
Gaming the ecosystem

Fragmented users and their unexpected buyer power

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The market power of digital ecosystem operators has been a key focus in antitrust debates. In this article, **Ying Li** and **Lau Nilausen** examine the game engine operator Unity's proposed pricing changes and the strong pushback from developers that ultimately forced Unity to reverse course. The authors show that even a fragmented user base can collectively exert countervailing buyer power, limiting an ecosystem operator's ability to impose unfavourable terms.

Introduction

In recent years, the potential for operators of digital ecosystems to exert market power has sparked significant antitrust policy debate and motivated regulatory intervention. At first glance, the game engine operator, Unity, exhibits many of the characteristics that typically stimulate such concerns. However, its response to users' backlash over its new pricing scheme suggests otherwise. Its actions did not align with those of an entrenched operator wielding significant market power. Rather, its reaction indicates that, in this case, countervailing buyer power was relatively easy to maintain, which constrained an otherwise well-positioned ecosystem operator.

This article explores Unity's abandoned pricing scheme to illustrate an interesting and underappreciated feature of digital ecosystems: that a fragmented user base with similar incentives can nonetheless limit the bargaining power of the operator of an ecosystem, as though they act collectively. This analysis adds nuance to the ongoing debates about how ecosystems work in practice, and the concept of countervailing buyer power more generally. Specifically: (i) the externalities within an ecosystem that

benefit the operator may also/equally benefit other participants, and (ii) a static assessment of buyer power that focuses on the size of individual buyers in isolation may understate the bargaining power that smaller buyers exert collectively.

The game engine ecosystem

The nature and the emergence of a game engine

Unity operates a "game engine". A game engine is an environment for developing software. It provides a set of specialised tools and components – including graphics rendering, real-time experience simulation, scripting, sound, and animation support – that game developers can use to build their games.²

Game engines' users are mostly game developers.³ Before game engines emerged, game developers typically had to create each video game from scratch. Game engines improved the efficiency of game development by allowing developers to reuse the core components of games. This led to specialisation and separation of the engine and content development such that it is common practice today for game developers

to use a third party's game engine to develop their video games.⁴

The nature and formation of an ecosystem

Aspects of Unity Engine are akin to those typically associated with economic ecosystems. The value of the ecosystem increases with the number of users ("direct network effect"); and the values of related products and services in the ecosystem complement each other ("indirect network effect"). In recent years, the potential source of power of ecosystem operators has become an increasingly common antitrust concern.⁵

All else equal, developers would prefer game engines with a larger existing user base. The importance of a large user base for game engine providers is also evident in that many providers, including Unity, offer users whose revenues fall below certain thresholds access to the game engine for free.

Three important yet common mechanisms strengthen Unity's ecosystem,⁶ i.e., (i) Unity provides a two-sided market place, (ii) switching costs among game engines leads to certain degrees of lock-in, (iii) the labour force in the ecosystem benefits from proficiency in the most widely used game engines. We explain these below.

The asset store ecosystem effect: a two-sided marketplace

Users can create 2D and 3D content ("assets") in Unity and sell these in the Unity Asset Store.⁷ For example, a user could create a set of characters ready for other users to "plug in" to the graphics of their projects. Assets are important for game developers as these promote efficiency in game development. According to Unity's gaming report in 2023, around 62% of independent ("indie") game developers use between 5 to 14 asset packages in their games and close to 30% of large game studios use more than 30.⁸

Unity benefits from the Asset Store in two ways. First, Unity charges a 30% commission

on asset sales.⁹ Second, the Asset Store makes Unity a more attractive option to its users by (i) allowing users to make games more efficiently, and (ii) providing an alternative method of revenue generation, i.e., developing assets to sell in the store.

Like other marketplaces, the Unity Asset Store creates positive network effects. More creators selling content attracts more users to the store, and likewise more users purchasing from the store attracts more creators to produce content. The Unity Asset Store can thereby act as a catalyst for a virtuous cycle whereby the greater the number of developers using and contributing to the Unity Asset Store, the greater the benefit for developers from doing so. This makes it easier to attract and retain developers to the Unity ecosystem.

