Survival Economics of Indie Games after Generative AI:

Evidence from Three Steam Launch Cohorts, 2024–2026

Sultan Assan Aibek Ayazgaliyev

Suleyman Demirel University, Almaty, Kazakhstan

Working paper, not peer reviewed
18 November 2026

Abstract

Generative AI has increased the number of indie games released on Steam, but it is unclear whether it lowered the chance that a game pays its developer. We define the **breakeven share**, the share of paid games whose estimated net revenue reaches $12,000 (about one solo developer's annual cost) within 12 months of release, and estimate it for random samples of indie games released in March–August 2024 and 2025 (n = 1,168). A third cohort released in March–May 2026, developed largely after coding agents spread, is compared with the same months of 2024 and 2025 over the first 150 days (n = 1,698). Revenue is estimated from review counts with the Boxleiter method, and confidence intervals are clustered by sampled store page.

The 12-month breakeven share was 10.5% for 2024 releases and 12.0% for 2025 releases (difference +1.5 points, 95% CI −4.3 to +7.3). Over 150 days, the share reaching $5,000 fell from 20.4% (2024) and 17.5% (2025) to 13.5% (2026); the 2024–2026 difference is −6.9 points (−12.5 to −1.4). Indie releases in these months almost doubled between 2024 and 2026, while the estimated number of games reaching the threshold rose by about a third. Games that disclose AI-generated content reached the threshold far less often (4.7% vs 12.7% over 12 months) and drew 27% fewer first-year reviews at the same price; they made up 30% of 2026 releases, but the 2026 decline is also visible, less precisely, among games without a disclosure. Higher price, more languages and a separate publisher go with higher odds, although these were observed after launch. The odds held for 2025 releases and show early signs of falling for games built in the agentic period.

Keywords: indie games, Steam, generative AI, breakeven share, platform economics

1 Introduction

1.1 Background

Generative AI has made games and apps cheaper to build, but it has not made buyers more numerous. For an indie developer the likely result is a more crowded store competing for a pool of players that grows far more slowly than the catalogue.

Steam releases rose by about 32% from 2023 to 2024 (GamingOnLinux, 2025), and in 2025 the share of new Steam games that disclose generative AI kept climbing (Sidorkin, 2026). Across app stores, new releases rose after agentic coding tools spread in early 2025 while total usage did not (Demirer et al., 2026). Whether this extra supply lowered the commercial odds of a typical new game is the question this paper takes up.

1.2 Problem statement

Developers, educators and incubators cannot yet answer a basic question: what are the odds that a new indie game pays for its developer, and did generative AI change those odds? Existing studies use different

success thresholds (1,000 reviews, $1,000 a month, $1M a year), so their results cannot be compared. Most claims that AI has "flooded" the market are about supply, measured in release counts; whether the flood lowered the chance of commercial survival has not been tested with revenue estimates, and no study we found checks whether the *kind* of AI use matters. The question also matters for developers in lower-cost regions such as Kazakhstan, where a global store is the main route to paying customers and where public data on indie outcomes are scarce (Inshakov & Egorov, 2023).

1.3 Aim and research questions

This paper measures the share of paid indie games on Steam that reach a solo developer's annual cost in net revenue within 12 months of release, and tests whether that share changed after agentic coding tools spread in early 2025. It asks four questions:

- **RQ1.** What share of paid indie games reaches $12,000 in net revenue within 12 months of release?
- **RQ2.** Did that share, and the distribution of early reviews, change between games released in 2024, 2025 and 2026?
- **RQ3.** Which launch characteristics (price, genre, localization, Early Access, publisher, AI disclosure) are associated with reaching the threshold?
- **RQ4.** Do games that use AI for art differ from games that use it only for audio, text or localization?

1.4 Main findings

The share of paid games that reached $12,000 within a year did not fall between 2024 and 2025 releases (10.5% and 12.0%). Games released in March–May 2026, however, reached a scaled 150-day threshold less often than games released in the same months of 2024 (13.5% against 20.4%), while the number of indie releases in those months almost doubled. Games that disclose AI-generated content reached the threshold far less often in every cohort, whatever kind of content the disclosure covered.

1.5 Contribution

The paper makes three contributions. First, it defines a simple survival metric, the **breakeven share**, that can be computed from public store data at any threshold. Second, it compares launch cohorts over identical windows after release and reports uncertainty that accounts for the clustered way store data are sampled. Third, it separates AI disclosures by type of use, which tests whether the market penalizes AI as such or only AI that players can see.

1.6 Structure of the paper

Section 2 reviews the literature and states the hypotheses. Section 3 describes the sample, the revenue estimate, the coding of AI disclosures and the statistical tests. Section 4 reports the results. Section 5 answers the research questions, discusses limitations and sets out directions for further research, and Section 6 concludes. The appendices give the AI-use codebook, robustness checks, comparable figures for other indie segments, and the data and code.

2 Literature Review

The literature agrees that indie revenue is extremely concentrated and that generative AI has raised supply more than demand. It disagrees on whether AI lowers a game's commercial odds, and it measures success in ways that cannot be compared. This review draws on 28 sources (12 academic and 16 industry or practitioner sources); industry data carry much of the 2025–2026 evidence because peer-reviewed work on indie economics is scarce (Demyanenko, 2024).

2.1 Revenue follows a power law

On Steam about 1% of games take 80% of revenue, and a tenfold rise in releases has barely changed that ratio (Shahrabi, 2026). In 2025, 76% of new games received no reviews and 90% received fewer than 20 (Shahrabi, 2026), and only 608 of 20,282 new games (2.99%) reached 1,000 reviews (VoxBooster, 2026).

The middle of the market is more stable than the bottom. The $100,000–850,000 revenue band holds about 500 games a year, and almost all growth in supply lands among games earning under $10,000 (Shahrabi, 2026). Mobile and micro-SaaS show the same shape: apps launched in 2025 or later earn 3% of subscription revenue (Turazashvili, 2026), and 67.8% of micro-SaaS products have earned under $1,000 in their lifetime (Steal What Works, 2026).

2.2 What predicts commercial survival

Five factors recur across studies. **Demand signals** come first: Steam followers and pre-launch interest are the strongest predictors of revenue (Ma, 2025), and the number of players waiting for release is one of only two significant price factors in Demyanenko's (2024) model. **Niche** matters: the share of successful games ranges from 20.8% in open-world survival craft to 5.1% in roguelike deckbuilders (VoxBooster, 2026), and tag trends rise and fade over about four years (Grelier et al., 2025).

Trust and social proof also count. Early Access games collect fewer but more positive reviews (Lin et al., 2018). **Investment matched to audience** and **repeat launches** complete the list: a studio's third game grosses about 74% more than its first, and a publisher makes $200,000+ revenue about four times more likely (VoxBooster, 2026). Startups outside games most often pivot after negative customer reaction (Bajwa et al., 2017).

