasing its market share as t increases. The opposite result holds when $\beta > \bar{\beta}$, in which case platform B has momentum as t increases (until eventually covering the entire market). When $\beta = \bar{\beta}$, the market share of the two platforms remains constant over time. Notice that in this case, platform B sustains a larger market share than platform A in all periods, despite A 's higher intrinsic quality. The reason is that for stability in equilibrium, B must consistently collect more data than A in each period; otherwise, A 's quality advantage would allow it to gain share.⁶

The intuition for this result is the following. Recall that in the first period after entry ($t = 1$) platform B holds the data-driven incumbency advantage due to its initial data base, while platform A has a quality advantage, that does not depend on previous data collection. When β is higher than the momentum threshold (i.e., $\beta > \bar{\beta}$), platform B 's data-driven incumbency advantage is stronger than platform A 's quality advantage, resulting in an increase in platform B 's market share, i.e., $x_2 > x_1$. This increases platform B 's data driven incumbency advantage even further and enables platform B

⁶This parallels results in Markovich (2008) where dynamic stability requires the weaker-quality firm to command a larger user base.

to increase its market share even further in the next period: $x_3 > x_2$, and so on. The opposite case occurs if $\beta < \bar{\beta}$, in which case platform A 's quality advantage is stronger than platform B 's data-driven advantage, which enables platform A to increase its market share over time. In the case where $\beta = \bar{\beta}$, the two effects of initial data collection and initial quality advantage balance each other. Therefore, $x_2 = x_1$. As market share in the second period did not change, the two effects continue to balance each other such that $x_3 = x_2$ and so on.

Notice that momentum does not necessarily depend on the initial market share. As shown in Figure 1, if β is slightly lower than $\bar{\beta}$, platform B enjoys in the first period after entry a higher market share than platform A ($x_1 < 1/2$). Yet, because $\beta < \bar{\beta}$, the incumbency advantage due to data collection is small, and platform A can increase its market share in the next period ($x_2 > x_1$). Platform A accumulates the data for period $t = 3$, and as the gap in data accumulation decreases (following the increase in platform A 's market share), platform A increases its market share in $t = 3$. Hence, platform A has momentum despite starting with an inferior market share.

These results differ from Hagiu and Wright (2023) that show that an increase in the value of the new data (which is equivalent, in our model, to an increase in β) decreases the incumbent's competitive advantage.⁷ In Hagiu and Wright (2023), competition is all - or-nothing, as users are identical. Here, because users are heterogeneous in their preferences for the two platforms, it is possible to find a $\bar{\beta}$ and a market share that balances the data-advantage and the quality advantage. Then, if β increases above $\bar{\beta}$, platform B has momentum because its data-driven advantage becomes stronger. As β decreases below $\bar{\beta}$, platform A has momentum because platform B 's data-driven advantage becomes weaker.

Next we move to how market conditions affect $\bar{\beta}$. Corollary 1 follows directly from Proposition 1:

Corollary 1. *Platform A is more likely to have momentum (the momentum cutoff $\bar{\beta}$ increases) as:*

- (i) *platform A 's quality advantage, v , increases;*
- (ii) *product differentiation, θ , increases;*

⁷In their Proposition 2, they show that when both platforms are in the increasing part of their learning curves, increasing the value of new data by a multiplier factor greater than one decreases the incumbent's competitive advantage.

- (iii) *platform B's initial data accumulation, D_0 , decreases;*
- (iv) *data depreciation factor, γ , decreases.*

Intuitively, as platform A's quality advantage, v , increases, it is easier for platform A to have momentum, which enables it to have momentum for higher values of β . Likewise, as platform B's data-advantage, D_0 (or the ability to accumulate data, γ), increases, it is easier for platform B to have momentum, which enables it to have momentum for lower values of β . A less straightforward result is that as differentiation (measured by θ) increases, it is easier for the entrant to have momentum. To see the intuition for this result, define x^* as the market share evaluated at $\beta = \bar{\beta}$. We have:

Proposition 3. *At the momentum threshold $\bar{\beta}$, where market shares remain stable over time, platform B holds a larger market share than platform A. That is, $x^* = \frac{1}{2} - \frac{1}{2}D_0(1 - \gamma)$. Hence, $0 < x^* < \frac{1}{2}$ and is independent of θ .*

Proposition 3 shows that in order to balance the data-driven advantage and the quality advantage (which occurs when $\beta = \bar{\beta}$), platform B needs to have a superior market share. The intuition is that B's data-driven advantage can be sustained over time only if platform B continues to collect more data than platform A in all periods.

This result explains why differentiation benefits the entrant. At $\bar{\beta}$, the indifferent user, $x^* < \frac{1}{2}$, has stronger preferences for platform A because this user is closer in preferences to platform A. As θ increases, and users' preferences become stronger, it becomes more costly for this user to join the incumbent that offers a more distant service than platform A. Hence, this user will no longer be indifferent and now strictly *prefers* to join platform A. As a result, a higher β is needed to make this user indifferent between the two platforms, resulting in an increase in $\bar{\beta}$.

Finally, we note that it is not always the case that $\bar{\beta} \leq \theta$. Figure 2, shows the case where $D_0 < \min\left\{\frac{v-1}{\gamma\theta}, \frac{1}{(1-\gamma)}\right\}$.⁸ In this case, because D_0 is low, platform B's data-driven advantage is weak, such that the entrant has momentum for all values of $\beta \leq \theta$. Platform A starts the first period with a larger market share than platform B ($x_1 > 1/2$ for all β) due to its superior quality advantage. This enables platform A to gain more data in the second period which further increases its advantage. For this reason, platform A's momentum increases, i.e., the gap $x_{t+1} - x_t > 0$ increases as β increases.

⁸This condition holds if either $D_0 < \frac{v-1}{\gamma\theta} < \frac{1}{(1-\gamma)}$, where the last inequality holds whenever $\frac{v-1}{v-1+\theta} < \gamma < 1$, or $D_0 < \frac{1}{(1-\gamma)} < \frac{v-1}{\gamma\theta}$, where the last inequality holds whenever $0 < \gamma < \frac{v-1}{v-1+\theta}$.