The lock-in effect: switching costs between rival ecosystems

Individual games are typically developed using a single game engine. Game studios designing a new game choose a game engine based on the type of the game, the quality of the game engine, and the associated ecosystem. However, once the decision has been made, switching to another game engine requires the studio to move the entire development and support system to a different architecture.

The switching cost depends on the developer's circumstances. The cost is more onerous for developers that are further into the development or support process. Such lock-in is particularly relevant for established games with a large fan base. In contrast, the cost of switching at the beginning of the development process is relatively low.

The labour market ecosystem effect: economies of scope

Developers need technical know-how to use a game engine. This creates an incentive for game studios to use game engines which a lot of developers are familiar with to facilitate collaboration between staff members and improve the ability to shift staff members

between projects as the workloads evolve. Similar to the choice of programming languages, this in turn creates a virtuous cycle where developers in the labour market prioritise learning the most popular game engines to benefit from more job opportunities.

Again, the scale of the benefit depends on circumstances. If a studio has only built games with one engine, moving to a different one requires acquiring new skills or hiring developers. If a studio is small, its main consideration is access to a competitive market of labour already skilled in using the game engine it intends to use for developing new games. However, if the studio is large and has successful games already, then it has less flexibility: it already has games, workforce, and labour needs that depend on the game engine it already uses.

The competitive landscape

Markets with network effects, and the features of an ecosystem, tend to be relatively concentrated – reflecting the value of a large user base. Much like many of the markets for other tech products that form ecosystems, the market for game engines is concentrated around two large providers: Unity Engine and Unreal Engine.

Unity Engine and Unreal Engine are two of the most popular game engines today.^{10, 11} According to a survey in 2023, 66% of serviced game developers used Unity Engine or Unreal Engine as their primary engine.¹² There is a long tail of other well-established and easy-to-use game engines, including Gamemaker, Godot, Stride, and RPG Maker.¹³ However, the user bases of these game engines are much smaller than those of Unity Engine and Unreal Engine, especially when considering users that use these game engines as their primary game engine.¹⁴

Unity Engine was released in 2005 aiming to “*democratise game development*”, making its functionality accessible to developers of all levels.^{15, 16} It is relatively easy to use and popular with indie gaming studios designing

lower-budget games.¹⁷ Unity supports games on more platforms than Unreal,¹⁸ and therefore is popular with developers of cross-platform games,¹⁹ and especially for mobile game development.²⁰

Mobile games have become increasingly popular in the past decades²¹ and accounted for approximately half of the global gaming revenue in 2023.²² This trend is particularly evident in a nascent type of mobile game called hypercasual games.²³ Hypercasual games are typically mobile games with simple and intuitive gameplay that require minimal learning.²⁴ Gamers can often play these games with a single action such as tapping or swiping while multi-tasking.²⁵ Hypercasual games gained popularity as the minimum time and attention required makes these games a good fit for a wide audience.²⁶ A number of the highest grossing mobile games, such as Candy Crush Saga, Royal Match,²⁷ and Fruit Ninja,²⁸ are hypercasual games. Given the simple nature of the gameplay, many hypercasual game developers rely on Unity in the development process.

What happened in the price rebalancing: the triumph of users

The mutually beneficial monetisation model

The monetisation model of a game engine is closely connected to its users’ scale and revenues similar to most digital ecosystems. Unity generates more than 60% of its revenues through downstream ad revenues.^{29, 30} Game engines such as Unity therefore generate more revenues through larger users that are more successful.

Unity also offers subscription plans of its game engines at various prices to users. Only users with annual revenues above a certain threshold need to pay to use Unity’s tools. The proposed changes in pricing scheme target users of Unity Engine, i.e., game studios/developers.