Two launch choices that public data do record, price and localization, have received less attention. Price carries information about scope in Demyanenko's (2024) model, and developer case studies report that adding languages opens markets that Steam otherwise filters out by the player's store language (Doucet, 2014). Neither has been tested against a common survival threshold.

2.3 Generative AI raises supply, not demand

The strongest causal evidence comes from Demirer et al. (2026). Using telemetry from more than 500,000 GitHub developers, they find that interactive coding agents raise commits by about 180% and autonomous agents by about 240%, but the autonomous-agent effect shrinks to 80% for new projects and to 30% for shipped releases. Across four software marketplaces the number of new apps rose while total usage did not, and the authors date the rise to the spread of agentic tools in early 2025. App Store releases rose 60% year over year in the first quarter of 2026 (Perez, 2026).

Productivity gains are not guaranteed even on the supply side. In a randomized trial, experienced developers took 19% longer with early-2025 AI tools while believing they were 20% faster (Becker et al., 2025). On Steam, AI-disclosing games account for 60–90% of release growth but only 10–27% of sales, and their share of new releases rose from 10.9% in 2024 to 30.8% in January–July 2026 (Sidorkin, 2026).

Total Steam releases, however, grew far more slowly in 2025 than in 2024. Counts taken at the end of 2025 put the rise at 2–11% (GamingOnLinux, 2025; Zukowski, 2026), and later counts that include games added to the database afterwards put it at about 16%, with 2026 on course for a further rise (Notebookcheck, 2026). The "flood" is therefore real in composition but modest in total volume.

2.4 How players and developers respond to AI

Players penalize visible AI. Games that disclose generative AI receive 68.4% positive reviews, against 86.3% for games using procedural generation (Bazzaz & Cooper, 2026a). In a controlled experiment,

players could not tell AI-made levels from human-made ones (53% accuracy, near chance), yet rated levels they *believed* were AI-made as more frustrating (Bazzaz & Cooper, 2026b).

The revenue penalty is less clear. Within the same revenue band, AI games get 5–10% fewer positive reviews but show no clear gap in median revenue (Shahrabi, 2026). Among AI games that failed, 72% used AI for visuals, while successful ones more often used it where players do not look, such as voice (24% vs 8%) and localization (18% vs 6%) (Sidorkin, 2026).

Developers are divided. 52% of game professionals now say generative AI harms the industry, up from 18% in 2024 (GDC Festival of Gaming, 2026; GIANTY, 2026). Solo developers describe it as an "ill-informed co-worker" that saves money but brings creative, legal and quality risks (Panchanadikar & Freeman, 2024).

2.5 Gaps and hypotheses

Three gaps motivate this paper. No study measures the share of indie games that pays for its developer using one fixed threshold. The AI effect on Steam is inferred from release counts, not tested on revenue across matched cohorts. And AI disclosures are treated as one group, although the evidence above suggests that visible and less visible uses differ.

The literature points in two directions on RQ2. Flat demand and rising supply (Demirer et al., 2026) predict a lower breakeven share, while the stable middle market (Shahrabi, 2026) predicts no change. We state the first as H1 and treat the second as its alternative. Table 1 lists the hypotheses.

Table 1: Hypotheses

	Hypothesis	Grounded in
H1 (RQ2)	The breakeven share is lower for later launch cohorts than for games released in 2024.	Demirer et al. (2026)
H2 (RQ2)	Extra supply lands at the bottom: the share of games with few or no reviews rises while the share of hits does not.	Shahrabi (2026); VoxBooster (2026)
H3 (RQ3)	AI-disclosing games reach the threshold less often, after controlling for price, genre, localization, Early Access and publisher.	Bazzaz & Cooper (2026a); Sidorkin (2026)
H4 (RQ4)	Among AI-disclosing games, those using AI for art reach the threshold less often than those using it only for other content.	Bazzaz & Cooper (2026b); Sidorkin (2026)

3 Methodology

3.1 Research design

The study is a quantitative, observational comparison of launch cohorts of Steam indie games, using public store data collected in three rounds (6 October, 11 November and 18 November 2026).

The main comparison sets games released in March–August 2024 against games released in March–August 2025, using the same six calendar months to remove seasonal effects. Demirer et al. (2026) date the jump in software releases to February 2025, when agentic coding tools spread. A game takes one to three years to make, however, so most 2025 releases were built before those tools existed. We therefore add a third cohort, games released in March–May 2026, which were developed largely after the tools spread. Its first year has not yet ended, so all three cohorts are also compared over their first 150 days, the longest window that every 2026 release had completed by the last collection round.

3.2 Population and sample

The population is games carrying Steam's Indie tag. The store search, filtered to that tag and sorted by release date, was located by binary search at the pages covering each cohort window. From each window we drew random result pages of 50 games (random seed 2026; seed 7 for the additional pages) and kept every game released inside the window. Table 2 shows the samples.

Table 2: Samples and collection rounds

Sample	Release window	Pages	Games	Collected
Main, 2024	Mar–Aug 2024	12	568	6 Oct; 11 Nov; 18 Nov
Main, 2025	Mar–Aug 2025	12	600	6 Oct; 11 Nov; 18 Nov
Additional, 2024	Mar–May 2024	6	300	18 Nov
Additional, 2025	Mar–May 2025	6	300	18 Nov
New cohort, 2026	Mar–May 2026	12	600	18 Nov

At the 6 October collection the store listed about 3,850 indie games released in March–August 2024 and about 4,750 in March–August 2025, so the main samples cover roughly 15% and 13% of each cohort. At the 18 November collection the store listed about 1,806, 2,344 and 3,565 indie games released in March–May of 2024, 2025 and 2026. The 150-day comparison combines the March–May games of the main samples with the additional pages (18 games that appeared in both were counted once), giving 548, 550 and 600 games, of which 460, 469 and 510 are paid. Free-to-play games stay in the review distributions but are excluded from breakeven shares, since their revenue cannot be estimated from price. Because each page holds 50 games released within a few days of one another, games on the same page are not independent; all confidence intervals and tests below treat the sampled page as a cluster.

3.3 Variables

Table 3 defines the variables. Price, review counts and AI disclosure describe the game when it was collected, not when it launched. The same holds for languages, publisher and Early Access status, which successful games can change after launch; Section 5.6 discusses what this means for RQ3.

