Proposed legislation threatens our Internet ecosystem.

With The Stop Online Piracy Act and Protect IP Act, investment will collapse, and our future will be cut short.

We will miss innovation and opportunity.

$43 Billion in investments from Angels and VCs for 65,000 companies *In 2010

11% of total U.S. employment is accounted for by VC-backed companies.

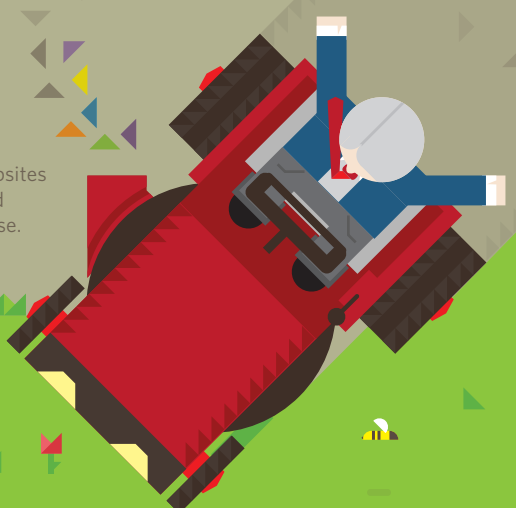
4th largest category of VC investment in 2010 (Media & Entertainment).

New restrictions like SOPA will restrict growth.

80% of investors are uncomfortable investing in business models beset by regulatory ambiguity.

89% of investors are uncomfortable investing when the amount of damages is uncertain and potentially large.

81% reduction in interested investors by regulations holding websites liable for user-uploaded content without a license.



The Internet and Digital Content industries are thriving and growing.

~3 Million American jobs created by the Internet industry.

15% U.S. GDP growth over the past five years attributed to the Internet industry.

10% increase in small & medium-sized business productivity attributed to the Internet industry.

$32.5 Billion expected as the size of the digital music market in 2014.

$9 Billion expected as the size of the web-to-TV video market in 2014.

$17 Billion expected as the size of the e-book market in 2013.

Industries affected

- Music
- Videos, Movies & TV
- Books
- Social, Photos
- Blogs, News

Amazon
Netflix
Spotify
iTunes
Google AdSense
TuneCore
Facebook
Twitter
Hulu
Youtube

THE ECONOMICS OF SOPA AND PROTECT IP

1. Letter from the Leading Internet and Tech Companies Opposing SOPA (November 15, 2011)
2. Entrepreneurs' Opposition Letter on the PROTECT IP Act (September 8, 2011)
3. Venture Capitalists' Opposition Letter on the PROTECT IP Act (June 23, 2011)
4. Statement in Opposition to SOPA by Christian Dawson of the Save Hosting Coalition
5. Booz & Company, "The Impact of U.S. Internet Copyright Regulations on Early-Stage Investment: A Quantitative Study"
6. Josh Lerner, "The Impact of Copyright Policy Changes on Venture Capital Investment in Cloud Computing Companies" White Paper
7. McKinsey Global Institute, "Internet matters: the Net's sweeping impact on growth, jobs, and prosperity" Study (May 2011)

400 North Capitol Street, NW
Suite 585
Washington, DC 20001

November 15, 2011

The Honorable Pat Leahy
Chairman
Committee on the Judiciary
United States Senate
Washington, DC 20510

The Honorable Chuck Grassley
Ranking Member
Committee on the Judiciary
United States Senate
Washington, DC 20510

The Honorable Lamar Smith
Chairman
Committee on the Judiciary
House of Representatives
Washington, DC 20515

The Honorable John Conyers, Jr.
Ranking Member
Committee on the Judiciary
House of Representatives
Washington, DC 20515

Dear Chairman Leahy, Ranking Member Grassley, Chairman Smith and Ranking Member Conyers:

The undersigned Internet and technology companies write to express our concern with legislative measures that have been introduced in the United States Senate and United States House of Representatives, S. 968 (the "PROTECT IP Act") and H.R. 3261 (the "Stop Online Piracy Act").

We support the bills' stated goals -- providing additional enforcement tools to combat foreign "rogue" websites that are dedicated to copyright infringement or counterfeiting. Unfortunately, the bills as drafted would expose law-abiding U.S. Internet and technology companies to new uncertain liabilities, private rights of action, and technology mandates that would require monitoring of web sites. We are concerned that these measures pose a serious risk to our industry's continued track record of innovation and job-creation, as well as to our Nation's cybersecurity. We cannot support these bills as written and ask that you consider more targeted ways to combat foreign "rogue" websites dedicated to copyright infringement and trademark counterfeiting, while preserving the innovation and dynamism that has made the Internet such an important driver of economic growth and job creation.

One issue merits special attention. We are very concerned that the bills as written would seriously undermine the effective mechanism Congress enacted in the Digital Millenium Copyright Act (DMCA) to provide a safe harbor for Internet companies that act in good faith to remove infringing content from their sites. Since their enactment in 1998, the DMCA's safe harbor provisions for online service providers have been a cornerstone of the U.S. Internet and technology industry's growth and success. While we work together to find additional ways to target foreign "rogue" sites, we should not

jeopardize a foundational structure that has worked for content owners and Internet companies alike and provides certainty to innovators with new ideas for how people create, find, discuss, and share information lawfully online.

We are proud to be part of an industry that has been crucial to U.S. economic growth and job creation. A recent McKinsey Global Institute report found that the Internet accounts for 3.4 percent of GDP in the 13 countries that McKinsey studied, and, in the U.S., the Internet's contribution to GDP is even larger. If Internet consumption and expenditure were a sector, its contribution to GDP would be greater than energy, agriculture, communication, mining, or utilities. In addition, the Internet industry has increased productivity for small and medium-sized businesses by 10%. We urge you not to risk either this success or the tremendous benefits the Internet has brought to hundreds of millions of Americans and people around the world.

We stand ready to work with the Congress to develop targeted solutions to address the problem of foreign "rogue" websites.

Thank you in advance for your consideration.

eBay Inc.
Facebook Inc.
Google Inc.
LinkedIn Corporation
Mozilla Corp.
Twitter, Inc.
Yahoo! Inc.
Zynga Game Network

To Members of the United States Congress:

The undersigned are 130 entrepreneurs, founders, CEOs and executives who have been involved in 283 technology start-ups, and who have created over 50,000 jobs directly through our companies and hundreds of thousands, if not millions, more through the technologies we invented, funded, brought to market and made mainstream. We write today urging you to reject S.968, the PROTECT IP Act, also known as "PIPA." We appreciate the stated purpose of the bill, but we fear that if PIPA is allowed to become law in its present form, it will hurt economic growth and chill innovation in legitimate services that help people create, communicate, and make money online.

It is a truism that small businesses create significant economic growth and jobs, but it is more accurate to say that *new* businesses, including tech start-ups, are most important.[1] The Internet is a key engine of today's economy,[2] and much of its economic contribution is attributable to companies that did not even exist 10 or even 5 years ago. The Internet has also created new opportunities for artists and other content creators -- today, there is more content being created by more people on more platforms (including some of our businesses) than ever before.

We are not opposed to copyright or the bill's intent, but we do not think this bill will actually fulfill copyright's purpose of encouraging innovation and creativity. While the bill will create uncertainty for many legitimate businesses and in turn undermine innovation and creativity on those services, the dedicated pirates who use and operate "rogue" sites will simply migrate to platforms that conceal their activities.

Our concerns include the following:

- **The notion of sites "dedicated to infringing activities" is vague and ripe for abuse, particularly when combined with a private right of action for rightsholders:** Legitimate sites with legitimate uses can also in many cases be used for piracy. Historically, overzealous rightsholders have tried to stop many legitimate technologies that disrupted their existing business models and facilitated some unauthorized activity. The following technologies were condemned at one point or another - the gramophone (record player), the player piano, radio, television, the photocopier, cable TV, the VCR, the DVR, the mp3 player and video hosting platforms. Even though these technologies obviously survived, many individual businesses like DVR-maker ReplayTV and video platform Veoh were not so fortunate - those companies went bankrupt due to litigation costs, and sold their remaining assets to foreign companies.

  PIPA provides a new weapon against legitimate businesses and "rogue" sites alike, and the concern in this context is not merely historical or theoretical. Recent press reports noted that advertising giant WPP's GroupM subsidiary had put together a list of 2,000 sites that were declared to be "supporting piracy," on which none of its advertising would be allowed to appear. That list - which was put together with suggestions from GroupM clients - includes Vibe.com, the online version of the famed Vibe Magazine, founded by Quincy Jones, and a leading publication for the hip hop and R&B community. It also included the Internet Archive's Wayback Machine, which preserves copies of Web pages in order to fill a similar function as libraries.

  When a famous magazine and a library get lumped in with "rogue pirate sites" in this way, it's not hard to see how an overzealous copyright holder might seek to shut legitimate businesses down through PIPA.

- **The bill would create significant burdens for smaller tech companies:** One of the key reasons why

[1]See John Haitiwanger et al, Who Creates Jobs? Small vs. Large vs. Young, *US Census Bureau Center for Economic Studies Paper No. CES-WP- 10-17* (August 2010), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1666157&

[2]See McKinsey Global Institute, Internet Matters (May 2011), available at http://www.mckinsey.com/mgi/publications/internet_matters/pdfs/MGI_internet_matters_full_report.pdf

startups and innovative small businesses became the success stories we know of today was protection from misguided lawsuits under the safe harbors of Section 512 of the Digital Millennium Copyright Act (DMCA). By properly putting the legal liability on the actual actors of infringement rather than third-parties, Congress wisely ensured that service providers, such as many of the companies represented in this letter, could flourish.

PIPA would put new burdens and possible liability on independent third parties, including payment processors, advertising firms, information location tools and others. The definitions here are incredibly vague, and many companies signed below could fall under the broad definitions of "information location tools," meaning costly changes to their infrastructure, including how we remain in compliance with blocking orders on an ever-changing Internet.

Separately, including a private right of action means that any rightsholder can tie up a service provider in costly legal action, even if it eventually turns out to not be valid. Given the broad definitions used above for sites "supporting piracy," it's not difficult to predict that plenty of legitimate startups may end up having to spend time, money and resources to deal with such actions.

These burdens will be particularly intense for small businesses who can't easily afford the legal fees, infrastructure costs or staff required to remain in compliance with broadly worded laws in a rapidly changing ecosystem.

Legitimate services already do their part by following the notice-and-takedown system of the DMCA. While we take these types of legal responsibilities seriously and already take on costs to do so, that's no reason to pile on additional regulations.

- **Breaking DNS will harm our ability to build new, safe, and secure services.** As detailed in a recent whitepaper by some of the foremost experts in Internet architecture and security, PIPA will fragment parts of key Internet infrastructure, and disrupt key security tools in use today.[3] Interfering in the basic technological underpinnings of the Internet that we all rely on today would be a huge anchor on innovation in many of our companies.

As Web entrepreneurs and Web users, we want to ensure that artists and great creative content can thrive online. But this isn't the right way to address the underlying issue. Introducing this new regulatory weapon into the piracy arms race won't stop the arms race, but it will ensure there will be more collateral damage along the way. There are certainly challenges to succeeding as a content creator online, but the opportunities are far greater than the challenges, and the best way to address the latter is to create more of the former.

In other words, innovation in the form of more content tools, platforms and services is the right way to address piracy -- while also creating new jobs and fueling economic growth. Entrepreneurs like us can help do that; PIPA can't.

Sincerely,

(In alphabetical order by name, followed by companies either founded or where one was in a job-creating executive role)

Jonathan Abrams
Nuzzel, Founders Den, Socializr, Friendster, HotLinks

Asheesh Advani
Covestor, Virgin Money USA, CircleLending

David Albert
Hackruiter

[3] Security and Other Technical Concerns Raised by the DNS Filtering Requirements in the PROTECT IP Bill" http://domainincite.com/docs/PROTECT-IP-Technical-Whitepaper-Final.pdf

Will Aldrich
SurveyMonkey, TripIt, Yahoo

Courtland Allen
Syphir, Tyrant

Jean Aw
NOTCOT Inc.

Andy Baio
Upcoming, Kickstarter

Edward Baker
Friend.ly

Jonathan Baudanza
beatlab.com, Rupture

Katia Beauchamp
Birchbox

Idan Beck
Incident Technologies

Matthew Bellows
Yesware Inc., WGR Media

David Berger
XL Marketing, Caridian Marketing Labs

Nicholas Bergson-Shilcock
Hackruiter

Ted Blackman
Course Zero Automation, Motion Arcade

Matthew Blumberg
MovieFone, ReturnPath

Nic Borg
Edmodo

Bruce Bower
Plastic Jungle, Blackhawk Network, Reactrix, Soliloquy Learning, ZapMe! Corporation, YES! Entertainment

Josh Buckley
MinoMonsters

John Buckman
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Lingt Language, EveryArt

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iLoding, Market Diligence, CEO Research, New Era Strategies

Zach Coelius
Triggit, Votes For Students, Coelius Enterprises

John Collison
Stripe

Ben Congleton
Olark, Nethernet

Dave Copps
PureDiscovery, Engenium

Jon Crawford
Storenvy

Dennis Crowley
Foursquare, Dodgeball

Angus Davis
Swipely, Tellme

Eric DeMenthon
PadMapper.com

Steve DeWald
Proper Suit, Data Marketplace, Maggwire

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Etsy

Suhail Doshi
Mixpanel

Natalie Downe
Lanyrd Inc.

Nick Ducoff
Infochimps

Jennifer Dulski
The Dealmap

Rod Ebrahimi
ReadyForZero, DirectHost

Chas Edwards
Luminate, Digg, Federated Media, MySimon

David Federlein
Fowlsound Productions, Soapbox Coffee, Inc.

Mark Fletcher
ONElist, Bloglines

Andrew Fong
Kirkland North

Tom Frangione
Simply Continuous, Telphia

Brian Frank
Live Colony

Ken Fromm
Vivid Studios, Loomia, Iron.io

Nasser Gaemi
BigDates, ASAM International

Matt Galligan
SimpleGeo, SocialThing

Zachary Garbow
Funeral Innovations

Jud Gardner
Comprehend Systems

Eyal Goldwerger
TargetSpot, XMPie, WhenU, GoCargo

Jude Gomila

Heyzap

Jeremy Gordon
Department of Behavior and Logic, Secret Level, MagicArts

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drop.io

James Gross
Percolate, Federated Media

Sean Grove
Bushido, Inc.

Anupam Gupta
Mixpo

Mike Hagan
LifeShield, Verticalnet, Nutrisystem

Tony Haile
Chartbeat, Chi.mp

Jared Hansen
Breezy

Scott Heiferman
Meetup, Fotolog

Eva Ho
Factual, Navigating Cancer, Applied Semantics

Reid Hoffman
LinkedIn, Paypal, Socialnet, Investor in many more, including Facebook, Zynga & GroupOn

Ben Ifeld
Macer Media

Jason Jacobs
FitnessKeeper

Daniel James
Three Rings Design

David Jilk
Standing Cloud, eCortex, Xaffire

Noah Kagan
Appsumo, GetGambit

Jon Karl
iovation, ieLogic

Michael Karnjanaprakorn
Skillshare

Bryan Kennedy
Sincerely.com, AppNinjas, Xobni, Pairwise

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Jeff Lawson
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Peter Lehrman
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Michael Lewis
Stellar Semiconductor, Cryptic Studios

Eric Marcoullier
OneTrueFan, Gnip, MyBlogLog, IGN

Michael Masnick
Floor64

Jordan Mendelson
SeatMe, Heavy Electrons, SNOCAP, Web Services Inc

Dwight Merriman
DoubleClick, BusinessInsider, Gilt Groupe, 10gen

Scott Milliken
MixRank.com

Dave Morgan
Simulmedia, TACODA, Real Media

Zac Morris
Caffeinated Mind Inc.