Unity's proposed change in its pricing scheme

There are two main components of Unity Engine that Unity licenses to its users: Unity Editor and Unity Runtime. Developers use Unity Editor as a tool to create games. Unity Runtime is installed with the game to ensure games built in Unity function on different platforms.³¹ Historically, Unity charged a subscription fee for Unity Editor with various levels of access for functionalities at different prices while distributing Unity Runtime for free. Users would need to upgrade to the next tier plan of Unity Editor once their revenue exceeded certain levels.³² Users making less than \$100k in revenue per year can use Unity Editor for free.³³

Unity announced a plan in September 2023 to change its pricing structure starting from January 2024. The new prices would apply to existing games as well as new ones.³⁴ In broad terms, Unity proposed a new model where they removed the compulsory revenue thresholds for users to upgrade to the more advanced tier of Unity Editor, while introducing a royalty for each game install for using Unity Runtime (regardless of whether the game install generates revenue for the user), the "**Runtime Fee**".³⁵ The proposed Runtime Fee would only apply to games that made at least \$200k of revenues in the last 12 months and achieved at least 200k lifetime installs. For users on any paid-for subscription plans of Unity Editor, the thresholds for the Runtime Fee to kick-in are higher.

Unity explained that 90% of its customers would not pay more under the new pricing structure.³⁶ Indeed, irrespective of the subscription plan chosen for Unity Editor, the revenue and install thresholds for the Runtime Fee were set at a level that most games would never achieve. This is evident in the statistics in the gaming industry:

- In PC gaming, by 2020 only 9% of the indie games on one of the most popular PC gaming marketplaces, Steam, had made over \$200k of revenue in their entire

lifetime and over 50% of indie games on Steam never made more than \$4,000 of revenue.³⁷

- In mobile gaming, revenue and download statistics from Google Play and the App Store show that the top 1% of game publishers generated 82% of global mobile game downloads and 95% of the global mobile game revenues in 2019 Q3 whereas the remaining 99% of game publishers on average had approximately 18k downloads each and \$18k in revenues in that quarter.³⁸ As each publisher could publish multiple games in Google Play or the App Store, the average downloads and revenues of a game would be even lower.

The changes in the pricing scheme therefore by and large increase prices for the most successful users. The vast majority of users were less successful and should be no worse off.

Reaction to the proposal

The proposed changes nonetheless provoked overwhelmingly negative reactions from game studios and developers, including threats to switch away from Unity.³⁹

Unity responded rapidly by revising its price structure to introduce elements that are more favourable for its users including capping the Runtime Fee to 2.5% of revenues a little more than one week after announcing the original plan.⁴⁰ Eventually, Unity cancelled the Runtime Fee entirely "*after extensive consultation with our games community and customers.*"⁴¹

Unity of incentives

At first glance, Unity's pricing u-turn is surprising. Unity is an ecosystem for which many developers, especially developers with successful games, experience a degree of lock-in given the high switching costs. It is also one of the most popular game engines overall, particularly important for mobile, hypercasual games, and by extension has a

largely fragmented user base. Such characteristics suggest that Unity may enjoy some degree of market power and an ability to impose price changes on its customers, *even if* those customers disapprove.⁴² This raises the question of why Unity dialled back price changes which would have captured more value from the most profitable games in the face of user pushback.

To understand these outcomes, we first describe how Unity's proposed price changes changed the economics of game development and then provide an economic rationale for Unity's decision.

How the proposed price rebalancing increased risk for developers

Many modern games launched for mobile phones are free to install and gamers may not make substantial in-app purchases. Game developers instead rely on ad revenues. This is particularly the case for games with simple gameplay such as hypercasual games: according to Unity's Gaming Report, ad revenues represented 94% of the total revenues of hypercasual games in 2022.⁴³

Ad revenues are driven by the number of daily active users (DAU).⁴⁴ DAU is in turn driven by user acquisition and user retention.⁴⁵ Taking hypercasual games as an example, this has the following implications.