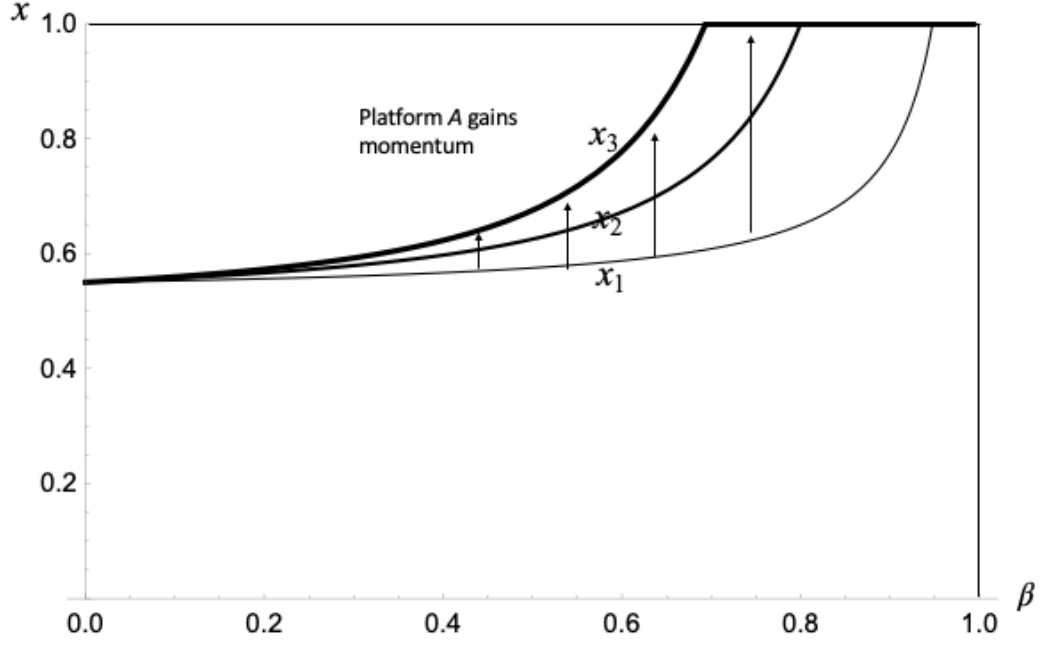


Figure 2: Market share of the two platforms ($v = 1.1$, $\gamma = 0.5$, $D_0 = 0.1$ and $\theta = 1$)

5 Long run steady state equilibrium

In this section we consider the equilibria in the steady-state, when market shares remain constant over time: $x_{t+1} = x_t$ for all t . These equilibria will hold in the long-run, after the market converges to one of these equilibria following the short-run dynamics that we identified in the previous section. We first solve for the potential steady-state equilibria, and then investigate which equilibrium the market converges to.

There are three potential steady-state equilibria: (i) both platforms have positive market shares; (ii) platform A wins; and (iii) platform B wins.

Starting with the equilibrium in which both platforms have positive market shares, define x^{**} as the indifferent user in this equilibrium. In each period, platform A collects x^{**} data and therefore accumulates $D_{t,A} = \frac{x^{**}}{1-\gamma}$. Likewise, platform B accumulates $D_{t,B} = \frac{1-x^{**}}{1-\gamma}$. The indifferent user solves:

$$v - \theta x^{**} + \beta \frac{x^{**}}{1-\gamma} = 1 - \theta(1 - x^{**}) + \beta \frac{1 - x^{**}}{1-\gamma}, \quad (7)$$

or

$$x^{**} = \frac{1}{2} - \frac{(1-\gamma)(v-1)}{2(\beta - \theta(1-\gamma))}. \quad (8)$$

There is an equilibrium with positive market shares if $0 < x^{**} < 1$.

In a steady-state equilibrium in which platform A wins the market in all periods, user $x = 1$ prefers joining platform A over platform B , given that in all periods, all users join platform A :

$$v - \theta + \frac{\beta}{1 - \gamma} > 1. \quad (9)$$

Likewise, in a steady-state equilibrium in which platform B wins, user $x = 0$ prefers joining platform B over platform A , given that in all periods, all users join platform B :

$$1 - \theta + \frac{\beta}{1 - \gamma} > v. \quad (10)$$

To analyze when each steady-state equilibrium holds in the long run, it is useful to distinguish between the case of high-benefit and low-benefit from data, β .

High data benefits

Consider first the case of a high benefit from data: $\beta \in [(1 - \gamma)(v + \theta - 1), \theta]$. The following proposition shows that if β is sufficiently high, all three equilibria are possible:

Proposition 4. *Suppose that $(1 - \gamma)(v + \theta - 1) < \beta < \theta$. Then, in the long-run steady-state, the market converges to one of three equilibria:*

- (i) *all users join platform A ,*
- (ii) *all users join platform B ,*
- (iii) *$x^{**} < \frac{1}{2}$ users join platform A and $1 - x^{**}$ users join platform B . $x^{**} = 0$ at $\beta = (1 - \gamma)(v + \theta - 1)$ and increases with β .*

Figure 3 shows the three potential steady-state equilibria. Notice first that all three equilibria are independent of D_0 . This is because in the steady-state, the initial data-advantage of platform B already depreciated. As the figure and Proposition 5 show, when β is high, either platform can dominate the market. Intuitively, as the value of data is high, if a platform accumulated sufficient data, it can dominate the market, regardless of the base quality advantage. Yet, there is also a potential steady-state equilibrium in which the platforms share the market. Perhaps counter intuitive, in

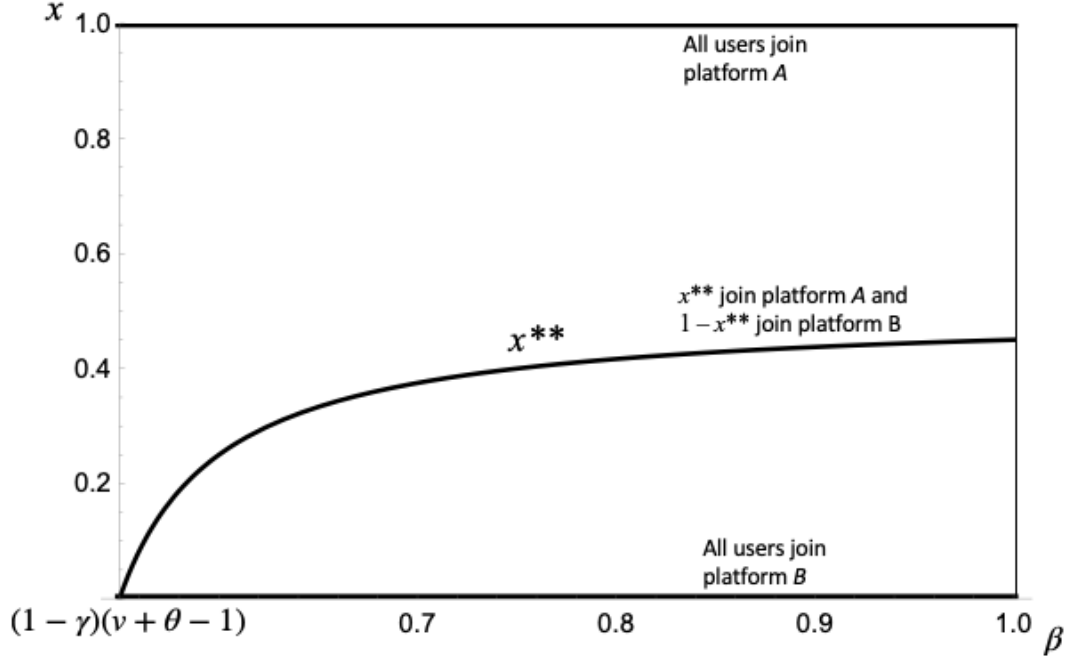


Figure 3: Potential steady-state equilibria ($v = 1.1$, $\gamma = 0.5$, and $\theta = 1$). Steady states are independent of D_0 ; selection depends on short-run momentum.

this equilibrium the higher-quality platform A has lower market share than the lower-quality platform B . The intuition for this result is that in order to obtain steady-state equilibrium with positive market shares, platform B needs to balance the quality advantage of platform A by consistently accumulating more data, which requires it to capture a larger market share. In this equilibrium, platform A 's market share increases with β , because as β increases a smaller amount of data accumulation is needed for platform B to balance the quality advantage of platform A .