Rick Morrison
Comprehend Systems

Darren Nix
Silver Financial

Jeff Nolan
GetSatisfaction, NewsGator, Teqlo, Investor in many more

Tim O'Reilly
O'Reilly Media, Safari Books Online, Collabnet, Investor in many more

MIchael Ossareh
Heysan

Gagan Palrecha
Chirply, Zattoo, Sennari

Scott Petry
Authentic8, Postini

Chris Poole
4chan, Canvas

Jon Pospischil
PowerSportsStore, AppMentor, FoodTrux, Custora

Jeff Powers
Occipital

Scott Rafer

Omniar, Lookery, MyBlogLog, Feedster, Fresher, Fotonation, Torque Systems

Vikas Reddy
Occipital

Michael Robertson
DAR.fm, mp3tunes.com, Gizmo5, Linspire, mp3.com

Ian Rogers
TopSpin, MediaCode, FISTFULAYEN, NullSoft/AOL, Yahoo! Music

Avner Ronen
Boxee, Odigo

Zack Rosen
ChapterThree, MissionBicycle, GetPantheon

Oliver Roup
VigLink

Slava Rubin
IndieGoGo

David Rusenko
Weebly

Arram Sabeti
ZeroCater

Peter Schmidt
Midnight Networks, NorthStar Internetworking, Burning Blue Aviation, New England Free Skies Association, Lifting Mind, Analog Devices, Teradyne, Ipanema Technologies, Linear Air

Geoff Schmidt
Tuneprint, MixApp, Honeycomb Guide

Sam Shank
HotelTonight, DealBase, SideStep, TravelPost

Upendra Shardanand
Daylife, The Accelerator Group, Firefly Network

Emmett Shear
Justin.tv

Pete Sheinbaum

LinkSmart, DailyCandy, Alexblake.com, Shop.Eonline.com

Chris Shipley
Guidewire Group

Adi Sideman
Oddcast, Ksolo Karaoke, TargetSpot, YouNow

Chris Sims
Agile Learning Labs

Rich Skrenta
Blekko, Topix, NewHoo

Bostjan Spetic
Zemanta

Joel Spolsky
StackExchange, Fog Creek Software

Josh Stansfied
Incident Technologies

Mike Tatum
Whiskey Media, Listen.com/Rhapsody, CNET

Khoi Vinh
Lascaux, NYTimes.com, Behavior Design

Joseph Walla
HelloFax

Brian Walsh
Castfire, Three Deep

David Weekly
PBWorks

Evan Williams
Blogger, Twitter, Obvious

Holmes Wilson
Worchester LLC, Participatory Culture Foundation

Pierre-R Wolff
DataWorks, E-coSearch, AdPassage, Impulse! Buy Network, Kinecta, Impermium, First Virtual

Holdings, Revere Data, Tribe Networks

Dennis Yang
Infochimps, Floor64, CNET, mySimon

Chris Yeh
PBWorks, Ustream, Symphoniq

Kevin Zettler
Bushido, Inc.

Thursday, June 23, 2011

Members of the U.S. Congress,

We write to express our concern with S. 968, the PROTECT IP Act ("PIPA"). As investors in technology companies, we agree with the goal of fostering a thriving digital content market online. Unfortunately, the current bill will not only fail to achieve that goal, it will stifle investment in Internet services, throttle innovation, and hurt American competitiveness.

Online innovation has flourished, in part, because the Digital Millennium Copyright Act (DMCA), though flawed, created clear, defined safe harbors for online intermediaries. The DMCA creates legal certainty and predictability for online services -- so long as they meet the conditions of the safe harbors, including an appropriate notice-and- takedown policy, they have no liability for the acts of their users. At the same time, the DMCA gives rights-holders a way to take down specific infringing content, and it is working well.

We appreciate PIPA's goal of combating sites truly dedicated to infringing activity, but it would undermine the delicate balance of the DMCA and threaten legitimate innovation. The bill is ripe for abuse, as it allows rights-holders to require third-parties to block access to and take away revenues sources for online services, with limited oversight and due process.

In particular:

1. By requiring "information location tools" -- potentially encompassing any "director[ies], index[es], reference[s], pointer[s], or hypertext link[s]" -- to remove access to entire domains, the bill puts burdens on countless Internet services.

2. By requiring access to sites to be blocked by Domain Name System providers, it endangers the security and integrity of the Internet.

3. The bill's private right of action will no doubt be used by many rights-holders in ways that create significant burdens on legitimate online commerce services. The scope of orders and cost of litigation could be significant, even for companies acting in good faith. Rights-holders have stated their interest in this private right of action because they worry that the Department of Justice will not have enough resources to initiate actions against all of

> the infringing sites. Yet, why should costs be shifted to innocent Internet entrepreneurs, most of whom have budgets smaller than the Department of Justice's?

While we understand PIPA was originally intended to deal with "rogue" foreign sites, we think PIPA will ultimately put American innovators and investors at a clear disadvantage in the global economy. For one, services dedicated to infringement will simply make their sites easy to find and access in other ways, and determined users who want to find blocked content will simply shift to services outside the reach of U.S. law, in turn giving a leg up to foreign search engines, DNS providers, social networks, and others. Second, PIPA creates a dangerous precedent and a convenient excuse for countries to engage in protectionism and censorship against U.S. services. These countries will point to PIPA as precedent for taking action against U.S. technology and Internet companies.

The entire set of issues surrounding copyright in an increasingly digital world are extremely complex, and there are no simple solutions. These challenges are best addressed by imagining, inventing, and financing new models and new services that will allow creative activities to thrive in the digital world. There is a new model for financing, distributing, and profiting from copyrighted material and it is working -- just look at services like iTunes, Netflix, Pandora, Kickstarter, and more. Pirate web sites will always exist, but if rights holders make it easy to get their works through innovative Internet models, they can and will have bright futures.

Congress should not chill investment and reduce incentives to work on private sector solutions. Instead, we encourage Congress to focus on making it easier to license works and bring new, innovative services to market.

Sincerely,

Marc Andreessen, Andreessen Horowitz
Brady Bohrmann, Avalon Ventures
John Borthwick, Betaworks
Mike Brown, Jr., AOL Ventures
Brad Burnham, Union Square Ventures
Jeffrey Bussgang, Flybridge Capital Partners
John Buttrick, Union Square Ventures
Randy Castleman, Court Square Ventures
Tony Conrad, True Ventures
Ron Conway, SV Angel

Chris Dixon, Founder Collective
Bill Draper, Draper Richards
Esther Dyson, EDventure Holdings
Roger Ehrenberg, IA Ventures
Brad Feld, Foundry Group
Peter Fenton, Benchmark Capital
Ron Fisher, Softbank Capital
Chris Fralic, First Round Capital
David Frankel, Founder Collective
Ric Fulop, North Bridge
Brad Gillespie, IA Ventures
Allen "Pete" Grum, Rand Capital
Chip Hazard, Flybridge Capital Partners
Rick Heitzmann, FirstMark Capital
Eric Hippeau, Lerer Ventures
Reid Hoffman, Greylock Partners
Ben Horowitz, Andreessen Horowitz
Mark Jacobsen, OATV
Amish Jani, First Mark Capital
Brian Kempner, First Mark Capital
Vinod Khosla, Khosla Ventures
Josh Kopelman, First Round Capital
David Lee, SV Angel
Lawrence Lenihan, FirstMark Capital
Kenneth Lerer, Lerer Ventures
Jordan Levy, Softbank Capital
Jason Mendelson, Foundry Group
R. Ann Miura-Ko, Floodgate
Howard Morgan, First Round Capital
John O'Farrell, Andreessen Horowitz
Tim O'Reilly, OATV
David Pakman, Venrock
Eric Paley, Founder Collective
Alan Patricof, Greycroft Partners
Danny Rimer, Index Ventures
Neil Rimer, Index Ventures
Bryce Roberts, OATV
Bijan Sabet, Spark Capital
David Sze, Greylock Partners
Andrew Weissman, Betaworks

Albert Wenger, Union Square Ventures
Eric Wiesen, RRE Ventures
Fred Wilson, Union Square Ventures

The following statement may be attributed to the Christian Dawson, Organizer, Save Hosting Coalition:

The Internet infrastructure industry is comprised almost entirely of small to medium-sized businesses, generates $46 billion a year in revenue and is growing at a rate of 20% per year. These days every new initiative that creates jobs and wealth for this nation also has an Internet component, sometimes at its core. On its own, our industry generates $9.2 billion dollars a year in positive trade flow to the US Businesses on the Internet fuel industry and innovation at every level.

Our industry does not deny that there is a piracy problem on the Internet. The Internet infrastructure industry within the United States has been on the front lines of this fight for a couple of decades now, and we know how complex this issue truly is. We have taken the lead on some extremely important and successful programs, such as a public/private partnership to stop the sale of illegal pharmaceuticals online. Now, our industry wants to share its expertise and collaborate on legislation that will serve to curb online piracy in constructive ways.

The Stop Online Piracy Act is not that legislation. It would not curb piracy, only push it further to the fringes of the Internet, out of the reach of our laws. This bill would also unnecessarily hurt legitimate, productive, job-creating businesses that companies like mine would be forced to take down -- without due process -- on a daily basis.

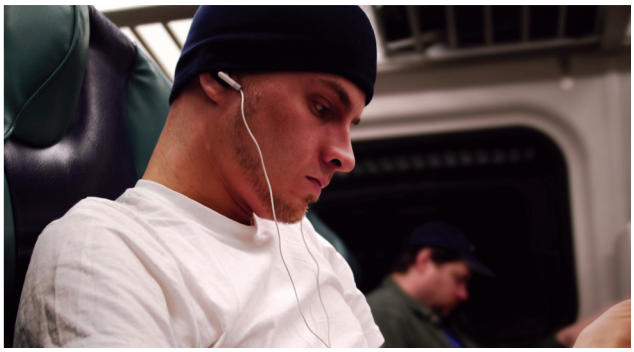
This law creates a culture of "shoot first and ask questions later," and the idea that it would only hurt people doing bad things is ridiculous and impossible. Under the current DMCA framework, we are seeing that 5 to 8% of copyright claims have no merit when challenged. If this law were to pass, we could easily see tens of thousands of businesses being shuttered each year, without access to basic due process.

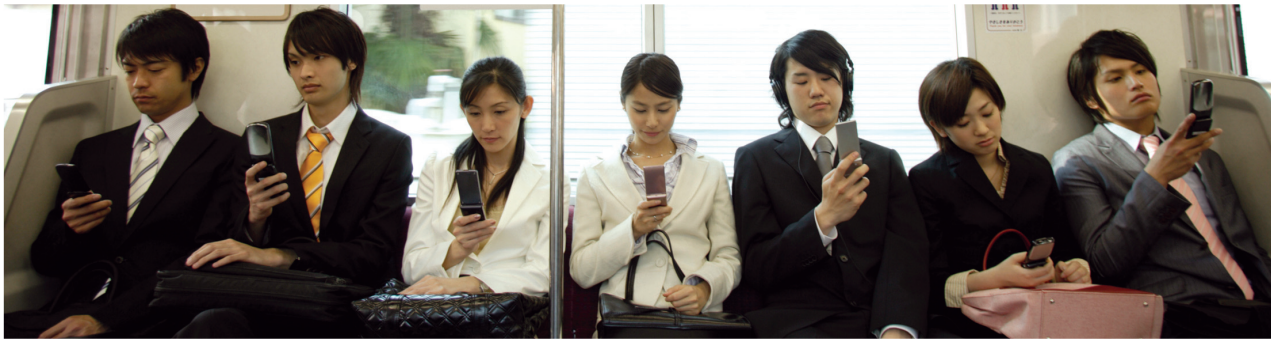
Businesses don't deal well with uncertainty, and the next generation's content-driven innovators will not accept the risks associated with using United States-based Internet infrastructure if this bill passes. This nation's Internet trade surplus will vanish, as will its Internet-based job creators. We will not solve the problem of piracy on the Internet, and we will do little more than stimulate the economies of Asia and Europe as legitimate businesses leave our shores for overseas Internet services that continue to grant due process of law. As a result of this emigration, the American Internet hosting and infrastructure industry itself -- an industry our nation invented -- will likely collapse, taking thousands of jobs and billions of American dollars with it.

Briefing

Matthew Le Merle
Raju Sarma
Tashfeen Ahmed
Christopher Pencavel

booz&co.





The Impact of U.S. Internet Copyright Regulations on Early-Stage Investment *A Quantitative Study*

PREFACE

The world has benefited enormously from an impressive level of growth and innovation over the past several decades. Since the beginning of the Internet age, a mere two decades ago, society has grown to expect accelerating growth in technology and innovation. Thanks in part to this rapid rate of change, lawmakers have relied heavily on self-regulation rather than government enforcement and compliance as a means of controlling the growth of the Internet. As we move into a new era of Internet growth fueled by new and emerging technologies—including widespread broadband access, cloud computing, social media, and mobile connectivity—it will be increasingly important to understand the potential effects of regulatory changes.

One area of Internet regulation currently being debated is digital copyright. To keep up with new methods of distributing content, regulators are now evaluating several potential changes to current copyright law that could have a large impact not only on content providers and distributors but also on how users themselves interact with content. Our research goal: to understand how future regulatory changes might affect the level of early-stage investment in young companies acting as intermediaries for digital content.

New startup companies have long been an important driver of innovation and economic growth in the U.S., and few of them would have grown to maturity without the early-stage financing that allowed them to bring their ideas to the marketplace. It was our research hypothesis that this financing, which comes primarily from angel investors and venture capitalists, might be greatly affected by the regulatory environment; our study looks to test empirically how particular copyright regulations might affect this. Though there are many players who may be affected by potential copyright regulations, including the holders of copyrights themselves, we focused on digital content intermediaries, given their importance in the value chain and their potential as engines of innovation in the Internet content space.

To understand how early-stage investors might react to new regulations, we took a direct approach, one that to our knowledge has never been tried in a systematic way—we asked them. We surveyed almost 200 angel investors and interviewed more than 20 prominent venture capitalists to determine their sentiments regarding a variety of potential regulatory changes. It is our hope that this study will leave readers with a clear sense of how changes to the current copyright regulatory regime might affect early-stage investing.

This report is one of two on U.S. investment attitudes toward Internet companies. The other report focuses on privacy regulations and is titled *The Impact of Internet Privacy Regulations on Early-Stage Investment:A Quantitative Study for the U.S.* Additionally, Booz & Company has published two reports examining the impact on early-stage investment in the European Union of Internet copyright and privacy regulations.

This report was financed by Google Inc., and independently researched and written by Booz & Company.

TABLE OF CONTENTS

ACKNOWLEDGMENTS

The authors would like to acknowledge the central role played by the several angel groups that provided access to their membership during the preparation of this study. Foremost of these was Keiretsu Forum, with more than 850 accredited investor members on three continents. Keiretsu Forum provided access to its members in the U.S. and abroad, and encouraged other angel groups to participate.

Several other angel groups, including Alliance of Angels, Angel List, Angel Resource Institute, Band of Angels, Boise Angel Fund, Dingman Angels, Harvard Angels, Oregon Entrepreneurs Network, PA Angel Network, Plug and Play Tech Center, Sacramento Angels, and Sand Hill Angels also participated in our study, and we gratefully acknowledge their support.

We would also like to thank the numerous venture capitalists and legal experts we interviewed for providing their expertise and insights. Specifically we would like to thank the following, as well as four others who preferred to remain anonymous:

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Foley & Lardner LLP
Globespan Capital Partners
Granite Ventures
Greylock Partners
GSR Ventures
Intel Capital
Next World Capital
OATV
Rho Capital Partners
Rothken Law Firm
Rustic Canyon Partners
Scale Ventures
Selby Ventures
Silver Lake
Sofinnova Ventures
TeleSoft Partners
TVG Capital Partners
Vantage Point Venture Partners
Wilson Sonsini Goodrich & Rosati LLP

Finally we would like to acknowledge the valuable contributions of the following individuals: David Meer, whose expertise in survey methodology and statistics was invaluable; Thomas Kuenstner for his expertise on the digital landscape; and Ed Baker for his deft editorial hand.

This report was financed by Google Inc., and independently researched and written by Booz & Company, drawing on expertise from its consumer, media, and technology practice, and also on academic and public research, publicly available information, and primary research.

EXECUTIVE SUMMARY

Over the past 20 years, the world has been transformed by the emergence and meteoric growth of the Internet. It is estimated that the Internet has represented 3.4 percent of global gross domestic product (GDP) and 21 percent of GDP growth in mature countries over the past five years. As the Internet continues to grow, however, further investment will be needed to support the creation of new technologies in social media, mobility, cloud computing, and the streaming of video and audio content.

