



Korean App Economy Update 2022

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AUGUST 2022



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INTRODUCTION

Korea is one of the leading technology countries in the world. By some measures, Korea's manufacturing sector is more diversified and complex than U.S. manufacturing.¹

In this report, we focus on one aspect of Korea's technological strength: the App Economy, which reflects the employment of workers to develop, maintain, and support mobile applications. The global App Economy expanded rapidly during the pandemic. Individuals and businesses were suddenly dependent on the internet, their smartphones, and their mobile applications for critical daily activities like work, shopping, and communication with loved ones. The App Economy, already important, became an increasingly indispensable part of the real economy.

In Korea, the pandemic was much more controlled compared to the United States and Europe.² Still, almost overnight, huge swathes of economic activity that relied on face-to-face interactions were forced into virtual mode.^{3,4} In Korea, time spent on mobile applications rose from 4.1 hours in 2019 to 5.0 hours in 2021, the third highest in the world.⁵

Even as the pandemic enters a milder stage largely due to vaccines, many jobs and economic interactions are still remote, placing an increased premium on mobile communications. After a slow start because of government regulations, Korean health organizations have learned about

the usefulness of telemedicine apps.^{6,7} Korean financial companies like Toss and Kakao Bank are increasingly doing transactions through their mobile apps. Delivery apps are also still experiencing booming business.

In Korea, as in other countries, the increased prominence of the App Economy is reflected in the growing number of jobs that required App Economy skills. We did our first report on Korea's App Economy in 2018, using detailed data on job postings as our major tool for analysis.⁸ In this 2022 report, we update our previous estimate, finding that Korea has 516,000 App Economy jobs as of July 2022, a number that is highly competitive globally. We end with a brief discussion of policy.

MEASURING THE APP ECONOMY

As the App Economy grows in significance globally, it becomes essential to have a consistent set of App Economy job estimates so that policymakers can compare their country's performance with that of other countries. However, official economics statistics do not provide an easy way to measure the size of the App Economy.

In response, PPI developed a methodology based on a systematic analysis of online job postings. In particular, we look for job postings that call for app-related skills such as knowledge of iOS or Android. We issued our first App Economy report for the United States in 2012. Since then, this methodology has been applied to a wide variety of countries, languages, and economic environments.⁹

Our goal is to produce a set of globally-consistent and credible estimates for App Economy employment by individual countries, by broad geographical regions, and in some cases

by major cities. The ultimate objective is to be able to track the growth of the App Economy globally, and to see which countries are benefitting the most. Ideally, we should be able to link App Economy growth to policy measures implemented by governments.

For this study, a worker is in the App Economy if he or she works in:

- An information and communications technology (ICT) related job that uses App Economy skills – the ability to develop, maintain, or support mobile applications. We will call this a “core” App Economy job. Core App Economy jobs include app developers; software engineers whose work requires knowledge of mobile applications; security engineers who help keep mobile apps safe from being hacked; and help desk workers who support use of mobile apps.
- A non-ICT job (such as human resources, marketing, or sales) that supports core App Economy jobs in the same enterprise. We will call this an “indirect” App Economy job.
- A job in the local economy that is supported by the income flowing to core and indirect App Economy workers.

These “spillover” jobs include local retail and restaurant jobs, construction jobs, and all the other necessary services.

To estimate the number of core App Economy jobs, we use a multi-step procedure based on data from the universe of online job postings. Our first observation is that online job postings typically describe the skills and knowledge being sought by the employer. For example, if a job posting requires that the job candidate have experience developing apps for iOS or Android, then we can reasonably conclude that the

posting refers to a core App Economy job. The methodology section at the end of the paper describes the procedure in detail.

RESULTS

Table 1 presents an estimate of App Economy jobs in Korea. We estimate that Korea has 516,000 App Economy jobs as of July 2022. This figure includes a conservative estimate of spillover jobs. Our methodology also allows us to estimate the relative share of mobile operating systems in Korea's App Economy.¹⁰ We find that the iOS ecosystem includes 252,000 jobs, and

the Android ecosystem includes 379,000 jobs. The two numbers sum to more than the total because many App Economy jobs belong to both ecosystems.

These figures are 23% to 25% higher than our previous 2018 estimates for Korean App Economy employment. Because of improvements in the implementation of the methodology, the number are not directly comparable. Nevertheless, this increase across the pandemic years is similar to what we see in other countries.

TABLE 1. THE KOREAN APP ECONOMY

| | JULY 2022 | APR 2018* | PERCENTAGE DIFFERENCE |
|------------------------|---------------------|-----------|-----------------------|
| | (THOUSANDS OF JOBS) | | |
| Total App Economy jobs | 516 | 420 | 23% |
| iOS ecosystem | 252 | 202 | 25% |
| Android ecosystem | 379 | 309 | 23% |

**Not directly comparable to 2022 because of methodology improvements.
Data: PPI, Indeed, ILO*

Table 2 compares Korea's App Economy with the United States, Germany, and the United Kingdom, three large technologically advanced countries (we currently do not have a public estimate for China or a recent report for Japan). Korea has roughly the same number of App Economy jobs as Germany, somewhat less than the U.K., and much fewer than the U.S.