- Hypercasual game publishers compete fiercely to acquire users. In 2019, 60% of ads shown in hypercasual games were ads for other hypercasual games or cross promotional campaigns from the same game publisher.⁴⁶ The use of advertisement to attract users creates a positive link between user acquisition and operating costs.
- Most hypercasual games are free to install. This encourages users to install and try games which they have no prior knowledge of. Whereas this makes it easier to acquire users, retaining them is a matter of the quality and addictiveness of gameplay.⁴⁷ For a median mobile game, only 34% of players continue

playing 1 day after installing/opening the game, and only 3% of players continue playing 1 month after installing/opening the game.⁴⁸ Installations alone are therefore a poor predictor for DAU. As hypercasual publishers aggressively advertise their games to acquire users, a game could be loss-making if it could not retain enough users to recoup the cost of advertising.

The statistical disconnect between the number of installations and DAU means that a game hypothetically could breach the proposed thresholds without generating any meaningful revenues for each additional user acquired. Game developers could thereby face additional costs for games that attract but do not retain users. By introducing the Runtime Fee based on installs, Unity thereby increased game developers' financial risk.

How the proposed price rebalancing decreased the financial upside for developers

The commercial performance of video games is largely binary: a small minority of games achieve exceptionally high sales leaving the remaining vast majority of games only a modest uptake. Because electronic distribution of games means that the variable costs of servicing incremental users are very low, the combination of fixed costs of development and low costs of distribution further skews profitability towards hit games.

Other than the mandatory subscription plan upgrades linked to revenues, Unity's original pricing was largely agnostic to the performance of a developer's games. However, the introduction of the Runtime Fee effectively increased costs for developers that generated the most installs. Developers of widely distributed games could face a substantial cost which, as noted above, would not necessarily reflect any revenue. The proposed price rebalancing thereby reduced the potential upside from developing a successful game.

The reverse ecosystem effect

The assessment of countervailing buyer power in competition investigations typically focuses on larger customers as these are more likely to be of “*commercial significance for the dominant undertaking*”.⁴⁹ However, switching costs for studios with an existing portfolio of successful games are considerable for the reasons discussed above, denying them the “*ability to switch quickly to competing suppliers*”.⁵⁰ Any countervailing buyer power from the largest game studios would also seem inconsistent with the fact that Unity would target the price increase to the most successful games using its tools.

Whereas game developers without existing hit games benefit from a better “*ability to switch quickly to competing suppliers*”, they are not individually commercially significant. At face value, this suggests that these also lack countervailing buyer power. Moreover, most small game developers were not supposed to be adversely affected by price rebalancing due to the high revenue and install thresholds for the Runtime Fee to kick in. However, small game developers played a crucial role in informing Unity’s decision to roll back its pricing changes. We see a number of reasons for this.

It may seem contradictory that small game developers challenged a price change that would only affect large developers, but it is not. Whereas only a small minority of developers ultimately create a hit game, all developers invest in pursuit of such success. The proposed price rebalancing therefore did not only eat into currently successful developers’ existing profits but also the expected future profits of all the small game developers in terms of (i) increasing risk, and (ii) decreasing financial upside.

Even though the prospect of future success may have motivated small game studios to push back against the proposed price rebalancing, they would still face the challenge that none of them is individually critical for Unity’s success. However:

- Although each small user is commercially insignificant, a sufficient number of small users motivated by a similar commercial logic to respond in a similar way to the proposed price rebalancing may muster the prerequisite commercial significance. The relevant question for the assessment of countervailing buyer power is therefore not whether each customer (or game developer in the present example) is individually significant but whether it belongs to a materially sized cohort of similarly motivated customers. Importantly, this does not require coordination between fragmented users, only that they rationally would respond in a similar way.
- The ability of Unity to capture value from users depends on how profitable users are. The inability to predict which game developers or games will succeed in the future therefore may further confer bargaining power to small game developers. Specifically, as it is impossible to “pick winners” due to the risky nature of game development, Unity is incentivised to seek to keep as many developers onboard as possible.
- Even those users that do not ultimately create a hit game will nonetheless contribute to the Unity ecosystem by using the asset store as a buyer or a seller and by providing employment. A loss of a large number of users with a low probability of success may thereby discipline operators of ecosystems through the associated knock-on effect on the ability for the ecosystem to attract other users and enable their success in the future.