We continue our focus on the case in which all three steady-state equilibria are possible, i.e., $(1 - \gamma)(v + \theta - 1) < \beta < \theta$, and analyze which steady-state equilibrium the market converges to. We note that because $D_0 < \frac{1}{(1-\gamma)}$, $\bar{\beta} > (1 - \gamma)(\theta + v - 1)$. Moreover, if $\frac{v-1}{\gamma\theta} < D_0$ then $\bar{\beta} < \theta$. This implies that when $\frac{v-1}{\gamma\theta} < D_0 < \frac{1}{(1-\gamma)}$, $\bar{\beta} \in [(1 - \gamma)(v + \theta - 1), \theta]$.⁹ The following proposition connects between the short-run equilibrium of Section 4 and the long-run equilibria derived in this section:

Proposition 5. *Suppose that $\frac{v-1}{\gamma\theta} < D_0 < \frac{1}{(1-\gamma)}$, such that $\bar{\beta} \in [(1 - \gamma)(v + \theta - 1), \theta]$ and suppose that $\beta \in [(1 - \gamma)(v + \theta - 1), \theta]$, so that three long-run steady states are*

⁹To see why, we have that $(1 - \gamma)(v + \theta - 1) < \theta$ if and only if $\frac{v-1}{\gamma\theta} < \frac{1}{(1-\gamma)}$. Furthermore, we have that $\bar{\beta} > (1 - \gamma)(v + \theta - 1)$ if and only if $D_0 < \frac{1}{1-\gamma}$. Finally, recall that $\bar{\beta} < \theta$ if and only if $D_0 > \frac{v-1}{\gamma\theta}$.

feasible. Evaluated at $\beta = \bar{\beta}$, $x^{**} = x^*$. Therefore, the long-term outcome is uniquely determined by momentum in the following way.

- (i) if $\beta < \bar{\beta}$, platform A has momentum and the market converges to the steady state equilibrium in which platform A dominates the market,
- (ii) if $\beta > \bar{\beta}$, platform B has momentum and the market converges to the steady state equilibrium in which platform B dominates the market,
- (iii) if $\beta = \bar{\beta}$, neither platform has momentum and the market stays at steady state equilibrium in which x^{**} users join platform A and $1 - x^{**}$ users join platform B.

Platform competition typically has multiple equilibria because of users' coordination: users join the platform they expect others to join. Proposition 5 shows that, in our model, the comparison between β and $\bar{\beta}$ serves as an equilibrium selection mechanism, and shows how the short-run analysis selects the long-run equilibrium.

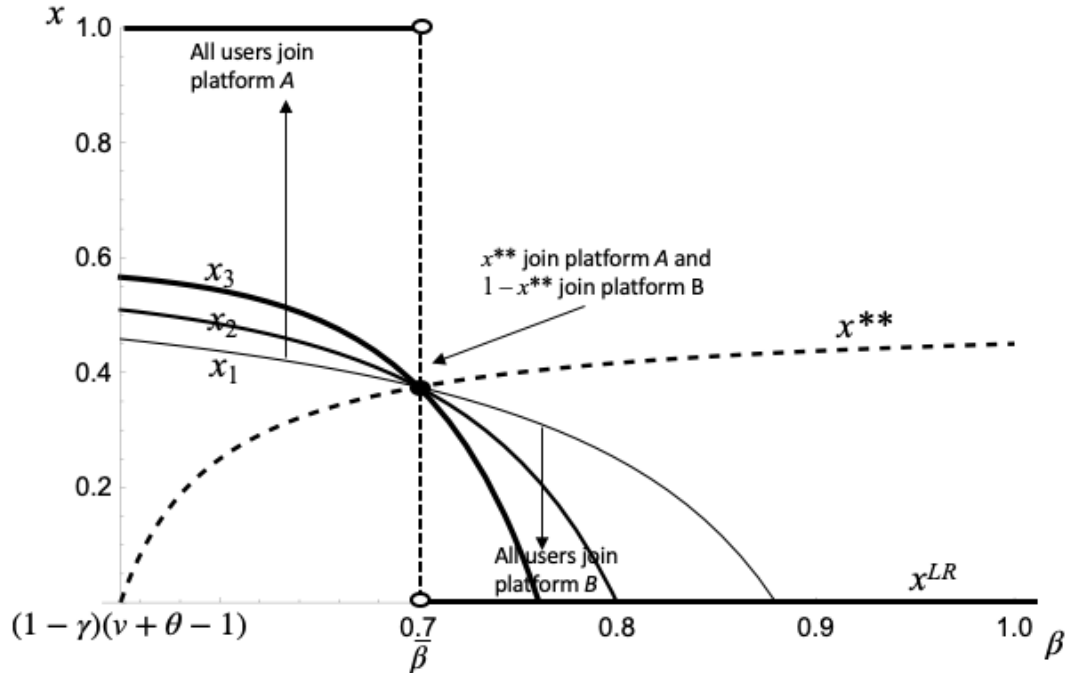


Figure 4: Market share of the two platforms ($v = 1.1$, $\gamma = 0.5$, and $\theta = 1$). All short-run x_t curves intersect at $(\bar{\beta}, x^{**})$.

To see the intuition for Proposition 5, let x^{LR} denote the long run steady-state market share of platform A. Figure 4 illustrates the results of Proposition 4 and the equilibrium x^{LR} as a function of β . As the figure shows, all short-run x_t intersect at

the same point, in which $\beta = \bar{\beta}$ and $x = x^{**}$. As a result, if $\beta < \bar{\beta}$, the short-run x_t increases over time and therefore in the steady-state platform A dominates the market. Likewise, if $\beta > \bar{\beta}$, the short-run x_t decreases over time and therefore in the steady-state platform B dominates the market. If $\beta = \bar{\beta}$, the short-run x_t is constant over time and therefore both platforms are active in the steady-state, with platform A attracting a smaller market share than platform B .

