A Preliminary Analysis of Pricing by App Stores

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Comments and thoughts on this preliminary analysis are encouraged and welcomed.

How much do the Apple App Store and Google Play, the two major mobile application stores, charge? The short and obvious answer is that Apple and Google levy a fee of 30% of the revenue from downloading paid apps; 30% of revenue from in-app purchases of digital goods and services; and a lower charge of 15% for renewed subscriptions.

But this answer is at best incomplete, and perhaps wrong. The two major app stores also provide a distribution and download service for millions of "free" apps—including testing them for malware—while charging only a minimal fixed fee to each developer. These free apps can potentially generate a big benefit for consumers and a large return for their owners.

To put it more precisely, the app stores provide a distribution, search and validation service to all app developers and app owners for nearly nothing. This service is the equivalent of a major retailer like Walmart providing free shelf space to millions of different goods owned and sold by other companies.

The average price charged by Apple and Google is therefore much less than the face value of 30%, if we take into account the large number of free apps. Our preliminary scenario analysis suggests that the revenues collected by the app stores could be in the range of 4-7% of the value generated by all apps in the app stores, including both free and paid.

To understand the rationale for including free apps as part of the pricing calculation, consider that very few businesses or industries offer a single price to all of their customers. For example, when economists talk about the cost of an airplane ticket, they don't simply cite the price of flying first class. Instead they average the money paid by all the passengers, from the low-priced economy flyers on discount carriers to the front of the plane business class travellers. That's the number that the

Department of Transportation cites for plane fares, no matter how little is paid by the back-seaters.[1]

Or let's turn to the financial services industry, where banks charge some customers for checking accounts, while offering free accounts to other customers. Do the statisticians at the Bureau of Economic Analysis ignore the free checking accounts when they calculate the price of financial services? Hardly.

Instead, the BEA makes a special effort to measure the value of "free" checking accounts and other services provided without explicit payment.[2] These items are a not-insignificant part of gross domestic product (GDP). In 2018, "financial services furnished without payment" provided $357 billion in value for consumers in 2018, almost as much as the $370 billion that consumers paid in charges, fees and commissions to financial institutions.

So we are on solid statistical ground broadening our analysis of the Apple App Store and Google Play pricing to include the value of distribution services that the app stores provide to all apps without receiving payment in return.[3] Consider, for example, a banking app that is downloaded for free from an app store. These days, most banking apps allow checks to be deposited at home by using the mobile device to take a picture of the front and the back of the check. This is what's known as "Remote Deposit Capture," and it is one of the most compelling features of mobile banking for consumers. It's also a big money saver for banks: According to JP

[1] For example, in the fourth quarter of 2018, the average air fare between
[2] "Measuring the Services of Commercial Banks in the National Income and Products Accounts," Survey of Current Business, February 2013. https://apps.bea.gov/scb/pdf/2013/02%20February/0213_nipa-rev.pdf
[3] With the exception of the fixed developer fee which is $99 for an individual app developer and $299 for an enterprise for the Apple App Store, and $25 for Google Play.

Morgan Chase, depositing a check through an app costs the bank pennies, compared to $0.65 for a check deposited at a branch teller. [4]

Banks get their apps distributed for free through the app stores. That might be less important to a big bank like Chase, but it's absolutely essential to smaller banks that would not be able to compete without mobile apps.

To be clear, assessing the "true" price of the app stores is not a straightforward endeavor, since there are usually multiple approaches to valuing "free" services. In this preliminary report we will examine three different approaches to giving a more complete perspective on the prices charged by the app stores. We will look at consumer time, consumer value, and business value. Finally, we will briefly discuss implications.

[4] Based on a JP Morgan Chase shareholder letter in 2015. https://www.jpmorganchase.com/corporate/investor-relations/document/ar2015-lettertoshareholders.pdf

Background: Measuring the Value of Free Services

In general, the average price of a good or service is the total payments for that good or service, divided by the quantity provided. So the average price of a plane ticket is the total paid by the passengers on that plane, divided by the number of passengers. Alternatively, we could calculate the average price per passenger-mile as the total payments divided by the number of passenger miles flown. Either of these two numbers would give us useful information about the pricing behavior of the airlines.

By contrast, it would be misleading for government statisticians to simply provide pricing data on business class tickets, while ignoring economy or basic economy, which is a new category that many airlines have introduced with low fares and fewer services. First, the airlines may be getting $2000 for a business class ticket from DC to Europe, but that's only a small fraction of the seats on the plane. The true average price is much lower.

Second, economy passengers are getting a valuable service, even if they are paying very low prices compared to business class. They may not get the same meals or the same seats, but they arrive at the same destination.

Third, passengers make a voluntary choice about whether they are going to buy an economy or business-class ticket, based on price and the different services offered. For example, if the airlines introduce a basic economy fare that allows fewer bags to be checked, they may attract more passengers who couldn't afford to fly before. As a result, the average price results from an interaction between airline pricing decisions and passenger buying decisions.