The companies at the heart of these innovations depend heavily on early-stage investment from angel investors and venture capitalists (VCs) alike. These two critical groups invest an estimated US$20 billion and $23 billion, respectively, into early-stage companies in the U.S. annually, while also providing mentoring advice to entrepreneurs.

The ease with which digital content of all kinds—news, music, videos, even entire books—can be copied and redistributed has raised important issues. An important voice has been the government, which has played a critical role in setting copyright legislation and jurisprudence in tandem with the technological advances of the Internet.

Leading lawyers in interviews have told us that the government's involvement in copyright issues may move in one (or more) of four potential directions:

1. Decreasing the cost and complexity of obtaining licenses. *An integral function of copyright law is the granting of licenses. Changing this process could have important consequences for rights holders and content distributors alike.*

2. Reducing legal ambiguity concerning the likelihood of lawsuits and the size of damages in the event of liability. *Some aspects of copyright law are as young as the Internet itself, and thus, many argue, still very ambiguous.*

3. More actively prosecuting pirates. *A common method of deterring piracy has been direct prosecution of pirates themselves. Despite many steps in this direction in the past, the potential for expanding these efforts remains.*

4. Holding websites and content intermediaries responsible for copyright infringement. *Proposed legislation would hold the intermediaries that redistribute content liable for the activity of their users. These companies would be required to screen and filter content and could be held responsible for any ensuing copyright infringement.*

Any of these regulations has the potential to affect a wide range of Internet-based companies—most notably, the digital content intermediaries (DCIs) that provide search, hosting, and distribution services for digital content. They generate value for content producers by reducing the costs of distribution and allowing many artists to monetize the content they create more easily. And they provide consumers with access to a greater variety and volume of content, as well as an improved consumption experience.

We undertook this empirical, quantitative study to understand better how potential changes to copyright regulations might affect angel and venture capital investment

in DCIs. In the course of preparing the study, we surveyed 189 U.S. accredited angel investors and interviewed 24 prominent venture capitalists. In sum, our principal findings support the following points:

- *Increasing liability for content providers would have a greater negative impact on early-stage investment than would a weak economy and an increased competitive environment combined.*

- *Holding DCIs liable for the content uploaded by users would have a significantly negative effect on investment in this space, reducing the pool of interested angel investors by 81 percent.*

- *Regulations making users more easily prosecuted for copyright violations would have a negative effect on investment in this space, reducing the pool of interested angel investors by 48 percent.*

- *A large majority of angels and venture capitalists support increased clarity in copyright law, especially if it would decrease the level of ambiguity surrounding the probability of facing a lawsuit in cases of copyright infringement, as well as the size of damages in the event of liability. Fully 80 percent report being uncomfortable investing in business models in which the regulatory framework is ambiguous.*

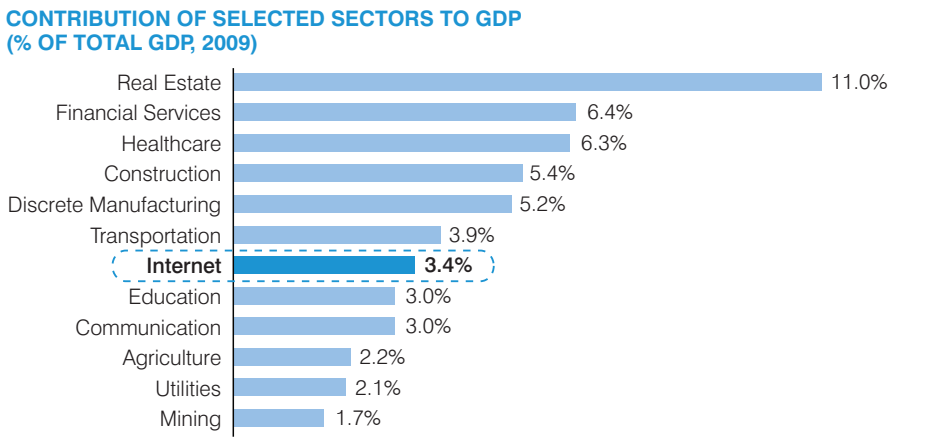
In light of these results, lawmakers might wish to consider the angel and venture capital community when contemplating new copyright regulations.

Chapter 1
BACKGROUND ON INTERNET GROWTH

The creation of the global Internet infrastructure and of the vast array of companies offering products and services that leverage its connectivity has transformed our world over the past two decades. In this short period of time, the Internet has grown from a resource for a handful of scientists and researchers to an essential medium for more than 2 billion users worldwide. Its rapid growth has also generated enormous economic value for the global economy; indeed, it is estimated that the Internet contributes as much to worldwide GDP as many other, far more mature sectors of the economy, including agriculture, utilities, and mining (*see Exhibit 1*).

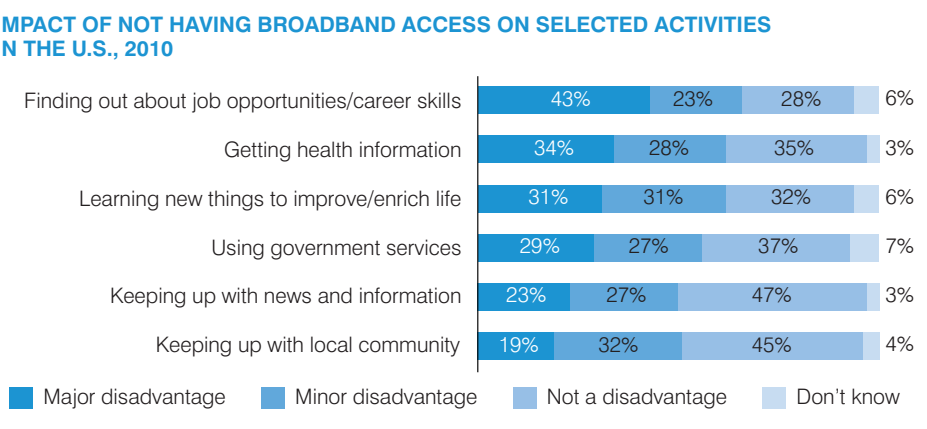
Moreover, the Internet has dramatically changed the way information is collected, distributed, and used. Most Americans now believe that not having high-speed Internet access at home would put them at a disadvantage in terms of their careers, their health, and the overall richness of their lives (*see Exhibit 2*).

Exhibit 1
Global Internet Value as a Sector, Compared with Other Sectors



Note: Figures represent the following 13 countries that account for 70 percent of global GDP: Brazil, Canada, China, France, Germany, India, Italy, Japan, Russia, South Korea, Sweden, the United Kingdom, and the United States.
Source: Organisation for Economic Co-operation and Development; McKinsey Global Institute

Exhibit 2
The Effect of a Lack of Broadband Access at Home on Various Activities



Source: Organisation for Economic Co-operation and Development

As the Internet continues to evolve, and its influence increases, further investment will be needed to support that growth. Fast-emerging technologies and platforms such as social media, the cloud, mobile access, and "big data"—most of which barely existed as recently as a decade ago—are now expected to drive the Internet's future growth. Estimates place the annual value of big data to the U.S. healthcare sector alone at $300 billion,[1] and the proliferation of 4G networks is expected to account for as much as $150 billion in annual GDP, partly by further enabling the continued growth of social media, the cloud, and mobility (*see Exhibit 3*).

Twenty years ago, when the Internet first emerged in the public sphere, it garnered less scrutiny from policymakers and regulatory bodies—in part because its technological complexity and rapid evolution made it difficult to devise and enforce regulations. Thus, many of the regulatory frameworks that were created at the time relied more on self-regulation than on government-mandated oversight or compliance. For example, the notice and takedown standards in the Digital Millennium Copyright Act (DMCA) regulations placed the burden on companies to find practical, efficient means of protecting their customers' rights while at the same time providing the goods and services their customers demanded.

As the Internet grows and its impact on society increases, however, the pressure to regulate it will likely increase. The manner in which governments handle this issue will have a lasting impact on how the Internet evolves.

One key area in which policies and regulations are likely to have a significant effect is at the intersection of the Internet and early-stage capital investment. The next phase of the Internet's development will require the contributions of many parties as new technologies are developed and launched and as new products and services are introduced. As in the past, a major factor will be the new and emerging companies that fuel innovation—and which typically require startup and early-stage capital to survive. The majority of this capital will come from the private markets and, particularly, early-stage investors—the angel investors and venture capital firms with the skills to support the growth of new businesses and the willingness to risk the money needed to help them grow.

Exhibit 3
Incremental Impacts of Investment in 4G Networks, 2012–16

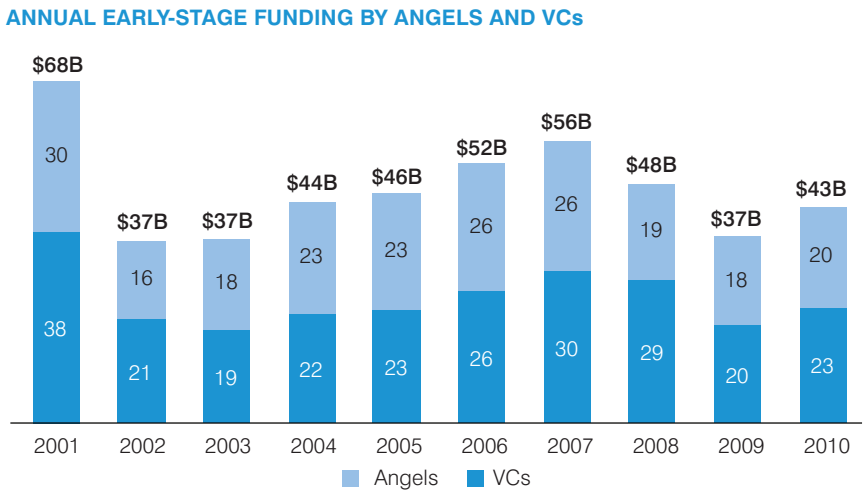
	BASELINE $25 BILLION INVESTMENT	$53 BILLION INVESTMENT
GDP	$73 billion	$151 billion
Jobs	371,000	771,000

Source: Deloitte

Chapter 2
ANGELS AND VENTURE CAPITALISTS

To determine the impact of the regulatory environment we have focused our study on understanding how the early-stage investment community—particularly angel investors and VCs—might react to potential regulatory changes. Angel investors and VCs play a critical role in the capital markets, providing early financing to new companies that otherwise would find it difficult to secure funding.[2] Taken together, angel investors and VCs are the primary source of this entrepreneurial funding, investing nearly $43 billion in the U.S. in 2010 alone (*see Exhibit 4*).[3] In fact, angels and VCs were early investors in many companies that are household names, including Apple, Cisco, Dell, eBay, Facebook, Google, Intel, and Microsoft.[4]

Exhibit 4
Early-Stage Investments by Angels and VCs



Note: Numbers may not add up due to rounding
Source: National Venture Capital Association; Center for Venture Research

Though VCs may be the more familiar of the two, it is actually the angels that provide the majority of the earliest funding for new ventures, with the VCs typically investing in later rounds (*see Exhibit 5*).

Indeed, angels are the most active investors in seed and early-stage startup businesses, contributing as much as 80 percent of seed and startup capital for high-tech entrepreneurial ventures.[5] In 2010, 265,400 individual angels invested in 61,900 new ventures, for a total of more than $20 billion in invested capital, almost equal to the total amount invested by VCs.[6]

In addition to injecting capital, angel investors often play a hands-on role in the deals they invest in by providing entrepreneurs with mentoring, business advice, and contacts. It has been suggested that these "softer" benefits of angel investing can have as great an impact on the success of a startup as the funding itself.[7] Their many contributions, both financial and managerial, make angel investors a critical part of the entrepreneurial finance landscape.

VCs also play a critical role in providing capital for entrepreneurs. They typically invest during the later stages of a startup's growth, and often make much larger individual investments. And they usually play a similarly important hands-on role in the companies in

Exhibit 5
Equity Capital for Entrepreneurs, by Funding Stage

EQUITY CAPITAL FOR ENTREPRENEURS

Stage	Pre-Seed	Seed/Startup	Early	Later
Source	1 Founders	2 Angels/Angel Alliances		3 VCs
Demand (per deal)	$25K–$100K	$100K–$2M	$2M–$5M	$5M+

Observations

1. Initial funding is typically provided by entrepreneurs and "friends and family." The maximum amount of this capital is on the order of $100,000.
2. Angel investors or angel groups typically provide the bulk of the "seed" or "early stage" capital in the next round.
3. VCs generally invest in later rounds after one or more rounds of angel investment.

Source: Jeffrey E. Sohl, "The US Angel and Venture Capital Market: Recent Trends and Developments"

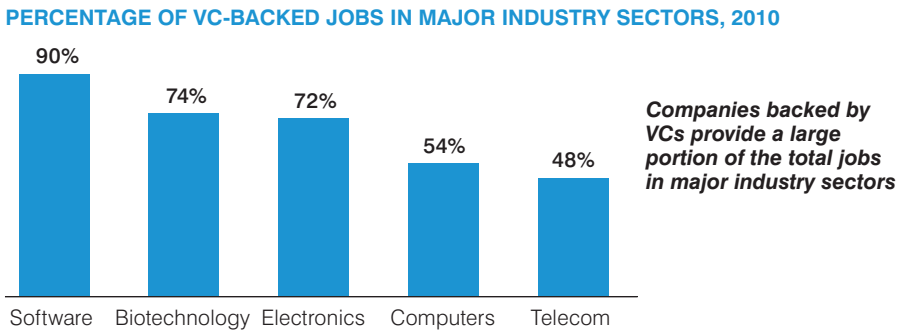
which they invest.[8] VCs have historically invested heavily in startups in various technology sectors, including software, electronics, and computers. A large percentage of the jobs created in these sectors can be attributed to these startups (*see Exhibit 6*).

Indeed, the impact that VC-funded companies have had on the economy across all sectors in the U.S. has been substantial: Revenue from VC-backed companies accounts for 21 percent of total GDP, and employment at these companies accounts for 11 percent of all U.S. jobs.[9]

Given the key role that angels and VCs play, not only in funding new companies but also in working with them to promote their success, their continued willingness to invest is critical to the future creation and growth of new companies. In producing this Booz & Company study, we surveyed nearly 200 angels to understand better how potential regulatory changes might affect their investment behavior, and interviewed more than 20 prominent venture capitalists to gain a more qualitative perspective on their views.

In this study, we have chosen to concentrate on digital copyright laws and regulations. Digital copyright is a timely issue, given recent court rulings and contemplated legislation, and it is particularly relevant to technology companies—an important area of focus for early-stage investors.

Exhibit 6
VC-Created Jobs in Major Industry Sectors



Source: National Venture Capital Association

Chapter 3
THE CURRENT AND FUTURE COPYRIGHT LANDSCAPE

Today, the Digital Millennium Copyright Act ("DMCA") governs compliance and enforcement of U.S. digital copyright law. Passed in 1998, the DMCA provides protection against charges of copyright infringement under its "safe harbor" clause. In brief, ISPs, companies that host content, and information location tools (like search engines and directories) are not expected to actively monitor their systems for copyright infringement. Instead, the company must respond "expeditiously, to remove, or disable access to the material that is claimed to be infringing or to be the subject of infringing activity," if they are to receive the "safe harbor" protections. The user who originally posted the content can then send a counter-notice claiming the content was actually legitimate and non-infringing.

To understand angel and VC sentiment, we needed to focus on specific aspects of the regulatory environment. We spoke with experts and copyright attorneys at leading law firms to identify the important characteristics of the existing legal framework and categorize the major directions of copyright law. The following scenarios are by no means exhaustive; nor are they mutually exclusive; indeed, it is possible that they could occur in any combination. They include: (i) the ease of obtaining licensing agreements, (ii) the complexity in existing laws, (iii) greater prosecution of end users in violation of copyright law, and (iv) holding websites liable for copyright infringement.

Licensing Agreements
At present, a digital content intermediary seeking to distribute content must negotiate a license with one of two parties: the individual who holds the copyright, or several separate parties that collectively control the copyright, which might include the original artists or composers, publishers such as record labels and studios, broadcasters and retailers, and collecting societies.

