

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

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1. Introduction

This paper examines the effect of copyright policy changes in the EU on venture capital (VC) investment in cloud computing companies. To do this, we analyze the effects of a court ruling in France and several court rulings in Germany on VC investment in cloud computing firms in these countries. These court rulings were seen as negatively affecting the development of cloud computing, and our findings confirm this view by showing that these rulings regarding the scope of copyrights had significant, negative impacts on investment. Specifically, we find that VC investment in cloud computing firms declined in Germany and France, relative to the rest of the EU,² after the French and German rulings. Our results suggest that these rulings led to an average reduction in VC investment in French and German cloud computing firms of \$4.6 and \$2.8 million per quarter, respectively. This implies a total decrease in French and German VC investment of \$87 million over an approximately three year period. When paired with the findings of the enhanced effects of VC investment relative to corporate investment, this may be the equivalent of \$269.7 million in traditional R&D investment.³

2. Background – The Impact of the French and German Litigation

To understand the impact of copyright policy changes on the willingness of venture capitalists to invest in cloud computing, we analyze changes in VC investment around several important junctures in EU copyright policy: a November 2008 ruling by the Tribunal de Grande Instance de Paris in France, and several court rulings regarding Shift.tv and Save.tv in Germany.

² Other EU countries included in the analysis are: Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom.

³ On average, a dollar of venture capital appears to be 3.1 times more potent in stimulating manufacturing industry patenting than a dollar of traditional corporate R&D. (Kortum, Samuel & Lerner, Josh, “Assessing the Contribution of Venture Capital to Innovation,” *The RAND Journal of Economics* 31, no. 4 (Winter, 2000): 674-692, p. 691.)

Our analysis compares VC investment in cloud computing in France and Germany to VC investment in cloud computing in the rest of the EU, where the rulings did not have bearing, both before and after the court rulings, by employing a differences-in-differences approach.

We employed this approach in a previous paper, “The Impact of Copyright Policy Changes on Venture Capital Investment in Cloud Computing Companies,” in which we analyzed the effect on VC investment in U.S. cloud computing firms of the U.S. Second Circuit Court of Appeals’ August 2008 decision in *The Cartoon Network, et al. v. Cablevision*. This previous paper and our current work are important due to the relationship between VC, innovation, and job growth. In particular, as discussed in detail in “The Impact of Copyright Policy Changes on Venture Capital Investment in Cloud Computing Companies,” venture funding appears to have both a strong positive impact on innovation and a strong relationship with job creation.

2.1. France: M6, W9, France Television, TF1, and NT1 v. Wizzgo (2008)

In May 2008, Wizzgo launched the first online DVR platform in France which allowed users to view recorded copies of programs broadcast on domestic terrestrial television channels as long as they requested that the show be recorded before the programs started.⁴ The copy was a faithful reproduction and included the original advertising.⁵ In response, a consortium of French television and copyright holders, including M6, W9, France Television, TF1, and NT1, filed complaints against Wizzgo over alleged copyright infringement.

Wizzgo argued that its technological platform fell under two exceptions in French copyright law: transience and privacy copying. First, Wizzgo claimed that it provided users with a temporary and transient copy of a program, and only assisted users in saving private copies.

⁴ International Law Office. “Rise and Fall of Online Digital Video Recorders,” February 19, 2009, accessed through <http://www.internationallawoffice.com/newsletters/detail.aspx?g=a08cc455-b5ae-42d4-881d-fa85fc7c3a53>.

⁵ Wizzgo, “Wizzgo Blog,” March 16, 2009, accessed through www.wizzgo.com/blog/.

Second, Wizzgo claimed that each copy of a recorded program was private. In France, copying copyrighted work strictly for personal use falls under the private copy exception as long as the copyist and the user of the copy are the same person.⁶ Throughout August and November 2008, the Tribunal de Grande Instance de Paris issued a series of injunctions, banning Wizzgo from using the plaintiffs' copyrighted works.⁷ On November 25, 2008, the Tribunal de Grande Instance de Paris declared the final set of summary judgments against Wizzgo and levied a fine.⁸ In response to the court's ruling and the fine ordered by the court, Wizzgo and similar companies halted operations.⁹ Outside sources suggest that the French litigation had a negative impact on VC investment and delayed the development of related technology. For example, a paper by European Digital Rights states that "[t]he [Wizzgo] case is a relevant example to further corroborate the idea that the current EU copyright policy hinders technology."¹⁰ Some members of the popular press was similarly disappointed; for example, one member wrote that "[b]y

⁶ International Law Office. "Rise and Fall of Online Digital Video Recorders," February 19, 2009, accessed through <http://www.internationallawoffice.com/newsletters/detail.aspx?g=a08cc455-b5ae-42d4-881d-fa85fc7c3a53>.

⁷ The Tribunal de Grande Instance issued five summary judgments against Wizzgo: (1) *Metropole Television v. Wizzgo* (August 6, 2008); (2) *France 2 v. Wizzgo* (November 6, 2008); (3) *TF1 v. Wizzgo* (November 6, 2008); (4) *NT1 v. Wizzgo* (November 10, 2008); and (5) *Metropole Television v. Wizzgo* (November 25, 2008). (International Law Office. "Rise and Fall of Online Digital Video Recorders," February 19, 2009, accessed through <http://www.internationallawoffice.com/newsletters/detail.aspx?g=a08cc455-b5ae-42d4-881d-fa85fc7c3a53>); ZDNet.fr, "TNT: Wizzgo Interdit d'Enregistrer les Programmes de France Télévisions et TF1," November 14, 2008, accessed through <http://www.zdnet.fr/actualites/tnt-wizzgo-interdit-d-enregistrer-les-programmes-de-france-televvisions-et-tf1-39384863.htm>.

⁸ International Law Office. "Rise and Fall of Online Digital Video Recorders," February 19, 2009, accessed through <http://www.internationallawoffice.com/newsletters/detail.aspx?g=a08cc455-b5ae-42d4-881d-fa85fc7c3a53>.

⁹ "The court ordered compensatory damages of more than €440,000 against Wizzgo for copyright infringement, which convinced other French online DVR platforms immediately to cease similar services." (International Law Office. "Rise and Fall of Online Digital Video Recorders," February 19, 2009, accessed through <http://www.internationallawoffice.com/newsletters/detail.aspx?g=a08cc455-b5ae-42d4-881d-fa85fc7c3a53>.)

¹⁰ European Digital Rights, "The Response of the European Digital Rights to the European Commission's Green Paper on the Online Distribution of Audiovisual Works," 2011, accessed through http://ec.europa.eu/internal_market/consultations/2011/audiovisual/registered-organisation/edri_en.pdf, p. 5.

closing the door to the Wizzgo arguments [...] and the evolution of technology and uses, the French justice system is particularly reactionary and conservative.”¹¹

2.2. Germany: RTL et al. v. Shift.tv and Save.tv

Shift.tv, founded in 2005, and Save.tv, founded in 2006, are subscription-based services that allow customers to select and store television content on servers from which users can download and stream stored programs.¹² Online video recording platform service providers operate sites that facilitate the receipt of TV signals through satellite reception stations, and transform and store these signals in customer-dedicated server space.¹³ Customers select the content to be stored and can download and/or stream the content. In response to the services offered by these companies, two German television channels, RTL and SAT1, began judicial action claiming that the services constituted copyright infringement.¹⁴

A German District Court found that both Shift.tv and Save.tv infringed plaintiffs’ reproductions rights by storing and copying the data streams provided by the plaintiffs on servers for playback by customers, on May 12, 2006 and May 9, 2007, respectively. The Dresden Court of Appeals ruled against Shift.tv on November 28, 2006, yet in favor of Save.tv on October 9,

¹¹ “En claquant ainsi la porte à l’argumentaire de Wizzgo [...] et l’évolution des technologies et des usages, la justice française se montre particulièrement rétrograde et conservatrice.” (DeGroupNews.com, “Scandale judiciaire autour de Wizzgo,” November 26, 2008, accessed through <http://www.degroupnews.com/actualite/n3038-scandale-judiciaire-autour-de-wizzgo.html>.)