Table 3: Variables

Variable	Definition	Source, date
Price (USD)	US list price before any discount; 0 = free to play	Store search, at sampling
Total reviews	All user reviews posted up to collection	Store search or store page
Reviews in window	Total reviews $\times$ share of histogram reviews dated within W days of release (W = 365 or 150)	Review histogram endpoint
Positive share	Share of histogram reviews in the window that recommend the game	Review histogram endpoint
AI disclosure	Store page carries an "AI Generated Content Disclosure" section	Store page
AI use type	Category of the developer's disclosure text (Section 3.5)	Store page
Genre	Steam genre labels, several per game	App details endpoint
Languages	Number of supported languages	App details endpoint
Early Access	Genre list includes Early Access at collection	App details endpoint
Self-published	Developer and publisher are the same, or no publisher listed	App details endpoint

3.4 Revenue estimate and threshold

Steam does not publish sales, so researchers estimate them from reviews. The Boxleiter method multiplies review counts by 20–60 sales per review; across that range a single game's estimate can differ by a factor of three, so the method suits shares of whole cohorts better than figures for individual games. We estimate net revenue in the first W days as

$$R_W = N_W \cdot m \cdot P \cdot 0.5$$

where N_W is the number of reviews in the window, $m = 30$ sales per review (20 and 60 in sensitivity checks), P is the list price, and 0.5 is the developer's net share after Steam's 30% cut, sales tax, refunds and discounts.

A game reaches the **12-month threshold** when $R_{365} \geq T$ with T = \$12,000, about \$1,000 a month or one solo developer's annual cost before income tax. Sensitivity checks use \$6,000 (closer to living costs in Kazakhstan) and \$50,000 (a US part-time salary). For the 150-day comparison the threshold is scaled to \$5,000, with \$2,500 and \$20,000 as checks. The **breakeven share** of a cohort is the number of paid games at or above the threshold divided by the number of paid games. The term is shorthand: the threshold covers one year of a developer's living costs, not the full cost of a game that took longer than a year to build.

The review histogram reports reviews in daily, weekly or monthly bins, depending on the game's age and volume. In the first two rounds a bin was counted inside the window if it *started* before the cut-off, so a monthly bin could add up to a month of reviews. Monthly bins are far more common among 2024 games (252 of 568 in round 3) than among 2025 games (17 of 600). In round 3 we downloaded the full histograms again and prorated the bin that straddles the cut-off by time; results with both counts are reported.

3.5 AI disclosure and its coding

Since January 2024 Steam has asked developers to disclose generative AI on the store page. In January 2026 Valve rewrote the disclosure form so that AI tools used only during development, such as coding assistants, no longer need to be disclosed; the form now concentrates on AI-generated content that ships in the game or appears on its store page, and on content generated while the game runs (Videogames Chronicle, 2026). Because developers can edit their disclosures after launch and all our data were collected after the change, a disclosure in our data reflects the 2026 form, and AI used only for code is largely invisible to it. The disclosure therefore measures player-facing AI content, not AI-assisted development.

Each disclosure text was coded into one or more categories by keyword rules in English, Russian, Chinese and Japanese and then read in full by one author: visual (art, graphics, sprites, textures, characters, backgrounds, store images, video), audio (music, sound effects, voice), written content (story, dialogue, descriptions), localization (translation) and code or tools. The keyword rules agreed with the hand reading in 176 of 191 cases (92%); the hand reading is used throughout. A game counts as *visual AI* if any visual category applies and as *non-visual AI* otherwise. Appendix A gives the codebook.

3.6 Statistical analysis

Breakeven shares are reported with 95% confidence intervals. Differences between cohorts or groups are estimated as linear probability models with standard errors clustered by sampled page; z-tests that treat games as independent are shown only where they reproduce the earlier version of this paper. H2 compares the shares of games with no reviews, fewer than 10 reviews and many reviews, and the full review distributions with a Mann–Whitney U test. For RQ3 and H3 a logistic regression relates reaching the 12-month threshold to cohort, AI disclosure, log price, log number of languages, Early Access,

self-publishing and the five most common genres, reported as odds ratios. Because price enters the revenue formula, a second model uses log(1 + first-year reviews), a measure of demand that does not depend on price. A third model relates the positive share of first-year reviews to AI disclosure. H4 uses Fisher's exact test. The significance level is 0.05. The analysis runs in Python with pandas, SciPy and statsmodels.

3.7 Ethics and reproducibility

All data are public store pages and aggregate review counts; no personal data or review texts were collected. Requests were spaced at 0.4–2 seconds and paused when Steam signalled a rate limit. The samples, collection scripts and analysis code accompany the paper (Appendix D).

4 Results

4.1 Sample

Table 4 describes the two main cohorts. Prices, the share of self-published games and the share in Early Access are almost identical, while the 2025 cohort has more AI-disclosing games and more supported languages.

Table 4: Main samples by launch cohort

Measure	Mar–Aug 2024	Mar–Aug 2025
Indie games released (store count, 6 Oct 2026)	≈3,850	≈4,750
Random pages sampled	12	12
Games sampled	568	600
Paid games	458 (80.6%)	508 (84.7%)
Median list price, paid games	$4.99	$4.99
Games disclosing generative AI	13.7%	18.8%
Median reviews in first 12 months	9	8
Median share of lifetime reviews posted in first 12 months	88%	100%
Review histogram in monthly bins	44.4%	2.8%
Self-published (developer is the publisher)	81.0%	82.3%
In Early Access at collection	9.7%	9.8%
Median supported languages	1	2

The row on the share of lifetime reviews shows why a fixed window matters. Both cohorts had passed their first year by October 2026, but the 2024 games had been on sale a year longer, and the median 2024 game had received 12% of its reviews after its first year. Counting lifetime reviews would credit the older cohort with that extra year.

4.2 Breakeven share in the first 12 months (RQ1, RQ2, H1)

At the $12,000 threshold, 48 of 458 paid games from 2024 (10.5%, 95% CI 6.4–14.6%) and 61 of 508 from 2025 (12.0%, 95% CI 7.8–16.3%) reached it (Figure 1a). The difference is +1.5 percentage points with a clustered 95% CI of -4.3 to $+7.3$ ($p = 0.61$). The data show no fall, but they cannot rule out a fall of up to about 4 points, which would be a relative drop of about 40% from the 2024 level. **H1 is not supported.**

The direction holds at every threshold, sales multiplier and review window tested (Appendix B).

