

WHERE THE JOBS ARE:

THE APP ECONOMY



TechNet

Research by

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EXECUTIVE SUMMARY

How can the U.S. dig itself out of the current job drought? Government policy can temporarily boost employment. The ultimate answer, though, is innovation: The creation of new goods and services that spur the growth of new industries capable of employing tens or hundreds of thousands of workers.¹

Nothing illustrates the job-creating power of innovation better than the App Economy. The incredibly rapid rise of smartphones, tablets, and social media, and the applications—“apps”—that run on them, is perhaps the biggest economic and technological phenomenon today. Almost a million apps have been created for the iPhone, iPad and Android alone, greatly augmenting the usefulness of mobile devices. Want to play games, track your workouts, write music? There are a plethora of apps to choose from, many of them free.

On an economic level, each app represents jobs—for programmers, for user interface designers, for marketers, for managers, for support staff. But how many? Conventional employment numbers from the Bureau of Labor Statistics are not able to

track such a new phenomenon. So in this paper we analyze detailed information from The Conference Board Help-Wanted OnLine® (HWOL) database,² a comprehensive and up-to-the-minute compilation of want ads, to estimate the number of jobs in the App Economy.

This analysis—conducted for TechNet by Dr. Michael Mandel of South Mountain Economics, LLC—shows that the App Economy now is responsible for roughly 466,000 jobs in the United States, up from zero in 2007 when the iPhone was introduced. This total includes jobs at ‘pure’ app firms such as Zynga, a San Francisco-based maker of Facebook game apps that went public in December 2011. App Economy employment also includes app-related jobs at large companies such as Electronic Arts, Amazon, and AT&T, as well as app ‘infrastructure’ jobs at core firms such as Google, Apple, and Facebook. In addition, the App Economy total includes employment spillovers to the rest of the economy.

Moreover, we find that App Economy jobs are spread around the country. The top metro area

for App Economy jobs, according to our research, is New York City and its surrounding suburban counties, although San Francisco and San Jose together substantially exceed New York. And while California tops the list of App Economy states, states such as Georgia, Florida, and Illinois get their share as well. In fact, more than two-thirds of App Economy employment is outside of California and New York. Our results also suggest that the App Economy is still growing at a rapid clip, which shouldn't be a surprise to anyone.

BACKGROUND

'App', in the sense that we mean it today, did not exist before the iPhone was introduced in 2007. Apps are relatively lightweight programs, specifically designed to run on mobile platforms such as the iPhone and Android phones. In the past couple of years, the term 'app' has been extended to Facebook applications as well. In the prospectus for its initial public offering, Zynga described the App Economy in this way:

In order to provide users with a wider range of engaging experiences, social networks and mobile operating systems have opened their platforms to developers, transforming the creation, distribution and consumption of digital content. We refer to this as the "App Economy." In the App Economy, developers can create applications accessing unique features of the platforms, distribute applications digitally to a broad audience and regularly update existing applications"³

It must be noted, of course, that the App Economy is only four years old and extremely fluid. Both the location and number of app-related jobs are likely to shift greatly. It should also be noted that the figures presented in this paper are estimates, based on innovative techniques developed for this project. Finally, these may represent "jobs not lost" rather than net jobs gained.

Yet the basic principle holds. Innovation creates jobs, and in this case, lots of them.

The term 'App Economy' started coming into use in early 2009, and was popularized by a prescient November 2009 BusinessWeek cover story.⁴

The combination of ease of development and ease of delivery makes possible a stunning variety of apps. To just give some examples: You can take verbal notes; make your voice sound like a robot; schedule plane flights; play a baseball simulation; have customized news delivered to your device; create a digitized voodoo doll; and edit Microsoft Word documents.

But the App Economy is much more than a better delivery channel for software. From the economic perspective, we can think of the App Economy as a collection of interlocking innovative ecosystems. Each ecosystem consists of a core company, which creates and maintains a platform and an app marketplace, plus small and large companies that produce apps and/or mobile devices for that

platform. Businesses can belong to multiple ecosystems and usually do.