¹² CNet, “Online-Videorekorder: mit ein paar Klicks zum Wunsch-Programm,” accessed through http://www.cnet.de/praxis/tv-gaming/39195111/fullcontent/online_videorekorder_mit_ein_paar_klicks_zum_wunsch_programm.htm; International Law Office, “Federal Court Rules on Internet-Based Video Recording,” June 11, 2009, accessed through <http://www.internationallawoffice.com/newsletters/detail.aspx?g=a3b4f236-0844-4890-8a9c-2801a77792d8&redir=1>; Bundesgerichtshof I ZR 216/06, p. 2.

¹³ Bird & Bird, “Copyright Update: an Update on Developments in Europe in 2009,” accessed through <http://www.twobirds.com/English/Publications/NewsLetters/Upload/Copyright%20Update%202009.pdf>, p. 10.

¹⁴ Three lawsuits: *SAT1 v. Shift.tv*; *RTL v. Shift.tv*; *RTL v. Save.tv* (IRIS Legal Observations of the European Audiovisual Observatory, “DPMA Decides that VG Media Does Not Need to Grant Rights to Operate an Online Video Recorder,” 2011, accessed through <http://merlin.obs.coe.int/iris/2011/1/article22.en.html>.)

2007.¹⁵ On April 22, 2009, the Federal Court of Justice repealed both rulings and remanded them to the Dresden Appeals Court.¹⁶ In doing so, the Federal Court of Justice considered the recording process and ruled on two issues: the right of reproduction and the right of retransmission. To the court, it was unclear whether Shift.tv and Save.tv recorded broadcasts on behalf of its users, or if the technology was automatic and users themselves recorded the programs. If the copying was not automatic, the Federal Court ruled that Shift.tv and Save.tv would be liable for direct infringement of reproduction rights. Even if the copying was fully automatic, the defendants could be liable for infringement of the plaintiffs' retransmission rights to the public, which are harmed by retransmitting broadcasting signals simultaneously to a large number of customers.¹⁷ Thus, The Federal Court instructed the Appeals Court, on a case-by-case basis, to rule on whether the reproduction process is automated and to clarify the extent to which the plaintiffs infringed retransmission rights.¹⁸

In July 2011, the Dresden Appeals Court ruled in favor of Save.tv and found that its online video recorder did not infringe RTL's rights of reproduction, though a similar ruling has not been

¹⁵ Burghart, Sara, "Cablevision – Please Rewind: A Legal Analysis of Copyright Infringement by Remote Storage-DVRs under German and U.S. Copyright Law," unpublished thesis paper, Boston University School of Law, 2010, p. 13; International Law Office, "Federal Court Rules on Internet-Based Video Recording," June 11, 2009, accessed through <http://www.internationallawoffice.com/newsletters/detail.aspx?g=a3b4f236-0844-4890-8a9c-2801a77792d8&redir=1>; IRIS Legal Observations of the European Audiovisual Observatory, "RTL Loses Dispute with Save.tv," 2011, accessed through <http://merlin.obs.coe.int/iris/2011/8/article21.en.html>; "OLG Dresden 14 U 801/07 Urteil vom 12.07.2011," accessed through <http://www.recht-hat.de/urteile/urheberrecht-urteile/olg-dresden-14-u-80107-urteil-vom-12-07-2011-rtl-gegen-save-tv/>.

¹⁶ International Law Office, "Federal Court Rules on Internet-Based Video Recording," June 11, 2009, accessed through <http://www.internationallawoffice.com/newsletters/detail.aspx?g=a3b4f236-0844-4890-8a9c-2801a77792d8&redir=1>; IRIS Legal Observations of the European Audiovisual Observatory, "RTL Loses Dispute with Save.tv," 2011, accessed through <http://merlin.obs.coe.int/iris/2011/8/article21.en.html>.

¹⁷ Burghart, Sara, "Cablevision – Please Rewind: A Legal Analysis of Copyright Infringement by Remote Storage-DVRs under German and U.S. Copyright Law," unpublished thesis paper, Boston University School of Law, 2010, p. 13; Bird & Bird, "Copyright Update: an Update on Developments in Europe in 2009," accessed through <http://www.twobirds.com/English/Publications/NewsLetters/Upload/Copyright%20Update%202009.pdf>, pp. 10-11.

¹⁸ IRIS Legal Observations of the European Audiovisual Observatory, "DPMA Decides that VG Media Does Not Need to Grant Rights to Operate an Online Video Recorder," 2011, accessed through <http://merlin.obs.coe.int/iris/2011/1/article22.en.html>.

reached for Shift.tv. The court found that from a technical standpoint, the user initiates an automated recording process to create a private copy of a television program.¹⁹ However, the court did not resolve the issue of retransmission rights infringement.²⁰ As such, Save.tv requires a license for retransmission from RTL, yet it has been unable to do obtain such a license.²¹ Thus, while Save.tv was not found liable of direct infringement, German law has blurred the issue by neither ruling completely in favor nor completely against companies like Save.tv and Shift.tv. While Save.tv does not infringe reproduction rights, the German courts have ruled that television channels can prevent these businesses from operating by refusing to issue licenses for retransmission.

While both Save.tv and Shift.tv continue to operate in Germany, outside sources suggest that the German litigation had a negative impact on investment in this technology. For example, “[a]lthough the Federal Court of Justice referred the case back to the Court of Appeal, it is already clear that the business model of Internet-based video recording can be operated legally only with the broadcasters’ prior permission. It is doubtful whether a service operated on this basis can be profitable.”²² The popular press also reacted negatively: “[N]ew technology and

¹⁹ IRIS Legal Observations of the European Audiovisual Observatory, “RTL Loses Dispute with Save.tv,” 2011, accessed through <http://merlin.obs.coe.int/iris/2011/8/article21.en.html>.

²⁰ IRIS Legal Observations of the European Audiovisual Observatory, “RTL Loses Dispute with Save.tv,” 2011, accessed through <http://merlin.obs.coe.int/iris/2011/8/article21.en.html>.

²¹ VG Media, the German royalty collecting society, refused to grant Save.tv the necessary licenses to operate its business, arguing that online video licenses are not covered by its agreement with German broadcasters. (IRIS Legal Observations of the European Audiovisual Observatory, “DPMA Decides that VG Media Does Not Need to Grant Rights to Operate an Online Video Recorder,” 2011, accessed through <http://merlin.obs.coe.int/iris/2011/1/article22.en.html>.) In a November 2010 ruling on the dispute, the Appeals Court of Munchen found that “RTL is entitled to prohibit Save.tv from retransmitting its programmes.” (IRIS Legal Observations of the European Audiovisual Observatory, “RTL Loses Dispute with Save.tv,” 2011, accessed through <http://merlin.obs.coe.int/iris/2011/8/article21.en.html>.)

²² International Law Office, “Federal Court Rules on Internet-Based Video Recording,” June 11, 2009, accessed through <http://www.internationallawoffice.com/newsletters/detail.aspx?g=a3b4f236-0844-4890-8a9c-2801a77792d8&redir=1>.

innovation are impeded by [the 2009 judgment], which unnecessarily increases the technical deficits of Germany compared to other Internet-nations.”²³

2.3. Hypothesized Effects of the French and German Rulings

Given the views that both the French and German rulings were likely to have a negative impact on related technologies, it is logical to hypothesize that these rulings would lead to decreased VC investment in cloud computing in France and Germany relative to other countries in the EU.²⁴ To the extent that firms in other EU countries do business in France or Germany, and to the extent that these businesses must abide by French or German laws, any estimate of the effect of these rulings will be conservative since we are only measuring the effect on businesses that are located in France or Germany.