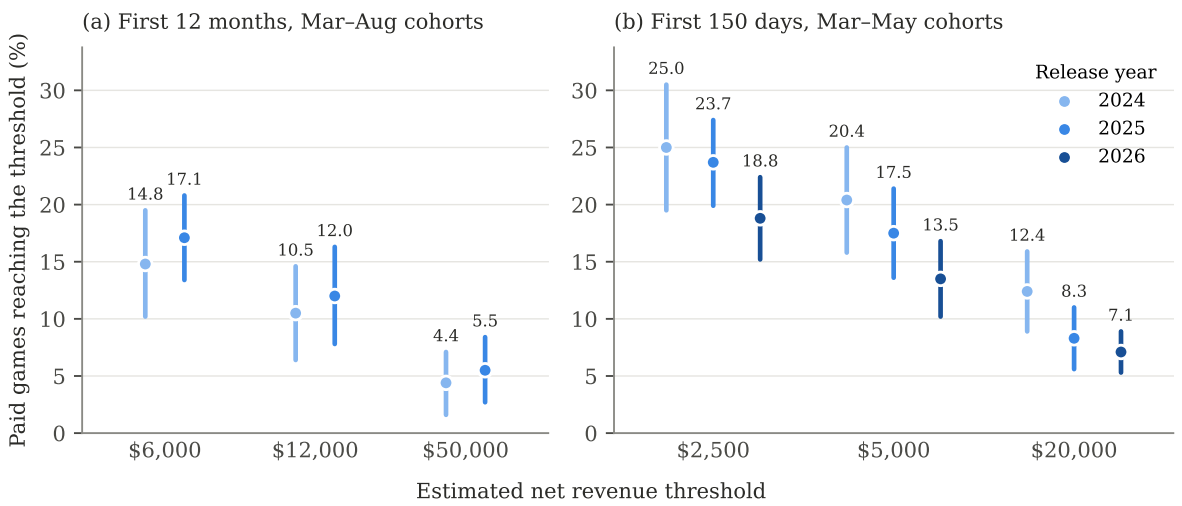

Figure 1: Share of paid indie games reaching each net revenue threshold, by release year. (a) First 12 months after release, games released in March–August 2024 and 2025. (b) First 150 days after release, games released in March–May 2024, 2025 and 2026. Bars are 95% confidence intervals clustered by sampled store page. *Source:* Steam store samples (6 Oct, 11 Nov and 18 Nov 2026); revenue = reviews in window × 30 × price × 0.5.

4.3 The 2026 cohort in its first 150 days (RQ2, H1)

Table 5 compares the March–May cohorts of the three years over their first 150 days. The cohorts have the same median price and similar shares of free games, but the 2026 cohort is far larger in the store and three times as likely to disclose AI as the 2024 cohort.

Table 5: First 150 days after release, games released in March–May of each year

Measure	2024	2025	2026
Indie games released (store count, 18 Nov 2026)	≈1,806	≈2,344	≈3,565
Random pages sampled	12	11	12
Games sampled (paid)	548 (460)	550 (469)	600 (510)
Median list price, paid games	$4.99	$4.99	$4.99
Games disclosing generative AI	10.4%	18.5%	30.3%
Median reviews in first 150 days	7	7	5
No reviews in first 150 days	14.4%	17.3%	14.7%
Fewer than 10 reviews	53.8%	55.8%	61.5%
500 or more reviews	4.9%	2.2%	3.0%
Paid games reaching $5,000 in 150 days	20.4%	17.5%	13.5%
95% CI (clustered)	15.8–25.0	13.6–21.4	10.2–16.8
Games without AI disclosure	21.1%	18.8%	15.0%
Games with AI disclosure	15.1%	12.1%	10.2%
Mean positive share, games with 10+ reviews, no AI	85.6%	83.5%	86.8%
Mean positive share, games with 10+ reviews, AI	77.9%	78.5%	78.8%

The share of paid games reaching $5,000 in net revenue within 150 days fell from 20.4% for 2024 releases and 17.5% for 2025 releases to 13.5% for 2026 releases (Figure 1b). The difference between 2024 and 2026 is −6.9 points (95% CI −12.5 to −1.4, $p = 0.015$); between 2025 and 2026 it is −4.0 points (−9.0 to +1.0, $p = 0.12$), and between 2024 and 2025 −3.0 points (−8.9 to +3.0, $p = 0.33$). The direction is the same at $2,500 (25.0%, 23.7%, 18.8%; 2024 to 2026 −6.2 points, $p = 0.06$) and at $20,000 (12.4%, 8.3%, 7.1%; −5.3 points, $p = 0.007$).

The fall is not only a change in the mix of games. Games without an AI disclosure also fell, from 21.1% to 15.0% (−6.1 points, 95% CI −12.9 to +0.6, $p = 0.08$), and if the 2026 cohort had kept the 2024 share of AI-disclosing games its overall share would have been 14.5% rather than 13.5%. In a logistic model with AI disclosure and log price, the 2026 cohort's odds ratio relative to 2024 is 0.74 (95% CI 0.48–1.14, $p = 0.17$), so the adjusted difference is smaller and no longer significant. Review scores did not fall: among games with at least 10 reviews, the mean positive share of 2026 games without a disclosure was 86.8%, as high as in earlier years.

Scaled to the store counts, indie releases in March–May almost doubled between 2024 and 2026, from about 1,810 to about 3,570, while the number of paid games reaching $5,000 in 150 days rose by about a third, from about 310 to about 410. **H1 is not supported for 2025 releases but is partly supported for 2026 releases**, on early evidence from one season and a 150-day window.

4.4 Where the extra supply landed (H2)

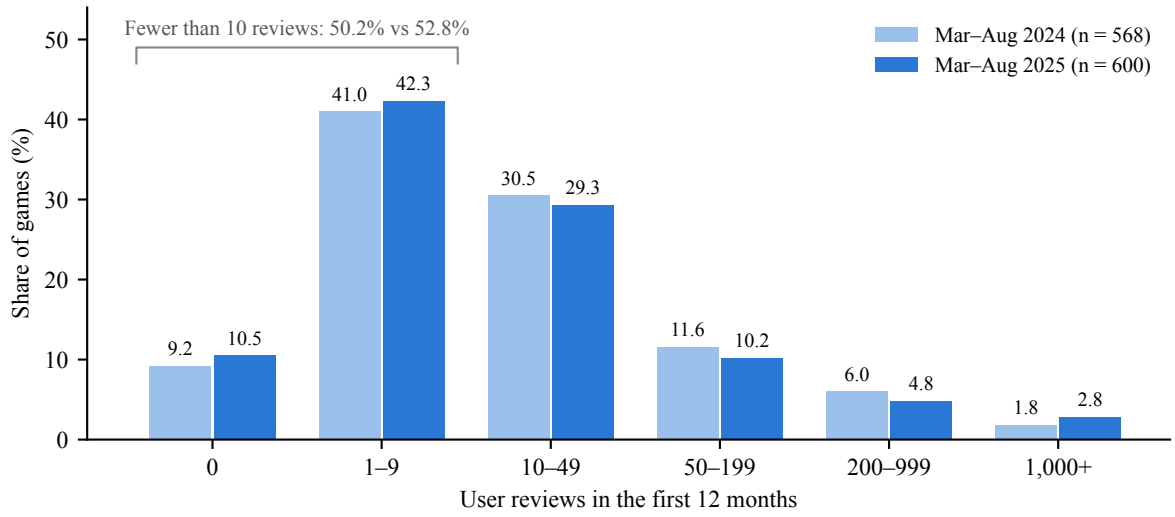

Figure 2: Distribution of first-year reviews by launch cohort. *Source:* Steam store sample of 1,168 indie games (6 Oct 2026); review timelines from Steam review histograms (11 Nov 2026).