The key platforms in the App Economy today are

- Android, anchored by Google;
- Apple iOS, anchored by Apple;
- Blackberry, anchored by RIM;
- Facebook, anchored by Facebook;
- Windows Phone and Windows Mobile, anchored by Microsoft

SIZING THE APP ECONOMY

The App Economy lends itself to several types of metrics. For example, it's relatively easy to count the number of apps in a particular app store, how many different developers, and even how many times apps have been downloaded. For example, the Apple App store had 529,550 active apps as of December 12, 2011, according to 148apps.biz, uploaded by 124,475 active publishers.⁵

Another important metric is revenue. By one estimate, the App Economy generated almost \$20 billion in revenue in 2011.⁶ This includes app downloads, in-app revenues, sales of virtual goods, and sales of physical goods and services.

Sizing the number of jobs generated by the App Economy is much more difficult, however. Any particular app could be created by a single teenager programmer, or by a large team at a big company.

Every major consumer-facing company, and many business-facing companies, has discovered that they need an app to be the public face of the business. In some sense, that makes the App Economy the construction sector of the 21st century, building a new front door to everyone's house and in some cases constructing a whole new house.

The process of updating and maintaining popular apps can be a hidden but a labor-intensive process. Finally, the construction and maintenance of the app infrastructure creates jobs as well.

One study of app-related jobs focused only on Facebook.⁷ Three academics estimated the number of jobs created by Facebook apps using data on number of downloads and number of developers. They estimated that "the number of employees employed by third party developers [of Facebook apps] to be 53,434." Then they calculated a range of spillover effects into the national economy, leading them to conclude that "a conservative estimate of the employment impact of developers building apps on the Facebook Platform in the United States in 2011 is 182,744 full time jobs."

METHODOLOGY

This paper takes a different, more general approach to estimating the number of jobs in the App Economy. We want to understand the whole labor market built up around apps—not just at the third party developers, but at the core firms as well. And we want a methodology that cuts across all the different ecosystems.

If the App Economy was more mature, we might be able to use the data that comes from the government statisticians at the Bureau of Labor Statistics. With a few years lag, the government updates its industry categories to reflect changes in the economy. For example, there is now a relatively new industry category labeled “Internet publishing and broadcasting and web search,” which includes companies such as Google, Yahoo, and Facebook.

However, the App Economy is far too new to show up in the government statistics. Instead, we use The Conference Board HWOL database, a compilation of online help-wanted ads that reflects “the full universe of all online advertised vacancies which are posted directly on internet job boards or through newspaper online ads.”⁸

This database has many advantages for a detailed look at new industries. It’s updated daily to reflect new ads, so it’s completely up to date. The ads are categorized by occupational category that matches the BLS occupational categories, so the number of want ads can be compared to BLS occupational

data. The database includes information on location and employers.

And perhaps most important, the database includes access to the full text of the ads, which allows keyword searches. This enables us to clearly identify those want ads that belong to the App Economy, with the right set of keywords.

Our procedure for estimating the number of App Economy jobs has several steps (see Table 1).

1. We identified a set of keywords that characterize want ads for App Economy computer and mathematical occupations, which for convenience we will call ‘tech jobs’;
2. We used historical relationships to estimate the ratio between the number of want ads for tech occupations and the actual level of tech employment;
3. We examined a sample of third-party app developers to estimate the ratio of tech jobs to non-tech jobs in the App Economy;
4. We drew from the literature to derive a conservative estimate of the spillover effects to the broader economy;
5. We used the location data in The Conference Board database to estimate App Economy jobs by metro area and by state.

Table 1: Methodology Summary

Non-duplicated help-wanted ads for app economy jobs

Using The Conference Board Help-Wanted Online database, we identified want ads for computer and mathematical occupations containing one of the following key words or phrases: Android, app, Blackberry, “Facebook API”, iOS, iPhone, “Windows Mobile,” “Windows Phone”.

Want-ad to employment ratio

We calculate the ratio between the number of want ads and the level of employment for app economy jobs, using 4 years of monthly data for computer and mathematical occupations from The Conference Board and from the BLS.

Tech employment to total employment ratio

We calculate the ratio between the number of tech jobs and total jobs in an App Economy company, using The Conference Board data on want ads for a sample of pure app economy companies.

Job creation multiplier

We estimate the total number of jobs created given the spillover effects of app economy jobs, based on our judgmental assessment of research on job multipliers.