Ordinarily, seeking a license from an individual copyright holder is not a problem. However, in the case of so-called "orphan works"—copyrighted content whose copyright holder cannot be found—licensing the content can be difficult or impossible.

The second source for obtaining a license—a network of parties, each of which must approve the license—involves having to determine the appropriate parties with whom to negotiate, and often having to deal with several parties independently of one another. Moreover, a single piece of content may have different types of copyrights, each held by different parties. This is often the case with musicians who hold the mechanical rights to their songs but sell the publishing rights to record labels or others.

The complexity in the current copyright situation may create three issues. First, it can be costly—obtaining rights often requires expensive experts and legal counsel. Second, it can take a long time to acquire rights. Third, the uncertainty of success can deter license-seekers from beginning the process in the first place.

Legal Clarity
Once a DCI obtains a copyright license, it still faces a great deal of uncertainty, due to the possibility of being taken to court, and the potentially enormous penalty if the court rules against it.

Several recent court rulings have increased that uncertainty. The settlement arising from Universal Music and EMI's lawsuit against venture capital firm Hummer Winblad raised

questions about how far liability can be extended—in this case, of investors being liable for copyright infringement by their portfolio companies. Another case, Blue Nile, Inc. v. Ideal Diamond Solutions, raised the question of the power of the corporate veil. In that ruling, the court held that company management can be held personally financially liable even if they were unaware of the company's infringement. Copyright law allows plaintiffs to elect to receive statutory damages (instead of actual damages) that can range from $750 to $150,000 for each violation. In cases of online piracy, in which songs or movies might be copied thousands of times, the damages can quickly reach the millions or even billions of dollars.

These potentially large damages, combined with recent court rulings, contribute to uncertainty in the level environment.

Prosecuting Users

Film and TV studios and record labels, among others, have directed lawsuits against individual violators who download or distribute content without a license. In such cases, the burden of proof is high, and cases can last months or even years.

Another impediment to legal recourse against individual violators is jurisdictional. Infractions committed across borders are far more difficult to enforce. Overseas pirates have long been able to hide behind conflicting national laws and regulations as they benefit from the borderless world of the Internet to reach users everywhere.

Website Liability

The safe harbor clause of the DMCA currently protects DCIs from litigation if they are unaware of infringing content and make their best efforts to remove disputed content. Liability for infringement could be shifted to DCIs by mandating that they implement preventative measures—such as screening content as, or shortly after, it is uploaded to their sites—to avoid infringement. As such, DCIs would be considered party to the copyright infringement and thus have to pay damages when found to have infringed. Similarly, liability could be extended to ISPs, making them responsible for filtering the content they aggregate and thus financially accountable in the event of copyright violations.

This would require DCIs and ISPs to implement a monitoring system that scans and tracks all content that has been uploaded. While such systems are uncommon today, there are already some in existence. YouTube, for example, has instituted on its own what it calls the Content ID System. As video is uploaded to the site, the Content ID System compares it to a library of copyrighted video content voluntarily provided by copyright owners. If the uploaded content matches any content in the library, the system flags the video. Once a video is identified as potentially infringing, YouTube notifies both the poster of the content and its copyright owner, and expedites the process of determining the legitimacy of the content. Now used extensively by YouTube, this solution came at a reported $30 million price tag and took more than 50,000 hours to develop.[10]

Other websites, including Facebook, use systems similar to YouTube's Content ID. While application of these types of systems is not currently mandated by the government, the private sector has already begun implementing them on its own.

Chapter 4
THE DCI BUSINESS MODEL

To assess angel investor sentiment about the effects of potential regulations, we focused on investment in digital content intermediaries because they play an important role in the distribution of digital content and garner much attention in today's dialogue around the Internet.

DCIs are a broad set of companies that provide hosting, distribution, and search capabilities for all kinds of digital media. They may include websites (such as Google's YouTube), desktop or cloud software (such as Apple's iTunes), digital forums (such as Craigslist), peer-to-peer software programs (such as BitTorrent), and even some Internet-based physical distributors (such as GameFly and Netflix). DCIs typically distribute content that is either created by professionals, such as professional musicians and movie studios, or generated by users, such as personally uploaded blogs, photos, and videos.

In the ordinary course of business, DCIs provide value to consumers in two ways. First, they serve as a cheaper means of distribution than traditional outlets like music and video rental stores.[11] This means that it is much easier for artists to get their content distributed[12] and that a great deal more content is available to consumers.[13] Second, they can improve the consumption experience itself, through features like personalized recommendation systems and forums where consumers can share experiences and reactions.

Much of the cost advantage of distribution through DCIs can be attributed to the fact that they do not have to bear many of the traditional costs of manufacturing, packaging, and distribution (including shipping, storage, and inventory) and retail sales costs, such as the labor, insurance, real estate, and other overhead costs associated with bricks-and-mortar stores. Indeed, DCIs have been shown to reduce the costs of content distribution and marketing for the music, film, and software industries by cutting physical distribution steps and shifting marketing outreach to consumer-based viral efforts.[14]

Manufacturing, distribution, and retail sales costs make up an estimated 55 percent of the undiscounted price of a typical music CD, for example. Artists, it is estimated, typically receive 12 percent in royalties—out of which they must pay other costs, including promotions, packaging, and retailer returns. As a result, somewhere between 500,000 and 1 million CDs must be sold for an artist to break even. At least 90 percent of artists receive no royalties at all from their CD sales.[15]

Musicians have found ways to reduce costs on their own. Firms like Bandcamp, FanBridge, ReverbNation, and Topspin Media help musicians market directly to fans, sell music online, and sell band paraphernalia as well. All of these activities help to lower the costs of producing and marketing CDs.[16]

Not only do the lower distribution costs lead to lower prices for consumers, but for the first time, they permit access to a wealth of content that was otherwise too expensive to supply.[17]

DCIs also offer content producers a number of new ways to monetize their content. Google AdSense, for example, allows website authors to add advertising banners and immediately begin earning revenue from visitors. YouTube allows copyright holders to earn advertising revenue from videos streamed on its site. These means of monetization

do not require relationships with publishers, whether they are studios, record labels, or publishing houses, and they are available to anyone.

The further advantage for consumers—improving the consumption experience itself—depends in large part on the network effects many DCIs have created. Crowdsourcing—the generation of collective information from large groups of people—allows DCIs to analyze vast swathes of consumer data. From this data emerge insights on consumer needs and preferences not gleaned from bricks-and-mortar venues.

Netflix's recommendation engine, for example, suggests movies for users based on their stated preferences and the movies they, and thousands of other users, have watched in the past. Facebook places advertisements tailored to each user based on the stated interests and pastimes of that user and his or her collection of friends. iTunes identifies top-rated and downloaded songs, while Spotify allows users to share their music playlists with one another and make suggestions.

DCIs have evolved to provide distinct value to consumers and content producers. They reduce producer costs and allow for immediate monetization for artists. Consumers have benefited from an increase in the pool of artists and content available as well as from a richer consumption experience.

Chapter 5
EMPIRICAL FINDINGS

The key goal of this study is to understand how changes to copyright law and regulations might affect levels of early-stage investment in digital content intermediaries. To that end, we surveyed 189 angel investors and interviewed 24 venture capitalists regarding their attitudes toward the current and future status of copyright in the U.S. (*for a more detailed description of the methodology, see Appendix*).

Our study finds that investors prefer a clear regulatory regime to an ambiguous one. Especially when that ambiguity increases the costs of compliance or the uncertainty of the size of damages in the event of noncompliance. Moreover, changes in copyright regulations that would increase liability for either users or websites would have a negative impact on investment. In addition, a change in the licensing environment that provided DCIs with easier access to licensed content would increase investment in the space.

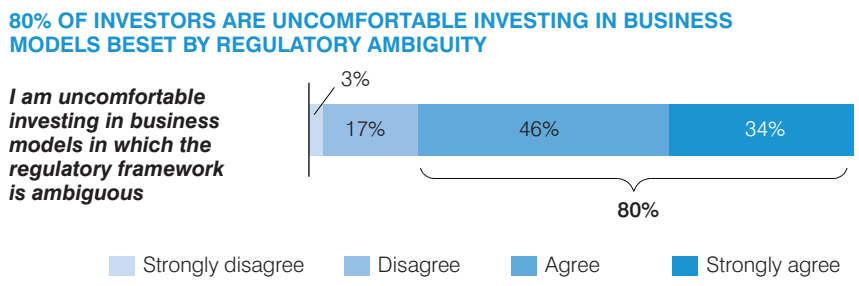
In this section we examine the results as they relate to four specific aspects of the copyright regulation landscape: regulatory ambiguity, access to licensed content, user liability, and DCI liability.

Regulatory Ambiguity

Fully 80 percent of the angels we surveyed said they are uncomfortable investing in an area with an ambiguous regulatory framework (*see Exhibit 7*). These results are consistent with the findings from our interviews with VCs, a substantial majority of whom reported that the current regulatory environment has had a negative effect on innovation.

Similarly, a clearer legal environment that would limit the risks of lawsuits and the size of potential damages would increase the willingness of investors to consider the space.

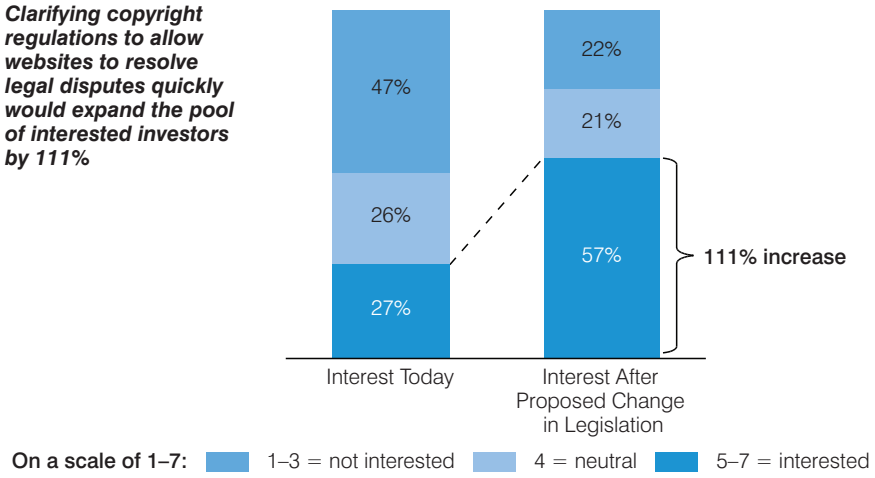
Exhibit 7
The Impact of Regulatory Ambiguity on Angel Investors



Source: Booz & Company analysis

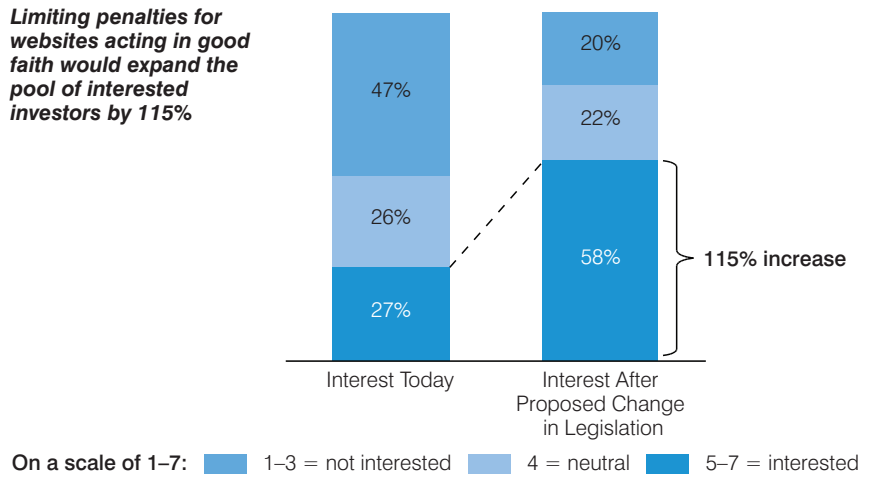
The pool of investors interested in investing in a particular DCI would increase by nearly 111 percent if copyright regulations were clarified to allow websites to resolve legal disputes quickly, thereby lowering their cost to comply with regulations (*see Exhibit 8*). By the same token, limiting penalties for websites acting in good faith would also increase the pool of interested investors by 115 percent (*see Exhibit 9*).

Exhibit 8
Change in Interest if Disputes Could Be Resolved Quickly



Note: Numbers may not add up due to rounding
Source: Booz & Company analysis

Exhibit 9
Change in Interest if Penalties Are Limited



Source: Booz & Company analysis

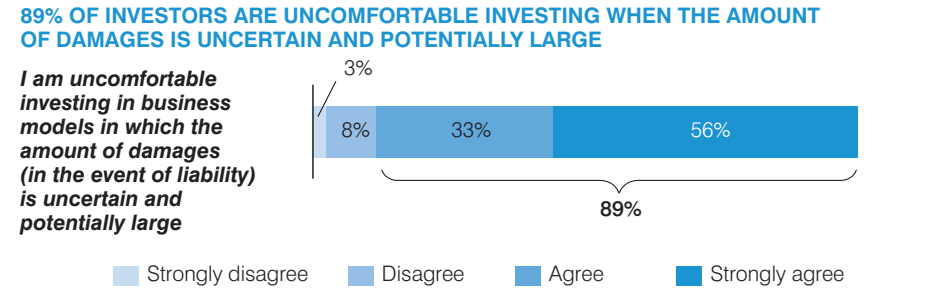
Potential damages have an effect on respondents' willingness to invest in DCIs; 89 percent said uncertain and potentially large damages made them uncomfortable with investing in DCIs (*see Exhibit 10*).

These results suggest that legal ambiguity in general deters investment. Furthermore, our study shows that greater clarity surrounding the current regulatory framework in copyright, specifically as it relates to limiting damages for website operators acting in good faith and allowing them to resolve litigation more easily, could have a positive impact on investment in DCIs.

Access to Licensed Content

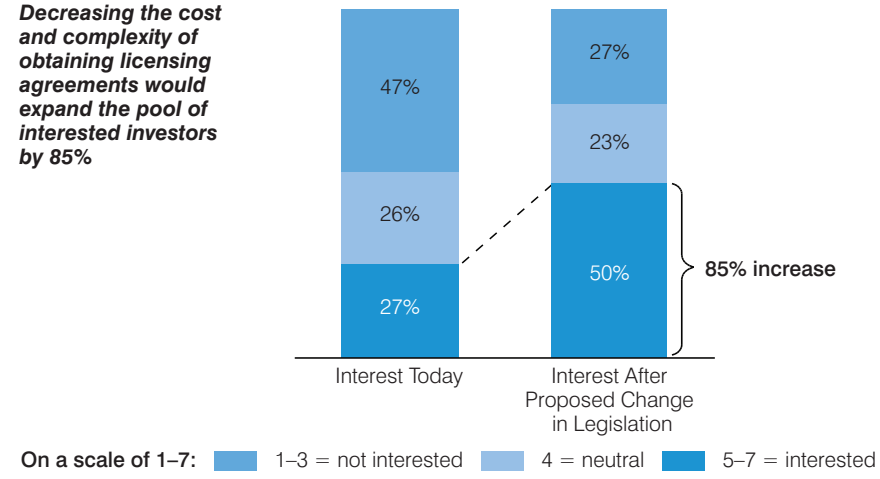
Just as increased regulatory clarity has a positive effect on investment, better access to licensed content is likely to improve the investment environment. We asked survey respondents if they would be interested in investing in a particular DCI, and then asked if their attitude would change if regulations were altered to decrease the cost and complexity of obtaining licensing agreements. Our study shows that the pool of respondents who were interested increased by 85 percent (*see Exhibit 11*).

Exhibit 10
Uncertain Potential Damages Make Angels Less Comfortable with Investing



Source: Booz & Company analysis

Exhibit 11
Better Access to Content Increases Willingness to Invest



Source: Booz & Company analysis

This suggests that decreasing the cost and complexity of obtaining licensing agreements would increase the pool of investment funds available to DCIs.

