

Pricing & revenue architecture

What is freemium?

Freemium is a pricing choice: a basic version at a price of zero beside one or more paid ones. Studies of books, web content and apps show the trade-offs.

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Management summary Freemium is a pricing and business-model choice in which a basic version of a product is offered at a price of zero, with no time limit, beside one or more premium versions sold for a price. This concept guide defines it (Gu, Kannan and Ma; Liu, Au and Choi), separates it from a free trial and a free sample, and reports three studies: one online content site that began charging for part of its content, measured against a forecast of its free sign-ups; a randomized field experiment in which a publisher added a second paid format beside a free PDF; and a panel of top-ranked Android apps. It explains why the value placed on a free user drives one study's revenue accounting and gives a one-page record for a freemium price list. None of the studies is of business software.

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What is freemium?

§ 1 of 7

It is a way of pricing one product at two levels: a basic version that costs nothing and one or more premium versions that cost money. Gu et al. (2018)¹ use the term for a strategy in which the basic version of a product or service is free and buyers pay to move up to a premium version with more features. They also state its test in one line: “The success of a freemium model depends on the number of customers who purchase the premium version in the presence of the free version.”

¹ Gu, X., Kannan, P. K., & Ma, L. (2018). Selling the premium in freemium. *Journal of Marketing*, 82(6), 10–27.

Liu et al. (2014)², citing a 2008 book by Hayes, call freemium “a business model by which a service or a product is offered free of charge, but a premium is charged”, and the premium is charged “for advanced features, functionality, or related products and services”. In the app market they studied, “freemium apps are free to download but typically include offers to upgrade to the paid version, which is ad free or has richer features”, or to buy content or services inside the app or unlock further game levels; the panel below studies the first kind. Pauwels and Weiss (2008)³ do not use the word. They study an online content provider that started charging for part of its content and use “the move from free to fee” as “a shorter term for “the move from free to free and fee.”” Their opening sentence names the difficulty: “Moving from free to “free and fee” for any product or service represents a challenge to managers, especially when consumers have plenty of free alternatives.”

² Liu, C. Z., Au, Y. A., & Choi, H. S. (2014). Effects of freemium strategy in the mobile app market: An empirical study of Google Play. *Journal of Management Information Systems*, 31(3), 326–354.

³ Pauwels, K., & Weiss, A. (2008). Moving from free to fee: How online firms market to change their business model successfully. *Journal of Marketing*, 72(3), 14–31.

In this guide, freemium means a price list in which one version of a product is offered at a price of zero, for as long as the user wants it, beside one or more versions of the same product sold for a price. What the free version holds back and what the paid versions add are pricing decisions. Freemium is distinct from a free trial, which ends after a set time; from a free sample, which is given once; and from a product paid for entirely by advertising, which has no paid version. The sources do not all draw these lines. Liu et al.² call the same free apps both free

versions and free trial versions, and the software literature they review separates sampling strategies by “full functionality with limited time period or limited functionality without time limitation”; this guide uses freemium for the second. Pauwels and Weiss’s³ firm was, before its move, a site “supported solely through advertising income”.

Why is a free version not just a very cheap one? § 2 of 7

Because, on Gu et al.¹’s argument, a price of zero may change how buyers see the paid versions too. Citing research on the zero-price effect, they argue that customers may value a free product more than a cost-benefit calculation would predict, so that a new premium version could draw people toward the free one instead of the paid ones; and that the price of a premium version may serve as an anchor that makes the free version look like a gain. Two effects from research on choice sets could pull the other way. Under the compromise effect, a dearer premium version turns the existing premium version into the middle option between it and the free one. Under the attraction effect, a new version that the existing premium version clearly beats makes the existing one more attractive. Which effect wins depends, they write, “on the relative strengths of these opposing effects”. These are expectations drawn from earlier research; the field experiment below was run to find the net result.