RESULTS

The first step was to choose a set of key words and phrases that would give us a fair representation of tech jobs in the App Economy.⁹ The key words and phrases we chose were:

- Android
- App
- Blackberry
- iOS
- iPhone
- “Facebook API”
- “Windows Mobile”
- “Windows Phone”

We identified all want ads for tech jobs—computer and mathematical occupations—which appeared online in the 90 days ending December 31, 2011, and contained at least one of these key words and phrases. In other words, this filter would capture an ad for a software engineer with iOS experience, or with knowledge of the Facebook API.

In order to verify that this filter was identifying the right want ads, we examined a sample of identified ads, and compared them to ads being run by well-known third party developers. For example, an ad by one App developer looking for an iOS development engineer and requiring “1–2+ years of iOS development experience” clearly was appropriate.

Over the 90-day period ending December 31, 2011, we identified roughly 44,400 non-duplicated ads for computer and mathematical occupations, and containing one or more of the above keywords.

These are ads for U.S. jobs. By comparison, there were 952,000 want ads for all computer and mathematical occupations over the same period. As a result, App Economy want ads made up 4.7% of the tech job total.¹⁰

Now we need to establish a ratio between actual employment and want ads. Obviously this ratio varies depending on whether companies are hiring or not. It will also vary across occupations, since hiring practices are different depending on the type of job. For example, companies are more likely to run want ads for computer programmers than for managers, relative to the total level of employment.

However, an examination of the past four years of data of want ads for computer and mathematical occupations, in particular, suggests that tech jobs and tech want ads tend to move together, except for anomalous periods such as 2009, at the bottom of the downturn. In particular, roughly 3.5 million workers were employed in tech jobs (computer and mathematical occupations) in the fourth quarter of 2011, a period which also saw roughly 1 million tech want ads. That suggests a ratio of roughly 3.5 tech jobs for each tech want ad (90-day unduplicated).

We derived this 3.5 ratio for the broad category of computer and mathematical occupations (tech jobs). The major assumption of this paper is that the same ratio holds for tech jobs and tech want ads in the App Economy.¹¹

Based on this ratio, our analysis suggests that there were 155,000 tech jobs in the App Economy as of December 2011. This number would include developer and tech support jobs at both dedicated app developers and at large companies who create apps for them or for others.

The next step is to calculate the ratio of non-tech jobs to tech jobs at App Economy enterprises. Obviously new startups in the tech area are weighted very heavily towards tech jobs—computer software engineers, developers and the like. But as companies grow, they add human resources, sales, marketing, and all sorts of other non-tech function. A careful examination of want ads placed by mid-size app developers suggests that a 1 to 1 ratio between tech jobs and non-tech jobs is not unreasonable.

SPILOVERS

There's a very long history of economic studies calculating the job market impact of various activities, from Wall Street to real estate to exports to broadband. Within the context of these studies, it's traditional to use a multiplier to estimate the combination of the direct and indirect job creation, such as the number of restaurant jobs created in New York by each investment banker job.

While the general principle of a multiplier is obvious, there's a lot of dispute about how big it should be. The Facebook job study mentioned above, for example, assumed that the multiplier should lie

That assumption implies that there are roughly 311,000 jobs in App Economy firms, not accounting for spillover effects into the rest of the economy (see Table 2). These include tech jobs, which require app-related skills, and the corresponding non-tech jobs.

Is 311,000 a big number or a small number? Figure 1 compares the App Economy employment (not including spillovers) with employment in several key tech industries. We see that App Economy employment is slightly larger than the number of jobs in the software publishing industry, at least as reported by the BLS. That makes the App Economy a significant force. (Remember that App Economy jobs are embedded within these industries, and are not a separate industry themselves).

between 2.4 and 3.4, based on past studies of the job impact of broadband (it's also traditional to use previous estimates of the multiplier, no matter how outrageous they are.)