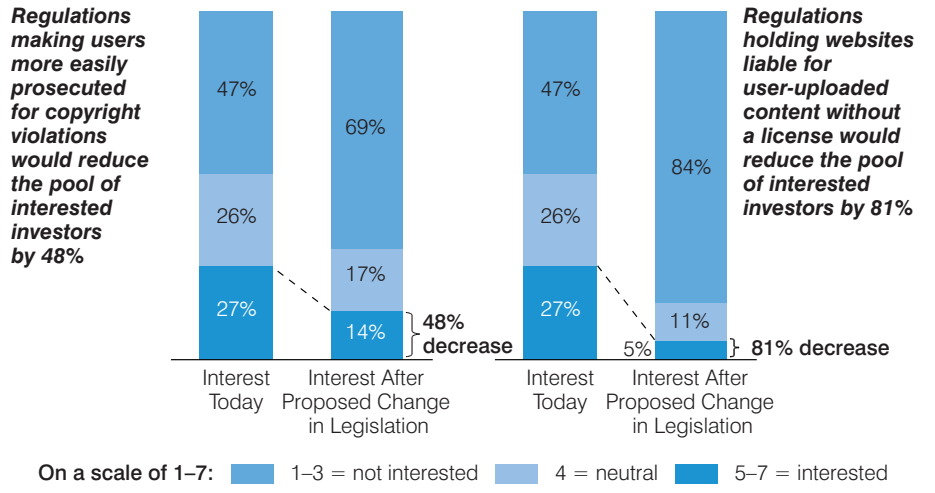
User Liability and DCI Liability

Though our results show that decreasing the cost and complexity of obtaining content licenses could increase investment in DCIs, our data suggests that increasing liabilities for users or content aggregators in cases of infringement would have a negative effect on investment. Making it easier to prosecute users for uploading content without licenses would reduce the pool of interested investors by nearly 50 percent. And holding websites themselves liable for unlicensed content uploaded by users creates an even greater change in sentiment: The pool of interested investors would decline by nearly 81 percent (*see Exhibit 12*).

These results are further supported by our interviews with VCs: Almost all interviewees said that changing regulations to remove the safe harbor protections currently afforded intermediaries would have a negative impact on investment.

The above results can be put into clearer context by considering them in terms of other factors that typically influence investment decisions, including expected returns, competition, and the economy. When angels were asked to choose an investment under a variety of conditions involving these factors, the results suggested that 47 percent of their investment decision is driven by the legal environments that were tested—roughly

Exhibit 12
Greater Likelihood of Prosecution of Users and Websites Decreases Willingness to Invest



Source: Booz & Company analysis

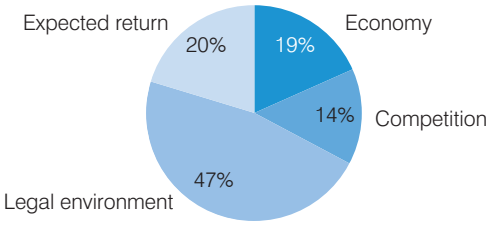
equivalent to the effect of the economy, competition, and expected returns combined (*see Exhibit 13*).

Indeed, even when offered a variety of scenarios in which trade-offs are made between a more competitive environment and a weaker economy, investors still preferred an environment in which there was no change to the current regulatory regime (*see Exhibit 14*).

Exhibit 13
Importance of Selected Variables in Making Investment Decisions

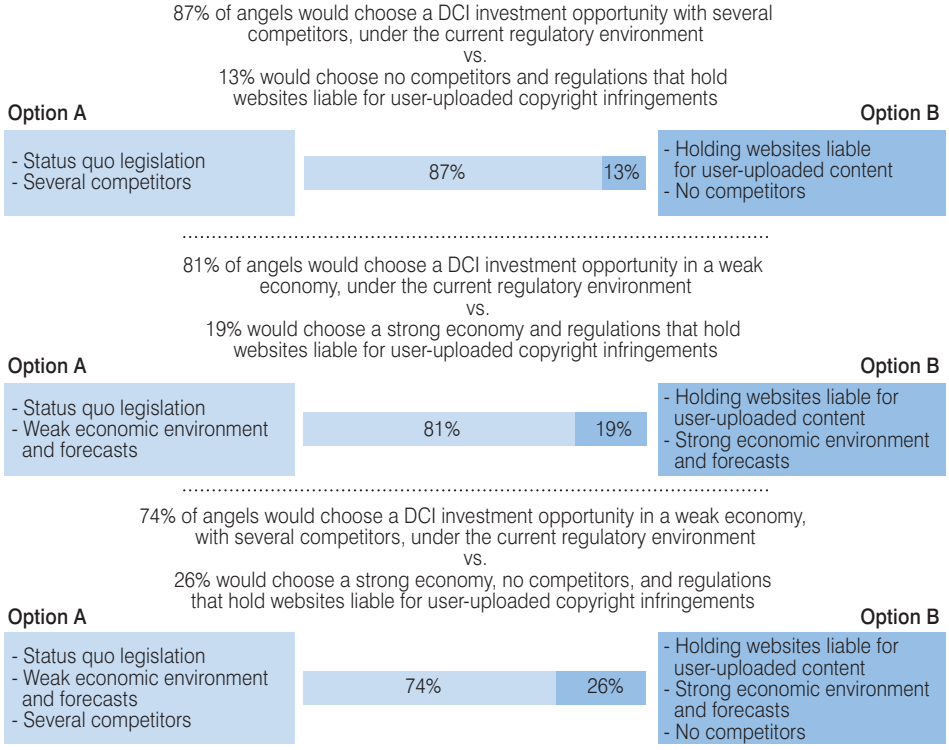
SHARES OF IMPORTANCE
AVERAGE IMPORTANCE OF EACH VARIABLE IN DETERMINING PREFERENCE FOR INVESTING ENVIRONMENT

Of the investment choices presented (legal, return, economy, and competition), legal accounts for 47% of the decision to invest in a given DCI



Source: Booz & Company analysis

Exhibit 14
Angel Head-to-Head Choices of Regulations in Different Investing Environments



Source: Booz & Company analysis

- 87 percent said they would prefer making an investment in a company with several competitors, under today's regulatory rules, compared with just 13 percent who said they would prefer no competitors but tighter regulations.

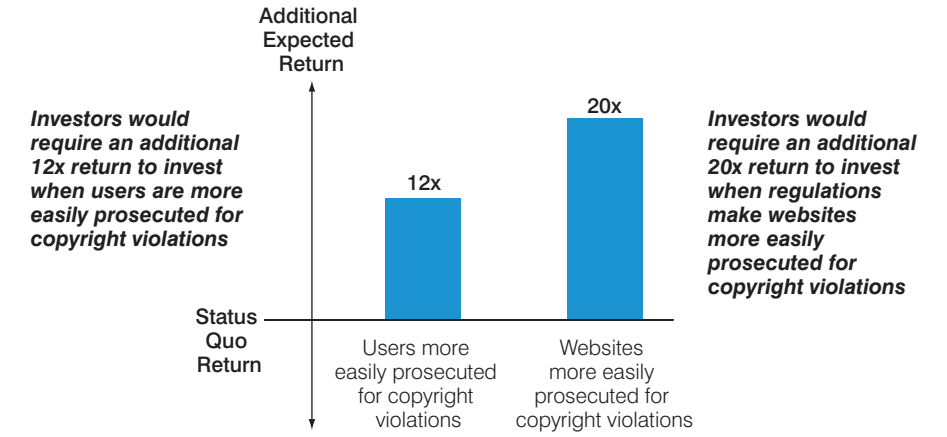
- 81 percent would prefer an investment under today's regulatory rules and a weak economy, compared with 19 percent who would prefer a strong economy but tighter regulations.

- 74 percent would prefer an investment with both several competitors and a weak economy, under today's regulatory rules, compared to 26 percent who would prefer no competitors and a strong economy but tighter regulations.

A closer look at the results can also provide a quantitative understanding of just how large an impact any particular regulatory regime might have compared with today's regulatory environment. As we have seen, holding either users or websites liable for uploaded unlicensed content would have a negative impact on investment. In order to overcome their reluctance under such circumstances, investors would demand an expected return of an additional 12x their original investment in order to feel indifferent about investing in either an environment where users are held liable for uploaded unlicensed content or the current state of copyright regulation (*see Exhibit 15*).

According to estimates by the Kauffman Foundation, the average return on angel investments is roughly 3x.[18] Thus, an investment would require a return of 15x in order to generate the same sentiment from investors in a regime in which users are held liable for uploading unlicensed content. The effect is even greater with respect to holding the DCIs themselves liable, as this would require an additional 20x the original investment (which would translate to an expected return of 23x) in order to make the potential investment comparable to investing in the same company under current copyright regulations. In short, investors strongly prefer the current regulatory regime and are likely to reduce their investments in DCIs under a regime in which either users or websites are held liable for uploading unlicensed content.

Exhibit 15
Incremental Expected Returns Required to Make Investors Indifferent to Proposed Regulatory Environments

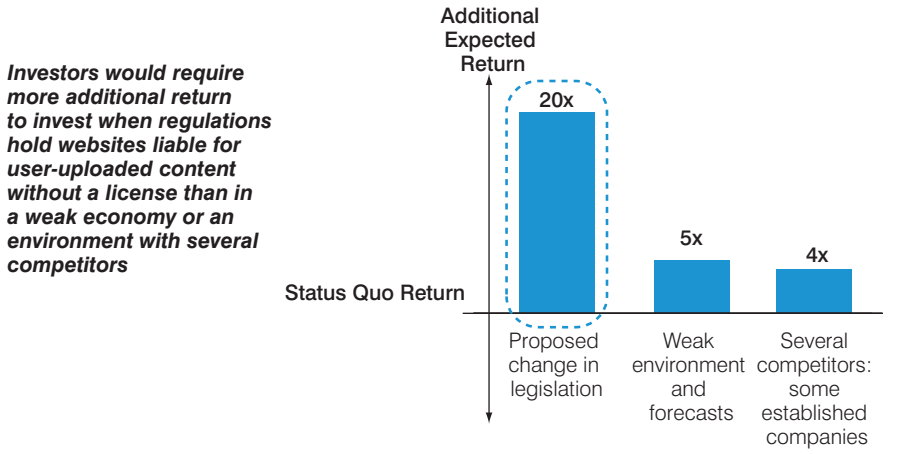


Source: Booz & Company analysis

Moreover, our study shows that investors would demand significantly higher returns to move from the current regulatory environment to a copyright regime in which users or DCIs could be held liable for uploaded licensed content than they would to move from an "average" economy to a "weak" economy or from an environment with few competitors to one with several (*see Exhibit 16*).

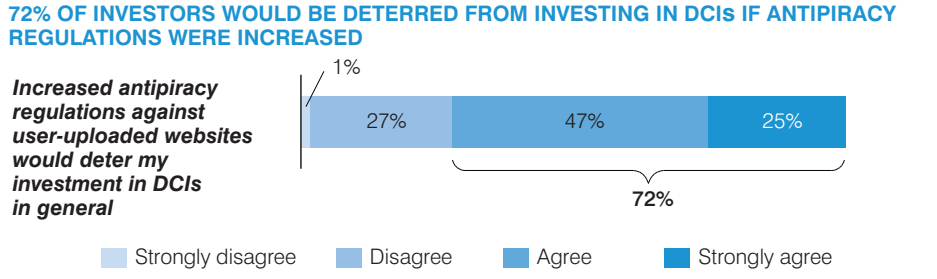
Finally, we looked at the impact of increased antipiracy regulation on the willingness to invest in DCIs, under the assumption that it might lead to an increase in liability for either users or websites. This analysis confirmed our prior results: 72 percent felt that increased antipiracy regulations would deter them from investing specifically in DCIs that offer user-uploaded music or videos (*see Exhibit 17*). This suggests that more stringent antipiracy laws would deter investment in DCIs.

Exhibit 16
Incremental Expected Returns Required in Different Regulatory Environment, Compared with Economic and Competitive Factors



Source: Booz & Company analysis

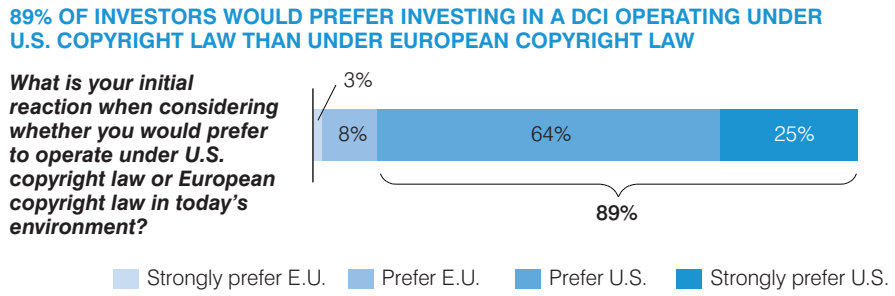
Exhibit 17
The Effect of Greater Antipiracy Regulation on Investor Willingness



Source: Booz & Company analysis

The behavior of investors in the E.U., where copyright laws are generally more stringent, may be a preview of how the level of investment in DCIs might change under any or all of the scenarios outlined in Chapter 6. Our survey found that a substantial majority of angel investors believe the U.S. copyright regulatory framework to be a more attractive environment for investment than the E.U. regulatory framework; similarly, all of the VCs we interviewed said they would prefer investing under the regulatory environment in the U.S. (*see Exhibit 18*).

Exhibit 18
Angel Preference for Investing in DCIs Operating Under U.S. Copyright Law vs. European Copyright Law



Source: Booz & Company analysis

Chapter 6
IMPLICATIONS FOR REGULATORS

The results of our research indicate that efforts to increase the stringency of the current copyright regulation landscape would have an adverse effect on early-stage investments in the DCI space. Specifically, our findings suggest the following:

- The regulatory environment is just as important a driver of early-stage investment decisions as is the state of the economy, the degree of competition in the space, or even the expected return on investments.

- Increasing the liability of users or websites in cases of copyright infringement will likely have a greater negative effect on investment than would a weak economy or a more competitive landscape.

Given these findings, our study suggests that it is important that regulators consider the following when debating potential new regulations:

- Early-stage investment is a critical component in the formation of new businesses. The impact of new regulations on the willingness of angel investors and venture capitalists to invest should be fully understood and taken into account before new regulations holding users or content providers liable are considered.

- Reaching out to local early-stage investors will provide regulators with an opportunity to understand investors' specific assessments of potential regulations and their implications for the level of future investment. This should be an important consideration when regulators seek to determine the impact of regulatory change on their local economies and communities.

Furthermore, our study found that an unclear or ambiguous legal environment in a particular space makes early-stage investors uncomfortable about investing in that space. While the following steps were not explicitly tested in this study, it might be valuable to:

- Identify areas of copyright regulation that are particularly prone to litigation and look to clarify the regulations so that DCIs acting in good faith are less likely to be engaged in litigation.

- Assess the full set of economic implications when considering any new regulations, especially regulations that could lead to large compliance costs.

Appendix
METHODOLOGY

This study took the form of an online survey of angels and a set of interviews with prominent venture capitalists. The angel survey was designed to serve as a broad measure to quantify investing behavior, while the interviews offered a more qualitative perspective and helped add color to the otherwise purely numerical results. The interviews also helped generate hypotheses about angel attitudes, which were then incorporated into the quantitative survey. In combination, the two provide a thorough perspective on early-stage investing behavior.

We worked with Keiretsu Forum, a top angel organization, to provide us access to their membership, which consists of wealthy U.S. and international angel investors, as well as guidance on how to design and administer the survey. In addition, Keiretsu Forum connected us with more than half a dozen other angel groups, including Alliance of Angels, Angel List, Angel Resource Institute, Band of Angels, Boise Angel Fund, Dingman Angels, Harvard Angels, Oregon Entrepreneurs Network, PA Angel Network, Plug and Play Tech Center, Sacramento Angels, and Sand Hill Angels that were very helpful in allowing us to contact their members as well. This diversity of groups allowed for a more geographically diverse sample and helped increase the sample size.

A total of 189 angels, all of them self-identified as U.S. accredited investors, completed the Web survey and were verified as valid respondents. Incomplete and duplicate responses were removed, as well as those from respondents who spent less than five minutes on the survey, as this was deemed too short a time to have completed the survey thoughtfully; the mean response time was 17 minutes. (A copy of the entire survey is available on request.)