Within the 12-month window the 2025 cohort kept nearly the same review distribution as the 2024 cohort (Figure 2). Games with no first-year reviews rose from 9.2% to 10.5% (+1.3 points, 95% CI −3.2 to +5.9) and games with fewer than 10 from 50.2% to 52.8% (+2.7, −1.8 to +7.2), while games with 1,000 or more reviews also rose, from 1.8% to 2.8% (+1.1, −0.9 to +3.1). The two distributions do not differ significantly (Mann–Whitney U, $p = 0.19$).

Scaled to the store counts, about 2,510 games from the 2025 window had fewer than 10 first-year reviews, against about 1,930 from the 2024 window, and about 480 paid games reached the threshold, against about 325. The bottom of the market grew by roughly 580 games, but so did every other band. Over the first 150 days, however, the 2026 cohort differs: 61.5% of its games had fewer than 10 reviews, against 53.8% in 2024 (+7.7 points, 95% CI 0.9–14.4), the review distributions differ (Mann–Whitney $p = 0.003$), and the share with 500 or more reviews did not rise (4.9% and 3.0%). Scaled to store counts, games with fewer than 10 reviews in 150 days rose from about 970 to about 2,190. **H2 is not supported for 2025 releases**, whose shares stayed stable while every band grew in absolute numbers, **but is supported for 2026 releases**, whose extra supply landed mostly at the bottom.

4.5 AI disclosure and other launch characteristics (RQ3, H3)

Games that disclose generative AI reached the 12-month threshold far less often (Table 6). The gap is 8.0 points (95% CI 3.7–12.3, $p < 0.001$) and is wider in 2025, although neither group changed significantly between cohorts. It is not a price effect: paid AI games have a median price of $4.96 against $4.99. They collected a median of 4 first-year reviews, against 7 for other paid games. The gap appears again in the 2026 cohort over 150 days (10.2% against 15.0% at $5,000), and across the three March–May cohorts it is 6.8 points (95% CI 2.3–11.4).

Table 6: Share of paid games reaching the 12-month threshold, by AI disclosure and cohort (T = $12,000)

Group	Mar–Aug 2024	Mar–Aug 2025	Both cohorts
Disclose generative AI	6.1% (4 of 66)	3.8% (4 of 104)	4.7% (8 of 170)
No AI disclosure	11.2% (44 of 392)	14.1% (57 of 404)	12.7% (101 of 796)

Table 7 reports the two regressions with standard errors clustered by sampled page. With the other characteristics held constant, disclosing AI goes with 60% lower odds of reaching the threshold and about 27% fewer first-year reviews, and the cohort effect stays small and insignificant. **H3 is supported** as an association.

Table 7: Launch characteristics associated with reaching the 12-month threshold and with first-year reviews (paid games, n = 966)

Characteristic	Threshold: odds ratio (95% CI)	First-year reviews: change (95% CI)
Released Mar–Aug 2025 (vs 2024)	1.19 (0.63–2.25)	−9% (−28% to +15%)
Discloses generative AI	**0.40 (0.17–0.93)**	**−27% (−44% to −5%)**
Price, per doubling	**3.18 (2.48–4.08)**	**+37% (+24% to +51%)**
Supported languages, per doubling	**1.49 (1.25–1.79)**	**+37% (+27% to +47%)**
Early Access at collection	1.32 (0.49–3.55)	−6% (−37% to +41%)
Self-published	**0.37 (0.21–0.66)**	**−36% (−52% to −13%)**
Genre: Casual	1.06 (0.60–1.89)	−16% (−30% to +1%)
Genre: Adventure	1.03 (0.66–1.61)	+18% (−5% to +45%)
Genre: Action	1.49 (0.85–2.60)	+3% (−15% to +25%)
Genre: Strategy	1.40 (0.76–2.57)	−11% (−28% to +11%)
Genre: Simulation	1.65 (0.86–3.16)	**+131% (+71% to +212%)**

Bold: $p < 0.05$. Logistic regression (pseudo-R^2 = 0.31) and least-squares regression on log(1 + first-year reviews) (R^2 = 0.22), standard errors clustered by sampled page (24 pages). Genres overlap; each is compared with games outside that genre. Price enters the revenue formula, so its odds ratio is partly mechanical.

Price, languages and publisher are also strongly associated with the outcome. Higher-priced games drew 37% more first-year reviews per doubling of price, each doubling of supported languages went with about 50% higher odds, and self-published games, 82% of the sample, had 63% lower odds than games with a separate publisher. No genre changes the odds significantly once these are controlled. All of these characteristics were recorded after launch (Section 5.6).

AI-disclosing games also received less favourable reviews. Among paid games with at least one first-year review, the mean share of positive first-year reviews was 67.5% for AI-disclosing games and 80.0% for others (Mann–Whitney $p = 0.001$). Most of that gap sits among games with very few reviews: among games with at least 10 first-year reviews the means are 79.8% and 83.1% ($p = 0.054$), and controlling for price and cohort the gap is 3.8 points (95% CI −0.5 to 8.1). The breakeven gap remains among well-rated games: of games with at least 10 first-year reviews and at least 80% positive, 5 of 28 AI-disclosing games (18%) reached the threshold, against 71 of 218 other games (33%).

4.6 Type of AI use (RQ4, H4)

Of 191 AI disclosures in the main samples, 189 named at least one use. Visual assets dominate: 154 disclosures (81%) mention art, icons, store images or video, 47 mention audio, 23 written text, 16 localization and 13 code. The 182 disclosures in the 2026 sample, coded by keyword rules only, show a similar profile: 139 (76%) mention visual uses, 52 audio, 35 written text, 30 localization and 24 code.

Table 8: Share of paid AI-disclosing games reaching the 12-month threshold, by type of AI use

Type of AI use	Paid games	Reached threshold	Share
Any visual use	137	7	5.1%
No visual use	31	1	3.2%
Audio (any)	41	2	4.9%
Written text (any)	22	1	4.5%
Localization (any)	16	0	0%
Code (any)	13	0	0%

Categories after the first two overlap, because many games use AI for several purposes.

Games that kept AI away from visuals did no better: 1 of 31 reached the threshold (3.2%), against 5.1% for games with visual AI (Fisher's exact test, $p = 1.00$). **H4 is not supported**, but the non-visual group is small, so the test can detect only a large difference. Every type of use sits well below the 12.7% of games without a disclosure.