The externalities that characterise ecosystems may hence not only create benefits conferring potential market power to the operator of that ecosystem but may also confer countervailing buyer power for individually insignificant but collectively important contributors to such an ecosystem. Whereas this may be particularly important in the context of ecosystems, it also has wider implications for general assessments of

countervailing buyer power in situations in which offending one buyer implies offending a significant number of similarly motivated buyers, i.e., when a fragmented buyer segment is large enough collectively.

Whether such a fragmented buyer segment could ultimately possess sufficient countervailing buyer power to make credible threats could depend on the following factors:

- **Degree of lock-in:** The degree of lock-in of a game engine scales with size and success of games. Studios without existing hit games, i.e., the fragmented buyer segment, are less affected by such lock-in and could more credibly switch away.
- **Importance of network effect for buyers:** Game engines provide critical value in themselves as tools that aid development process. Though users prefer game engines with a larger user base, all else equal, less popular game engines could offer the basic elements sufficient for game development. This is particularly true for small game studios designing low-budget games with relatively simple game play. The fragmented buyer segment may therefore have many credible alternatives to switch to without suffering significant disadvantages.

- **Focal point outside option:** The more likely users could switch to the same competitor, the greater benefit they could derive from the complementary forces in an ecosystem after the switch. If one or only a few outside options stand out, users may be able to infer where other similarly situated users would be most likely to switch to without explicit coordination. This would further diminish any lock-in resulting from network effects in the incumbent ecosystem.

In summary, the collective forward-looking behaviour of participants in the ecosystem can explain the seemingly counterintuitive outcome of Unity's proposed changes of pricing scheme. Small game developers pushed back against the changes to protect their future expected financial gain. Unity subsequently rolled back the pricing changes to secure its revenue source and maintain the competitive advantage of its ecosystem in the future. A buyer power assessment focusing solely on the snapshot of buyer size would therefore understate buyer power from smaller buyers and could not capture the commercial decision-making process of participants in the ecosystem.

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2 Thomas Bowman, Zita Vasas and the Compass Lexecon EMEA Research Team for their comments. The
3 views expressed in this article are the views of the authors only and do not necessarily represent the views of
4 Compass Lexecon, its management, its subsidiaries, its affiliates, its employees or its clients.

5 See <https://www.arm.com/glossary/gaming-engines> and <https://www.perforce.com/resources/vcs/game-engine-overview>

6 Users also use game engines for other application with real-time graphical requirements, such as architectural
7 visualisation, and diagnostic visualisation in healthcare and visual prototyping in transportation (Source:
8 <https://unity.com/industry>).

9 <https://www.gameopedia.com/game-engines-all-you-need-to-know-about/>

10 See e.g., European Commission: Directorate-General for Competition, Montjoye, Y., Schweitzer, H. and
11 Cr mer, J., Competition policy for the digital era, Publications Office, 2019.

12 The below discussion focuses on Unity, but similar features apply to Unreal and other game engines.

13 <https://assetstore.unity.com/>

14 2023 Unity Gaming report, page 8.

15 <https://assetstore.unity.com/publishing/publish-and-sell-assets>

16 <https://www.cbinsights.com/research/game-engines-growth-expert-intelligence/>

17 <https://www.valuecoders.com/blog/technology-and-apps/unreal-engine-vs-unity-3d-games-development/>

18 Statistics from Slashdata (Source: <https://www.slashdata.co/post/did-you-know-that-60-of-game-developers-use-game-engines>).

19 Also see <https://www.cbinsights.com/research/game-engines-growth-expert-intelligence/>
20 and <https://www.valuecoders.com/blog/technology-and-apps/unreal-engine-vs-unity-3d-games-development/>

21 <https://www.gamedesigning.org/career/video-game-engines/>

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23 https://en.wikipedia.org/wiki/Unity_Technologies

24 <https://www.polygon.com/2014/10/22/7039683/electronic-arts-john-riccitiello-unity-ceo>

25 <https://www.incredibuild.com/blog/unity-vs-unreal-what-kind-of-game-dev-are-you>

26 <https://daily.dev/blog/unity-vs-unreal-engine-for-vr-ar-development>

27 <https://rocketbrush.com/blog/unity-vs-unreal-engine-which-one-should-you-choose-in-2024>

28 As of October 2023, 82 out of the top 100 mobile games on Apple App Store and Google Play Store use Unity
29 for developing the games (Source: <https://unity.com>).