Liu et al.² frame the free version through the three effects of free samples that they take from Bawa and Shoemaker: acceleration (people buy earlier), cannibalization (the free version replaces a purchase) and expansion (people buy who otherwise would not). To these they add “a fourth “competitive” effect beyond the acceleration, cannibalization, and expansion effects”: in a market with many free substitutes, an app without a free version may lose more buyers to rivals than its own free version would take from it. That fourth effect is their hypothesis for a crowded app store, not a measured quantity.

What did one content site lose and gain when it began to charge?

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Pauwels and Weiss (2008)³ had daily data, from June 2001 to March 2005, for an online provider of articles for marketing professionals. The site was free to readers and funded by advertising until 1 January 2004, when paying subscribers began to get access to advanced articles and other services, at a regular price of US\$4.95 a month or US\$49.95 a year. The firm restricted “only a portion (approximately one-seventh) of the content”. The authors write the revenue effect as two terms: the change in free subscribers times the advertising revenue per free subscriber, plus the change in paying subscribers times the fee. There was no comparison group: their “data capture a single “natural experiment,”” and each effect is measured against what their time-series model forecasts would have happened without the move.

On that model the move itself cut new free sign-ups by 208 a day against the forecast, each search referral and each e-mail brought in fewer free sign-ups than before the move, and the firm’s own e-mails urging free users to upgrade cut free sign-ups most. In the model’s accounting of a shortfall of 1,031 free sign-ups a day, set against a gap of 1,003 between forecast and actual, those e-mails account for 752 and the move itself for 208. The same e-mails raised paid subscriptions; in the abstract’s words, “they increase subscription revenue at the expense of advertising revenue”.

The money comparison rests on one estimate from the firm: an extra free subscriber brought US\$1.63 a year in advertising revenue, or US\$0.0045 a day. On that basis the authors put the move’s daily loss at US\$4.64 (1,031 times US\$0.0045) against US\$277 a day from new paying subscribers (2.06 monthly subscriptions at US\$4.94 and 5.55 yearly ones at US\$48), and conclude that “the move from free to fee is profitable” for this firm. In their conclusion “the revenue loss appeared minor”, about “2% of the paid-subscriber revenue”. The free subscriber is valued only through advertising: “Other reasons to keep adding free subscribers”, such as building a community with critical mass, “are harder to quantify” and were left out.

On this guide’s reading, the comparison mixes two time bases. Each lost free sign-up is valued at one day of advertising revenue, while each new paid sign-up is valued at a full monthly or yearly fee. For the upgrade e-mails, the same article compares US\$2,454 of paid revenue with a loss of US\$1,224, which is 752 lost sign-ups at about US\$1.63 each, a full year of advertising. Valued that way, the 1,031 free sign-ups

lost on one day come to about US\$1,680: more than the US\$277, and more than the roughly US\$389 the day's paid sign-ups would bring if every monthly subscriber renewed for a year, the upper value the authors give. The authors note that "Free users typically stay on", although they "often become less active over time", and that they have no data on renewals or switching. So the profitability verdict depends on how long a lost free subscriber would have earned advertising revenue, which the article does not estimate. On this guide's arithmetic, at US\$0.0045 a day the advertising forgone on the 1,031 sign-ups lost on one day passes US\$277 after about 60 days and US\$389 after about 84 days, if those users would have stayed as active.

The authors also report that the move came after free sign-ups had gained momentum in spring 2003 and about a month after their growth had started to slow. They speculate that firms which move before such momentum gain less and lose more, and add that data on such firms are needed.