5 Discussion

This section answers the four research questions, compares the answers with earlier studies, and sets out what follows for developers, the limits of the evidence and the research it calls for.

5.1 How often a paid indie game breaks even (RQ1)

About one paid indie game in nine earned a solo developer's annual cost within its first year: 10.5% of 2024 releases and 12.0% of 2025 releases. The answer moves with the threshold but stays in the same range for the incomes that matter to a single developer, from about one game in six at $6,000 to one in twenty at $50,000 (Appendix B). These odds are several times higher than the share of new Steam games that reach 1,000 reviews, which VoxBooster (2026) puts at 3%, because 1,000 reviews marks a commercial hit rather than one person's living costs. The comparison shows why a single fixed threshold matters: published success rates for indie games differ by an order of magnitude mainly because they describe different events.

5.2 Whether the odds changed after AI tools spread (RQ2)

The odds did not fall for games released in 2025, but there are early signs that they fell for games released in 2026. The stable 12-month share matches the steady middle market reported by Shahrabi (2026) and contradicts the view that AI-made games had already crowded everyone else out by 2025. It is also what the development lag predicts, since most games released in mid-2025 were built before agentic coding tools existed.

The 2026 cohort, built largely after those tools spread, looks different. Its odds of reaching the scaled 150-day threshold were about a third lower than for the same months of 2024, and more of its games stayed below 10 reviews. Supply in those months almost doubled, while the number of games reaching the threshold grew by about a third. Demand for paid indie games is therefore still growing, but more slowly than supply, which is the pattern Demirer et al. (2026) describe for app marketplaces: more releases and little more use.

Three features of the 2026 decline point to crowding rather than to worse games. The decline appears among games without an AI disclosure, not only among AI-disclosing ones. Review scores of 2026 games are as high as before, so the players who find these games like them as much as earlier players did. And the decline is in the number of reviews, the proxy for buyers, which is what more games competing for the same attention would produce. The evidence is still early. It covers one season, a 150-day window and about 500 paid games per cohort, and the difference shrinks below significance once AI disclosure and price are held constant.

5.3 What goes with reaching the threshold (RQ3)

Disclosing AI-generated content is the clearest negative factor, while a higher price, more supported languages and a separate publisher go with higher odds. Genre and Early Access status make no significant difference once these are controlled.

The AI gap appears in every cohort and survives controls for price, localization, publisher and genre. It works mainly through volume: AI-disclosing games collect fewer first-year reviews at the same price. Their reviews are also less favourable, but that difference sits mostly among games with a handful of reviews, and even among well-rated games the AI-disclosing ones reached the threshold about half as often. This fits the gap between AI games' share of releases and their share of sales reported by Sidorkin (2026) better than a story in which players buy AI games and then reject them in reviews. The gap also matters for the market as a whole, because AI-disclosing games are a growing part of supply. Scaled to store counts, they rose from about 190 of the March–May 2024 releases to about 1,080 of the March–May 2026 releases, roughly half of the growth between the two years.

The other associations need more caution. Price enters the revenue formula and probably stands in for scope, which is how Demyanenko (2024) reads it, yet higher-priced games in our sample also drew more players, not fewer. Languages and publisher agree with developer reports that localization opens markets (Doucet, 2014) and with the publisher premium found by VoxBooster (2026), but both were recorded after launch, so part of each association may run from success to the characteristic.

5.4 Whether the type of AI use matters (RQ4)

The type of use made no difference in our data. Sidorkin (2026) found that successful AI games favour voice and localization, but here games that kept AI away from visuals did no better than games with AI art, although the non-visual group was small. Two explanations fit this pattern, and our design cannot separate them. The first is that the label itself is penalized: players see the disclosure on the store page whatever it covers, and Bazzaz and Cooper (2026b) show that the belief that content is AI-made, rather than the content itself, lowers ratings. The second is that disclosure marks thin resources. Several disclosures describe teams short of art skills, and a team that uses AI to replace missing skills may also lack money for marketing, testing and localization, which the regression captures only in part.

Neither explanation concerns AI-assisted programming, which the disclosure no longer records. Our results therefore say nothing about whether games built with coding agents sell better or worse. They say that games showing players AI-made content sell worse.

5.5 Implications for developers and incubators

Each of the following points rests on an association rather than a proven cause. A developer should plan for odds of about one in nine of earning a year's living costs from a first-year release, and lower odds for games released into the more crowded store of 2026; building alongside a job with a fixed budget ceiling fits these odds better than quitting to build full time. Underpricing is costly: at $12,000 the threshold needs about 800 first-year reviews at $0.99, 160 at $4.99 and 80 at $9.99. Localization and a publisher are worth testing, with the caveat that their association with success may partly reflect what successful games

do later. AI-generated content is best treated as a way to save costs rather than as a sales strategy, since games that show it to players drew fewer buyers whatever the content was.

For incubators such as Astana Hub, the lower threshold matters. At $6,000, closer to living costs in Kazakhstan, the 12-month odds are about 1.4 times the odds at $12,000. A global store such as Steam therefore remains a realistic path for a local solo developer with modest costs, provided the developer expects a more crowded store than in 2024.

5.6 Limitations

The first group of limitations concerns measurement. Revenue is estimated from reviews, not observed. The ratio of sales to reviews varies by genre and price, and a uniform error would shift all cohorts equally, but a change over time in how often buyers leave reviews would bias the cohort comparison. Steam's review-summary endpoint was unavailable in the last round, so reviews from activated keys could not be separated from reviews by buyers. Current prices replace launch prices, and discounts and regional prices are not modelled. Languages, publisher and Early Access status were recorded 14 to 30 months after release for the 2024 and 2025 games, and successful games often add languages, sign publishers or leave Early Access later. The AI disclosure records only player-facing content after Valve's January 2026 revision, developers can edit it after launch, and undisclosed AI games sit in the comparison group, which biases the AI gap toward zero.

The second group concerns the sample. Each cohort rests on 11 to 18 random pages of games released within days of one another, so the clustered intervals are wide and moderate cohort differences cannot be ruled out. The frame is today's store, so games delisted before collection are missing, which affects older cohorts more and probably raises their share. The Indie tag is partly applied by players.

The third group concerns the design. The comparison is before and after, not causal: changes in Steam's recommendation system or in consumer spending coincide with the spread of AI tools. Wishlists, budgets, team size and marketing, which the literature ranks as the strongest predictors, are not public. The AI codes were assigned by one author without a second coder.