Next, we analyze the convergence rate to the steady-state equilibrium. As can be seen in Figure 4, when $(1 - \gamma)(v + \theta - 1) < \beta < \bar{\beta}$, $x_3 - x_2 > x_2 - x_1$. That is, platform A 's momentum intensifies over time. Likewise, when $\bar{\beta} < \beta < \theta$, platform B 's momentum intensifies over time, such that $x_2 - x_3 > x_1 - x_2$. The following proposition confirms this observation:

Proposition 6. *Suppose that $\frac{v-1}{\gamma\theta} < D_0 < \frac{1}{(1-\gamma)}$, such that $\bar{\beta} \in [(1 - \gamma)(v + \theta - 1), \theta]$ and suppose that $(1 - \gamma)(v + \theta - 1) < \beta < \theta$. Then the market converges in an increasing rate to the steady state. That is, for all t , when $\beta < \bar{\beta}$, $x_{t+2} - x_{t+1} > x_{t+1} - x_t$ and when $\beta > \bar{\beta}$, $x_{t+1} - x_{t+2} > x_t - x_{t+1}$.*

Proposition 6 shows that when market dynamics exhibits momentum, each period's increase in market share further expands the leading platform's data stock, thereby, further accelerating its advantage. This compounding effect yields an increasing rate of convergence. By contrast, when market dynamics results in coexistence, the entrant's quality advantage and the incumbent's data advantage offset one another. As the market share approaches the interior steady state, the residual adjustment shrinks, leading to diminishing increments and a slower approach to equilibrium.

Our results in this subsection focused on the case where $\bar{\beta} \in [(1 - \gamma)(v + \theta - 1), \theta]$. When the threshold is larger, i.e., $\bar{\beta} > \theta$, then by the above analysis for all $\beta \in [(1 - \gamma)(v + \theta - 1), \theta]$ the market converges to the long-run steady state equilibrium in which all users join platform A . Moreover, they do so in an increasing rate.

Low data benefits

We now move to the case of low benefit from data: $\beta \in [0, (1 - \gamma)(v + \theta - 1)]$. From our assumption that $D_0 < \frac{1}{1-\gamma}$, $\bar{\beta} > (1 - \gamma)(v + \theta - 1)$, so in the short-run platform A increases its market share over time. Notice that this holds regardless of whether $\bar{\beta}$ is higher or lower than θ . The following proposition derives the long-run, steady state that the market converges to:

Proposition 7. Suppose that $\beta \in [0, (1 - \gamma)(v + \theta - 1)]$. Then,

- (i) if $\theta < v - 1$, the market converges to a long-run steady state in which platform A dominates: $x^{LR} = 1$.
- (ii) if $\theta > v - 1$, the market converges to a long-run steady state in which the two platforms share the market if β is sufficiently low:

$$x^{LR} = \begin{cases} x^{**}, & \text{if } \beta \in [0, (1 - \gamma)(\theta - (v - 1))], \\ 1, & \text{if } \beta \in [(1 - \gamma)(\theta - (v - 1)), (1 - \gamma)(v + \theta - 1)], \end{cases}$$

where $\frac{1}{2} < x^{**} < 1$ and increasing in β and decreasing with θ .

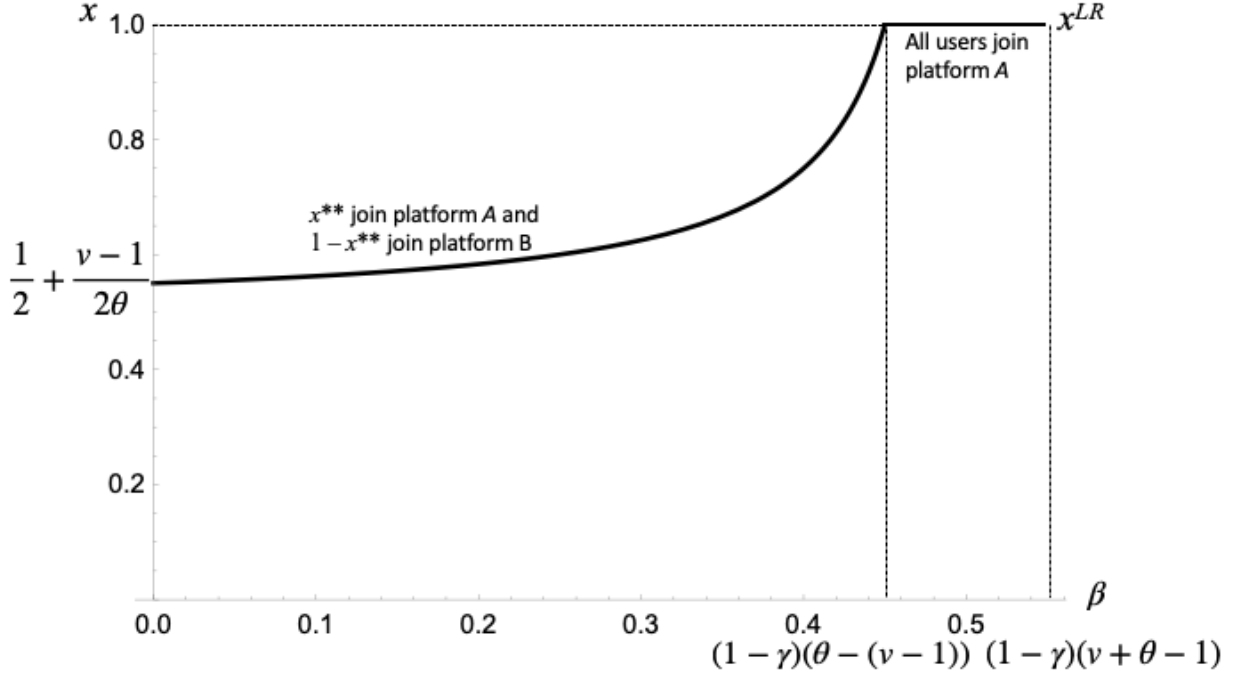


Figure 5: Market share of the two platforms ($v = 1.1$, $\gamma = 0.5$, and $\theta = 1$). Coexistence arises in the low- β region with high θ ; then $x^{**} > 1/2$ and increases in β .

Figure 5 illustrates the second part of Proposition 7. Intuitively, when data accumulation is not very important to users such that β is small, and when product differentiation, θ is high, there is a long-run steady state with two active platforms. In this equilibrium, $x^{LR} > \frac{1}{2}$ because platform A offers a superior base quality. As β increases, platform A's market share increases, because data accumulation becomes more important to users and platform A, who has a higher market share, accumulates

more data. Moreover, unlike the case of high β , where differentiation benefits platform A , here, θ decreases platform A 's market share. The intuition for this result is that now platform A gains a higher market share than platform B , hence, attracts more distant users. As θ increases, it is more costly for these users to join platform A , and some users switch to platform B .