However, a better measure for comparing the App Economy of countries of different size is "App Intensity." We define App Intensity as the number of App Economy jobs divided by the total size of employment. We see from Table 2 that Korea's App Intensity of 1.8% is higher than the U.K., the U.S., and Germany.

TABLE 2. HOW THE KOREAN APP ECONOMY COMPARES GLOBALLY

| | APP ECONOMY JOBS (THOUSANDS) | APP INTENSITY* | DATE OF ESTIMATE |
|----------------|---------------------------------|----------------|------------------|
| Korea | 516 | 1.8% | July 2022 |
| Germany | 504 | 1.3% | December 2021 |
| United Kingdom | 558 | 1.7% | December 2021 |
| United States | 2564 | 1.6% | January 2022 |

*App Intensity is the number of App Economy jobs divided by the total number of jobs in the country.
Data: U.S. App Economy Update 2022; Europe App Economy Update 2021

Another way of assessing the strength of Korea's App Economy is to look at the nationality of the companies who are doing well in terms of downloads and consumer spend.¹¹ In 2021, measured by number of downloads, 9 out of the top 10 companies are headquartered in Korea, led by NAVER, Kakao, and SK Group. Measured by consumer spend, 8 out of the top 10 companies are Korean.

It's useful to compare Korea with Germany's App Economy. The two countries have roughly the same number of App Economy workers. But in Germany, only 3 out of the top 10 companies measured by downloads are headquartered in Germany, and only 2 of the top 10 by consumers spending. Five are headquartered in the United States, two are headquartered in the U.K., and one is headquartered in China.

POLICY AND CONCLUSIONS

Korea's App Economy has entered an interesting period of development and regulation. Up to now, the Korean App Economy has been a sizable contributor to national employment. But notably, it was based on a system where much of the

cost of building, maintaining, and supporting the Korean app infrastructure has been provided by non-Korean firms, Apple and Google. At the same time, these companies received a share of download fees and in-app purchases. In effect, Apple and Google were getting a financial return on investing in the Korean App economy.

Korea implemented new regulations on the Apple App Store and Google Play as of March 2022, which required Apple and Google to give developers more choices for in-app payment systems.¹² In response, the two U.S. tech companies reduced their commission somewhat for developers who used alternative payment systems.¹³ In addition, Apple required developers to provide a separate binary for Korean iOS apps that use non-Apple payment systems.¹⁴ That's one step toward a globally fragmented internet.

The group of Korean companies that monetize their apps through download fees and in-app purchases — many of which are gaming and entertainment companies — would prefer that Apple and Google charge even lower commission rates. However, there is a much

larger second group of Korean companies whose apps do not charge significant download fees or make heavy use of in-app purchases. This second group would likely prefer the current system, because they benefit from distribution and malware screening services for virtually no cost. This second group would include banks, retailers, manufacturers, providers of telemedicine services, providers of travel apps, and virtually any app connected with the physical economy.

Security and privacy concerns will also be important for policy going forward. Apple and Google follow different mobile app development and distribution strategies, with Google taking more of an open approach and Apple restricting app downloads to the App Store. Nevertheless, both companies devote huge technological resources to scanning apps uploaded to their official stores for malware. These investments

have helped fuel the success of the Korean App Economy, which has been built on trust that downloaded apps will be safe. Regulators who underestimate security and privacy concerns run the risk of undercutting consumer trust in the mobile app ecosystems, and making it more difficult to use apps for key functions such as banking and health.

Finally, there is a broader issue as well. As one of the most technologically advanced countries in the world, Korean companies sell products and services globally, including cutting-edge chips, which embody large amounts of investment and intellectual capital. The question is whether Korea should be in favor of a global regulatory regime which intervenes in new technologies and significantly reduces the return on successfully-invested capital. That's not the way to achieve global growth or national success.

Methodology Appendix

Since 2012, we have developed and improved our methodology for estimating App Economy employment. The methodology uses online job postings for workers with app-related skills as a real-time measure of App Economy employment. This methodology can be applied to a wide variety of countries, languages, and economic environments.

As noted in the paper, an ICT-related job that uses App Economy skills — the ability to develop, maintain, or support mobile applications — is a “core” App Economy job. How do we tell which jobs require App Economy skills? The key is to look at help wanted ads — also called job postings — where enterprises actually describe the skills and knowledge they are looking for.

The key quantities that we need to estimate are:

Postings(App) = number of job postings for core App Economy jobs

Postings(ICT) = number of job postings for ICT jobs

Jobs(ICT) = number of ICT jobs

Jobs(App) = number of core App Economy jobs

We use the first three quantities to estimate the number of core app economy jobs:

(1) $\text{Jobs(App)} = \text{Postings(App)} / \text{Postings(ICT)} * \text{Jobs(ICT)}$

In other words, the share of core app economy job postings in ICT job postings is used to estimate the share of core app economy jobs in the total number of ICT jobs. To put it another way, if jobs that require App Economy skills are 20% of ICT job postings, we assume that they

are 20% of ICT jobs as well.