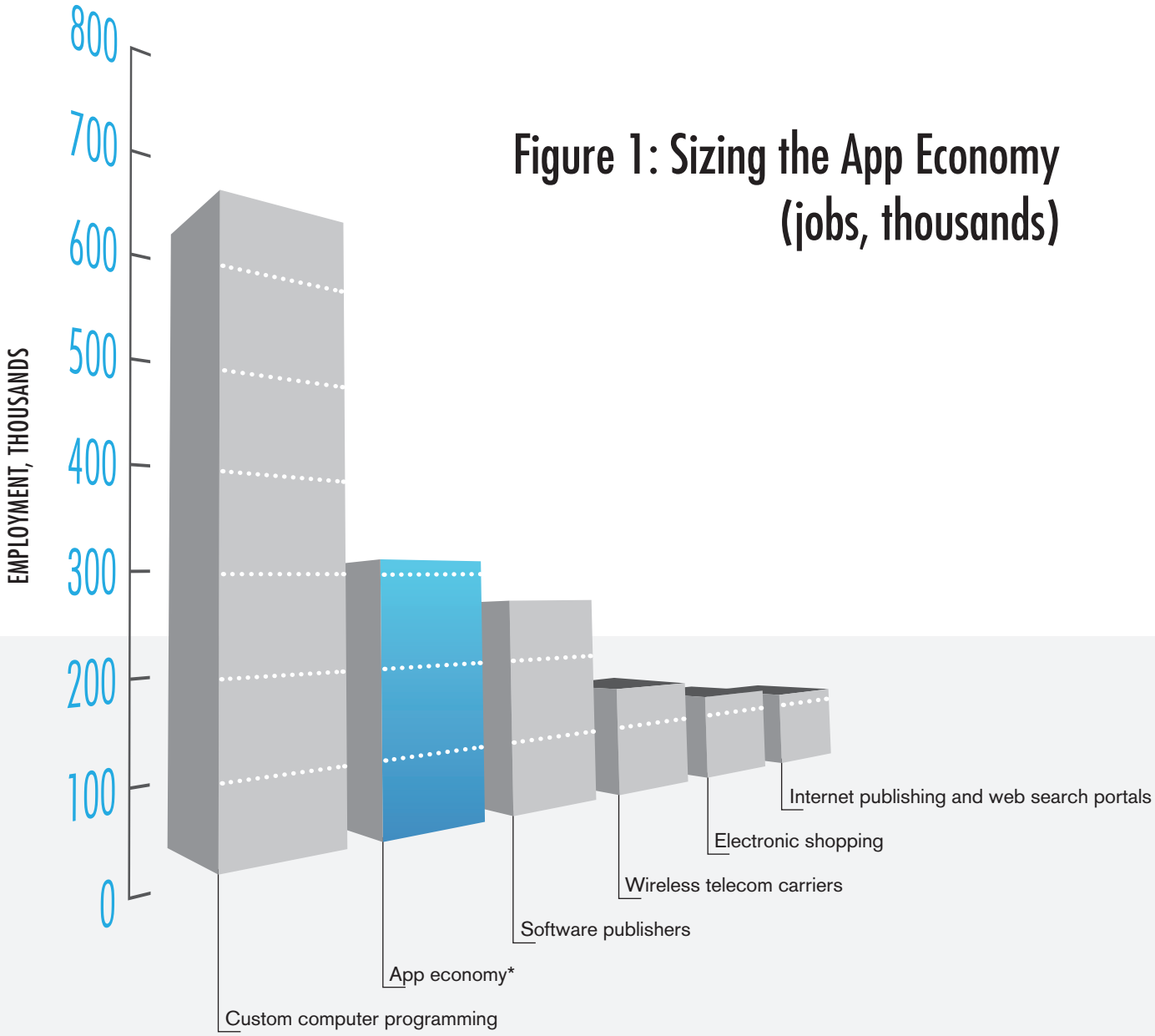
For the purpose of this study, we use a conservative multiplier of 1.5. Based on this multiplier, every app economy job generates another 0.5 jobs in the rest of the economy. This may be unduly conservative, but it suggests that in the aggregate, roughly 466,000 jobs have been created by the App Economy since the iPhone was introduced in 2007.

Table 2: Estimating the Size of the App Economy, December 2011*

SOURCE	NUMBER (thousands)
Non-duplicated help-wanted ads for app economy jobs (computer and mathematical occupations only)	44.4
Want-ad to employment ratio for computer and mathematical occupations	x 3.5
Estimated computer and mathematical employment in App Economy	=155.4
Tech to total employment ratio	x 2
Total jobs in App Economy	=310.8
Multiplier for job creation outside the app companies	x 1.5
Total economic impact	=466.1

*90 days ending December 31, 2011. Numbers may be rounded.
Data: The Conference Board, South Mountain Economics LLC.