Finally, we analyze the convergence rate to this long-run steady state equilibrium.

Proposition 8. *Suppose that $\beta \in [0, (1-\gamma)(\theta+(v-1))]$. Then the market converges in a decreasing (increasing) rate to the long-run steady state if $\beta < (1-\gamma)\theta$ ($\beta > (1-\gamma)\theta$).*

Intuitively, the speed of convergence depends on whether the long-run equilibrium is coexistence or dominance. When two platforms coexist (i.e., $0 < \beta < (1-\gamma)(\theta-(v-1))$), the market converges in a decreasing rate: each period brings smaller adjustments, as the share approaches the interior steady state without actually ever reaching it. By contrast, when platform A dominates (i.e., $0 < (1-\gamma)(\theta-(v-1)) < \beta < (1-\gamma)(\theta+(v-1))$), convergence can be either slow or fast. Specifically, there exists a threshold $(1-\gamma)\theta$ within this range such that if $\beta < (1-\gamma)\theta$, the approach is gradual (decreasing rate), whereas if $\beta > (1-\gamma)\theta$, the dynamics accelerate (increasing rate).

6 Data commercialization of personal data

The analysis so far assumed that platforms profit from commercializing *anonymous* data and therefore compete to attract market share. In this section, we extend the model to allow platforms to also commercialize personal data, which inflicts a disutility on users. To keep the analysis tractable and to focus on isolating the comparative statics around $\bar{\beta}$, we restrict attention to steady-state strategies. That is, suppose that platforms are very patient and therefore maximize their long-run steady state profits.

Suppose that platforms A and B can strategically set the amount of data that they commercialize from each user, d_A and d_B , respectively. Platforms care about the long run so are very patient and want maximize their payoff in the steady-state. We focus on the parameter space in which $\beta \in [(1-\gamma)(v+\theta-1), \theta]$ and $\frac{v-1}{\gamma\theta} < D_0 < \frac{1}{(1-\gamma)}$, such that without data commercialization, in the long-run steady-state platform A wins if $\beta < \bar{\beta}$ and platform B wins otherwise. Platform A and B 's profits in the long run from commercializing personal data are therefore $d_A x^{LR}$ and $d_B(1-x^{LR})$, respectively. Because in the relevant parameter space the steady state equilibrium that the market

converges to is not affected by t , and because platforms only concern with their long-run profits, it does not matter in which period the two platforms make this decision. For simplicity, we assume that the two platforms make this decision simultaneously.

Given data commercialization d_A and d_B , users' utilities from joining each platform become:

$$U_{A,t} = Q + v - d_A + \beta D_{A,t} - \theta x, \quad U_{B,t} = Q + 1 - d_B + \beta D_{B,t} - \theta(1 - x).$$

Therefore, applying our analysis from sections 4 and 5, it is straightforward to show that, there is a threshold,

$$\bar{\beta}(d_A, d_B) = \bar{\beta} + \frac{d_B - d_A}{D_0}, \quad (11)$$

such that platform A dominates in the steady-state if and only if $\beta < \bar{\beta}(d_A, d_B)$, where $\bar{\beta}(d_A, d_B)$ is decreasing in d_A and increasing in d_B .

Platforms compete by setting d_A and d_B , while taking into account that $\bar{\beta}(d_A, d_B)$ determines which platform dominates the market. Given d_B and the value of β , platform A sets the highest d_A possible subject to that it winning the steady state, i.e., $\beta < \bar{\beta}(d_A, d_B)$. At the same time, platform B sets the highest d_B possible subject to $\beta > \bar{\beta}(d_A, d_B)$. Therefore, if $\beta < \bar{\beta}$, the equilibrium strategies are $d_B^* = 0$ and the d_A^* that solves $\beta \leq \bar{\beta}(d_A, 0)$, resulting in platform A dominating the market in the steady state. Likewise, if $\beta > \bar{\beta}$, the equilibrium strategies are $d_A^* = 0$ and the d_B^* that solves $\beta \geq \bar{\beta}(0, d_B)$, resulting in platform B dominating the market. Solving $\beta = \bar{\beta}(d_A, 0)$ and $\beta = \bar{\beta}(0, d_B)$, yields the following equilibrium strategies:

$$d_A^* = \begin{cases} v - 1 - D_0(\beta - (1 - \gamma)\theta), & \text{if } \beta < \bar{\beta}, \\ 0, & \text{if } \beta \geq \bar{\beta} \end{cases}$$

$$d_B^* = \begin{cases} 0, & \text{if } \beta \leq \bar{\beta}, \\ D_0(\beta - (1 - \gamma)\theta) - (v - 1), & \text{if } \beta > \bar{\beta}. \end{cases}$$

The following corollary summarizes this result:

Corollary 2. *Suppose that platforms commercialize personal data to maximize their steady-state profits. Then, the amount of data commercialization is non - monotonic in β : it decreases in β if $\beta < \bar{\beta}$ and increases in it otherwise.*

Interestingly, an increase in the strength of the network effects does not necessarily pushes the platforms to commercialize more data. Intuitively, a platform may want to

take advantage of an increase in β to increase the data it commercializes, because β increases the users' benefit from data accumulation. Commercializing too much data, however, may negatively affect the platform's ability to win the market. That is, if β is substantially lower than $\bar{\beta}$, platform A would commercialize a high level of personal data as it can do so while still dominating in steady state, so d_A^* is high. As β increases, the gap $\bar{\beta} - \beta$ decreases, implying that platform A must reduce the amount of data it commercializes to ensure it does not affect its intrinsic value to the point that it will not continue to dominate the market. This continues until reaching $d_A^* = 0$ at $\beta = \bar{\beta}$. The opposite case occurs when $\beta > \bar{\beta}$, in which case platform B wins the steady state and increases the amount of data it commercializes as β increases.¹⁰

Notice that the non-monotonicity follows to other market parameters. In particular, when platform A wins, the amount of data commercialization is increasing in the degree of substitution, θ . This is because recall that substitution works in favor of platform A by making it easier for platform A to dominate the market. For the same reason, when platform B wins, the amount of data commercialization is decreasing in the degree of substitution.

7 Implications

Managerial implications

Short-run market share and long-run dominance

It might be expected that if a platform has a short-run market share above 50%, and data from current users accumulates over time, then this platform is bound to gain momentum, increase its market share further and end up dominating the market. Yet, the results of this paper show that this is not always the case. Consider platform B , whose competitive advantage is in its initial data accumulation. Suppose that β is slightly below $\bar{\beta}$. Because $x^{**} < \frac{1}{2}$, platform B has a market share of above 50%. However, because $\beta < \bar{\beta}$, platform B does not have momentum: it will gradually lose market share until eventually platform A will dominate the market. Therefore, platform B cannot rely on its current superior market share: it will need to take measures that reduce $\bar{\beta}$ (such as increasing its base quality) to prevent platform A from dominating

¹⁰At $\beta = \bar{\beta}$, $d_A^* = d_B^* = 0$ and the two platforms share the market. This is an equilibrium because given $d_j^* = 0$, if platform i collects even a slight amount of data, it loses the entire market.

the market.