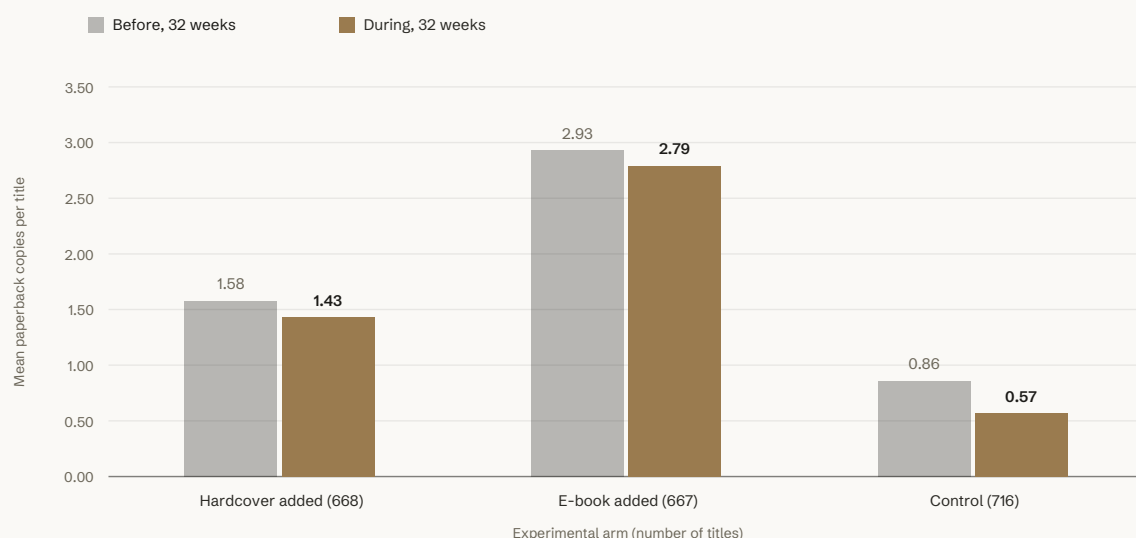
Can a second paid version sell more of the first? § 4 of 7

In one randomized field experiment, it did. Gu et al. (2018)¹ worked with the National Academies Press, a nonprofit publisher that offers every title as a free PDF and sells a paperback for a price. The authors report that its move to that model raised website traffic while revenue fell well below the period when the PDF was sold; the article gives no figures for that change. The experiment covered 2,051 randomly selected titles that were already sold in paperback, assigned within nine blocks of paperback price and popularity: 668 titles gained a hardcover version priced between 160 and 790 per cent of the paperback, 667 an e-book priced between 25 and 80 per cent, and 716 were left unchanged. The new formats went on sale on 10 January 2016, and the data cover 32 weeks before and 32 weeks after.

In their difference-in-differences model of paperback copies per title, adding either format raised paperback sales against the control titles, significantly at 5 per cent for the hardcover and at 1 per cent for the e-book. The authors translate this into 1.2 more paperback copies per title for the hardcover arm and 2.6 for the e-book arm (772 and 1,722 copies in total). Their table prints those two marginal effects without significance marks and with standard errors of 0.931 and 2.262. Without two blockbuster titles, one in each treatment arm, the estimates fall to 0.5 and 0.4 copies per title. Figure 1 shows the raw means behind the model.

Figure 1 Paperback copies per title before and during the experiment, by arm

Paperback sales fell in all three arms. They fell by about a third in the control titles and by less than a tenth where a hardcover or an e-book had been added.



Raw means, not model estimates. The arms' means differed before the experiment; the authors report no significant difference at 5 per cent in a one-way analysis of variance, and means much closer once two blockbuster titles are removed.

Source Gu et al. (2018), p. 17, Table 3: mean paperback quantity per title in the 32 weeks before and the 32 weeks during the experiment; 668 titles with an added hardcover version, 667 with an added e-book version and 716 control titles, randomly assigned within blocks of paperback price and popularity. The free PDF stayed free in every arm.

On the raw means, paperback copies per title fell by 0.15 in the hardcover arm, 0.14 in the e-book arm and 0.29 in the control arm, so the two treatment arms lost 0.14 and 0.15 copies per title less than the control. The raw means, the model and the estimate without blockbusters agree on the sign. They do not agree on the size, or on which of the two formats helped more. The authors' abstract gives the pattern across titles: "The positive impact on paperback sales is stronger for titles that are more popular or cheaper, and the effect of introducing the e-book version is higher when the e-book price is closer to the paperback price."