Figure 1: Sizing the App Economy (jobs, thousands)



*App economy employment, not including spillovers. Based on 90 days ending December 31, 2011. Industry employment as of November 2011. App economy jobs are distributed across all industries. Data: The Conference Board, BLS

GEOGRAPHIC DISTRIBUTION

People think of the App Economy as being centered in Silicon Valley, because that's the headquarters of the core firms—Apple, Google, and Facebook. What's more, the most visible pure app company, Zynga, is located in San Francisco.

But judging by the location of want ads, the App Economy is widely distributed around the country. Table 3 shows the top 10 metro regions for distribution of App Economy jobs across metro areas, with the New York metro area accounting for 9.2% of the total, followed closely by San Francisco and San Jose metro areas.

Probably one reason for New York's prominence is the concentration of media, advertising, and finance in the region. These are all sectors where major companies have been virtually forced to create apps or be left behind. Indeed, the App Economy may be playing a key role in keeping the New York City economy afloat during the downturn.

Not surprisingly, App Economy employment in San Francisco and San Jose together exceeds New York's total. Other non-NY and non-Silicon Valley

metro areas on the top ten list include Seattle, Los Angeles, Washington DC, Chicago, and Boston. These are all areas where the App Economy presence is significant.

We can do the same analysis on a state level, as shown in Table 4. App Economy jobs are concentrated in California, which has almost one-quarter of the total. The next four states are New York, Washington, Texas, and surprisingly, New Jersey.

Table 3: Location of App Economy Jobs by Metro Area

MSA	PERCENTAGE OF APP ECONOMY JOBS, DECEMBER 2011*
New York-Northern New Jersey-Long Island	9.2%
San Francisco-Oakland-Fremont	8.5%
San Jose-Sunnyvale-Santa Clara	6.3%
Seattle-Tacoma-Bellevue	5.7%
Los Angeles-Long Beach-Santa Ana	5.1%
Washington-Arlington-Alexandria	4.8%
Chicago-Naperville-Joliet	3.5%
Boston-Cambridge-Quincy	3.5%
Atlanta-Sandy Springs-Marietta	3.3%
Dallas-Fort Worth-Arlington	2.6%
San Diego-Carlsbad-San Marcos	2.3%
Philadelphia-Camden-Wilmington	1.9%
Portland-Vancouver-Beaverton	1.8%
Minneapolis-St. Paul-Bloomington	1.6%
Denver-Aurora	1.3%
Detroit-Warren-Livonia	1.1%
Phoenix-Mesa-Scottsdale	1.1%
Austin-Round Rock	1.1%
Baltimore-Towson	0.9%
Miami-Fort Lauderdale-Miami Beach	0.9%
Houston-Sugar Land-Baytown	0.8%

*Based on 90 days of unduplicated want ads, ending December 31, 2011.
Data: The Conference Board, South Mountain Economics LLC

Table 4: Top Ten States for App Economy Jobs

STATE	PERCENTAGE OF APP ECONOMY JOBS
California	23.8%
New York	6.9%
Washington	6.4%
Texas	5.4%
New Jersey	4.2%
Illinois	4.0%
Massachusetts	3.9%
Georgia	3.7%
Virginia	3.5%
Florida	3.1%

Data: The Conference Board, South Mountain Economics LLC.

GROWTH

Has App Economy employment topped out, or can we expect it to grow further? To get an idea of the labor market trends in the App Economy, we look at the number of want ads for computer and mathematical occupations that use the word 'app'. That won't be a completely accurate measure—since some ads use the word 'app' simply as an abbreviation for any software application—but it does give a good idea of growth.

In Figure 2 we see that the growth in the App Economy has followed the classic S-shape. The

figure shows a slight dip in early 2009, reflecting the deep overall recession. That was followed by a dramatic acceleration in 2009, 2010 and early 2011, and then a relative slowing of growth.