Notice that the same argument does not apply to platform A , whose competitive advantage is in its superior quality. If platform A benefits from a short-run market share above 50%, it will always (taking other market conditions as given) have momentum and dominate the market. To see why, notice that x_t can be higher than $\frac{1}{2}$ only if $\beta < \bar{\beta}$, in which case platform A has momentum.

Commercializing data and the threat of losing market dominance

Related to the previous policy implications, suppose that a platform (say, platform A) decides to start commercializing data in order to generate positive revenues. Suppose further that commercializing data inflicts a disutility of users and therefore decreases platform A 's quality advantage. This reduces v , which, in turn, reduces $\bar{\beta}$. In the short-run, commercializing data result in losing a certain market share, due to the decrease in v . Yet, in the long-run, if, after data commercialization, it is still the case that $\beta < \bar{\beta}$, platform A still has momentum. Whatever market share lost due to data commercialization, platform A will gain it back in future periods and eventually dominate the market. If, however, the decrease in $\bar{\beta}$ results in $\bar{\beta} < \beta$, then platform A will start losing momentum and eventually loose the entire market.

It is possible to apply this argument for platform B , though recall from the previous policy implication the difference between the two platforms. Suppose, for example, that platform A has, say, 70% of the market, and due to data commercialization, in the short-run its market share drops to 60%. Then, it is always the case that platform A still has momentum and will gain its high market share back. This is not necessarily the case for platform B . Suppose, for example, that platform B has 70% and has momentum, with an increase in market share in each period. Suppose further that once platform B starts commercializing data, in the short-run its market share drops to 60%. Although its market share is still above 50%, it is not necessarily the case that platform B still has momentum. It could be that the decrease in its base quality (equivalent to an increase in v in our model) increases $\bar{\beta}$ from values under which platform B has momentum ($\bar{\beta} < \beta$) to values under which it does not ($\beta < \bar{\beta}$). In other words, for platform B , a market share above 50% does not necessarily place it in a position in which it can start commercializing data.

Increased product differentiation result in entrant’s market dominance

It might be expected that as differentiation increases, it is more likely that competing platforms share the market. As a result, incumbents might be less fearful from entry threats as products are more substitutes. Yet, the results of this paper show that as differentiation increases (an increase in θ), $\bar{\beta}$ increases and it is more likely that platform A has momentum and will eventually dominate the market. Consequently, differentiation creates a threat of entry by providing a stronger competitive advantage to entrants. For example, when asking both ChatGPT and Gemini what are the differences between them, the two AI tools highlight differences, stating that each has unique advantages in serving specific needs. According to our model, such differentiation is more likely to benefit the entrant platform.

Policy implications

Before considering the policy implications of our results, notice that in this model, due to market dominance and product differentiation, there are two sources for loss of welfare. First, the equilibrium in which platform B dominates the market provides lower total welfare than the equilibrium in which platform A dominates the market. This is because platform B offers a lower base quality than platform A . Yet, because of product differentiation, the equilibrium in which platform A dominates the market does not maximize welfare. Users with strong preferences towards platform B (i.e., with x close to 1) may prefer to join platform B over platform A . Hence, a second loss of welfare occurs when a platform dominates the market, depriving users of the choice of a competing platform that is closer to their preferences.

Requiring the incumbent to share its initial data accumulation

Consider a policy that requires platform B to share with platform A the data it collected prior to platform A ’s entry. Only the initial data is shared: no platform is obligated to share data with its competitor in future periods. In our model, this implies that in period $t = 1$, platform B has to share D_0 with platform A , and then the two platforms continue to accumulate their own data, given their market shares. The following proposition shows that this policy solves the first source of loss of welfare:

Proposition 9. *Suppose that $D_{A,t} = D_{B,t}$. Then, platform A has momentum (i.e., $x_{t+1} > x_t$) if and only if $v > 1$.*

Proposition 5, along with our previous results, show that if platform B shares its initial data with platform A , then, the highest quality platform has momentum and will therefore dominate the market in the long-run. This result has three implications for welfare. First, it has been argued that if a high-quality incumbent platform share its data with a new platform, the incumbent will lose a welfare enhancing competitive advantage to a lower-quality platform. Yet, Proposition 9 shows that if platform B offers a superior quality than platform A (which corresponds to $v < 1$), sharing the initial D_0 with platform A will not prevent platform B from gaining momentum and dominating the market. Second, notice that in the long-run, this policy is relevant only if $\beta > \bar{\beta}$. Recall that if $\beta < \bar{\beta}$, platform A gains momentum and dominates the market without this policy, though in the short-run, this policy may expedite the convergence to the steady-state in which platform A wins. Finally, notice that while under this policy, the best platform wins the market, the market is not necessarily efficient. As explained above, welfare can be improved if both platforms are active in the market.

Requiring both platforms to continuously share their data

To show how welfare can be maximized, consider a rather extreme (and perhaps unpractical) policy in which both platforms need to share their data with each other in all periods. In this case, in each period, each platform collects data equals to 1 regardless of its market share. The indifferent user between the two platforms in period t , x_t , is:

$$v - \theta x_t + \beta \left(1 + \sum_{\hat{t}=1}^{t-1} \gamma^{\hat{t}} \right) = 1 - \theta(1 - x_t) + \beta \left(1 + \sum_{\hat{t}=1}^{t-1} \gamma^{\hat{t}} \right) \iff x_t = \frac{1}{2} + \frac{v-1}{2}. \quad (12)$$

Because both platforms have access to the same pool of data, β does not affect x_t and therefore x_t is constant over time. Moreover, $\frac{1}{2} < x_t < 1$, where the second inequality follows by the assumption that $v < 2$. We therefore have the following result:

Proposition 10. *Consider a policy that requires both platforms to share their data in all periods. Then, in all periods, users with $x < \frac{1}{2} + \frac{v-1}{2}$ join platform A and users with $x > \frac{1}{2} + \frac{v-1}{2}$ join platform B . Compared with the steady state equilibrium in which platform A (B) dominates, in the steady state users with $x > \frac{1}{2} + \frac{v-1}{2}$ ($x < \frac{1}{2} + \frac{v-1}{2}$) are better off following this policy and other users are indifferent.*

In evaluating policy, we measure welfare as the sum of user utilities under full market coverage and zero prices. That is, total welfare reflects the horizontal match

between users and platforms, adjusted for base quality and the value of accumulated data. Under this criterion, one-time sharing eliminates incumbents’ informational head start but does not maximize welfare, since some users with strong preferences for the lower-quality platform are forced onto the higher-quality one. By contrast, continuous reciprocal sharing sustains coexistence and aligns users with their preferred platform, while both benefit equally from the shared data stock. This configuration maximizes total welfare.