The estimated effect also differed with the new version's price, and not smoothly. In their Table 6 the e-book's effect on paperback sales was significant when the e-book cost 45 to 55 per cent or 65 to 80 per cent

of the paperback, and not in the bands in between or below. For the hardcover it was significant at 5 per cent only in the dearest band, 440 to 790 per cent, and at 10 per cent in the cheapest. Each band compares the titles that got the new version at that price with the control titles; the article says how titles were assigned to arms, not how prices were assigned to titles. The same tables carry the check the authors use for their main model: whether the treated and the control titles already differed before the experiment, which should not happen, they note, if their random assignment worked. In four of the ten bands the treated titles did differ: they had sold significantly fewer paperbacks than the control titles beforehand, and one of the four is the 65 to 80 per cent e-book band. In the authors' model, total revenue per title rose in both arms (Table 7). A scenario analysis built on the models led them to call an e-book price of 70 to 80 per cent of the paperback "optimal for NAP"; that is a projection from the estimates, not a separate test.

Two parts of the article do not fit together. Their Table 3 shows free PDF downloads per title falling in both treatment arms (from 166.83 to 162.36 and from 248.08 to 205.08) and rising slightly in the control arm (from 153.13 to 153.96), which the authors call "model-free evidence" of fewer free downloads. Later they write that a difference-in-differences analysis of free PDF downloads "shows an increase under the treatment" conditions, without printing that analysis. The article does not reconcile the two.

For the reason behind the gain, the authors fit a choice model to 742,991 individual downloads and purchases, most of them free PDFs; the paperback was chosen 1,024 times before and 1,049 times during the experiment, the hardcover only 6 times and the e-book 115 times. They read the hardcover result as a compromise effect, with the paperback now the middle option, and the e-book result as an attraction effect, concentrated where the e-book cost more than 65 per cent of the paperback. They also limit that reading, "so that we do not oversell the identification of the" mechanisms: the study "was not specifically designed" to rule out other effects, and they cannot identify the zero-price effect from their data. The [tiered pricing guide](#) argues that a top tier can make a middle tier look moderate; this experiment is a field test of a related idea, run as a product line extension with a free version at the bottom of the line.

Does it matter how good the free version is?

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In one panel of apps, the quality of the free version went with paid sales and its visibility did not, on average across app types; for games and entertainment apps, the authors report that a higher chart place was worth more and a better rating less. Liu et al. (2014)² collected daily data from Google Play's top-ranked lists for two months, from November 2011 to January 2012. Of 1,567 ranked paid apps, 1,020 (65.1 per cent) offered a free version. Google does not publish exact download counts, only ranges, so the authors reconstructed them from each app's download graph and its download-range milestones, which they could do for 711 apps and 23,771 daily observations. The design is an observational panel: nobody assigned a free version to an app.

Their regressions found that, for a paid app with an average rating, “offering a free version is associated with more paid app downloads”, and that a paid app's own rating was less strongly associated with its downloads when a free version was offered: “its magnitude is reduced when a free version of the app is offered”. The free version's rank and rating were recorded only for free versions on the free chart, which lists the top 504, so what follows compares visibility only among free versions that were already visible. Among paid apps that had a free version, and at the panel's mix of app types, the free version's rating was positively associated with paid downloads and a higher place on the free chart was not, so their hypothesis on rank was not supported. The mix matters. For games and entertainment apps, which the authors class as hedonic and which make up more than half of the panel's observations, they report that a higher place for the free version was worth more, and a better rating less, than for other apps. On the authors' arithmetic from their Table 4, a higher place on the free chart went with more paid downloads only for those apps; for the other apps it went with fewer, and that coefficient is significant at 5 per cent, while the abstract says only that the free version's rank “does not have a significant impact”. The authors conclude that offering a quality free version is more important than the visibility a free version brings, “especially for nonhedonic goods”.

When they split the apps by rating, the coefficients for having a free version and for its rating shrank substantially as ratings fell and “become insignificant when estimated with the lowest rating group”, which leads them to suggest that “a prerequisite for the freemium strategy to be effective is a minimum user satisfaction level with the free app, rather than a high ranking”.