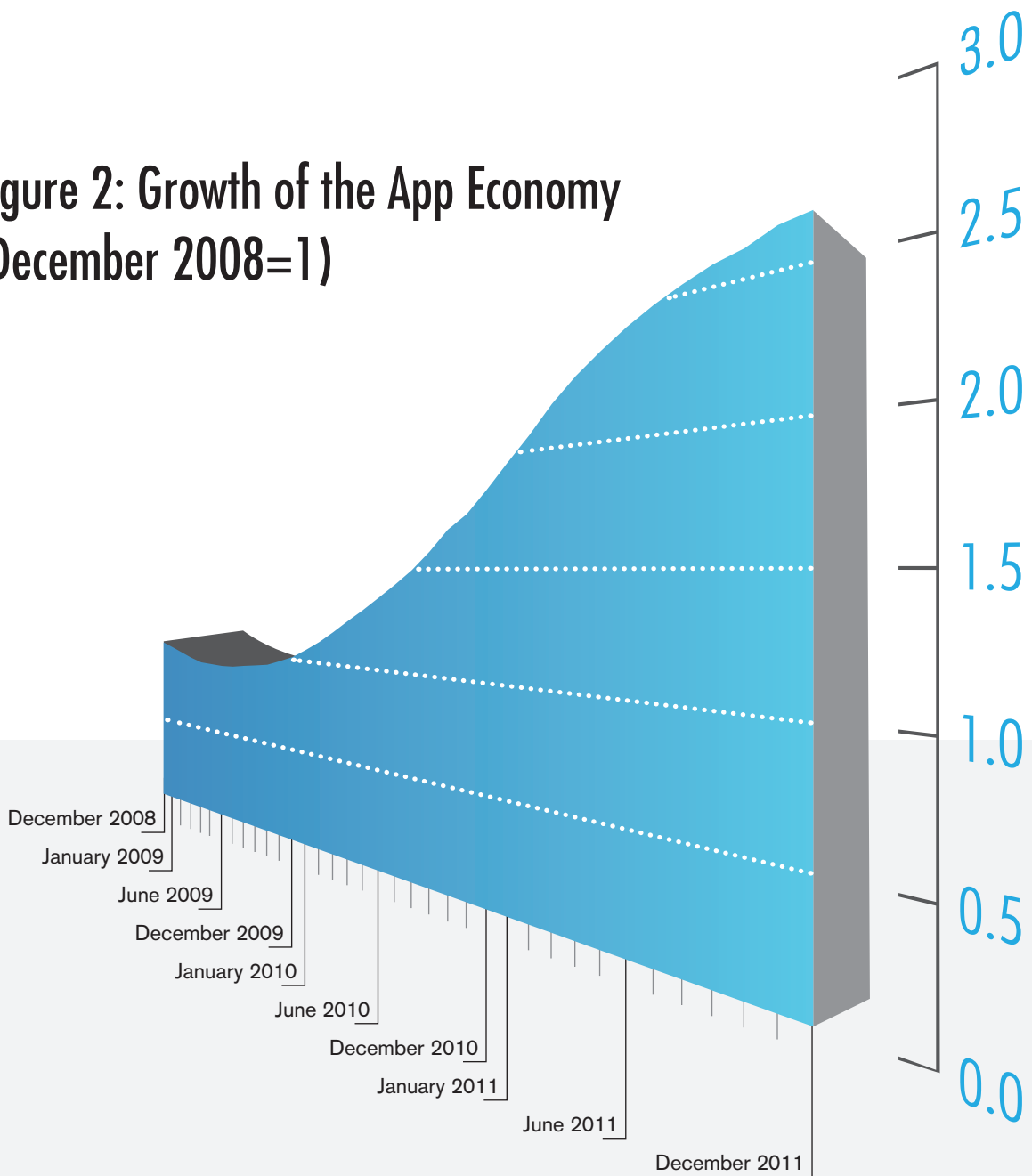
However, the key word here is 'relative'. In the year ending December 2011, the average number of tech want ads containing the word 'app' was still 45% higher than the previous year. That's rapid expansion by anyone's standards.

FUTURE GROWTH AND CONCLUSIONS

We have taken a snap shot of the App Economy, using The Conference Board HWOL database as our illumination. According to our analysis, the App Economy has created roughly 466,000 jobs since the iPhone was introduced in 2007.

How big can the App Economy get? That depends in many ways on the future of wireless and social networks. If wireless and social network platforms continue to grow, then we can expect the App Economy to grow along with them.