Proposition 10 shows that this policy can help the market to solve both types of inefficiencies. Both platforms are active, both have the same set of data and the higher-quality platform A gains a higher market share. Yet, we acknowledge that such a regulation can raise two problems. First, from a legal perspective, this regulation requires platforms to give up on their intellectual property – the data that they collect – in all periods. This is different from a one-time sharing of data from the incumbent to the entrant as in the previous subsection. Second, sharing data in a continuous manner may raise problems of data security and privacy that our paper does not model. Consequently, this policy should be interpreted as a benchmark case of what policy can enhance welfare in an ideal, unconstrained, market.

8 Conclusion

In the competitive landscape of digital platforms, does a data-rich incumbent hold an indisputable advantage against a higher-quality entrant? This paper demonstrates that this is not the case. The evolution of market dominance is not predetermined by initial conditions but hinges on a crucial, and often overlooked, trade-off: the economic value users derive from accumulated data versus the intrinsic quality of the service. To analyze the dynamics of market share, we introduce and formalize the concept of momentum: a platform has momentum when its market share grows period after period, and it increases its momentum when this growth accelerates. Crucially, short-run momentum serves as an equilibrium selection device, determining which of the multiple feasible long-run outcomes ultimately prevails.

Our central finding is the existence of a sharp threshold in the user benefit from data (β). This parameter determines the market’s trajectory. When this benefit is low, the entrant’s superior quality provides a powerful engine for growth, allowing it to gain momentum and ultimately capture the market—even from an initial position of market

share inferiority. Conversely, when the data benefit is high, the compounding force of the incumbent’s data accumulation creates a gravitational pull that is too strong for a higher-quality entrant to escape.

This framework yields counter-intuitive results with strategic implications. First, current market share can be a poor predictor of long-run viability. An incumbent enjoying a majority share may already be on a path to obsolescence. Second, and perhaps more surprisingly, greater product differentiation does not insulate the incumbent. Instead, it amplifies the entrant’s quality advantage among its core user base, making an eventual market takeover more, not less, likely.

These insights have direct implications for both strategy and policy. For incumbents, a decision to monetize data that degrades service quality can initiate a fatal loss of momentum, even if market share remains high in the short run. For policymakers, our analysis highlights the starkly different outcomes of regulatory interventions. A one-time mandated data transfer can level the playing field to ensure the best platform wins, but does not maximize welfare since some users lose access to their preferred match. By contrast, a more radical policy of continuous data pooling could sustain a duopoly, preserving user choice and enhancing total welfare. Taken together, our results underscore a broader message: in data-driven markets, what matters is not simply who has more users today, but how quality and data interact to shape momentum—and with it, the long-run equilibrium of competition.

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Appendix A

Below are the proofs for all propositions in the text.

Proof of Proposition 1:

We first show that regardless of t , $x_{t+2} > x_{t+1}$ if and only if $x_{t+1} > x_t$. Hence, if a platform has momentum in a certain period, it has momentum in all periods. To this end, x_{t+2} is the solution to:

$$\begin{aligned} v - \theta x_{t+2} + \beta (x_{t+2} + \gamma x_{t+1} + \gamma^2 x_t + \gamma^3 D_{A,t-1}) \\ = 1 - \theta(1 - x_{t+2}) + \beta (1 - x_{t+2} + \gamma(1 - x_{t+1}) + \gamma^2(1 - x_t) + \gamma^3 D_{B,t-1}). \end{aligned} \quad (13)$$

Substituting x_{t+1} and x_t from (4) and (2), yields:

$$x_{t+2} = \frac{1}{2} + \frac{(v-1)(\theta^2 + \beta^2(1-\gamma) - \beta\theta(2-\gamma-\gamma^2))}{2(\theta-\beta)^3} - \frac{\beta\gamma^3\theta^2(D_{B,t-1} - D_{A,t-1})}{2(\theta-\beta)^3}. \quad (14)$$

We have that:

$$x_{t+1} - x_t = \frac{\beta\gamma}{2(\theta-\beta)^2} [v-1 - (D_{B,t-1} - D_{A,t-1})(\beta - \theta(1-\gamma))], \quad (15)$$

and:

$$x_{t+2} - x_{t+1} = \frac{\beta\gamma^2\theta}{2(\theta-\beta)^3} [v-1 - (D_{B,t-1} - D_{A,t-1})(\beta - \theta(1-\gamma))]. \quad (16)$$

The terms in the squared brackets in (16) and (15) are identical. Recalling that $\theta > \beta$, we have that given any $D_{B,t-1}$ and $D_{A,t-1}$, $x_{t+2} > x_{t+1}$ if and only if $x_{t+1} > x_t$.

Next, we turn to derive $\bar{\beta}$. As the result above holds for any history (i.e., any $D_{B,t-1}$ and $D_{A,t-1}$), there is no loss of generality in solving for $\bar{\beta}$ that ensures that $x_2 - x_1 > 0$. In $t=1$, $D_{B,0} = D_0$ and $D_{A,0} = 0$. Substituting $D_{B,t-1} = D_0$ and $D_{A,t-1} = 0$ into the term squared brackets in (15) yields that $v-1 - D_0(\beta - \theta(1-\gamma)) > 0$ if and only if $\beta < \bar{\beta}$.

Finally, notice that it is always the case that $\bar{\beta} > 0$. Moreover, $\bar{\beta} < \theta$ if and only if: $\frac{v-1}{\gamma\theta} < D_0$. As we also require that $D_0 < \frac{1}{(1-\gamma)}$, we have that $\bar{\beta} < \theta$ if and only if $\frac{v-1}{\theta\gamma} < D_0 < \frac{1}{(1-\gamma)}$. It is possible to show that $\frac{v-1}{\theta\gamma} < \frac{1}{(1-\gamma)}$ if and only if: $\frac{v-1}{v-1+\theta} < \gamma < 1$.

Proof of Proposition 2:

Because evaluated at $\beta = \bar{\beta}$, $x_t = x_{t+1}$ for all t , there is no loss of generality in

evaluating x^* at $t = 1$. Substituting $D_{B,t-1} = D_0$ and $D_{A,t-1} = 0$ into x_t in (2), we have that x_1 is:

$$x_1 = \frac{1}{2} + \frac{v-1}{2(\theta-\beta)} - \frac{\beta\gamma D_0}{2(\theta-\beta)}. \quad (17)$$

Evaluating x_1 at $\beta = \bar{\beta}$ yields $x^* = \frac{1}{2} - \frac{1}{2}D_0(1-\gamma)$. Because $D_0 < \frac{1}{(1-\gamma)}$, $x^* > 0$, and because $\gamma < 1$ and $D_0 \geq 0$, $x^* < \frac{1}{2}$.