A complication is introduced by the fact that the volume of VC 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 VC 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 VC investment in cloud computing in a robustness check.

²³ “Moderner Technik und Innovation wird damit seiner Ansicht nach ein Riegel vorgeschoben, der die technischen Defizite Deutschland gegenüber anderer Internet-Nationen nur unnötig steigert. Mit dem neusten Urteil hingegen sei endlich ein Startschuss für weitere Entwicklungen gefallen.” (TVAnbieter.de, “Save.TV Gewinnt Rechtsstreit Gegen RTL Nur Teilweise,” July 25, 2011, accessed through <http://www.tvanbieter.de/2011/07/online-videorecorder-save-tv-gewinnt-rechtsstreit-gegen-rtl-nur-teilweise/>.)

²⁴ 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 over time between France, Germany, and the rest of the EU. In order to examine these differences, we construct a dataset that draws on historical VC investment figures captured by VentureXpert.²⁵

VentureXpert is a widely-used database to study VC investments in the EU.²⁶ It contains data on approximately 1.2 million global private companies and over 25,000 venture, buyout, and mezzanine funds.²⁷

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”²⁸ involving a portfolio company with a business description including the term “cloud.” These criteria yielded data on investments in 65 companies in the EU and rest-of-world (excluding the U.S.).

Independent research identified an additional 11 cloud computing companies which received VC investment from 1995 through 2010, as captured in VentureXpert.²⁹ Twenty-three companies

²⁵ More specifically, the Thomson ONE’s Private Equity module powered by VentureXpert was used.

²⁶ See for example Schwienbacher, Armin, “Venture Capital Investment Practices in Europe and the United States,” (2008); Rosa, Catarina and Raade, Kristiina, “Profitability of Venture Capital Investment in Europe and the United States,” (2006).

²⁷ “Private Equity Module: ThomsonONE.com Investment Banking,” Thomson Reuters factsheet, 2011.

²⁸ Venture capital investments include start-up, seed, and early, expansion, and later stage deals.

²⁹ This research 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.utilizer.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->

were removed from the list of 76 (65+ 11) companies appearing in VentureXpert based upon review of their business descriptions, and ten were removed for lack of any data on investment amount.³⁰ As a result, the final dataset contains data on VC investments in 43 cloud computing companies.

The unit of observation in the data extracted from VentureXpert is an investment by a particular VC fund into a particular portfolio company on a particular date. The dataset contains 152 observations on investments by 88 distinct funds into the 43 companies on 75 different dates. These data were then aggregated by calendar quarter of investment date by region (France, Germany, EU, and the rest-of-world).

Appendix A summarizes these quarterly investment figures and other data discussed below, for France and the EU (excluding France and Germany), for three time periods: (1) the entire period for which data from VentureXpert were obtained (Q1 1995 to Q4 2010), (2) a short period preceding the Wizzgo ruling (Q1 2006 to Q4 2008), and (3) a short period following the ruling (Q1 2009 to Q4 2010). We focus on relatively short periods around the ruling to mitigate the bias that could be introduced from long-term investment trends prior to 2006.

In the period immediately preceding the Wizzgo ruling, there were no VC investments in French venture-backed cloud companies, and subsequent to the ruling, the average quarterly VC

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 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/>.

³⁰ 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).

investment in French cloud companies was \$0.45 million. In the EU, for the period immediately preceding the Wizzgo ruling, the average quarterly VC investment in cloud companies was \$5.9 million. Subsequent to the ruling, the average quarterly VC investment in EU cloud companies was \$9.8 million.

Appendix B summarizes the quarterly investment figures and other data discussed below, for Germany and the EU (excluding France and Germany), for four time periods: (1) the entire period for which data from VentureXpert were obtained (Q1 1995 to Q4 2010), (2) a short period preceding the 2006 German District Court ruling (Q1 2004 to Q2 2006), (3) a short period following the ruling (Q3 2006 to Q4 2008), and (4) a longer period following the ruling (Q3 2006 to Q4 2010). As with the French ruling, we focus on relatively a short period around the 2006 German District Court ruling (Q1 2004 to Q4 2008) to isolate the effect of this ruling as well as the other similar rulings discussed above that occurred in 2006 and 2007. We also investigate the effect over a longer time period (Q1 2004 to Q4 2010) since the litigation involving Shift.tv and Safe.tv, to our knowledge, has not yet been completely resolved. Thus, uncertainty likely exists regarding the viability of certain cloud computing business models in Germany.

In the period immediately preceding the 2006 German District Court ruling (Q1 2004 to Q2 2006), there were no investments in German venture-backed cloud companies, while the average quarterly VC investment in EU cloud companies was \$3.5 million. Subsequent to the ruling, for the shorter period Q3 2006 to Q4 2008, there were also no investments in German venture-backed cloud companies, while EU cloud computing companies received average quarterly VC investment of \$6.9 million. For the longer period Q3 2006 to Q4 2010, the average quarterly VC

investment in German cloud companies was \$0.30 million, while EU cloud computing companies received average quarterly VC investment of \$8.2 million.

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.

The GDP data are quarterly, seasonally adjusted, fixed purchase power parity GDP.³¹ These data were obtained for the EU (a total of 25 countries excluding France and Germany), France, and Germany from Q1 1995 through Q4 2010. We subtract the GDP levels of France and Germany from the EU and then calculate a percentage growth rate from each previous quarter for France, Germany, and the EU.

Data on broadband penetration, which is equal to the number of broadband subscriptions per 100 inhabitants, were obtained from the OECD for 21 of the 27 EU member states from Q2 2002 through Q4 2010.³² To calculate an EU-specific measure of broadband penetration (excluding France and Germany) 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-specific measure of broadband penetration. Finally, quarterly broadband

³¹ Data accessed through <http://stats.oecd.org>.

³² Data accessed through <http://stats.oecd.org>.

penetration rates were calculated by linearly interpolating the semi-annual series. These supplemental data are summarized in Appendix A for France and Appendix B for Germany.

4. Estimation and Results

We have conducted multiple statistical analyses in order to determine whether investment in venture-backed French and German cloud companies declined subsequent to the Wizzgo and 2006 German District Court rulings. Each of these analyses are variants of difference-in-difference regression frameworks that rely on comparing historical investment levels in France and Germany to those in the EU in order to identify any statistically significant increase in VC investment in French and German cloud companies after the court rulings.

Our regression analyses are variants of the following two regression models that account for the impact of a variety of factors on quarterly venture-backed investment in the identified cloud companies. For France:

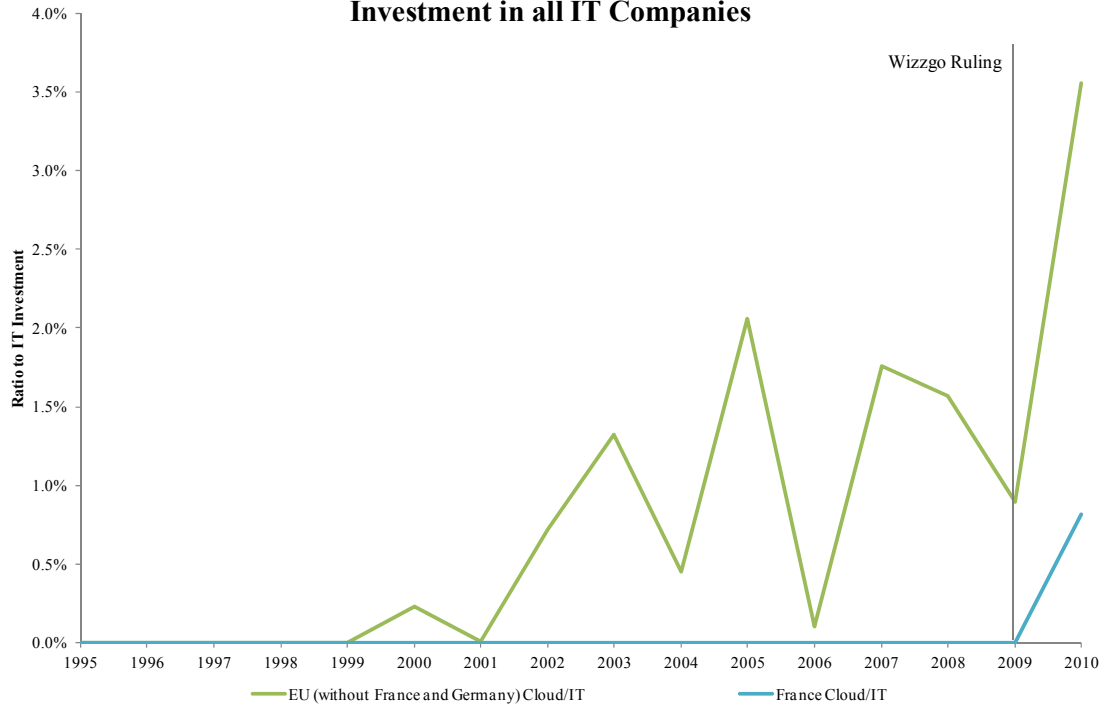
$$VC Ratio_{r,t} = \beta_0 + \beta_1(France Indicator)_r + \beta_2(Q1 2009 or After Dummy)_t + \beta_3(Effect of Wizzgo Decision on French VC Investment)_{r,t} + \theta X_{r,t} + \varepsilon_{r,t}. \quad (1)$$

And for Germany:

$$VC Ratio_{r,t} = \beta_0 + \beta_1(Germany Indicator)_r + \beta_2(Q3 2006 or After Dummy)_t + \beta_3(Effect of German Decisions on German VC Investment)_{r,t} + \theta X_{r,t} + \varepsilon_{r,t}. \quad (2)$$

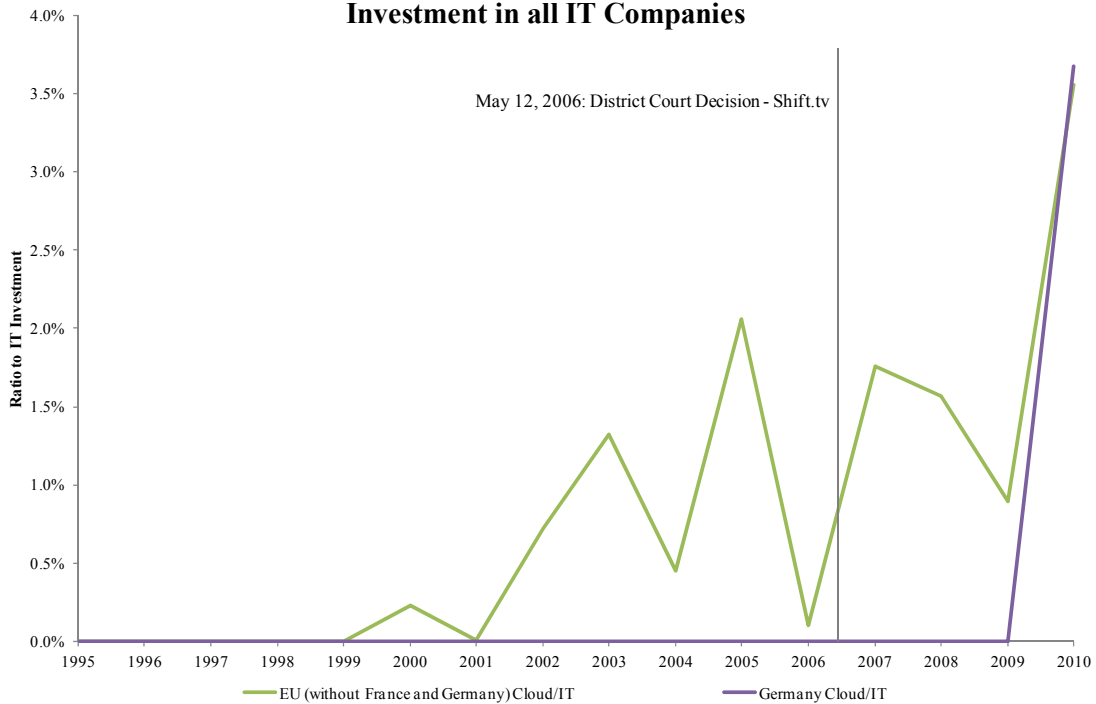
The dependent variable, $VC Ratio_{r,t}$, is VC dollars invested in the cloud computing companies in region r at quarter t divided by VC dollars invested in information technology (IT) companies in region r at quarter t . We normalized our dependent variable this way to control for secular trends in the VC market, as discussed in Section 2.3 above. Figure 1 depicts $VC Ratio$ for France and the EU annually from 1995 through 2010; Figure 2 depicts $VC Ratio$ for Germany and the EU annually from 1995 through 2010.

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



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

Figure 2
Ratio of Investment in German Cloud Computing Companies to Investment in all IT Companies



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

The explanatory variable *France Indicator* (*Germany Indicator*) equals one for investment in French (German) cloud computing companies and zero for investment in German (France) and EU cloud computing companies. The explanatory variable *Q1 2009 or After Dummy* (*Q3 2006 or After Dummy*) equal zero for all quarters before the French (German) Court ruling in November 2008 (May 2006) and one in Q1 2009 (Q3 2006) and all quarters thereafter. The explanatory variable, *Effect of Wizzgo Decision on French VC Investment* (*Effect of German Decisions on German VC Investment*), a dummy variable capturing the interaction between the *France Indicator* (*Germany Indicator*) and the *Q1 2009 Dummy* (*Q3 2006 or After Dummy*), equals one for investment in French (German) cloud computing companies in Q1 2009 (Q3 2006) 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 the parameter β_3 , which provides an estimate of the effect of the French and German rulings on investment in French and German cloud computing, respectively, controlling for trends in France and Germany relative to the EU (captured by the country indicators), and trends in cloud computing generally (captured by *Q1 2009 or After Dummy* and *Q3 2006 or After Dummy*) absent the policy.

The annual series plotted above in Figures 1 and 2 shows a long-term upward trend in VC investment in cloud computing companies in the EU beginning well before the French and German rulings. In order to focus more narrowly on the time period surrounding the French ruling, we analyze investment levels from 2006 to 2010. Doing so helps to eliminate long-term investment trends prior to 2006 from influencing the results. Similarly, in order to focus more narrowly on the time period surrounding the 2006 German District Court ruling, we first analyze

investment levels from 2004 to 2008. We also investigate the effect over a longer time period, 2004 to 2010, because additional court rulings were made in 2006, 2007, and 2009, and because the litigation involving Shift.tv and Safe.tv, to our knowledge, has not yet been completely resolved.

Our first set of regression results are presented below in Table 1, and show that investment in venture-backed cloud computing companies is lower in France than in the EU after the Wizzgo ruling. The coefficient on β_3 in Model 1, which provides an estimate of the effect of the Wizzgo ruling on VC investment in French cloud computing companies, is equal to -0.0185. This indicates that the increase in average VC investment in cloud computing in France as a percentage of VC investment in IT in France from the period Q1 2006 through Q4 2008 to the period Q1 2009 through Q4 2010 was approximately 1.85 percent lower than the corresponding rise in cloud computing investment in the EU. This estimate of β_3 , statistically significant at the 90 percent confidence level, implies that VC investment in French cloud computing companies decreased, relative to the rest of the EU, by an average of \$2.0 million per quarter after the Wizzgo ruling, or approximately \$16 million in total for 2009 and 2010.

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 control 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 Wizzgo Decision on French VC Investment* is almost identical to its magnitude and significance in Model 1. The implied decrease in quarterly French VC investment is nearly identical as well.