Their discussion goes further than the design: it concludes that letting consumers try an app for free “actually benefits the developer more than it hurts it”. An observational panel of top-ranked apps shows associations, not what offering a free version did, and the authors list its limits themselves: the sample covers only top-ranked apps, so it “may be subject to the usual caveats of a truncated sample”, and they could not control for within-category competition.

What should a freemium price list record?

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Six things, one row per paid version: what the free version gives and what it holds back; what a free user is worth to the seller, per year and for how long; each paid version’s price against the existing paid version; how users rate the free version; what the result will be compared with; and the measurement window. The fields follow the three studies: Pauwels and Weiss’s³ restriction decision and their valuation of a free subscriber, Gu et al.¹’s price bands and their before-and-during design, and Liu et al.²’s finding on the free version’s rating, which they report as weaker for games and entertainment apps. If no randomized comparison is possible, the record should say so, because a model forecast and an observational panel answer weaker questions about cause than a randomized arm.

Figure 2 A freemium price list record

Write down the free version, the value of a free user, the price ladder, the free version's rating, the baseline and the window before the price list changes.

Free	Free value	Price	Rating	Baseline	Window
What stays free, what is held back?	Worth per free user a year, how long?	Paid price against the base paid plan?	How do users rate the free version?	Random arm, forecast or none?	Weeks before and during?

If a free user is valued for one day and a paid user for a year, the comparison is not like for like.

One row per paid version. Value free users and paid users over the same period. Name the baseline: a randomized arm, a model forecast, or none.

Source Author's decision worksheet. The free and free-value fields follow Pauwels and Weiss (2008), pp. 15 to 17, 25 and 29; the price and window fields follow Gu et al. (2018), pp. 15 to 17 and 20 to 21; the rating field follows Liu et al. (2014), pp. 344 to 346; the baseline field contrasts the designs of all three. The fields are reader inputs; no company data is supplied.

An illustration, with no company data: a B2B software firm has a free plan and one paid plan and considers adding a second, dearer paid plan. The record states what the free plan holds back and what a free account is worth to the firm; without advertising, that worth is not advertising revenue, and none of the three studies measures what else it might be. It states the new plan's price as a multiple of the existing paid plan, and which plan is meant to become the middle option. It names the baseline: comparable accounts or regions assigned at random to the old and the new price list, measured over an equal period before and during, as Gu et al.¹ did with titles. And it names the risk Gu et al. list for their own design, that "the customers in the field experiment viewed different" conditions, since buyers who compare notes may see both price lists. These are the author's examples and have not been tested.

The willingness to pay guide sets out how the most a buyer would pay is defined and measured; Gu et al.¹ explain their stronger effects for cheaper titles by willingness to pay, and a freemium price list needs that estimate for each paid version. The product-led growth guide treats product access as a route into acquisition, activation and sales; this guide treats the free version as a price.

Which of these findings would hold for a software plan?

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Few without a test. Gu et al.¹ studied one nonprofit publisher, the only seller of its content, in one category, with buyers who are mostly academics and other highly educated readers; they write that their findings “should extend readily to other” freemium settings, and name software as one context where adding premium versions “could be fruitful”, but their field experiment “was conducted for one category”. Pauwels and Weiss³ say it plainly: “This article investigated one company.” Their models are reduced form, and they write that replication is needed to see whether their results apply to other content providers. Liu et al.² studied top-ranked Android apps over two months, with downloads reconstructed rather than reported.

On this guide’s reading, three points carry over with some confidence. A free version is a price, and what it costs depends on what a free user is worth and for how long, which one firm valued only through advertising. Adding a paid version can change sales of the existing paid version, as one randomized experiment with books found; how the change varied with the new version’s price is less secure, because the prices were not shown to be assigned at random. And in one observational panel of apps, the association between offering a free version and paid sales was weaker among lower-rated apps and no longer significant among the lowest-rated. What a free user is worth in business software, how buying committees respond to a free plan, and whether the compromise and attraction effects hold for plans priced per seat, these studies do not say.

 End of essay

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