By rearranging terms, this is equivalent to saying that the ratio of ICT jobs to ICT job postings is the same as the ratio of core app economy jobs to core App Economy job postings:

(2) $\text{Jobs(ICT)} / \text{Postings(ICT)} = \text{Jobs(App)} / \text{Postings(App)}$

This is a reasonable assumption if the labor market process generating job postings for core app economy jobs is roughly similar to the labor market process generating job postings for ICT jobs. To put it another way, the assumption is that companies go about looking for app developers the same way they go about looking for all software developers.

Note that the ratio of jobs to job postings (equation 2) can differ greatly across countries and across occupational sectors of the economy. It can also change over time.

DATA

The source of the job posting data is kr.indeed.com, which is the Korean site for Indeed.com. Indeed, which calls itself the “#1 job site in the world,” is available in more than sixty countries.¹⁵ For each country, the associated Indeed site accepts Boolean search expressions, and outputs the number of job postings in that country fitting those criteria.

We use Indeed wherever possible because it gives us the ability to use the same search terms in different countries and know that they will behave consistently. This cross-country comparability is very important for our global approach.

The methodology consists of six distinct steps.

1. Identification and validation of core App Economy job postings

Using summary statistics generated by searches on the Indeed website, we identify online job postings containing one of the following key words: “iOS,” “Android,” “app,” or the Korean term for app.

By the nature of the data, a keyword search for core App Economy workers will typically include some irrelevant job postings. For example, the word “app” can appear in a job posting for a truck driver who needs to use an app on the job. In order to adjust for these and other irrelevant job postings, we manually examine a sample of the job postings from step 1 to eliminate those that do not fit our criteria of a core App Economy worker. This validation ratio yields us an estimate of Postings(App).

2. Identification and validation of ICT job postings

Our methodology relies on benchmarking information and communications technology (ICT) job postings against an estimate of ICT occupations. We construct a keyword list to identify ICT job postings, appending Korean language terms as appropriate.

As in the previous step, we manually examine a sample of the job postings to eliminate those that do not fit our criteria of an ICT occupation. This validation ratio yields us an estimate of Postings(ICT).

3. Calculation of core app economy job postings as share of all ICT job postings

We calculate $\text{Postings(App)}/\text{Postings(ICT)}$, which gives us core app economy job postings as a share of all ICT job postings. This percentage differs between countries, but tends to be relatively stable over time.

4. Estimation of benchmark ICT employment

The question in Korea is what figure to use for Jobs(ICT), our benchmark ICT employment figure. Whenever possible, our App Economy studies base our analysis on the total number of information and communications technology (ICT) professionals (ISCO-08) as reported by the International Labour Organization (ILO). This figure, which is available for over 60 countries, notably excludes “help desk workers,” so we uniformly adjust this number by a small percentage upwards.

For Korea, the ILO reports on total number of employed professionals, but not the number of ICT professionals. To estimate the number of ICT professionals in Korea, we assume that the share of ICT professionals in the professional workforce is the same in Korea as in the United States. That yields an estimate of 760,000 ICT professionals in Korea.¹⁶

5. Estimation of core and total App Economy jobs

Using equation (1) at the beginning of the methodology section, we estimate core App Economy jobs. Then we use a conservative estimate of the multiplier effect. We assume that each core App Economy job is associated with one indirect job at the same company, and one spillover job elsewhere in the local area. To put it another way, we assume that each job in the tech sector (core + indirect) generates 0.5 jobs elsewhere in the economy, for a 1.5 multiplier. This assumption is consistent with the latest research on employment multipliers.¹⁷

6. Estimation of the jobs that belong to the iOS or Android ecosystems

Out of the set of job postings containing the terms iOS or Android, we identify the share that contain terms belonging to the iOS ecosystem (containing one of the terms Apple, iPad, iPhone,

or iOS) and the share belonging to the Android ecosystem (containing one of the terms Android or Google). Note that these shares add up to more than 100%, because many job postings specify more than one mobile operating system (i.e. looking for an iOS/Android developer). Thus, a single job can belong to multiple ecosystems.

Typically, our methodology calls for applying these shares to all App Economy employment. For Korea, however, we have only limited visibility about the job openings at large companies such as Samsung.

So we modified our methodology. We applied the job posting share data to App Economy jobs at small and medium size companies, which we assume make up half the ICT workforce. For large companies, such as Samsung, we assumed that the proportion of App Economy jobs by operating system matched the overall use of mobile operating systems for Korea, which is roughly 27% iOS and 72% Android.¹⁸

ABOUT THE AUTHOR

Dr. Michael Mandel is Vice President and Chief Economist at the Progressive Policy Institute.

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