Table 1
Cloud Computing Regression Results: France vs. the EU
Dependent Variable: Ratio of Cloud Computing VC Dollars to
Total IT VC Dollars¹

Independent Variables	(1)	(2)
France Indicator	-0.0125*** <i>(0.0041)</i>	-0.0207*** <i>(0.0060)</i>
Q1 2009 Dummy ²	0.0223** <i>(0.0092)</i>	0.0175* <i>(0.0091)</i>
Effect of the Wizzgo Decision on French VC Investment	-0.0185* <i>(0.0095)</i>	-0.0176* <i>(0.0089)</i>
Percent Change in GDP		0.4229** <i>(0.2011)</i>
Broadband Penetration Rate		0.1406** <i>(0.0641)</i>
Constant	0.0125*** <i>(0.0041)</i>	-0.0137 <i>(0.0112)</i>
Observations	40	40
R-Squared	0.500	0.535
Implied Quarterly Decrease in French Cloud VC Investment (\$ Millions)	-2.0	-1.9
Length of Time Period	1Q 2006 - 4Q 2010	1Q 2006 - 4Q 2010

Notes:

[1] *** indicates significance at a 1 percent level, ** indicates significance at a 5 percent level, and * indicates significance at a 10 percent level. Robust standard errors are provided under the point estimates in italics.

[2] Decision by Tribunal de Grande Instance of Paris in November of 2008. The 2009 Dummy variable is set equal to one for all quarters after 4Q 2008.

Analogous regression results for Germany are presented below in Table 2 and show that investment in venture-backed cloud computing companies is lower in Germany than in the EU after the 2006 German District Court ruling, both when a shorter post-ruling period is used (Q3 2006 to Q4 2008) and when a longer post-ruling period is analyzed (Q3 2006 to Q4 2010). Model 3, which estimates the estimate of the effect of the 2006 German District Court ruling on VC investment through the end of 2008, shows that the effect of the 2006 German District Court ruling (as well as other similar rulings that followed later in 2006 and 2007) on VC investment in

German cloud computing companies is equal to -0.0115. This indicates that the change in average VC investment in cloud computing in Germany as a percentage of VC investment in IT in Germany from the period Q1 2004 through Q2 2006 to the period Q3 2006 through Q4 2008 was approximately 1.15 percent lower than the corresponding rise in cloud computing investment in the EU. This estimate, statistically significant at the 95 percent confidence level, implies that VC investment in German cloud computing companies decreased, relative to the rest of the EU, by an average of \$0.5 million per quarter after the 2006 German District Court ruling, or approximately \$3 million in total from 3Q 2006 through 4Q 2008.

Table 2
Cloud Computing Regression Results: Germany vs. the EU
Dependent Variable: Ratio of Cloud Computing VC Dollars to Total IT VC Dollars¹

Independent Variables	(3)	(4)	(5)	(6)
Germany Indicator	-0.0031* <i>(0.0018)</i>	-0.0026 <i>(0.0020)</i>	-0.0031* <i>(0.0017)</i>	-0.0029 <i>(0.0028)</i>
Q3 2006 Dummy ²	0.0115** <i>(0.0049)</i>	0.0103* <i>(0.0053)</i>	0.0205*** <i>(0.0053)</i>	0.0098 <i>(0.0094)</i>
Effect of German Decisions on German VC Investment	-0.0115** <i>(0.0049)</i>	-0.0133** <i>(0.0054)</i>	-0.0156** <i>(0.0073)</i>	-0.0233*** <i>(0.0065)</i>
Percent Change in GDP		0.1952 <i>(0.1712)</i>		0.2488 <i>(0.1645)</i>
Broadband Penetration Rate		0.0270 <i>(0.0317)</i>		0.1181 <i>(0.0821)</i>
Constant	0.0031* <i>(0.0018)</i>	-0.0010 <i>(0.0042)</i>	0.0031* <i>(0.0017)</i>	-0.0102 <i>(0.0089)</i>
Observations	40	40	56	56
R-Squared	0.396	0.418	0.256	0.311
Implied Quarterly Decrease in German Cloud VC Investment (\$ Millions)	-0.5	-0.5	-0.6	-0.9
Length of Time Period	1Q 2004 - 4Q 2008	1Q 2004 - 4Q 2008	1Q 2004 - 4Q 2010	1Q 2004 - 4Q 2010

Notes:

[1] *** indicates significance at a 1 percent level, ** indicates significance at a 5 percent level, and * indicates significance at a 10 percent level. Robust standard errors are provided under the point estimates in italics.

[2] Decision by the German District Court against Shift.tv on May 12, 2006. The 2006 Dummy variable is set equal to one for all quarters after 2Q 2006. Additional decisions include an Appeals Court ruling against Shift.tv on November 28, 2006, a District Court ruling against Save.tv on May 9, 2007, an Appeals Court ruling in favor of Save.tv on October 9, 2007, and a Federal Court decision in which the cases against Shift.tv and Save.tv were remanded back to the Appeals Court on April 22, 2009.

Model 4 is similar to Model 3, except that it incorporates variables that control for GDP growth and broadband penetration. As shown in column 2 of Table 2, the coefficients on these

control variables have the expected positive sign. Interpretation of the other variables remains the same, and as shown in the table, the magnitude and significance of the *Effect of German Decisions on German VC Investment* is almost identical to its magnitude and significance in Model 1. The implied decrease in German VC investment is nearly identical as well.

As described above in Sections 2.2 and 3.1, the litigation involving Shift.tv and Safe.tv, to our knowledge, has not yet been completely resolved; as such, uncertainty likely exists regarding the viability of certain cloud business models in Germany. To investigate whether this ongoing legal uncertainty continued to depress VC investment in German cloud computing in 2009 and 2010, we also analyzed a longer post-ruling period (Q3 2006 to Q4 2010). These results, presented in Models 5 and 6 in Table 2, show that the magnitude and significance of the *Effect of German Decisions on German VC Investment* is similar to the estimates in Models 3 and 4. The implied decrease in German VC investment is nearly identical as well.

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 France and Germany 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 (France) and Model 3 and 5 (Germany) 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 decrease in investment in French (German) venture-backed cloud computing companies, relative to the rest of the EU, amounted to an average of \$0.9 million (\$0.2 million) per quarter after the Wizzgo (German) ruling.

Table 3
Cloud Computing Regression Results: France and Germany vs. ROW
Dependent Variable: Ratio of Cloud Computing VC Dollars to Total IT VC Dollars¹

Independent Variables	(7)	(8)	(9)
France Indicator	-0.0057* <i>(0.0028)</i>		
Q1 2009 Dummy ²	0.0117*** <i>(0.0037)</i>		
Effect of the Wizzgo Decision on French VC Investment	-0.0079* <i>(0.0045)</i>		
Germany Indicator		-0.0012 <i>(0.0008)</i>	-0.0012 <i>(0.0008)</i>
Q3 2006 Dummy ³		0.0056* <i>(0.0033)</i>	0.0104*** <i>(0.0026)</i>
Effect of German Decisions on German VC Investment		-0.0056* <i>(0.0033)</i>	-0.0054 <i>(0.0056)</i>
Constant	0.0057* <i>(0.0028)</i>	0.0012 <i>(0.0008)</i>	0.0012 <i>(0.0008)</i>
Observations	40	40	56
R-Squared	0.467	0.239	0.111
Implied Quarterly Decrease in French Cloud VC Investment (\$ Millions)	-0.9		
Implied Quarterly Decrease in German Cloud VC Investment (\$ Millions)		-0.2	-0.2
Length of Time Period	1Q 2006 - 4Q 2010	1Q 2004 - 4Q 2008	1Q 2006 - 4Q 2010

Notes:

[1] *** indicates significance at a 1 percent level, ** indicates significance at a 5 percent level, and * indicates significance at a 10 percent level. Robust standard errors are provided under the point estimates in italics.