5.7 Recommendations for future research

The most direct next step is to follow the 2026 cohort to 12 months in mid-2027 and to add cohorts from 2022 to 2027, so that a difference-in-differences design can compare genres or price bands with high and low exposure to AI. Launch-time characteristics should be measured from archived store pages or price-history services, so that languages, publisher and Early Access status describe the game at release, and the revenue estimate can be improved with launch prices, wishlist counts and, where Steam allows it, reviews separated by purchase type. The AI coding needs a second, independent coder with an agreement statistic, and the 2026 disclosures should be coded by hand. A store-page experiment in the style of Bazzaz and Cooper (2026b) could separate a penalty on the AI label from a penalty on low-budget production. Beyond Steam, the same metric could be applied to mobile apps and micro-SaaS with app-level revenue estimates and verified recurring revenue (Appendix C). Finally, interviews with indie developers in Kazakhstan would address the lack of regional data (Inshakov & Egorov, 2023; Demyanenko, 2024).

6 Conclusion

This paper set out to measure how often a paid indie game on Steam pays for its developer and whether generative AI changed those odds. Using a single threshold, one solo developer's annual cost in net revenue, and comparing launch cohorts over identical windows after release, it finds that the odds stayed at about one in nine for games released in 2025, when most games on sale had been built before agentic coding tools existed. Games released in 2026 show early signs of lower odds as the number of releases nearly doubled, which points to a store where supply is outgrowing demand rather than to worse games.

Games that show players AI-generated content reach the threshold far less often, whatever that content is, and they now make up almost a third of new releases. The generative AI boom has so far made it easier to release a game than to sell one. Whether the early decline of 2026 lasts will become clear when that cohort completes its first year, and the breakeven share offers a simple way to keep measuring it.

References

Bajwa, S. S., Wang, X., Nguyen Duc, A., & Abrahamsson, P. (2017). "Failures" to be celebrated: An analysis of major pivots of software startups. *Empirical Software Engineering, 22*(5), 2373–2408. https://doi.org/10.1007/s10664-016-9458-0

Bazzaz, M., & Cooper, S. (2026a). *Player perceptions of generative AI in games: A Steam review analysis* [Preprint]. arXiv. https://arxiv.org/abs/2608.11539

Bazzaz, M., & Cooper, S. (2026b). Playing the imitation game: How perceived generated content shapes player experience. In *Proceedings of the 2026 CHI Conference on Human Factors in Computing Systems* (pp. 1–21). ACM. https://doi.org/10.1145/3772318.3790473

Becker, J., Rush, N., Barnes, E., & Rein, D. (2025). *Measuring the impact of early-2025 AI on experienced open-source developer productivity* [Preprint]. arXiv. https://arxiv.org/abs/2507.09089

Demirer, M., Musolff, L., & Yang, L. (2026). *Writing code vs. shipping code: Productivity effects across generations of AI coding tools* (NBER Working Paper No. 35275). National Bureau of Economic Research. https://www.nber.org/papers/w35275

Demyanenko, I. M. (2024). Analiz faktorov, vliyayushchikh na tsenoobrazovanie na rynke «indi» videoigr [Analysis of factors affecting pricing in the "indie" video game market]. In *Modern methods of economic research: Laboratory experiments and econometric modelling* (pp. 907–910). Ural Federal University. [In Russian]

Doucet, L. (2014). *Was localizing Defender's Quest worth it?* Game Developer. https://www.gamedeveloper.com/business/was-localizing-defender-s-quest-worth-it-

GamingOnLinux. (2025, December). *Over 19,000 games have released on Steam in 2025 with nearly half seeing fewer than 10 reviews*. https://www.gamingonlinux.com/2025/12/over-19000-games-have-released-on-steam-in-2025-with-nearly-half-seeing-fewer-than-10-reviews

GDC Festival of Gaming. (2026, January 29). *2026 State of the Game Industry report* [Press release]. Business Wire. https://www.businesswire.com/news/home/20260129438528/en/

GIANTY. (2026, March 5). *GDC 2026 report: 52% of game devs say generative AI is harming the industry?* https://www.gianty.com/gdc-2026-report-about-generative-ai/

Grelier, N., Pfau, J., Mathieu, N., & Kaufmann, S. (2025). *From fads to classics: Analyzing video game trend evolutions through Steam tags* [Preprint]. arXiv. https://arxiv.org/abs/2506.08881

Indie Game Insights. (2026, February 11). *What genres were popular on Itch in 2025?* https://www.indiegameinsights.dev/blog/itch_2025

Inshakov, A. A., & Egorov, V. G. (2023). Industriya videoigr: ekonomicheskiy analiz i obzor sovremennykh issledovaniy [The video game industry: Economic analysis and review of current research]. *Postsovetskiy materik, 4*(40), 71–93. https://doi.org/10.48137/23116412_2023_4_71 [In Russian]

itch.io. (2024, November 20). *Generative AI disclosure tagging* [Developer update]. https://itch.io/t/4309690/generative-ai-disclosure-tagging

itch.io. (n.d.). *Accepting payments and getting paid*. Retrieved October 28, 2026, from https://itch.io/docs/creators/payments

Lin, D., Bezemer, C.-P., & Hassan, A. E. (2018). An empirical study of early access games on the Steam platform. *Empirical Software Engineering, 23*(2), 771–799. https://doi.org/10.1007/s10664-017-9531-3

Ma, J. (2025). Unveiling success drivers in gaming: A machine learning study across Steam, Twitch, and Metacritic. *International Journal of Computer Games Technology, 2025*, Article 5776632. https://doi.org/10.1155/ijcg/5776632

Notebookcheck. (2026, August). *Steam averages almost 70 new games a day in 2026*. https://www.notebookcheck.net/Steam-averages-almost-70-new-games-a-day-in-2026.1374113.0.html

Numminen, E., Sällberg, H., & Wang, S. (2022). The impact of app revenue model choices for app revenues: A study of apps since their initial App Store launch. *Economic Analysis and Policy, 76*, 325–336. https://doi.org/10.1016/j.eap.2022.08.010

Panchanadikar, R., & Freeman, G. (2024). "I'm a solo developer but AI is my new ill-informed co-worker": Envisioning and designing generative AI to support indie game development. *Proceedings of the ACM on Human-Computer Interaction, 8*(CHI PLAY), Article 317. https://doi.org/10.1145/3677082

Perez, S. (2026, April 18). *The App Store is booming again, and AI may be why*. TechCrunch. https://techcrunch.com/2026/04/18/the-app-store-is-booming-again-and-ai-may-be-why/

Shahrabi, S. (2026, August 6). *Deep dive in Steam 2026 indie market*. Medium. https://shahriyarshahrabi.medium.com/deep-dive-in-steam-2026-indie-market-4c0aec5c0533

Sidorkin, O. (2026, July 20). *One in three new Steam games now discloses AI, and the revenue tells a harder story*. Cinevva. https://app.cinevva.com/news/2026-07-20-steam-ai-disclosure-study