30 <https://www.statista.com/statistics/292512/mobile-content-market-value-worldwide/>

31 <https://gitnux.org/mobile-gaming-industry-statistics>

32 <https://www.blog.udonis.co/mobile-marketing/mobile-games/market-research-hyper-casual-games>

33 <https://machinations.io/articles/what-are-hypercasual-games>

34 <https://www.blog.udonis.co/mobile-marketing/mobile-games/hyper-casual-game>

35 <https://machinations.io/articles/what-are-hypercasual-games>

36 <https://www.statista.com/statistics/1179913/highest-grossing-mobile-games/>

<https://machinations.io/articles/what-are-hypercasual-games>

<https://businessquant.com/unity-software-revenue-by-segment>

Unity generated 60% of its revenues in 2023 from its Operate Solutions which support the ongoing operation
and monetisation of games and applications (Source: <https://www.tradingview.com/symbols/NYSE-U/financials-revenue/>). The majority of Unity's revenues from its Operate Solutions are linked to ad revenues
(Source: <https://businessquant.com/unity-software-revenue-by-segment>).

https://images.response.unity3d.com/Web/Unity/%7B410f1e43-64c2-4d2e-819a-0fa291ce719e%7D_09-12-2023-Unity-plan-pricing-and-packaging-updates-Unity-Blog-V1.pdf

<https://unity.com/pricing>

<https://gamedevbeginner.com/is-unity-free>

https://images.response.unity3d.com/Web/Unity/%7B410f1e43-64c2-4d2e-819a-0fa291ce719e%7D_09-12-2023-Unity-plan-pricing-and-packaging-updates-Unity-Blog-V1.pdf

The proposed new pricing scheme also includes other elements including retire the lowest paid-for tier of Unity
Editor while adding most its paid functionalities to the free tier of Unity Editor.

<https://news.sky.com/story/unity-why-are-developers-so-angry-about-the-game-engines-new-fees-12961744>

37 <https://vginsights.com/insights/article/infographic-indie-game-revenues-on-steam>

38 SensorTower analysis based on the estimated worldwide download and revenue totals of all publishers with apps ranking on the App Store and Google Play during Q3 2019 (Source: <https://sensortower.com/blog/top-one-percent-downloads>).

39 <https://www.nytimes.com/2023/10/02/technology/how-a-pricing-change-led-to-a-revolt-by-unitys-video-game-developers.html>

40 <https://www.theverge.com/2023/9/22/23882768/unity-new-pricing-model-update>

41 <https://unity.com/pricing-updates>

42 Communication from the Commission, Commission Notice on the definition of the relevant market for the purposes of Union competition law (C/2024/1645), paragraph 106.

43 2023 Unity Gaming Report, page 32.

44 The greater the number of users, the greater the number of ad views by users or the number of installs of other apps generated by click-throughs on ads triggering payment to the app displaying the ad.

45 2023 Unity Gaming Report, page 41.

46 <https://venturebeat.com/business/the-truth-about-hypercasual-games/>

47 2023 Unity Gaming Report, page 43.

48 2023 Unity Gaming Report, page 35, Chart 4.5: D1, D7, D30 retention retains relatively consistent between Tier 1 and Tier 2 markets.

49 European Commission, Communication from the Commission — Guidance on the Commission's enforcement priorities in applying Article 82 of the EC Treaty to abusive exclusionary conduct by dominant undertakings, OJ C 45, 24.2.2009, paragraph 18. See also O'Donoghue, R., & Padilla, A. J. (2020). The law and economics of article 102 TFEU (Third edition). Section 4.2.4.

50 *Ibid.*