[2] Decision by Tribunal de Grande Instance of Paris in November of 2008. The 2009 Dummy variable is set equal to one for all quarters after 4Q 2008.

[3] Decision by the German District Court against Shift.tv on May 12, 2006. The 2006 Dummy variable is set equal to one for all quarters after 2Q 2006. Additional decisions include an Appeals Court ruling against Shift.tv on November 28, 2006, a District Court ruling against Save.tv on May 9, 2007, an Appeals Court ruling in favor of Save.tv on October 9, 2007, and a Federal Court decision in which the cases against Shift.tv and Save.tv were remanded back to the Appeals Court on April 22, 2009.

As an alternative approach to examining the robustness of our findings, we have examined the extent to which investment levels decrease, relative to the rest of the EU, subsequent to the French and German rulings 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 French and German rulings should only affect cloud computing companies. The Models presented in Table 4 for France, and Table 5 for Germany, are analogous to Models 1 and 2 for France, and Models 3 – 6 for Germany, except that they are run on “internet-specific” companies rather than cloud companies.³³

Table 4
Cloud Computing Regression Results: France vs. the EU
Dependent Variable: Ratio of Internet Specific VC Dollars to
Total IT VC Dollars¹

Independent Variables	(10)	(11)
France Indicator	0.0693* <i>(0.0365)</i>	0.0268 <i>(0.0478)</i>
Q1 2009 Dummy ²	0.1006 <i>(0.0603)</i>	0.0733 <i>(0.0670)</i>
Effect of the Wizzgo Decision on French VC Investment	0.0537 <i>(0.0892)</i>	0.0458 <i>(0.0870)</i>
Percent Change in GDP		1.5879 <i>(2.4060)</i>
Broadband Penetration Rate		0.7718 <i>(0.7171)</i>
Constant	0.1966*** <i>(0.0246)</i>	0.0546 <i>(0.1314)</i>
Observations	40	40
R-Squared	0.307	0.321
Length of Time Period	1Q 2006 - 4Q 2010	1Q 2006 - 4Q 2010

Notes:

[1] *** indicates significance at a 1 percent level, ** indicates significance at a 5 percent level, and * indicates significance at a 10 percent level. Robust standard errors are provided under the point estimates in italics.

[2] Decision by Tribunal de Grande Instance of Paris in November of 2008. The 2009 Dummy variable is set equal to one for all quarters after 4Q 2008.

As the results in Table 4 show, investment levels in French internet-specific companies actually *increase*, relative to the rest of the EU, although not significantly, following the Wizzgo

³³ 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.”

ruling in France. This suggests that the findings described above are specific to cloud companies and do not reflect general trends associated with venture-backed investment in internet-specific companies. The results in Table 5 show that a similar result holds for investment levels in German internet-specific companies. Specifically, investment levels in German internet-specific companies also *increase*, relative to the rest of the EU, in Germany following the 2006 German District Court ruling; this increase is significant in Models 13 and 14, and insignificant in Models 12 and 15.

Table 5
Cloud Computing Regression Results: Germany vs. the EU
Dependent Variable: Ratio of Internet Specific VC Dollars to Total IT VC Dollars¹

Independent Variables	(12)	(13)	(14)	(15)
Germany Indicator	-0.0367 <i>(0.0666)</i>	-0.0712 <i>(0.0644)</i>	-0.0367 <i>(0.0655)</i>	-0.0450 <i>(0.0696)</i>
Q3 2006 Dummy ²	-0.0161 <i>(0.0446)</i>	-0.0355 <i>(0.0903)</i>	0.0284 <i>(0.0468)</i>	-0.0723 <i>(0.0814)</i>
Effect of German Decisions on German VC Investment	0.1620 <i>(0.1099)</i>	0.2254** <i>(0.0930)</i>	0.1666* <i>(0.0922)</i>	0.1297 <i>(0.0953)</i>
Percent Change in GDP		-10.5156** <i>(4.7984)</i>		-2.4386 <i>(3.0346)</i>
Broadband Penetration Rate		-0.4977 <i>(0.8165)</i>		0.8246 <i>(0.6774)</i>
Constant	0.2129*** <i>(0.0360)</i>	0.3445*** <i>(0.0981)</i>	0.2129*** <i>(0.0354)</i>	0.1538* <i>(0.0838)</i>
Observations	40	40	56	56
R-Squared	0.105	0.281	0.161	0.202
Length of Time Period	1Q 2004 - 4Q 2008	1Q 2004 - 4Q 2008	1Q 2004 - 4Q 2010	1Q 2004 - 4Q 2010

Notes:

[1] *** indicates significance at a 1 percent level, ** indicates significance at a 5 percent level, and * indicates significance at a 10 percent level. Robust standard errors are provided under the point estimates in italics.

[2] Decision by the German District Court against Shift.tv on May 12, 2006. The 2006 Dummy variable is set equal to one for all quarters after 2Q 2006. Additional decisions include an Appeals Court ruling against Shift.tv on November 28, 2006, a District Court ruling against Save.tv on May 9, 2007, an Appeals Court ruling in favor of Save.tv on October 9, 2007, and a Federal Court decision in which the cases against Shift.tv and Save.tv were remanded back to the Appeals Court on April 22, 2009.

4.1.2. Stationarity³⁴

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 the decrease in French and German investment subsequent to the French and German rulings, relative to the EU, 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 simple ordinary least squares regression on the difference between French and EU investment levels against a time trend, as well as on the difference between German and EU investment levels against a time trend. This revealed that French investment levels relative to EU investment levels were falling on average, but not significantly, during the pre-ruling time period, and that German investment levels relative to EU investment levels were increasing on average, but not significantly, during the pre-ruling time period.

To more formally test for stationarity in our time series data, we conducted three well-known tests on our data: 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, we do not 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.³⁵ After correcting for potential

³⁴ 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.

³⁵ Wooldridge, J.M, *Econometric Analysis of Cross Section and Panel Data*, Cambridge, MA: MIT Press (2002), pp. 282-283.

autocorrelation, the estimate of the effect of the French and German rulings remains significant and negative, and the implied increase in French and German cloud VC investment is qualitatively similar.

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 for France, and Models 3 – 6 for Germany, where the dependent variable was the total quarterly cloud VC investment measured in dollars, rather than measured in terms of a ratio relative to total IT spending. Total other IT VC investment and total other VC investment in a given region were controlled for by their inclusion as separate independent variables in the regression analysis. The results of these regressions, presented in Tables 6 and 7, show that the French and German rulings continue to have a negative and significant impact on cloud VC investment, although both the French and German results imply a larger decrease in cloud VC investment, relative to the EU, as compared to the regressions in which cloud VC investment is measured in terms of a ratio relative to total IT spending.

In Model 16, the analog to Model 1, French investment was, on average, \$9.9 million lower each quarter after the Wizzgo ruling, relative to the EU, totaling \$80 million over the two subsequent years. The corresponding figures for Model 17, the Model 2 analog, which incorporates controls for GDP changes and broadband penetration, imply \$8.1 million lower investment on a quarterly basis, which totals \$65 million over two years.