We can approach app store pricing from a similar perspective. The 30% charge on paid apps and in-app purchases gets all of the headlines. Nevertheless, many apps are free to download and do not have in-app purchases. Such free apps, despite only paying a small fixed charge, receive valuable distribution and vetting services.

Finally, app developers can choose whether to rely on in-app purchases or a different business model that doesn't require payments to the app stores. Indeed, developers can choose whether to build a native app or rely on increasingly capable web apps.

The Basic Analysis

How can we broaden the analysis of app store pricing to include the free services offered to all apps? As we noted at the beginning of the previous section, average price is equal to total payments divided by the total quantity provided. In the case of the app stores, the "true" average app store price can be calculated with equation (1):

$$(1)\ \text{Average app store price} = \frac{Total\ payments\ to\ app\ store}{(Revenue\ from\ paid\ apps\ and\ in{-}app\ purchases)+(dollar\ value\ of\ free\ services\ provided\ to\ all\ other\ apps)}$$

It's worth considering this equation in more detail. First, app stores charge a percentage of relevant revenues as their price. Such *ad valorem* prices are not unusual. Credit card companies usually charge a percentage of the transaction price as their fee. Similarly, real estate agents usually charge a percentage of the sale price as their fee.

Second, equation (1) takes "free" services into account when calculating the average price by adding in the second term in the denominator. All else being equal, the more services provided for free, the lower the "true" average price. Conversely, if the provider provides fewer services for free, the average price goes up.

Third, government statisticians have developed various methodologies for placing a dollar value on free services. As noted earlier, the BEA has developed methodologies for valuing "free" checking accounts, and related services, such as processing of checks, disbursing or transferring funds when and where needed, protecting deposited funds, and investment services.

The Bureau of Labor Statistics (BLS), which tracks price data, has developed a methodology for valuing telecom services—such as text messaging and long distance phone calls—that were formerly priced separately and are now included for free as part of most calling plans. For example, when texting was made free, it was the equivalent of a price decline because the telecom company was offering more service at the same price.[5]

Fourth, there are usually multiple approaches to valuing free services. In particular, there is no well-developed methodology for assessing free services of the kind being offered by app stores. So this preliminary report will briefly examine three possible approaches we could use to value the free services received by app developers and app owners.

[5] https://www.bls.gov/cpi/factsheets/telecommunications.htm

Approach 1: Consumer Time

One measure of value is time. We know that consumers spend a lot of time on their apps. [6] Some of that app time creates revenue for the app stores, in the form of in-app purchases and paid downloads, but most of it doesn't.

However, this "free" consumer app time generally translates into gains for the app owner, in one way or another. For example, time spent on social media apps typically translates into advertising revenues.

How much is this "free" app time worth? We can make a preliminary estimate by using mobile game apps as a benchmark. According to a 2019 report from App Annie, mobile games made up roughly 10% of the time spent globally on apps. [7] But in a measure of their outsize influence, mobile games account for almost 75% of money flowing through the app stores, according to App Annie estimates.

These two relationships are represented in equations (2) and (3). Equation (2) accounts for the 30% fee to the app stores.

(2) Money spent on game apps = *(0.75* Total payments to app store)/0.30*

(3) Time spent on game apps = *0.10* Time spent on all apps*

The combination of equations (2) and (3) gives some insight into the value of time spent on apps.

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[6] https://www.emarketer.com/content/mobile-time-spent-2018

[7] App Annie, "State of Mobile Games: Robust Growth in 2019 & Beyond," June 2019. https://www.appannie.com/en/insights/mobile-gaming/the-state-of-mobile-games-in-2019-and-beyond/

(4) Ratio of value to time for mobile game apps = $\frac{Money\ spent\ on\ game\ apps}{Time\ spent\ on\ game\ apps}$ = VTG

We will examine two possible scenarios. The first scenario assumes that other apps have the same value to time ratio (VTG) as mobile game apps. The second scenario assumes that other apps have half the value to time ratio as mobile game apps.

Under the first scenario

(5) Average app store price =

$$\frac{Total\ payments\ to\ app\ store}{(Money\ spent\ on\ game\ apps)+(dollar\ value\ of\ consumer\ time\ spent\ on\ other\ apps)}$$

(6) Dollar value equivalent of consumer time spent on other apps =

*= 0.90*Time spent on all apps*VTG*

*=0.90*Time spent on all apps*Money spent on game apps/(0.10*Time spent on all apps)*

*=9*Money spent on game apps*

(7) Average app store price = $\frac{Total\ payments\ to\ app\ store}{(Money\ spent\ on\ game\ apps)+9*(Money\ spent\ on\ game\ apps)}$

*= .30/(10*0.75) =0.04*

So under the first scenario, the revenues received by games apps account for only 10% of the value created by the app store. As a result, the fees collected by the app stores amount to only 4% of value created.

A similar calculation done for the second scenario gives us this equation:

(8) Average app store price = $\frac{Total\ payments\ to\ app\ store}{(Money\ spent\ on\ game\ apps)+4.5*(Money\ spent\ on\ game\ apps)}$

*=0.30/(5.5*0.75) = 0.072*

Under the second scenario, the fees collected by the app stores amount to 7.2% of the value created.