**Figure 2: Growth of the App Economy
(December 2008=1)**



Help-wanted ads for computer and mathematical occupations that contain the word 'app'; 12-month moving average
Data: The Conference Board



ABOUT TECHNET

TechNet is the preeminent bipartisan political network of CEOs and Seniors Executives that promotes the growth of technology-led innovation. Founded in 1997 by visionaries John Doerr, Jim Barksdale and John Chambers, TechNet unites with government leaders across the country to sculpt public policies that ensure American competitiveness and economic leadership. TechNet members are chief executive officers and senior executives of the nation's leading companies in the fields of information technology, biotechnology, clean technology, venture capital, e-commerce and finance. Together, they represent two million employees and \$800 billion in revenues. As part of our network, TechNet members enjoy unique access to critical discussion that shapes our nation's public policy. TechNet provides members

the opportunity to forge deep relationships with both federal and state policymakers and other industry leaders. Under the direction of industry leaders, TechNet is now the technology industry's strongest voice in innovation, as a powerful fundraising network, an effective policy advocacy organization and through its nonprofit ConvergeUS with a mission of uniting the industry around technology enabled solutions to solve societal problems. Through our policies, our advocacy, and the power of our network, TechNet has an extraordinary impact on federal and state issues that are critical to sustaining American competitiveness in the global market. Learn more about TechNet at www.technet.org or follow us on Twitter @technetupdate.

ABOUT DR. MICHAEL MANDEL

Dr. Michael Mandel is president of South Mountain Economics LLC, a consulting firm which tracks the impact of innovation and trade on state, local, and national labor markets. His blog, "Mandel on Innovation and Growth," can be found at <http://www.southmountaineconomics.com>. Dr. Mandel, who holds a PhD in economics from Harvard University, formerly served as chief economist at BusinessWeek, where he directed the magazine's coverage of the domestic and global economies. While at BusinessWeek, Dr. Mandel was named one of the top 100 business journalists of the 20th century for his writings on innovation and growth. He received multiple awards for his work, including "Best

Economic Journalist of the Year" by the World Leadership Forum, and the Gerald Loeb Award for Business and Financial Journalism, the top award in the field. Dr. Mandel also serves as Chief Economic Strategist at the Progressive Policy Institute in Washington DC. He is Senior Fellow at the Mack Center for Technological Innovation at the Wharton School, and produces education-oriented economics videos through his company Visible Economy LLC. He is also the author of four books, including an introductory economics textbook, *Economics: The Basics*, now in its second edition. His main twitter feed is @MichaelMandel, and his textbook twitter feed is @MandeltheBasics.

ENDNOTES

- 1 See, for example, the July 2010 paper from the Progressive Policy Institute: "The Coming Communications Boom? Jobs, Innovation and Countercyclical Regulatory Policy".
- 2 We thank June Shelp and The Conference Board for use of their well-organized Help Wanted OnLine® (HWOL) database. The Conference Board bears no responsibility for the analysis in this report.
- 3 Zynga prospectus, filed 12/15/11
- 4 "Inside the App Economy," *BusinessWeek*, November 2, 2009.
- 5 <http://148apps.biz/app-store-metrics/>
- 6 "How Big is the US App-Economy? Estimates and Forecasts 2011-2015" by Appnation and Rubinson Partners, Inc., November 2011
- 7 "The Facebook App Economy," Il-Horn Hann, Siva Viswanathan and Byungwan Koh , University of Maryland, September 2011
- 8 The monthly public release can be found at <http://www.conference-board.org/data/helpwantedonline.cfm>
- 9 At this stage we are focused solely on tech jobs, which are computer and mathematical occupations. This category includes software and web developers; database and network administrators; computer support specialists; statisticians; and related technicians. We can identify non-tech App Economy want ads from The Conference Board database if we know the employer is a pure app company such as Zynga. More generally, however, an ad for a human resources job at an app developer cannot be distinguished from other HR jobs.
- 10 If we look at shorter periods, the number of non-duplicated want ads goes down, of course. For example, in the week ending December 15, there were 10585 non-duplicated want ads for App Economy tech jobs, roughly 4.1% of the total for all tech want ads for that week.
- 11 When we look at individual app developers, this ratio seemed roughly correct.