Proof of Proposition 3:

There is a steady state equilibrium in which all users join platform A if (9) holds, or: $\beta > (1-\gamma)(\theta - (v-1))$. Likewise, there is a steady state equilibrium in which all users join platform B if (10) holds, or: $\beta > (1-\gamma)(\theta + (v-1))$. Because $v-1 > 0$, we have that $(1-\gamma)(\theta + (v-1)) > (1-\gamma)(\theta - (v-1))$, so if $(1-\gamma)(\theta + (v-1)) < \beta < \theta$, both equilibria holds. Notice that $(1-\gamma)(\theta + (v-1)) < \theta$ if and only if $\frac{v-1}{v-1+\theta} < \gamma < 1$ and recall from the proof of Proposition 1 that in this case $\frac{v-1}{\theta\gamma} < \frac{1}{(1-\gamma)}$.

Next, consider the steady-state equilibrium with two active platforms. Straightforward calculation shows that $x^{**} = 0$ at $\beta = (1-\gamma)(\theta + (v-1))$. Moreover, x^{**} is increasing in β . Evaluating x^{**} at $\beta = \theta$ yields $x^{**}|_{\beta=\theta} = \frac{1}{2} - \frac{(1-\gamma)(v-1)}{2\gamma\theta} < \frac{1}{2}$.

Proof of Proposition 4:

Substituting $\beta = \frac{v-1}{D_0} + \theta(1-\gamma)$ into x^{**} in (8) yields $x^{**}|_{\beta=\bar{\beta}} = \frac{1}{2} - \frac{1}{2}D_0(1-\gamma) = x^*$. As $x_{t+1} > x_t$ if and only if $\beta < \bar{\beta}$ and $x_{t+1} = x_t$ if $\beta = \bar{\beta}$, we have that for $\beta < \bar{\beta}$, platform's A 's market share expands over time until reaching the steady-state where it dominates the market. The opposite case occurs when $\beta > \bar{\beta}$. When $\beta = \bar{\beta}$, $x^{**} = x^*$ and the market remains stable over time at $x_t = x^*$.

Proof of Proposition 5:

Given any time t , we have from the proof of Proposition 1 (and using $x_{t+2} - x_{t+1}$ in (16) and $x_{t+1} - x_t$ in (15)) that:

$$x_{t+2} - x_{t+1} - (x_{t+1} - x_t) = \frac{\beta\gamma(\beta - (1-\gamma)\theta)}{2(\theta-\beta)^3} [v-1 - (D_{B,t-1} - D_{A,t-1})(\beta - \theta(1-\gamma))] \quad (18)$$

Suppose that $\beta < \bar{\beta}$, such that the term in the squared brackets of (18) is positive. The gap $x_{t+2} - x_{t+1} - (x_{t+1} - x_t)$ is positive if $\beta > (1-\gamma)\theta$, which holds because $\beta > (1-\gamma)(\theta + (v-1))$. Suppose now that $\beta > \bar{\beta}$, such that the term in the squared

brackets of (18) is negative. Then, because $\beta > (1 - \gamma)\theta$, $x_{t+2} - x_{t+1} - (x_{t+1} - x_t) < 0$, implying that $x_{t+1} - x_{t+2} > x_t - x_{t+1}$.

Proof of Proposition 6:

From the proof of Proposition 3, there is no steady state in which platform B dominates, and there is a steady state in which platform A dominates if $\beta > (1 - \gamma)(\theta - (v - 1))$. If $(1 - \gamma)(\theta - (v - 1)) < 0$ (such that $\theta < v - 1$), this equilibrium holds for all $\beta > 0$. If $(1 - \gamma)(\theta - (v - 1)) > 0$ (such that $\theta > v - 1$), this equilibrium holds only for $\beta > (1 - \gamma)(\theta - (v - 1)) > 0$. For $\beta \in [0, (1 - \gamma)(\theta - (v - 1))]$, there is a unique equilibrium with $x^{LR} = x^{**}$, where x^{**} is given by (8). It is straightforward to see that $x^{**}|_{\beta=0} = \frac{1}{2} + \frac{v-1}{2\theta} < 1$ where the inequality follows if and only if $\theta > v - 1$. Moreover, $x^{**}|_{\beta=0} > \frac{1}{2}$ because $v > 1$. As β increases, x^{**} increases and $x^{**}|_{\beta=(1-\gamma)(\theta-(v-1))} = 1$. Moreover, x^{**} is decreasing with θ because:

$$\frac{\partial x^{**}}{\partial \theta} = -\frac{(1 - \gamma)^2(v - 1)}{2(\theta(1 - \gamma) - \beta)^2} < 0.$$

Finally, to show that the market converges to this x^{LR} , we need to show that $x_1 < x^{**}$ (as recall that for $\beta < \bar{\beta}$, x_t increases over time). To this end, the gap:

$$x^{**} - x_1 = \frac{\beta\gamma(v - 1)}{2(\theta - \beta)(\theta(1 - \gamma) - \beta)} + \frac{\beta\gamma D_0}{2(\theta - \beta)} > 0, \quad (19)$$

where the first term is positive because $v > 1$ and because $\beta < (1 - \gamma)(\theta - (v - 1))$ implies that $\beta < \theta(1 - \gamma)$ and the second term is positive because $\theta > \beta$.

Proof of Proposition 7:

The proof follows directly from the first part of the proof of Proposition 5.

Proof of Proposition 8:

Substituting $D_{A,t-1} = D_{B,t-1}$ into the gap $x_{t+1} - x_t$ in (15) yields $x_{t+1} - x_t = \frac{\beta\gamma}{2(\theta - \beta)^2} [v - 1]$, which is positive if and only if $v > 1$.

Proof of Proposition 9:

The result that under this policy, users with $x < \frac{1}{2} + \frac{v-1}{2}$ join platform A and users with $x > \frac{1}{2} + \frac{v-1}{2}$ join platform B follows directly from the text. Moving to part (i), we have that under this policy, in the steady state a user of type x that joins platform A gains a utility of $Q + v - \theta x + \beta$, which is the same utility that the user gains in the

steady state in which all users join platform A . A user that joins platform B under this policy (a user with $x > \frac{1}{2} + \frac{v-1}{2}$) gains a utility of $Q + 1 - \theta(1 - x) + \beta > Q + v - \theta x + \beta$, where the inequality follows because $x > \frac{1}{2} + \frac{v-1}{2}$. Hence, this user benefits from the policy. Part (ii) is equivalent.