In addition to our standard analysis of the results, we also conducted what is called a conjoint analysis to arrive at some of our results. This is a statistical modeling technique used to gauge the value of discrete components of a complex value proposition or decision. Conjoint analysis is particularly valuable for understanding *trade-offs* among attributes, and thus can provide insights not otherwise captured through the answers to direct questions.

For the conjoint section of the survey, respondents were presented with an investment in a hypothetical DCI. We held constant the internal variables of the investment, such as the company's business description, management team, capital structure, financial situation, and exit strategy. We then varied several external variables relating to the investing environment, such as the state of the economy, degree of competition, legal environment, and expected return. By forcing respondents to choose among different scenarios, we were able to tease apart statistically the underlying preferences through the observed trade-offs. The results are shown in Chapter 5. (A more complete description of how we conducted the conjoint analysis is available on request.)

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[5] "Models of Angel Investing: Portals to the Early Stage Market"; "Historical Size of the US Angel Market"; "The Consequences of Entrepreneurial Finance: A Regression Discontinuity Analysis."

[6] University of New Hampshire Center for Venture Research; Jeffrey E. Sohl; NVCA MoneyTree Report.

[7] "The Consequences of Entrepreneurial Finance: A Regression Discontinuity Analysis."

[8] "The Consequences of Entrepreneurial Finance: A Regression Discontinuity Analysis."

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[15] "Content and Control: Assessing the Impact of Policy Choices on Potential Online Business Models in the Music and Film Industries."

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The Impact of Copyright Policy Changes on Venture Capital Investment in Cloud Computing Companies

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1. Introduction

This paper examines the effect of copyright policy changes on venture capital (VC) investment in cloud computing companies. To do this, we analyze the effect on venture investment in cloud computing firms of the U.S. Second Circuit Court of Appeals' August 2008 decision in *The Cartoon Network, et al. v. Cablevision*, which was widely seen as easing certain ambiguities surrounding the intellectual property standing of these firms in the U.S. Our findings suggest that decisions around the scope of copyrights can have significant impacts on investment and innovation. We find that VC investment in cloud computing firms increased significantly in the U.S. relative to the EU after the *Cablevision* decision. Our results suggest that the *Cablevision* decision led to additional incremental investment in U.S. cloud computing firms that ranged from $728 million to approximately $1.3 billion over the two-and-a-half years after the decision. When paired with the findings of the enhanced effects of VC investment relative to corporate investment, this may be the equivalent of $2 to $5 billion in traditional R&D investment.

2. Background

2.1. Academic Research Examining Impact of Policy on Venture Financing

To understand the impact of copyright policy changes on the willingness of venture capitalists to invest in cloud computing, we employ a difference-in-difference approach, hypothesizing that policy shifts affect investments in different geographies, sectors, and years in varying ways. While such analyses are widely employed in the economics literature, the closest analogy to our work is that of Goldfarb and Tucker (2011), which examines how the enactment of the EU Privacy and Electronic Communications Directive affected the performance of

advertisement campaigns in the European countries that enacted it, relative to other countries that had no such laws.

This topic is important due to the relationship between venture capital, innovation, and job growth. It might be thought that it would not be difficult to address the question of the impact of venture capital. For instance, one could look at regressions across industries and time, and examine whether, controlling for R&D spending, venture capital funding has an impact on various measures of innovation. But, even a simple model of the relationship between venture capital, R&D, and innovation suggests that this approach is likely to give misleading estimates.

Both venture funding and innovation could be positively related to a third unobserved factor such as the arrival of technological opportunities. Thus, there could be more innovation at times that there was more venture capital, not because the venture capital caused the innovation, but rather because the venture capitalists reacted to some fundamental technological shock which was sure to lead to more innovation. To date, only a handful of papers have attempted to address these challenging issues.

Hellmann and Puri (2000), for instance, examines a sample of 170 recently formed firms in Silicon Valley, including both venture-backed and non-venture-backed firms. Using questionnaire responses, they find empirical evidence that venture capital financing is related to product market strategies and outcomes of startups. They find that firms that are pursuing an "innovator strategy" (a classification based on the content analysis of survey responses) are significantly more likely and faster to obtain venture capital. The presence of a venture capitalist is also associated with a significant reduction in the time taken to bring a product to market, especially for innovators. Furthermore, firms are more likely to list obtaining venture capital as a significant milestone in the lifecycle of the company as compared to other financing events.

The results suggest significant interrelations between investor type and product market dimensions, and a role of venture capital in encouraging innovative companies. Given the small sample size and the limited data, they can only modestly address concerns about causality, and as a result, the possibility remains that more innovative firms select venture capital for financing, rather than venture capital causing firms to be more innovative.

Kortum and Lerner (2000), by way of contrast, examines whether these patterns can be discerned on an aggregate industry level, rather than on the firm level. The authors address concerns about causality in two ways. First, they exploit the major discontinuity in the recent history of the venture capital industry: in the late 1970s, the U.S. Department of Labor clarified the Employee Retirement Income Security Act, a policy shift that freed pensions to invest in venture capital. This shift led to a sharp increase in the funds committed to venture capital. This type of exogenous change should identify the role of venture capital, because it is unlikely to be related to the arrival of entrepreneurial opportunities. They exploit this shift in instrumental variable regressions. Second, they use R&D expenditures to control for the arrival of technological opportunities that are anticipated by economic actors at the time, but that are unobserved to econometricians. In the framework of a simple model, they show that the causality problem disappears if they estimate the impact of venture capital on the patent-R&D ratio, rather than on patenting itself.

Even after addressing these causality concerns, the results suggest that venture funding has a strong positive impact on innovation. The estimated coefficients vary according to the techniques employed, but on average a dollar of venture capital appears to be three to four times more potent in stimulating manufacturing industry patenting than a dollar of traditional corporate R&D. The estimates, therefore, suggest that venture capital, even though it averaged less than

three percent of corporate R&D from 1983 to 1992, is responsible for a much greater share—perhaps ten percent—of U.S. industrial innovations in this decade. Moreover, the venture-backed firms' patents are more frequently cited and litigated, which suggests that the results are not being driven by patenting for its own sake.

There also appears to be a strong relationship between venture capital and job creation. There are several ways to see this relationship. Perhaps the most straightforward way is to take a snapshot of the public markets. By late 2011, venture-backed firms that had gone public made up over 11 percent of the total number of public firms in existence in the U.S. Those public firms supported by venture funding employed six percent of the total public-company workforce—many of which were high-salaried, skilled positions in the technology sector.[2]

Puri and Zarutskie (2010), in a more academically rigorous analysis, looks at job creation by venture-backed firms. They highlight that many of the firms that receive venture backing for the first time have no revenues and very modest employment. They compare the evolution of venture-backed and non-venture-backed firms using the records of the U.S. Census's Longitudinal Business Database, which tracks both public and private entities. After venture financing, they find very rapid employment growth in venture-financed firms relative to non-venture-financed firms. While the venture-backed firms (and by construction, the matching entities) have an average of about 20 employees at the time of the initial financing, five years later the venture-financed firms have on average about 80 employees, while non-venture-financed firms have grown to around 30 employees. Beyond the fifth anniversary of the financing, they continue to see greater employment growth by venture-financed firms relative to non-venture-financed firms.

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2.2. The Impact of the Litigation

The present analysis looks at venture investment around a key juncture in copyright policy in the United States: the 2008 appellate decision in *The Cartoon Network, et al. v. Cablevision*. It will compare venture capital investment in cloud computing in the U.S. against that in the EU (where the decision did not have bearing) both before and after the *Cablevision* decision by employing a differences-in-differences approach.

In 2006, Cablevision announced the development of a Remote Storage Digital Video Recorder (RS-DVR). Similar in operation to a traditional recorder, the Cablevision RS-DVRs allow customers to record, pause, and replay television content on a hard drive. Unlike traditional DVRs, however, in which a consumer installs and uses an appliance in their own home, the Cablevision RS-DVR was located remotely, recording to and playing back from remote servers. When a consumer hit the "record" button on their remote, the RS-DVR would start to record, just as if that RS-DVR were right in their living room. In response, a consortium of U.S. television and copyright holders filed a complaint against Cablevision in May 2006 over alleged copyright infringement.

In March 2007, the District Court declared a summary judgment against Cablevision.[3] As the appellate court narrated:

> *[P]laintiffs successfully argued that Cablevision's proposed system would directly infringe their copyrights in three ways. First, by briefly storing data in the primary ingest buffer and other data buffers integral to the function of the RS-DVR, Cablevision would make copies of protected works and thereby directly infringe plaintiffs' exclusive right of reproduction under the Copyright Act. Second, by copying programs onto … hard disks …, Cablevision would again directly infringe the reproduction right. And third,*

[3] *Twentieth Century Fox Film Corp. v. Cablevision Sys. Corp.*, 478 F. Supp. 2d 607 (S.D.N.Y. 2007).

by transmitting the data ... to ... customers in response to a "playback" request, Cablevision would directly infringe plaintiffs' exclusive right of public performance.[4]

In August 2008, the District Court decision was reversed on appeal by the Second Circuit Court of Appeals.[5] The Circuit Court held that Cablevision's RS-DVR system did not infringe the plaintiffs' rights of reproduction and public performance on any of the three claimed grounds. The original decision was reversed, vacated, and sent back to be reconsidered by the lower court. In June 2009, the Supreme Court refused to hear the case, thereby effectively finalizing the Second Circuit's decision.

At the time of the decision, the ruling was viewed as an important one that would impact cloud computing. To cite two contemporaneous accounts:

- *The Cablevision ruling is good for IT companies moving into cloud computing, said Dow Lohnes PLLC attorney James Burger, who represents technology companies in IP and content licensing matters. If the court had found Cablevision guilty of direct infringement for giving its customers the RS-DVR data storage system, system operators storing consumers' legally acquired entertainment media in the internet cloud could have faced the same claims.*[6]
- *[A] rule holding Cablevision liable merely because it housed and maintained the servers in this case could imperil a wide variety of innovative business models that rely on the use of remote computing, ranging from examples like*

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4 *Cartoon Network, LP v. CSC Holdings*, 536 F.3d 121 (2d Cir. 2008).

5 *Ibid.*

6 Standeford, Dugie, "US Cablevision Decision Has Implications for Cloud Computing, Online Advertising," *Intellectual Property Watch*, July 3, 2009, http://www.ip-watch.org/weblog/2009/07/03/us-cablevision-decision-has-implications-for-cloud-computing-online-advertising/.

Internet-enabled self-service photo processing and printing, to cloud computing services offered by companies like Amazon, Apple and Google.[7]

Thus, it is logical to hypothesize that the *Cablevision* decision would lead to increased venture investment in cloud computing in the U.S. relative to other counties where no comparable legal clarity has been established.[8] To the extent that U.S.-based firms also do business in the rest of the world, or EU firms do business in the U.S., such international activity will dampen the hypothesized effect. In the presence of such dampening influences, any estimates of the hypothesized effect, should one be found, are likely to be conservative.

A complication is introduced by the fact that the volume of venture capital activity varies considerably over time due to factors that are largely exogenous to the issues being studied here. To cite one notable example, the volume of venture investment fell by almost 90 percent between 2000 and 2002; this decline was driven primarily by the collapse in the public valuations for internet and telecommunications stocks in 2000, and the subsequent inability of venture funds to exit many of their investments at attractive prices. In other cases, funds have flowed to particular sectors, such as cleantech, potentially crowding out investment elsewhere. As a result, the bulk of our analyses examine VC investments in cloud computing as a share of all VC investments, though we also analyze the level of venture investment in cloud computing in a robustness check.

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[7] Kwun, Michael, "Victory for DVRs in the Cloud," *Electronic Frontier Foundation*, August 4, 2008, https://www.eff.org/deeplinks/2008/08/victory-dvrs-cloud.

[8] While there have been several copyright cases against online video recording service providers in Europe, we are unaware of any that has resolved such substantial uncertainty with respect to reproduction and retransmission rights in favor of such service providers as the *Cablevision* decision has in the U.S.

3. Data

3.1. Venture Capital Funding Data

Our analysis focuses on how VC investment in cloud companies varies between the U.S. and EU, and over time. In order to examine these differences, we construct a dataset that draws on historical investment figures captured by VentureXpert.[9] VentureXpert is one of the two most widely-used databases of venture capital investments in the U.S.[10] It contains data on approximately 1.2 million global private companies and over 25,000 venture, buyout, and mezzanine funds.[11]

The dataset is seeded with all private equity investments in the Thomson database from the beginning of 1995 through the end of 2010 classified as "Venture Capital Deals"[12] involving a portfolio company with a business description including the term "cloud." These criteria yielded data on investments in 280 companies. Independent research identified an additional 216 cloud computing-related companies,[13] 59 of which received VC investment from 1995 through 2010

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[9] More specifically, the Thomson ONE's Private Equity module powered by VentureXpert was used.

[10] Maats, Frederike, Metrick, Andrew, Hinkes, Brian, Yasuda, Ayako & Vershovski, Sofia, "On the Consistency and Reliability of Venture Capital Databases," (2009).

[11] "Private Equity Module: ThomsonONE.com Investment Banking," Thomson Reuters factsheet, 2011.

[12] Venture capital investments include start-up, seed, and early, expansion, and later stage deals.

[13] This researched involved the review of numerous sources, including: Corbin, Kenneth, "15 Cloud Computing Firms to Watch: Security, Storage, Apps," *datamation.com,* April 26, 2011, last accessed October 3, 2011, http://itmanagement.earthweb.com/cloud-computing/15-Cloud-Computing-Firms-to-Watch-Security-Storage-Apps-3931826.htm; "The Top 20 Software as a Service (SaaS) Vendors," *clouds360.com,* last accessed October 3, 2011, http://www.clouds360.com/saas.php; "The Top 20 Infrastructure as a Service (IaaS) Vendors," *clouds360.com,* last accessed October 3, http://www.clouds360.com/iaas.php; "The Top 20 Platform as a Service (PaaS) Vendors," *clouds360.com,* last accessed October 3, http://www.clouds360.com/paas.php; Kirilov, Kiril, "Top 25 European Cloud Computing Rising Stars To Watch – Complete List," *cloudtweaks.com*, April 6, 2011, last accessed October 3, 2011, http://www.cloudtweaks.com/2011/04/top-25-european-cloud-computing-rising-stars-to-watch-complete-list/; Geelan, Jeremy, "The Top 150 Players in Cloud Computing: SYS-CON's Cloud Computing Journal Expands Again Its List of Most Active Players in the Cloud Ecosystem," *soacloud.utilizer.com*, October 29, 2009, last accessed October 3, 2011, http://soacloud.ulitzer.com/node/770174; "50 Top Cloud Computing Companies," *cloudtweaks.com,* July 30, 2010, last accessed October 3, 2011, http://www.cloudtweaks.com/2010/07/over-50-of-the-biggest-and-best-cloud-computing-companies; Depena, Ray, "Cloud Computing Companies to Watch in 2011," *Cloud Computing Journal*, Cloud Expo Blog Feed Post, February 4, 2010, last accessed October 3, 2011, http://cloudcomputing.sys-con.com/node/1662284; Singh, Basant Narayan, "Top 10 Cloud Computing Service

captured in VentureXpert. Seventy-nine companies were removed from the list of 339 (280 + 59) companies appearing in VentureXpert based upon review of their business descriptions, and 17 were removed for lack of any data on investment amount.[14] As a result, the final dataset contains data on VC investments in 243 cloud computing companies.

The unit of observation in the data extracted from VentureXpert is an investment by a particular venture capital fund into a particular portfolio company on a particular date. The dataset contains 2,009 observations on investments by 706 distinct funds into the 243 companies on 587 different dates. These data were then aggregated by calendar quarter of investment date by region (U.S., EU, and rest of world).