Table 6
Cloud Computing Regression Results: France vs. the EU
Dependent Variable: Cloud Computing VC Dollars¹

Independent Variables	(16)	(17)
French IT Minus Cloud VC Investment	0.0203*** <i>(0.0067)</i>	0.0195*** <i>(0.0062)</i>
Total French VC Investment Minus IT Minus Cloud VC Investment	0.0002 <i>(0.0010)</i>	-0.0007 <i>(0.0010)</i>
France Indicator	1.6962 <i>(3.2316)</i>	-3.0309 <i>(4.1813)</i>
Q1 2009 Dummy ²	10.3236** <i>(3.8434)</i>	8.0265** <i>(3.9036)</i>
Effect of the Wizzgo Decision on French VC Investment	-9.9446** <i>(3.8490)</i>	-8.1107** <i>(3.4266)</i>
Percent Change in GDP		270.0514** <i>(105.7151)</i>
Broadband Penetration Rate		63.7616** <i>(31.1572)</i>
Constant	-3.8858 <i>(3.8896)</i>	-14.9104*** <i>(5.1048)</i>
Observations	40	40
R-Squared	0.571	0.628
Implied Quarterly Decrease in French Cloud VC Investment (\$ Millions)	-9.9	-8.1
Length of Time Period	1Q 2006 - 4Q 2010	1Q 2006 - 4Q 2010

Notes:

[1] *** indicates significance at a 1 percent level, ** indicates significance at a 5 percent level, and * indicates significance at a 10 percent level. Robust standard errors are provided under the point estimates in italics.

[2] Decision by Tribunal de Grande Instance of Paris in November of 2008. The 2009 Dummy variable is set equal to one for all quarters after 4Q 2008.

Table 7 presents similar results for Germany. In Model 18, the analog to Model 3, German investment was, on average, \$3.8 million lower each quarter after the 2006 German District Court ruling (after controlling for EU differences). The corresponding figure for Model 19, the Model 4 analog, which incorporates controls for GDP changes and broadband penetration, implies \$5.0 million lower investment on a quarterly basis. When the longer post-ruling period is

analyzed, the estimated decrease in quarterly investment is \$7.2 million in Model 20 and \$9.1 million in Model 21.

Table 7
Cloud Computing Regression Results: Germany vs. the EU
Dependent Variable: Cloud Computing VC Dollars¹

Independent Variables	(18)	(19)	(20)	(21)
German IT Minus Cloud VC Investment	0.0119 <i>(0.0079)</i>	-0.0129* <i>(0.0069)</i>	0.0144* <i>(0.0078)</i>	0.0144* <i>(0.0073)</i>
Total German VC Investment Minus IT Minus Cloud VC Investment	-0.0005 <i>(0.0027)</i>	-0.0020 <i>(0.0023)</i>	-0.0022 <i>(0.0036)</i>	-0.0033 <i>(0.0032)</i>
Germany Indicator	1.8987 <i>(2.4262)</i>	1.9702 <i>(2.3332)</i>	1.8041 <i>(1.8319)</i>	1.6259 <i>(1.9181)</i>
Q3 2006 Dummy ²	3.7146 <i>(2.5231)</i>	3.9986 <i>(2.4620)</i>	7.5471*** <i>(2.3380)</i>	6.7182** <i>(2.6475)</i>
Effect of German Decisions on German VC Investment	-3.7622 <i>(2.5160)</i>	-4.9726* <i>(2.8590)</i>	-7.2437*** <i>(2.3567)</i>	-9.0964*** <i>(2.7749)</i>
Percent Change in GDP		159.9313 <i>(100.3206)</i>		143.5600 <i>(89.2020)</i>
Broadband Penetration Rate		9.6318 <i>(16.3778)</i>		18.5790 <i>(12.9991)</i>
Constant	-2.3038 <i>(2.7809)</i>	-3.9396 <i>(2.4841)</i>	-2.1293 <i>(2.0958)</i>	-4.3394** <i>(1.8465)</i>
Observations	40	40	56	56
R-Squared	0.448	0.495	0.472	0.513
Implied Quarterly Decrease in German Cloud VC Investment (\$ Millions)	-3.8	-5.0	-7.2	-9.1
Length of Time Period	1Q 2004 - 4Q 2008	1Q 2004 - 4Q 2008	1Q 2004 - 4Q 2010	1Q 2004 - 4Q 2010

Notes:

[1] *** indicates significance at a 1 percent level, ** indicates significance at a 5 percent level, and * indicates significance at a 10 percent level. Robust standard errors are provided under the point estimates in italics.

[2] Decision by the German District Court against Shift.tv on May 12, 2006. The 2006 Dummy variable is set equal to one for all quarters after 2Q 2006. Additional decisions include an Appeals Court ruling against Shift.tv on November 28, 2006, a District Court ruling against Save.tv on May 9, 2007, an Appeals Court ruling in favor of Save.tv on October 9, 2007, and a Federal Court decision in which the cases against Shift.tv and Save.tv were remanded back to the Appeals Court on April 22, 2009.

4.1.5. Investment Rounds (vs. Investment Ratios or Investment Levels)

We also ran regressions analogous to Models 1 and 2 for France, and Models 3 – 6 for Germany, where the dependent variable was the number of rounds of VC investment received within a given quarter (in France, Germany, or the EU), rather than total quarterly investment measured in dollars or the ratio of total quarterly investment relative to total IT spending. Our

results indicate that the effect of the French and German rulings on the number of French or German VC investment rounds is negative and significant in Germany, and negative, although insignificant in France. This suggests that our principal results are not being driven by a small number of large VC investments and provides further evidence that decisions around copyright scope can have significant impacts on VC investment.

5. Conclusions

In this paper we set out to examine the effect of copyright policy changes on VC investment in cloud computing companies by analyzing the effect of French and German court rulings on VC investment in French- and German-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 decrease in French and German cloud companies after various French and German court rulings.

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 French and German rulings led to reduced investment in French and German cloud computing companies compared to the EU experience. Our results suggest that these rulings led to an average reduction in VC investment in French and German cloud computing firms of \$4.6 and \$2.8 million per quarter, respectively, implying a total decrease in French and German VC investment of \$87 million after these rulings through the end of 2010. When paired with the findings of the enhanced effects of VC investment relative to corporate investment, this may be the equivalent of \$269.7 million in traditional R&D investment.

References

“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>.

Bird & Bird, “Copyright Update: an Update on Developments in Europe in 2009,” accessed through <http://www.twobirds.com/English/Publications/NewsLetters/Upload/Copyright%20Update%202009.pdf>.

Bundesgerichtshof I ZR 216/06.

Burghart, Sara, “Cablevision – Please Rewind: A Legal Analysis of Copyright Infringement by Remote Storage-DVRs under German and U.S. Copyright Law,” unpublished thesis paper, Boston University School of Law, 2010.

CNet, “Online-Videorekorder: mit ein paar Klicks zum Wunsch-Programm,” accessed through http://www.cnet.de/praxis/tv-gaming/39195111/fullcontent/online_videorekorder_mit_ein_paar_klicks_zum_wunsch_programm.htm.

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>.

DeGroupNews.com, “Scandale judiciaire autour de Wizzgo,” November 26, 2008, accessed through <http://www.degroupnews.com/actualite/n3038-scandale-judiciaire-autour-de-wizzgo.html>.

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>.

European Digital Rights, “The Response of the European Digital Rights to the European Commission's Green Paper on the Online Distribution of Audiovisual Works,” 2011, accessed through http://ec.europa.eu/internal_market/consultations/2011/audiovisual/registered-organisation/edri_en.pdf.

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.utilizer.com/node/770174>.

International Law Office, “Federal Court Rules on Internet-Based Video Recording,” June 11, 2009, accessed through

<http://www.internationallawoffice.com/newsletters/detail.aspx?g=a3b4f236-0844-4890-8a9c-2801a77792d8&redir=1>.

International Law Office. "Rise and Fall of Online Digital Video Recorders," February 19, 2009, accessed through <http://www.internationallawoffice.com/newsletters/detail.aspx?g=a08cc455-b5ae-42d4-881d-fa85fc7c3a53>.

IRIS Legal Observations of the European Audiovisual Observatory, "DPMA Decides that VG Media Does Not Need to Grant Rights to Operate an Online Video Recorder," 2011, accessed through <http://merlin.obs.coe.int/iris/2011/1/article22.en.html>.

IRIS Legal Observations of the European Audiovisual Observatory, "RTL Loses Dispute with Save.tv," 2011, accessed through <http://merlin.obs.coe.int/iris/2011/8/article21.en.html>.

