



The Direction of Broadband Spillovers

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..... Revenue for US Internet access more than doubled during the first decade of the millennium owing to some simple arithmetic: the number of households using the Internet increased, and prices for broadband access averaged twice those of dial-up. More concretely, in the summer of 2000, while 37.1 percent of US households connected with dial-up, only 4.4 percent had broadband. By October 2009, 63.5 percent of US households connected with broadband.

The upgrade to broadband initially led most US households to spend more time online. At first, much of that new time went into the same activity found in dial-up (for example, checking e-mail, reading news, and shopping). Only gradually did users add activities that dial-up couldn't handle (such as watching YouTube videos, downloading music, or reading many blogs). By now, the transformation is rather apparent: broadband has created more online users and, moreover, these users are more valuable users of electronic commerce and advertising-supported media.

The relationship between broadband's growth and other online markets is what economists call a *growth spillover*—that is, growth in one market spilled into another. Spillovers can be negative or positive. For example, broadband's diffusion produced negative spillovers for the printed magazine and newspaper business, and it produced a positive spillover for online video sharing, such as YouTube.

Spillovers don't need to be confined to a geographically local area, so they're often challenging to observe and trace. This column focuses on understanding the geographic direction of the positive spillovers from broadband to online retailers and advertising-supported media, about which we know very little. To whom did the positive gains flow, and where?

Who and where?

Because so many households surf at the same sites, the most popular web sites provide good clues about which suppliers benefited from seeing more and better surfers. Accordingly, I downloaded Alexa's list of the top 100 web sites in the United States for January 2011.

Why this list and not another? First, it was convenient and easy to use (let's give Alexa some credit for that). Second, this list has all the representative names one might expect to find. After all, Google, Yahoo, Facebook, eBay, and Amazon should be at the top of any list, and they were on Alexa's, too.

To be sure, this list has one obvious drawback: it's too short. The top 100 web sites doesn't include any of the long tail of little niche online sites. This exercise necessarily raises a question: are the locations of popular sites similar or different from smaller sites?

Why go forward despite this open question? Surfing is skewed toward popular sites, so even the top 100 sites are informative about more than half of a typical

household's time online. Additionally, my goal is to hint at an answer, even if I can't be definitive. Because I had no answer before I made this list, any hint of an answer is better than nothing. Finally, I would be delighted if my exercise motivates someone else to put together another list. (Feel free to make a list yourself. When you finish it, please send me an e-mail, telling me what you get.)

I focused on only the profit-oriented commercial web sites—namely, sites providing electronic commerce and advertising-supported media. Thus, I removed nonprofit organizations (such as the US Postal Service and Wikipedia) and firms in infrastructure or broadband businesses (such as Comcast, Verizon, and Go Daddy). Finally, I removed all firms based outside the US (such as BBC.com). That left 83 firms (see Table 1).

The first finding confirms what I had suspected—namely, the positive spillovers from broadband had to have been high for this group of firms. According to Alexa, the typical firm in this sample got 46 percent of its traffic from US users. Because most of these firms depend on US users for a high fraction of their traffic, this group benefited when US surfers stayed online longer or bought more goods.

Who are these firms? I classified firms into electronic commerce and advertising-supported media. Take this classification with a grain of salt, please. While most of the time this classification was obvious,

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a few choices were confusing, maybe even a bit arbitrary. For example, I classified FedEx as electronic commerce because its business is shipping. MSN.com and Bing looked like advertising-supported sites, while Microsoft's home site (for software sales and support) looked more like electronic commerce. I also counted the four porn companies in this sample as electronic commerce, though they seem to be a category unto themselves.

By this count, 58 of the 83 firms (70 percent) were in an advertising-supported business. I later checked to see whether the two types of firms differed in their locations, and largely, they did not.

I assigned each company to one location—usually, the company headquarters. This is informative about spillovers if most of a firm's online support staff is located near the company headquarters. It's less likely to be informative for a large firm that spreads employment around. Once again, a grain of salt is required.

Who benefits?

The first conclusion from Table 1 shouldn't surprise anyone. The Bay Area is headquarters to the largest fraction of firms who gained a spillover. Northern California had 31 firms (37.3 percent) in this sample, 2.5 times more than each of the next two biggest areas: the greater Seattle region—12 firms (14.5 percent)—and the greater New York City area—11 firms (13.2 percent). The next largest cluster was Southern California, which had 7 firms (8.4 percent). The other 22 firms (26.5 percent) came from other locations throughout the US.

Many examples from Northern California tell the same story: it's the most common location for software start-ups that gained spillovers from broadband's deployment. Indeed, the Valley might have gained even more than the table indicates if the largest firms in this sample—Google, YouTube, Yahoo, Facebook, and eBay—kept the majority of their operations in Northern California.

The table also supports a second, and somewhat different, conclusion. The

Table 1. 83 commercial-oriented online firms from Alexa's top 100.

Firm type and location	Number of firms	Percent
Advertising-supported firms	58	70
Electronic commerce firms	25	30
% US traffic at site (median firm)	N/A	46
Located in Northern California	31	37.3
Located in the Seattle area	12	14.5
Located in the New York City area	11	13.2
Located in Southern California	7	8.4
Located elsewhere	22	26.5

Northern California fraction, 37 percent, is big, but not overwhelming. Other parts of the country probably got positive spillovers.

More to the point, if you look more closely, it appears the stories about positive spillovers elsewhere only partially overlap with those in the Valley. Seattle's status mostly reflects the presence of Microsoft, Amazon, and some other software firms founded by alumni of those firms. New York's status partly reflects old-line media that have made a transition into the present (such as the *New York Times* and *Wall Street Journal*), but it also partly reflects some Silicon Alley entrepreneurship. Finally, Southern California's number reflects a mix of sites (such as Hulu), and the presence of three porn sites, a consequence of the video industry that has been there for decades.

A third conclusion also isn't surprising: a quarter of the spillovers fell all over the place. Upon close inspection, it's clear why: many firms chose their headquarters long before broadband grew. That explains the locations for, say, Target, Best Buy, Walmart, and UPS—all major beneficiaries from spillovers to electronic commerce firms today. The same goes for some advertising-supported firms, too, such as CNN and AOL. Additionally, some recent start-ups ended up in their locations for idiosyncratic reasons, or have created such a virtual organization that no location singularly defines them. Match.com, Groupon, and WordPress are examples.

A final conclusion concerns the lack of representation for some regions. More than half the states in the US had no

firm among these 83. This might be an artifact of leaving off the long tail of niche suppliers, so I won't make too much of it.

This first look at positive spillovers begs several questions. First, does the long tail of niche online firms resemble their bigger brethren in their locations and their dependence on broadband? I would guess partly yes. Second, does the geographic pattern of negative spillovers—for example, newspapers and magazines—correspond closely to the geographic pattern for positive spillovers? I would guess not. Third, does the geography of positive spillovers to online firms resemble the pattern for equipment suppliers, another beneficiary of positive spillovers from broadband? Again, I would guess not.

These are all just guesses. We won't know the answer until someone puts together the appropriate lists.

Does this partial answer about the geography of positive spillovers change any policy discussion today? I would say yes. For example, the standard analysis for building rural broadband—to roughly 5 million households—assumes that broadband will improve local schools, libraries, and hospitals and make local businesses more productive. What about positive spillovers? Are these local? After this exercise, I would guess not. Many positive spillovers go to national firms in electronic commerce and advertising-supported services—namely, firms in the urban areas of Northern California, Seattle, and New York. In short, none of these positive spillovers are rural.