Appendix A summarizes these quarterly investment-level figures and other data discussed below, by quarter, for both the U.S. and EU. As Appendix A depicts, total VC investment in the identified U.S. cloud companies from the first quarter of 1995 to the end of 2010 amounted to $5.9 billion. This reflects average quarterly investment of $92.3 million over that time period. In the period immediately preceding the *Cablevision* ruling (Q1 2006 to Q2 2008), average quarterly investment in U.S. venture-backed cloud companies was $131.0 million, and subsequent to the ruling, that figure amounted to $184.7 million. Thus, average quarterly investment in U.S. cloud computing increased by approximately 41 percent after the *Cablevision* decision. Appendix A further depicts that VC investment in the identified EU cloud companies from the first quarter of 1995 to the end of 2010 amounted to $242.3 million. This reflects

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Providers of 2009," *techno-pulse.com,* December 8, 2009, last accessed October 3, 2011, http://www.techno-pulse.com/2009/12/top-cloud-computing-service-providers.html; and, "List of Top 'Cloud Computing Solution Providers to Watch in 2009," *onCloudComputing.com*, July 1, 2009, last accessed October 3, 2011, http://www.oncloudcomputing.com/en/2009/07/list-of-top-cloud-computing-solution-providers-to-watch-in-2009/.

[14] Business descriptions from VentureXpert, Bloomberg, the company websites, and news stories were reviewed. Companies were excluded if cloud computing did not appear to be a primary part of their business or their business appeared to focus on pushing non-user-generated content to from the cloud to users (*e.g.*, security updates, games, licensed media content).

average quarterly investment of $3.8 million over that time period. In the period immediately preceding the *Cablevision* ruling (Q1 2006 to Q2 2008), the average quarterly investment in EU venture-backed cloud companies was $7.0 million, and subsequent to the ruling, that figure amounted to $8.9 million. Thus, average quarterly investment in EU cloud computing increased by approximately 27 percent, as compared with 41 percent in the U.S., after the *Cablevision* decision.

3.2. Supplemental Data

We augment the VC funding data with data on other factors that could influence investors' decisions to invest in cloud computing, specifically, and in other sectors more generally. Such factors include macroeconomic conditions reflected in gross domestic product (GDP) measures and the feasibility of cloud computing as measured by broadband penetration.

Our GDP data are quarterly growth rates of real, seasonally adjusted GDP as a percent change over the previous quarter from the OECD.[15] These data are available for the U.S. from Q1 1995 through Q2 2011, and for the EU (27 countries) from Q2 1995 through Q2 2011.

Data on broadband penetration, which is equal to the number of broadband subscriptions per 100 inhabitants, was obtained from the OECD for the U.S. and 21 of the 27 EU member states from Q2 2002 through Q4 2010.[16] To calculate an EU-specific measure of broadband penetration in each period, the broadband penetration rate of each EU member state was multiplied by its corresponding annual population to obtain the number of broadband subscribers. Next, the total number of EU broadband subscribers was obtained by summing over all EU member states; this total was then divided by the total EU population to obtain an EU-

[15] Data accessed through http://stats.oecd.org.
[16] Data accessed through http://stats.oecd.org.

specific measure of broadband penetration. Finally, quarterly broadband penetration rates were calculated by linearly interpolating the semi-annual series.

These supplemental data are also summarized in Appendix A. As the summary statistics show, quarterly GDP growth in the U.S over the period 1995 through 2010 was higher on average than in the EU (means of 0.6 and 0.5 percent, respectively) and more volatile than in the EU (standard deviations of 0.7 and 0.6 percent, respectively). In the period immediately preceding the *Cablevision* ruling (Q1 2006 to Q2 2008), quarterly GDP growth in the U.S. was lower on average and more volatile than in the EU (means of 0.4 and 0.7 percent, respectively; standard deviations of 0.5 and 0.4 percent, respectively). Subsequent to the ruling, quarterly GDP growth in the U.S. was higher on average than in the EU and more volatile (means of -0.1 and -0.3 percent, respectively; standard deviations of 1.2 and 1.1 percent, respectively).

4. Estimation and Results

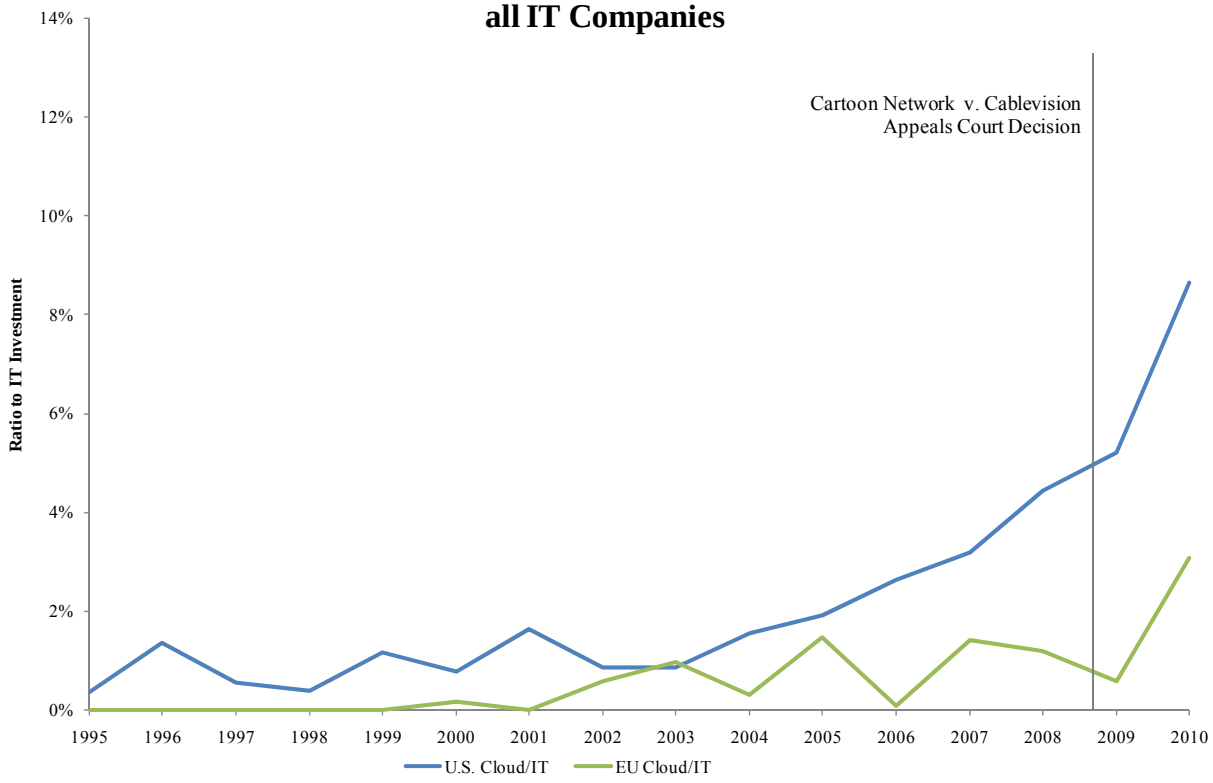
We have conducted multiple statistical analyses in order to determine whether investment in venture-backed U.S. cloud companies rose subsequent to the Q3 2008 *Cablevision* appeals court ruling. Each of these analyses are variants of difference-in-difference regression frameworks that rely on historical investment levels in both the U.S. and EU as controls in order to identify any statistically significant increase in U.S. cloud companies post *Cablevision*.

Our initial set of regression analyses are variants of the following regression model that accounts for the impact of a variety of factors on quarterly venture-backed investment in the identified cloud companies:

$$VC\ Ratio_{r,t} = \beta_0 + \beta_1(U.S.\ Indicator)_r + \beta_2(Q3\ 2008\ or\ After\ Dummy)_t + \beta_3(Effect\ of\ Cablevision\ on\ U.S.\ VC\ Investment)_{r,t} + \theta X_{r,t} + \varepsilon_{r,t}. \quad (1)$$

Specifically, the dependent variable, *VC Ratio*$_{r,t}$, is venture capital dollars invested in the cloud computing companies in region *r* at quarter *t* divided by venture capital dollars invested in information technology (IT) companies in region *r* at quarter *t*. We normalized our dependent variable this way to control for secular trends in the venture capital market, as discussed in Section 2.2 above. Figure 1 depicts *VC Ratio* for the U.S. and EU annually from 1995 through 2010.

Figure 1
Ratio of Investment in Cloud Computing Companies to Investment in all IT Companies



Source: Private Equity Investment data Jan 1995 - Dec 2010 from Thomson ONE.

The explanatory variable *U.S. Indicator* equals one for investment in U.S. cloud computing companies and zero for investment in EU cloud computing companies. The explanatory variable *Q3 2008 or After Dummy* equals zero for all quarters before the U.S. Appellate Court decision in the *Cablevision* case in August 2008 and one in Q3 2008 and all quarters thereafter. The explanatory variable, *Effect of the Cablevision Decision on U.S. VC Investment*, a dummy

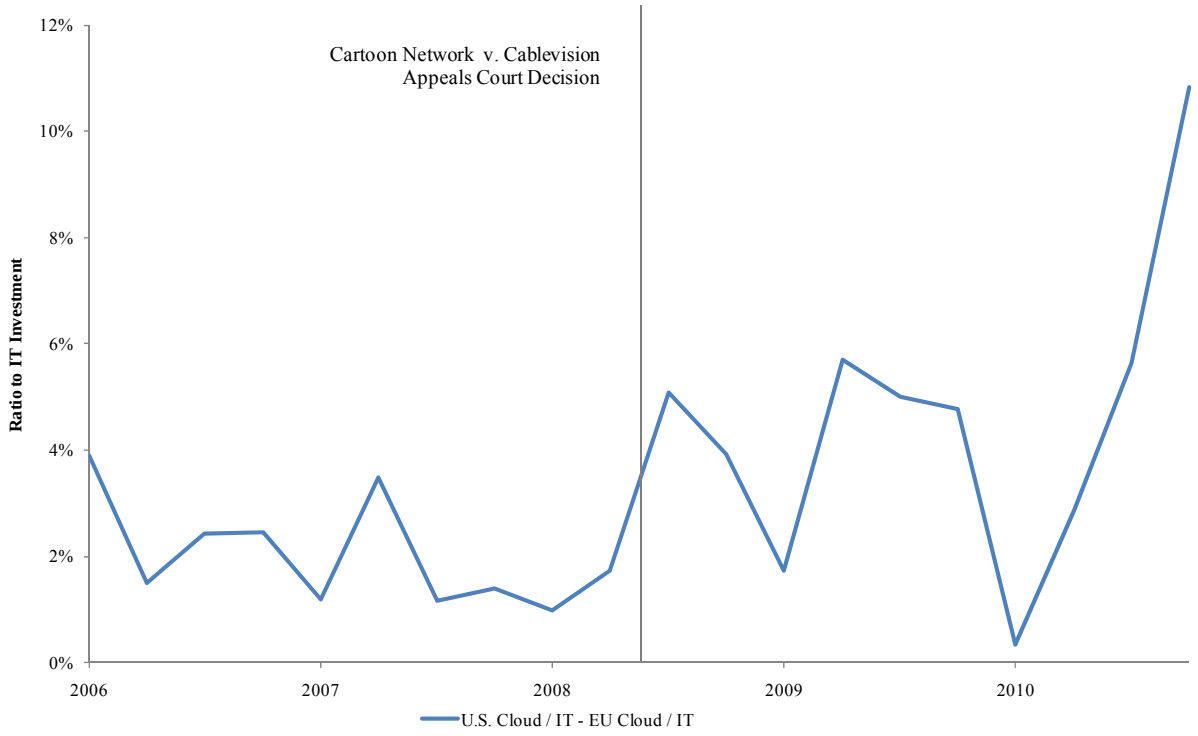
variable capturing the interaction between the *U.S. Indicator* and the *Q3 2008 Dummy*, equals one for investment in U.S. cloud computing companies in Q3 2008 and thereafter, and zero otherwise. $X_{r,t}$ is a vector of other explanatory variables including GDP growth and broadband penetration that may be associated with investment in cloud companies.

This difference-in-difference model is designed to estimate parameter β_3, the effect of the *Cablevision* decision on investment in U.S. cloud computing, controlling for trends in the U.S. relative to EU (captured by *U.S. Indicator*), and trends in cloud computing generally (captured by *Q3 2008 or After Dummy*) absent the policy.

The annual series plotted in Figure 1 shows a long-term upward trend in VC investment in cloud computing companies, particularly in the U.S., beginning well before the *Cablevision* decision. In order to focus more narrowly on the time period surrounding the *Cablevision* decision, our analyses focus on investment levels from 2006 to 2010. Doing so eliminates long-term investment trends prior to 2006 from influencing the results. Figure 2, which depicts the quarterly difference between investment in U.S. and EU venture-backed firms, suggests that investment in U.S. venture backed cloud companies was not systematically increasing, relative to EU firms, in the time period immediately preceding the 2008 *Cablevision* ruling, an observation that is confirmed more rigorously in Section 4.1.2 below.

Our first set of regression results are presented below in Table 1, and show that investment in venture-backed cloud computing companies is significantly higher in the U.S. than in the EU after the *Cablevision* decision. The difference-in-difference framework shows that this result holds after controlling for both differences in levels of investment in U.S.- vs. EU-based cloud computing companies and differences in investment in cloud computing companies before vs. during and after Q3 2008, the quarter of the appellate court ruling in the *Cablevision* case.

Figure 2
Difference in the Ratio of Investment in Cloud Computing Companies to Investment in all IT Companies in the U.S. and EU



Source: Private Equity Investment data Jan 2006 - Dec 2010 from Thomson ONE.

More specifically, results for Model 1 presented in Table 1 can be interpreted as follows.

- The constant term, $\beta_0 = 0.0117$, is an estimate that VC investment in cloud computing in the EU as a percentage of VC investment in IT in the EU averaged approximately 1.17 percent prior to Q3 2008. The standard error of this estimate indicates that it is statistically significant at the 99 percent confidence level.[17]
- The coefficient $\beta_1 = 0.0202$ on the *U.S. Indicator* variable is an estimate that VC investment in cloud computing in the U.S. as a percentage of VC investment in IT in the U.S. averaged approximately 2.02 percent higher than the corresponding share in the EU, or 3.19 percent of VC investment in IT in the U.S. prior to Q3 2008.[18] The standard error of the β_1 estimate indicates that it is statistically significant at the 99 percent confidence level.

[17] Robust standard errors are used throughout.
[18] $\beta_0 + \beta_1 = 0.0117 + 0.0202 = 0.0319$.

Table 1
Cloud Computing Regression Results: U.S. vs. EU[1,2]
Dependent Variable: Ratio of Cloud Computing VC Dollars to Total IT VC Dollars

	Model	
Independent Variables	(1)	(2)
U.S. Indicator	0.0202***	0.0129***
	(0.0048)	*(0.0045)*
2008 Dummy[3]	0.0059	-0.0094
	(0.0080)	*(0.0090)*
Effect of Cablevision on U.S. VC Investment	0.0257**	0.0256**
	(0.0114)	*(0.0095)*
Percent Change in GDP		0.0093***
		(0.0030)
Broadband Penetration Rate		0.3754***
		(0.0900)
Constant	0.0117***	-0.0629***
	(0.0038)	*(0.0167)*
Observations	40	40
Adjusted R-Squared	0.544	0.699
Implied Increase in U.S. Cloud VC Investment ($ Millions)	**$730**	**$728**
Length of Time Period	1Q 2006 - 4Q 2010	1Q 2006 - 4Q 2010

Notes:
[1] Robust standard errors are provided under the point estimates in italics.
[2] *** indicates significance at a 1 percent level, ** indicates significance at a 5 percent level, and * indicates significance at a 10 percent level.
[3] Decision by Appellate Court (judgment of District Court is reversed) (8/4/2008). The 2008 Dummy variable is set equal to one for all quarters after 2Q 2008.