Approach 2: Consumer Value

A second approach would be to directly measure the value of apps to consumers, rather than using time spent as a proxy. It's well known that app usage is highly concentrated by time, with one survey noting that "[n]early half of app time occurs in an individual's top app, and 90% in the top five."[8]

But that's not the full story if we are assessing value of apps to consumers. Some apps are used only in short bursts, but would be sorely missed if they disappeared. For example, ridesharing apps such as Uber and Lyft are often highly valued by their users, but no one spends a lot of elapsed time on the associated apps (unless the car seems lost!).

Similarly, most people don't regularly hang out on their banking apps. Instead, they check their balances, pay bills and deposit checks, and then log out. And as 50 percent of Americans now use online banking, mobile apps for banking have become increasingly popular, ranking behind only apps for social media and the weather.[9]

How can we measure the value of apps to consumers? Economists have been developing new methodologies for measuring the economic contribution of "free" Internet services such as social networks, email, and messaging apps. In particular, Erik Brynjolfsson of MIT and colleagues have been using "massive online choice experiments" to measure the value of free digital goods, enabling them to construct a new measure of national economic output that they call "GDP-B." [10] They write: "The welfare contributions of the digital economy, characterized by the proliferation

[8] https://www.emarketer.com/content/mobile-time-spent-2018
[9] "Mobile Banking One of Top Three Most Used Apps by Americans, 2018 Citi Mobile Banking Study Reveals". https://www.citigroup.com/citi/news/2018/180426a.htm
[10] Brynjolfsson, Erik and Collis, Avinash and Diewert, W. Erwin and Eggers, Felix and Fox, Kevin J., "GDP-B: Accounting for the Value of New and Free Goods in the Digital Economy (March 1, 2019)." Available at SSRN: https://ssrn.com/abstract=3356697

of new and free goods, are not well-measured in our current national accounts." For example, they found that Facebook generates over $500 of consumer benefits per year for the average user in the US and Europe.

The results that Brynjolfsson and colleagues have published do not distinguish between the app and the website versions of Facebook and other free online services. However, the methodology that they have developed could be used, in theory, to estimate the value that consumers place on all mobile apps, both free and paid, as compared to other methods of accessing the same services. And that, in turn, would enable us to estimate the true average price charged by app stores.

Approach 3: Business Value

The first two approaches looked at the value of apps from the perspective of the consumer. However, we can also look at the app store average prices from the perspective of the app owner, which is usually a company. Businesses invest in building native apps because it makes them more money, either directly by gaining revenue, indirectly by cutting costs or increasing sales in other ways.

Many companies treat their apps, freely downloaded, as an essential part of doing business in the age of the Internet. Ecommerce, banking, travel, health: The usability and performance of their apps are paramount.

In some cases, use of apps by customers is a direct cost savings for the business. We mentioned banking apps and check deposits at the beginning of this paper. In 2018, 37% of households deposited a check using their phone's camera.[11] Big banks have led the way, but more and more smaller banks and credit unions are adding check depositing capabilities to their app in order to compete.

From the perspective of banks trying to digitize as fast as possible, the ability to deposit checks remotely is the "killer app."[12] Indeed, depositing checks is one of the key reasons that consumer download bank apps.

Note also that a secure, free distribution site for banking apps is key for accelerating digitization of financial services. No one will download a banking app from a site

[11] This figure comes from the Federal Reserve's 2018 Survey of Household Economics and Decisionmaking (SHED). The survey asked (question BK20): "In the past 12 months, have you (and/or your spouse and/or your partner) used your mobile phone to deposit a check using your phone's camera"? https://www.federalreserve.gov/publications/appendix-b-consumer-responses-to-survey-questions.htm

[12] https://www.javelinstrategy.com/webinar/connecting-dots-mobile-imaging-create-full-mobile-banking-experience

that might tap into their confidential financial data. And smaller banks are not in the situation to set up their own download facilities.

Conclusion

The app stores have an unusual pricing structure where paid downloads and in-app purchases are charged a fee, but other uses of the app stores—including downloads of free apps from both small and large companies—are not charged. In practice, it appears that most of the fees are paid by games.

Our preliminary analysis suggests that taking free apps into account substantially lowers the "true" average price of the app stores. But there's a broader point as well.

The pricing structure of the app stores creates a structure conducive to innovation across the whole range of mobile applications. Companies always have the choice to implement their apps in a way that involves near-zero payments to the app stores. That means the barriers to entry for new mobile apps are very low.

Originally this low barrier to entry benefited small makers of mobile game apps, productivity apps, and the like. The classic "programmer in the basement" could develop a hit app, scale up at next to no cost, and then monetize.

In the coming years, the ability to distribute new apps at no cost is going become increasingly important with the spread of digitization to the physical world. Mobile apps will become the key user interface for everything from autos to homes to healthcare devices. This trend will be accelerated because of how easy and cheap it is to innovate in the mobile app space. In effect, the pricing structure of the app stores subsidizes innovation and creativity.