Steal What Works. (2026, August 27). *Are indie hackers really going extinct?* https://stealwhatworks.com/blogs/news/indie-hackers-going-extinct

Turazashvili, N. (2026, September 27). *App economy 2026: Why new apps get 3% of subscription revenue*. DEV Community. https://dev.to/axrisi/app-economy-2026-why-new-apps-get-3-of-subscription-revenue-3cj8

Videogames Chronicle. (2026, January). *Valve has 'significantly' rewritten Steam's rules for how developers must disclose AI use*. https://www.videogameschronicle.com/news/valve-has-significantly-rewritten-steams-rules-for-how-developers-much-disclose-ai-use

VoxBooster. (2026, July 6). *Indie game statistics (2026): 40+ data points on Steam releases, breakout hits, and the revenue long tail*. https://voxbooster.com/blog/indie-game-statistics-2026/

Zukowski, C. (2026, January 8). *How many games were released in 2025*. How To Market A Game. https://howtomarketagame.com/2026/01/08/how-many-games-were-released-in-2025/

A AI-use codebook

Each of the 191 AI disclosure texts in the 2024 and 2025 samples was matched against keyword rules in English, Russian, Chinese and Japanese, then read in full by one author. The hand reading changed 15 codes, mostly negations ("we do not use AI for in-game art") and words with two meanings ("background music", "trailer music"). A second, independent coder has not yet checked the codes.

Table 9: AI-use categories

Category	Example keywords	Disclosures (of 191)
Visual	art, image, illustration, sprite, texture, background, icon, capsule, trailer, logo, store page	154
Audio	music, BGM, sound, voice, narration, speech	47
Written text	text, dialogue, story, description, quest, language model	23
Localization	translation, localization	16
Code	code, programming, debugging, Copilot	13
Unspecified	no use named ("some assets were generated by AI")	2

A disclosure can fall into several categories. For H4, a game counts as *visual AI* if any visual category applies and as *non-visual AI* if it names only other uses. Since Valve's January 2026 revision of the disclosure form, AI used only for code does not have to be disclosed, so the code category holds games whose developers chose to mention it.

B Robustness of the 12-month breakeven share

Table 10 repeats the 12-month comparison under other thresholds, sales multipliers and review windows. The direction of the cohort difference is the same in every row.

Table 10: Sensitivity of the 12-month breakeven share (paid games; 95% CIs clustered by sampled page)

Threshold and assumption	Mar–Aug 2024	Mar–Aug 2025	Difference, pp (95% CI)
\$12,000, 30 sales per review (main)	10.5%	12.0%	+1.5 (−4.3 to +7.3)
\$6,000, 30 sales per review	14.8%	17.1%	+2.3 (−3.5 to +8.1)
\$50,000, 30 sales per review	4.4%	5.5%	+1.1 (−2.7 to +5.0)
\$12,000, 20 sales per review	8.5%	9.4%	+0.9 (−4.2 to +6.1)
\$12,000, 60 sales per review	14.8%	17.1%	+2.3 (−3.5 to +8.1)
\$12,000, lifetime reviews	12.2%	12.8%	+0.6
\$12,000, bin-corrected first-year reviews	10.5%	12.0%	+1.5 (−4.3 to +7.3)

With 60 sales per review the shares equal those at \$6,000, because doubling the multiplier is the same as halving the threshold.

Two choices in the design change the results enough to matter for similar studies. Counting lifetime reviews instead of first-year reviews adds 1.7 points to the older cohort's share, because the 2024 games had been on sale a year longer; in our pilot it also produced an apparent rise in games with no reviews. Prorating the monthly histogram bins at the cut-off moves no game across the \$12,000 threshold and lowers mean first-year reviews by 2% for the 2024 cohort and by less than 1% for the 2025 cohort. Treating the 50 games on one search page, released within a few days of one another, as independent observations makes the confidence interval for the cohort difference about 30% too narrow, which is why every interval in this paper is clustered by page.

C Other indie segments

The Steam figures cannot yet be repeated on other platforms with the same method, and the closest published measures are not comparable. RevenueCat data put the share of subscription apps reaching \$1,000 a month in gross revenue within two years at 17.3% (Turazashvili, 2026); 15.2% of micro-SaaS products that verified their revenue on TrustMRR have earned \$10,000 or more in their lifetime (Steal What Works, 2026); and 19% of itch.io games released in 2025 received at least one public rating (Indie Game Insights, 2026). These figures use gross revenue, longer windows, self-selected samples or attention rather than revenue, so they are upper bounds or different quantities. A ranking of segments would need app-level revenue estimates of the kind Numminen et al. (2022) built from chart ranks. On itch.io, creators set the platform's share themselves and sales are visible only to creators (itch.io, n.d.), but the platform has recorded AI disclosures by type since November 2024 (itch.io, 2024), which would allow the visual and non-visual comparison of Section 4.6 with sales data from consenting creators.

D Data and code

All files are in the folder `paper_data` of the OSF project linked to this preprint.

Table 11: Data and code files

File	Contents
`steam_paper_sample.csv`	1,168 games released in March–August 2024 and 2025 with price, total and first-year reviews, estimated revenue, threshold flag, AI disclosure and use, genres, languages, Early Access, developer, publisher
`ai_disclosures_coded.csv`	The 191 disclosure texts with automatic and hand-checked categories
`hist.jsonl`, `details.jsonl`	Raw review-histogram summaries and app details from round 2 (11 Nov 2026)
`round3/recheck_2024_2025.jsonl`	Full review histograms for the 1,168 games (round 3, 18 Nov 2026)
`round3/cohort2026.jsonl`	The March–May 2026 sample with histograms, AI disclosure texts and app details
`round3/extra2024.jsonl`, `extra2025.jsonl`	Additional March–May 2024 and 2025 pages
`steam_150day_sample.csv`	All games in the 150-day comparison with window reviews, positive share and threshold flags
`scripts/enrich.py`, `scripts/collect2026.py`, `scripts/recheck.py`	Collection scripts for rounds 2 and 3
`scripts/ai_code.py`, `scripts/ai_override.py`	Keyword coding of AI use and the hand corrections
`scripts/analyze2.py`, `scripts/extra.py`	Round 2 analysis (shares, z-tests, regressions)
`scripts/analyze3.py`, `scripts/figures3.py`	Round 3 analysis (clustered intervals, bin-corrected windows, 150-day comparison, review scores) and figures
`results.json`, `results3.json`	Every statistic reported in Section 4 and Appendix B

The original pilot sample (`pilot/steam_pilot_sample.csv`) and its collection script are unchanged. On 18 November 2026 Steam's review-summary endpoint (`appreviews`) redirected to the store front, so round 3 takes total review counts from the store search and store pages and does not separate reviews by purchase type.