- The coefficient $\beta_2 = 0.0059$ on the *Q3 2008 Dummy* is an estimate that VC investment in cloud computing in the EU as a percentage of VC investment in IT in the EU averaged approximately 0.59 percent higher beginning in Q3 2008 than it did prior to Q3 2008, or 1.76 percent of VC investment in IT in the EU in that latter time period.[19]
- The coefficient $\beta_3 = 0.0257$ on the *Effect of Cablevision on U.S. VC Investment* interaction dummy is an estimate that the rise in average VC investment in cloud

[19] $\beta_0 + \beta_2 = 0.0117 + 0.0059 = 0.0176$.

computing in the U.S. as a percentage of VC investment in IT in the U.S. from the period Q1 2006 through Q2 2008 to the period Q3 2008 through Q4 2010 was approximately 2.57 percent greater than the corresponding rise in cloud computing investment in the EU, or approximately 3.16 percent overall.[20] This estimate of β_3, statistically significant at the 95 percent confidence level, implies an approximately $730 million increased VC investment in U.S. cloud computing companies after the *Cablevision* decision.

Model 2 is similar to Model 1, except that it incorporates variables that control for GDP growth and broadband penetration. As shown in column 2 of Table 1, the coefficients on these variables have the expected positive sign and are statistically significant. Interpretation of the other variables remains the same, and as shown in the table, the magnitude and significance of the *Effect of Cablevision on U.S. VC Investment* is almost identical to the magnitude and significance of the *Effect of Cablevision on U.S. VC Investment* in Model 1. The implied increase in U.S. VC investment of approximately $728 million is nearly identical as well.

To investigate the potential impact of outliers on our analysis, we ran Models 1 and 2 using a difference-in-difference quantile regression analysis. Quantile regression analysis allows one to estimate the relationship between a set of independent variables and a specific quantile, or percentile, of the response variable. One advantage of such an analysis is that the influence of large outliers is mitigated. Thus, for our context, it allows us to determine the extent to which our results are sensitive to quarters with very large or very small values of the dependent variable, *VC Ratio*. Results for median (quantile) difference-in-difference regressions are presented in Table 2.

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[20] $\beta_2 + \beta_3 = 0.0059 + 0.0257 = 0.0316$.

Table 2
Cloud Computing Quantile Regression Results: U.S. vs. EU[1,2]
Dependent Variable: Ratio of Cloud Computing VC Dollars to Total IT VC Dollars

	Model	
Independent Variables	(3)	(4)
U.S. Indicator	0.0204*	0.0099
	(0.0105)	*(0.0066)*
2008 Dummy[3]	-0.0014	-0.0174
	(0.0085)	*(0.0149)*
Effect of Cablevision on U.S. VC Investment	0.0335**	0.0318*
	(0.0138)	*(0.0160)*
Percent Change in GDP		0.0058
		(0.0061)
Broadband Penetration Rate		0.3594***
		(0.0792)
Constant	0.0112	-0.0556***
	(0.0075)	*(0.0142)*
Observations	40	40
Implied Increase in U.S. Cloud VC Investment ($ Millions)	**$952**	**$904**
Length of Time Period	1Q 2006 - 4Q 2010	1Q 2006 - 4Q 2010

Notes:
[1] Robust standard errors are provided under the point estimates in italics.
[2] *** indicates significance at a 1 percent level, ** indicates significance at a 5 percent level, and * indicates significance at a 10 percent level.
[3] Decision by Appellate Court (judgment of District Court is reversed) (8/4/2008). The 2008 Dummy variable is set equal to one for all quarters after 2Q 2008.

Results for Model 3, the quantile regression version of Model 1, are presented in Table 2. These results are similar to those presented in Table 1 and imply that the rise in median (as opposed to average) VC investment in cloud computing in the U.S., as a percentage of VC investment in IT in the U.S. from the period Q1 2006 through Q2 2008 to the period Q3 2008 through Q4 2010, was approximately 3.4 percent greater than the corresponding rise in cloud computing investment in the EU. This estimate, which is statistically significant at the 95 percent

confidence level, implies an approximately $952 million increase in VC investment in U.S. cloud computing companies after the *Cablevision* decision.

Results for Model 4, the quantile regression version of Model 2, are also presented in Table 2, and are similar to those for Model 3 with an implied increase in U.S. cloud computing investment of approximately $904 million.

4.1. Additional Sensitivity Analyses and Robustness Checks

4.1.1. Alternative Control Group Specifications

We have also estimated a difference-in-difference model comparing investment in the U.S. to investment in the rest of the world (ROW) in order to examine whether the results are sensitive to the use of EU companies as a control group. Specifically, we have conducted analyses analogous to Model 1 using ROW investment (rather than investment in the EU) as a benchmark. These results are presented in Table 3 and are qualitatively similar, finding that the surge in investment in U.S. venture-backed cloud computing companies amounted to $779 million.

As an alternative approach to examining the robustness of our findings, we have examined the extent to which investment levels increased subsequent to the *Cablevision* ruling for a broad set of internet companies, rather than just the cloud companies included in the above analyses. We anticipate that there will be no effects for this set of internet companies since the Cablevision ruling should only affect cloud computing companies. The results associated with Models 6 and 7, presented in Table 4, are analogous to Models 1 and 2 except that they are run on the "internet-specific" companies rather than the cloud companies.[21]

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[21] VentureXpert categorized 8,510 companies as being internet-specific. This list includes companies described as "internet communications," "e-commerce technology," "computer hardware," "internet software," "internet programming," "internet ecommerce," "internet content," and "internet services."

Table 3
Cloud Computing Regression Results: U.S. vs. Rest of World[1,2]
Dependent Variable: Ratio of Cloud Computing VC Dollars to Total IT VC Dollars

	Model
Independent Variables	(5)
U.S. Indicator	0.0257***
	(0.0045)
2008 Dummy[3]	0.0042
	(0.0044)
Effect of Cablevision on U.S. VC Investment	0.0274***
	(0.0092)
Constant	0.0062*
	(0.0034)
Observations	40
Adjusted R-Squared	0.706
Implied Increase in U.S. Cloud VC Investment ($ Millions)	**$779**
Length of Time Period	1Q 2006 - 4Q 2010

Notes:
[1] Robust standard errors are provided under the point estimates in italics.
[2] *** indicates significance at a 1 percent level, ** indicates significance at a 5 percent level, and * indicates significance at a 10 percent level.
[3] Decision by Appellate Court (judgment of District Court is reversed) (8/4/2008). The 2008 Dummy variable is set equal to one for all quarters after 2Q 2008.

As the results in Table 4 show, investment levels in U.S. internet-specific companies either actually *decrease* in the U.S. following the Cablevision decision (Model 6), or are not statistically different in the time periods before and after the *Cablevision* ruling (Model 7). This suggests that the findings described above are specific to cloud companies, in particular, and do not reflect general trends associated with venture-backed investment in internet-specific companies.

Table 4
Cloud Computing Regression Results: U.S. vs. EU[1,2]
Dependent Variable: Ratio of Internet-Specific VC Dollars to Total IT VC Dollars

	Model	
Independent Variables	(6)	(7)
U.S. Indicator	0.1094***	0.0806***
	(0.0274)	*(0.0282)*
2008 Dummy[3]	0.1185**	0.0501
	(0.0446)	*(0.0574)*
Effect of Cablevision on U.S. VC Investment	-0.0857*	-0.0793
	(0.0491)	*(0.0501)*
Percent Change in GDP		0.0152
		(0.0147)
Broadband Penetration Rate		1.2995***
		(0.4465)
Constant	0.2030***	-0.0441
	(0.0238)	*(0.0804)*
Observations	40	40
Adjusted R-Squared	0.303	0.370
Length of Time Period	1Q 2006 - 4Q 2010	1Q 2006 - 4Q 2010

Notes:
[1] Robust standard errors are provided under the point estimates in italics.
[2] *** indicates significance at a 1 percent level, ** indicates significance at a 5 percent level, and * indicates significance at a 10 percent level.
[3] Decision by Appellate Court (judgment of District Court is reversed) (8/4/2008). The 2008 Dummy variable is set equal to one for all quarters after 2Q 2008.

4.1.2. Stationarity[22]

One assumption made in our regression analyses is that the data are stationary; that is that the data series do not depend on time and thus, that the mean, variance, and covariance of the data do not vary with time. To examine the extent to which increased U.S. investment subsequent to the *Cablevision* decision reflects an ongoing trend, perhaps attributable to factors not reflected in any of the data we collected, we have conducted a variety of tests. First, we ran a

[22] A stationary time series is one whose statistical properties such as mean, variance, and autocorrelation, are all constant over time. Most statistical methods are based on this assumption, and violations of stationarity can lead to biased point estimates.

simple ordinary least squares regression on the difference between U.S. and EU investment levels against a time trend; this revealed that U.S. investment levels relative to EU investment levels were falling on average, but not significantly, during the Q1 2006 to Q3 2008 time period.

To more formally test for stationarity in our time series data, we conducted three well-known tests on our data from Q1 2006 through Q4 2010: the Dickey-Fuller, Phillips-Perron, and Kwiatkowski–Phillips–Schmidt–Shin tests. Using each test, we found no evidence of non-stationarity. As such, our data appear to be stationary, and thus, it is not necessary to adjust our regression equations or data.

4.1.3. Autocorrelation

We also tested for the presence of autocorrelation in our regression analyses by conducting a test proposed by Jeffrey Wooldridge for panel data.[23] After correcting for autocorrelation, the estimate of the effect of Cablevision remains significant and positive, and the implied increase in U.S. cloud VC investment actually increases from that of Models 1 and 2.

4.1.4. Investment Levels (vs. Ratios)

We ran additional sensitivities based on an alternate specification of the dependent variable. Specifically, we ran regressions analogous to Models 1 and 2 where the dependent variable was the total quarterly investment (in the U.S. or EU) measured in dollars, rather than measured in terms of a ratio relative to total IT spending. The total other IT venture capital investment and total other venture capital investment in a given region were controlled for by their inclusion as separate independent variables in the regression analysis. These regressions yielded results, presented in Table 5, comparable to those of Models 1 and 2.

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[23] Wooldridge, J.M, *Econometric Analysis of Cross Section and Panel Data*, Cambridge, MA: MIT Press (2002), pp. 282-283.

In Model 8, the analog to Model 1, U.S. investment was, on average, $119.1 million higher each quarter after the Cablevision ruling (after controlling for EU differences), totaling $1.2 billion over the 2.5 subsequent years. The corresponding figures for Model 9, the Model 2 analog, which incorporates controls for GDP changes and broadband penetration, imply $126.8 million higher investment on a quarterly basis and $1.3 billion in total for the 2.5 years.

Table 5
Cloud Computing Regression Results: U.S. vs. EU[1,2]
Dependent Variable: Cloud Computing VC Dollars

	Model	
Independent Variables	(8)	(9)
IT U.S. Minus Cloud VC Investment	0.0532	0.0590**
	(0.0327)	*(0.0267)*
Total VC Investment Minus IT Minus Cloud VC Investment	0.0087	-0.0004
	(0.0106)	*(0.0115)*
U.S. Indicator	-71.1660	-87.7535
	(108.5990)	*(84.7400)*
2008 Dummy[3]	7.2783	-24.2030
	(8.8634)	*(26.8703)*
Effect of Cablevision on U.S. VC Investment	119.1098*	126.8498**
	(59.3409)	*(51.4516)*
Percent Change in GDP		20.6457**
		(9.2363)
Broadband Penetration Rate		713.7737*
		(376.2864)
Constant	-37.2162	-170.5333**
	(22.5880)	*(71.7582)*
Observations	40	40
Adjusted R-Squared	0.750	0.803
Implied Increase in U.S. Cloud VC Investment ($ Millions)	**$1,191**	**$1,268**
Length of Time Period	1Q 2006 - 4Q 2010	1Q 2006 - 4Q 2010

Notes:
[1] Robust standard errors are provided under the point estimates in italics.
[2] *** indicates significance at a 1 percent level, ** indicates significance at a 5 percent level, and * indicates significance at a 10 percent level.
[3] Decision by Appellate Court (judgment of District Court is reversed) (8/4/2008). The 2008 Dummy variable is set equal to one for all quarters after 2Q 2008.

4.1.5. Cloud Company Identification

We have also tested the sensitivity of our results to the list of cloud computing companies included in our dataset. Our results are robust to the use of a smaller set of companies, that is, one that includes those with "cloud" in their VentureXpert business descriptions but does not include additions based on review of third party cloud computing company lists.

Our research also revealed specific types of service companies that rely on cloud computing technologies. These include companies described as software-as-a-service (SaaS), hardware-as-a-service (HaaS), and/or platform-as-a-service (PaaS). The *Cablevision* decision is likely only to have an indirect effect on these computing companies as they generally are much less likely to be directly associated with third-party copyrighted material. As one would expect, including these "as-a-service" companies in our data sample renders the effects associated with the 2008 *Cablevision* ruling statistically insignificant.

5. Conclusions

In this paper we set out to examine the effect of copyright policy changes on venture capital investment in cloud computing companies by analyzing the effect of the Second Circuit Court of Appeals' decision in *The Cartoon Network, et al. v. Cablevision* on VC investment in U.S-based cloud computing companies. To that end, we constructed a dataset on VC investment in cloud computing companies and estimated multiple difference-in-difference regression models designed to test for a statistically significant increase in U.S. cloud companies post *Cablevision*.

Our findings suggest that decisions around copyright scope can have significant impacts on investment and innovation. We have tested a number of models and consistently find that the U.S. Second Circuit Court of Appeals' decision led to additional incremental investment in U.S. cloud computing companies compared to the EU experience. As shown in the figure in Appendix

B, estimates of increased VC investment in U.S. cloud computing from our seven models range from $728 million to approximately $1.3 billion, with an average of $936 million. When paired with the findings of the enhanced effects of VC investment relative to corporate investment, this may be the equivalent of $2 to $5 billion in traditional R&D investment.

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Appendix A
Summary Statistics for Investment Levels and Regression Variables

	Q1 1995 - Q4 2010						Pre Cablevision: Q1 2006 - Q2 2008						Post Cablevision: Q3 2008 - Q4 2010					
	Mean	Std Dev	Min	Med	Max	Total	Mean	Std Dev	Min	Med	Max	Total	Mean	Std Dev	Min	Med	Max	Total
VC Investment in U.S. Cloud ($ Millions)[1]	$92.3	$88.0	$0.0	$71.8	$406.5	$5,906.3	$131.0	$39.9	$72.9	$125.8	$191.1	$1,309.7	$184.7	$84.9	$58.8	$176.6	$369.4	$1,847.1
VC Investment in U.S. Cloud as % of VC Investment in U.S. IT[1]	2.2%	2.3%	0.0%	1.6%	11.5%		3.2%	0.9%	1.8%	3.0%	4.6%		6.3%	2.4%	3.1%	6.1%	11.5%	
VC Investment in EU Cloud ($ Millions)[1]	$3.8	$7.4	$0.0	$0.0	$34.0	$242.3	$7.0	$7.7	$0.0	$4.5	$20.5	$69.9	$8.9	$11.5	$0.0	$3.7	$34.0	$88.7
VC Investment in EU Cloud as % of VC Investment in E.U. IT[1]	0.7%	1.4%	0.0%	0.0%	6.4%		1.2%	1.2%	0.0%	0.9%	3.6%		1.8%	2.2%	0.0%	0.8%	6.4%	
Real U.S. GDP Growth Rate Prior Quarter[2]	0.6%	0.7%	-2.3%	0.7%	2.0%		0.4%	0.5%	-0.4%	0.4%	1.3%		-0.1%	1.2%	-2.3%	0.5%	1.0%	
Real EU GDP Growth Rate Prior Quarter[2]	0.5%	0.6%	-2.6%	0.5%	1.2%		0.7%	0.4%	-0.3%	0.7%	1.0%		-0.3%	1.1%	-2.6%	0.3%	1.0%	
U.S. Broadband Penetration Rate[3]	17.7%	7.4%	5.4%	18.6%	27.7%		20.7%	2.6%	16.6%	20.8%	23.9%		26.1%	0.8%	24.7%	25.9%	27.7%	
EU Broadband Penetration Rate[3]	15.0%	8.4%	2.0%	15.8%	26.0%		18.2%	3.0%	13.5%	18.5%	22.2%		24.6%	1.0%	22.8%	24.9%	26.0%	

Notes and Sources:
[1] Thomson ONE Private Equity data, Jan 1995 to Dec 2010.
[2] OECD real GDP growth from the previous quarter.
[3] OECD broadband penetration rate.

Appendix B
Implied Increase in U.S. Cloud VC Investment ($ Millions)