IRIS Legal Observations of the European Audiovisual Observatory, "DPMA Decides that VG Media Does Not Need to Grant Rights to Operate an Online Video Recorder," 2011, accessed through <http://merlin.obs.coe.int/iris/2011/1/article22.en.html>.

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/>.

Kortum, Samuel & Lerner, Josh, "Assessing the Contribution of Venture Capital to Innovation," *The RAND Journal of Economics* 31, no. 4 (Winter, 2000): 674-692.

"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/>.

"OECD Stat Extracts," *Organization for Economic Co-operation and Development*, <http://stats.oecd.org>.

"OLG Dresden 14 U 801/07 Urteil vom 12.07.2011," accessed through <http://www.recht-hat.de/urteile/urheberrecht-urteile/olg-dresden-14-u-80107-urteil-vom-12-07-2011-rtl-gegen-save-tv/>.

"Private Equity Module: ThomsonONE.com Investment Banking," *thomsonreuters.com*, last accessed October 17, 2011, http://thomsonreuters.com/content/financial/pdf/i_and_a/thomsononecom_ib_pe.pdf.

Rosa, Catarina and Raade, Kristiina, "Profitability of Venture Capital Investment in Europe and the United States," (2006).

Schwiebacher, Armin, "Venture Capital Investment Practices in Europe and the United States," (2008).

Singh, Basant Narayan, "Top 10 Cloud Computing Service 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>.

"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>.

"The Top 20 Software as a Service (SaaS) Vendors," *clouds360.com*, last accessed October 3, 2011, <http://www.clouds360.com/saas.php>.

"Thomson ONE's Private Equity module powered by VentureXpert," *ThomsonOne*.

TVAnbieter.de, "Save.TV Gewinnt Rechtsstreit Gegen RTL Nur Teilweise," July 25, 2011, accessed through <http://www.tvanbieter.de/2011/07/online-videorecorder-save-tv-gewinnt-rechtsstreit-gegen-rtl-nur-teilweise/>.

Wizzgo, "Wizzgo Blog," March 16, 2009, accessed through www.wizzgo.com/blog/.

Wooldridge, J.M, *Econometric Analysis of Cross Section and Panel Data*, Cambridge, MA: MIT Press (2002).

ZDNet.fr, "TNT: Wizzgo Interdit d'Enregistrer les Programmes de France Télévisions et TF1," November 14, 2008, accessed through <http://www.zdnet.fr/actualites/tnt-wizzgo-interdit-d-enregistrer-les-programmes-de-france-televisions-et-tf1-39384863.htm>.

Appendix A - France
Summary Statistics for Investment Levels and Regression Variables

	Q1 1995 - Q4 2010						Pre-Wizzgo Decision: Q1 2006 - Q4 2008						Post-Wizzgo Decision: Q1 2009 - 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 French Cloud (\$ Millions) ¹	\$0.056	\$0.321	\$0.000	\$0.000	\$2.199	\$3.561	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.445	\$0.854	\$0.000	\$0.000	\$2.199	\$3.561
VC Investment in French Cloud as % of VC Investment in French IT ¹	0.05%	0.28%	0.00%	0.00%	1.70%		0.00%	0.00%	0.00%	0.00%	0.00%		0.38%	0.72%	0.00%	0.00%	1.70%	
VC Investment in EU Cloud (\$ Millions) ¹	\$3.645	\$7.301	\$0.000	\$0.000	\$32.645	\$233.303	\$5.900	\$7.388	\$0.000	\$3.070	\$20.500	\$70.800	\$9.840	\$12.037	\$0.000	\$3.707	\$32.645	\$78.720
VC Investment in EU Cloud as % of VC Investment in E.U. IT ¹	0.91%	1.88%	0.00%	0.00%	8.79%		1.25%	1.41%	0.00%	0.65%	3.83%		2.76%	2.87%	0.00%	1.97%	8.13%	
Real French GDP Growth Rate Prior Quarter ²	0.41%	0.51%	-1.58%	0.53%	1.31%		0.19%	0.69%	-1.45%	0.37%	1.07%		0.10%	0.71%	-1.58%	0.34%	0.60%	
Real EU GDP Growth Rate Prior Quarter ²	0.53%	0.61%	-2.33%	0.62%	1.34%		0.31%	0.90%	-1.84%	0.69%	1.04%		-0.03%	1.00%	-2.33%	0.30%	0.75%	
French Broadband Penetration Rate ³	18.01%	10.44%	1.57%	18.84%	33.66%		22.54%	3.75%	16.31%	22.95%	27.64%		30.95%	1.91%	28.30%	30.92%	33.66%	
EU Broadband Penetration Rate ³	13.61%	7.31%	1.78%	14.97%	22.62%		17.75%	2.83%	12.88%	18.14%	21.41%		21.57%	0.87%	20.15%	21.60%	22.62%	

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 - Germany
Summary Statistics for Investment Levels and Regression Variables

	Q1 1995 - Q4 2010						Pre-German District Court decision: Q1 2004 - Q2 2006						Post-German District Court decision: Q3 2006 - Q4 2008						Post-German District Court decision: Q3 2006 - Q4 2010					
	Mean	Std Dev	Min	Med	Max	Total	Mean	Std Dev	Min	Med	Max	Total	Mean	Std Dev	Min	Med	Max	Total	Mean	Std Dev	Min	Med	Max	Total
VC Investment in German Cloud (\$ Millions) ¹	\$0.087	\$0.690	\$0.000	\$0.000	\$5.473	\$5.473	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.304	\$1.290	\$0.000	\$0.000	\$5.473	\$5.473
VC Investment in German Cloud as % of VC Investment in German IT ¹	0.15%	1.15%	0.00%	0.00%	8.86%		0.00%	0.00%	0.00%	0.00%	0.00%		0.00%	0.00%	0.00%	0.00%	0.00%		0.49%	2.09%	0.00%	0.00%	8.86%	
VC Investment in EU Cloud (\$ Millions) ¹	\$3.645	\$7.301	\$0.000	\$0.000	\$32.645	\$233.303	\$3.514	\$7.094	\$0.000	\$0.000	\$22.710	\$35.140	\$6.913	\$7.728	\$0.000	\$4.545	\$20.500	\$69.126	\$8.214	\$9.671	\$0.000	\$4.483	\$32.645	\$147.846
VC Investment in EU Cloud as % of VC Investment in E.U. IT ¹	0.91%	1.88%	0.00%	0.00%	8.79%		1.18%	2.73%	0.00%	0.00%	8.79%		1.46%	1.46%	0.00%	1.30%	3.83%		2.04%	2.23%	0.00%	1.59%	8.13%	
Real German GDP Growth Rate Prior Quarter ²	0.32%	0.88%	-4.01%	0.36%	1.95%		0.44%	0.57%	-0.15%	0.29%	1.51%		0.27%	1.03%	-2.17%	0.62%	1.22%		0.24%	1.36%	-4.01%	0.62%	1.95%	
Real EU GDP Growth Rate Prior Quarter ²	0.53%	0.61%	-2.33%	0.62%	1.34%		0.71%	0.23%	0.36%	0.75%	0.99%		0.19%	0.94%	-1.84%	0.64%	1.04%		0.09%	0.94%	-2.33%	0.41%	1.04%	
German Broadband Penetration Rate ³	17.21%	10.31%	3.14%	16.55%	31.93%		10.10%	3.16%	6.01%	9.71%	15.01%		22.72%	3.81%	16.55%	23.07%	27.44%		26.17%	4.91%	16.55%	27.16%	31.93%	
EU Broadband Penetration Rate ³	13.61%	7.31%	1.78%	14.97%	22.62%		9.54%	2.83%	5.52%	9.40%	13.97%		18.61%	2.18%	14.97%	19.00%	21.41%		19.93%	2.26%	14.97%	20.54%	22.62%	

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.